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**Southwestern
Region**

# FINAL Vegetation Specialist Report

## Forest Plan Revision DEIS

**Submitted by:** /s/ *Mitchel R. White*
Mitchel R. White, Ph.D.
Ecologist
Apache-Sitgreaves National Forests

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# Specialist Report

## Introduction

The purpose of this assessment is to profile the terrestrial ecosystems of the Apache-Sitgreaves National Forests (ASNFs) and the surrounding area with an emphasis on vegetation (see the 2008 Vegetation Specialist Report (ASNFs 2008a) for a more in-depth discussion of this topic). This report evaluates and discloses the potential environmental consequences on the vegetation resource that may result from the adoption of a revised land management plan. It examines, in detail, four different alternatives for revising the 1987 Apache-Sitgreaves NFs land management plant (1987 forest plan).

## Relevant Laws, Regulations, and Policy that Apply

The authority for restoring National Forest System lands derives from many laws enacted by Congress that define the purpose of national forests and grasslands. Forest Service Manual 2020 - Ecological Restoration and Resilience, summarizes the principal statutes that govern management and restoration, and provides an overview of each statute (see the Apache-Sitgreaves National Forests Proposed Land Management Plan for a more in-depth listing).

The Laws include:

- *Organic Administration Act* of 1897 (16 U.S.C. 475, 551)
- *Weeks Act* of 1911, as amended (16 U.S.C. 515, 552)
- *Knutsen-Vandenberg Act* of 1930 (16 U.S.C. at 576b)
- Anderson-Mansfield Reforestation and Revegetation Joint Resolution Act of 1949 (16 U.S.C. 581j and 581j(note))
- *Granger-Thye Act* of 1950 (16 U.S.C. at 580g-h)
- *Surfaces Resources Act* of 1955 (30 U.S.C. 611-614)
- *Sikes Act* (Fish and Wildlife Conservation) of September 15, 1960 (16 U.S.C. at 670g)
- *Multiple-Use Sustained Yield* Act of 1960 (16 U.S.C. 528-531)
- *Wilderness Act* of 1964 (16 U.S.C. §§ 1131 et seq.)
- *Wild and Scenic Rivers Act* of 1968 (82 Stat. 906, as amended, 16 U.S.C. 1271 (note), 1271-1287)
- *National Environmental Policy Act* of 1969 (16 U.S.C. 4321 et seq.)
- *Clean Air Act* of 1970 as amended 1977 and 1990 (42 U.S.C. 7401, 7418, 7470, 7472, 7474, 7475, 7491, 7506, 7602)
- *Endangered Species Act* of 1973 (P.L. 93-205, 87 Stat. 884; 16 U.S.C. 1531-1544, as amended)
- *Forest and Rangeland Renewable Resources Planning Act* of 1974, as amended through Public Law 106–580, Dec. 31, 2000
- *National Forest Management Act* of 1976 (16 U.S.C. 1600-1614, 472a)
- *Clean Water Act* of 1977 (33 U.S.C. 1251, 1254, 1323, 1324, 1329, 1342, 1344; 91 Stat. 1566)
- *North American Wetland Conservation Act* of 1989 (16 U.S.C. 4401 (note), 4401-4413, 16 U.S.C. 669b (note))
- *Healthy Forests Restoration Act* of 2003 (16 U.S.C. at 1611-6591)
- *The Omnibus Appropriations Act* for Fiscal Year 2003 [Stewardship End Result Contracting Projects (Public Law 108-7, 16 U.S.C. 2104 (note))
- *Tribal Forest Protection Act* of 2004 (P.L. 108-278, 118 Stat. 868; 25 U.S.C. 3115a)

Principal Executive Orders relevant to ecological restoration are listed below:

- Executive Order 11514: Protection and enhancement of environmental quality (35 FR 4247, March 7, 1970)
- Executive Order 11644: Use of off-road vehicles on the public lands (37 FR 2877, February 9, 1972)
- Executive Order 11988: Floodplain management (42 FR 26951, May 25, 1977)
- Executive Order 11990: Protection of wetlands (42 FR 26961, May 25, 1977)
- Executive Order 13112; Invasive species (64 FR 6183, February 8, 1999)

Forest Service Manual 2020 itself also establishes further policy aimed to re-establish and retain ecological resilience of National Forest System lands.

## Methodology and Analysis Process

This report describes and analyzes the 14 PNVTs of the ASNFs. It describes the forests role in the larger landscape of the ecoregion and the contribution to sustainability of these vegetation types. The report quantifies how far departed the PNVTs' structure, composition, and cover are from desired condition and historic range of variability using the measure of Departure Index[1] (DI) and what that departure and trend will be after implementing the vegetation treatment objectives identified in each alternative. It discusses the threats and risks that have caused departures from desired conditions and may hinder progress towards desired conditions. This report examines the state of quaking aspen (*Populus tremuloides* Michx.), or aspen, by estimating the current and potential amount (acres) of aspen and whether it has open or closed canopy (which indicates the age and state of the aspen stands). The report also describes the overstory and understory herbaceous vegetation cover relationship using the amount (acres) of closed canopy cover. See the 2008 Vegetation Specialist Report (ASNFs 2008a) for a more in-depth discussion of these topics.

## Potential Natural Vegetation Types (PNVTs)

The Vegetation Specialist Report (ASNFs 2008a) is organized around Potential Natural Vegetation Types (PNVTs). The Region 3 Ecological Sustainability Report (USDA Forest Service 2008) provides guidance on evaluating ecological sustainability by using PNVTs as the framework for vegetation analysis.

The distribution of PNVTs on Region 3 National Forest System lands and across land ownership throughout Arizona and New Mexico was analyzed by the Nature Conservancy (Vander Lee et al. 2006). PNVTs are coarse-scale groupings of ecosystem types that share similar geography, soils, vegetation, and historic ecosystem disturbances such as fire, drought, and grazing by native species. PNVTs represent the vegetation type and characteristics that would occur when natural disturbance regimes and biological processes prevail (Vander Lee et al. 2006). Tables 1 and 2 display the major PNVTs (Vander Lee et al.

[1] Departure Index (DI) is a rating based on departure from characteristic or desired vegetation and fuel conditions considered to be those that occurred within the historic range of variability (HRV). Uncharacteristic conditions are those that did not occur within the HRV, such as invasive species (e.g., plants, insects, and diseases), changes in forest structure, size class and canopy cover due to vegetation treatments, repeated annual livestock grazing, and uncharacteristic fire behavior due changed fuel characteristics. Determination of the amount of departure is based on comparison of a composite measure of forest structure, size class, and canopy cover. DI classes are: No departure (0-20%); composition and structure of vegetation and fuels are similar to HRV and/or DCs, and risk of loss of key ecosystem components (e.g., native species, forest structure, soil) is minimal. Low departure (21-40%); composition and structure of vegetation and fuels are somewhat altered from HRV and/or DCs, and risk of loss of key ecosystem components is low. Moderate departure (41-60%); composition and structure of vegetation and fuels are moderately altered from HRV and/or DCs, and risk of loss of key ecosystem components is moderate. High departure (61-80%); composition and structure of vegetation and fuels are highly altered from HRV and/or DCs, and risk of loss of key ecosystem components is great. Severe departure (81-100%); composition and structure of vegetation and fuels are extremely altered from HRV and/or DCs, and risk of loss of key ecosystem components is pronounced.

2006) found within the ASNFs. The ASNFs' Terrestrial Ecosystem Survey (ASTES) data (Laing et al. 1987) was used for PNVT delineation and development, then used to summarize vegetation for this analysis because of their relevance to the characterizations of historic range of natural variability (HRV[2]) and vegetation state and transition models[3] being developed for PNVTs in preparation for the forest planning process.

The PNVTs (table 1) used for this analysis were summarized from the Terrestrial Ecosystem Survey of the Apache-Sitgreaves National Forests (Laing et al. 1987) and cross-walked with the Southwest Regional Gap Analysis Project (Lowry et al. 2005) land cover vegetation data.

**Table 1. The 14 potential natural vegetation types (PNVTs) of the ASNFs**

| Potential Natural Vegetation Types (PNVTs)†‡ | | | | |
|---|---|---|---|---|
| **Forests** | **Woodlands** | **Grasslands** | **Chaparral** | **Riparian Areas/ Riparian Forests** |
| ponderosa pine (PPF) | Madrean pine-oak (MPOW) | Great Basin (GBG) | interior (IC) | wetland/cienega (WCRA) |
| wet mixed conifer (WMCF) | piñon-juniper (PJW) | semi-desert (SDG) | | cottonwood-willow (CWRF) |
| dry mixed conifer (DMCF) | | montane/subalpine (MSG) | | mixed broadleaf deciduous (MBDRF) |
| spruce-fir (SFF) | | | | montane willow (MWRF) |

†PNVTs were defined by terrestrial ecosystem units, based on the terrestrial ecosystem survey of the ASNFs (Laing et al. 1987)
‡Within each major vegetation type, the PNVTs are arranged by size: largest to smallest

According to the Schussman and Smith (2006a), historic range of variability (HRV) is a description of the change over time and space in the ecological condition of PNVTs and the ecological processes that shape those types. A comparison between a PNVT's existing vegetation and HRV was used to show the departure from reference conditions. HRV descriptions focus on characteristics important for managing PNVTs found on National Forests in Arizona and New Mexico, including: vegetation composition and structure and how this attribute varies across the region within a PNVT; patch or stand characteristics such as size and spatial distribution; patch dynamics such as succession; the dominant disturbance processes and frequency of disturbance that shape ecological conditions within a PNVT over time; anthropogenic disturbances or exclusion of natural disturbance regimes; and the effects of climatic fluctuations (Schussman and Smith 2006a).

The closer ecological composition, structure, and process are to their historic conditions, the more properly each vegetation type is functioning and the more secure dependent species (plants and animals)

[2] Some of the drawbacks and limitations of using historic range of variability (HRV) (Romme et al. 2012): 1. The role of humans in reference ecosystems is not well known, 2. The amount and quality of data available for HRV summaries and assessments may be incomplete or not well known, and 3. Can HRV be relevant when facing a future of climate change, invasive species, and accelerated human land-use impacts? Some examples of how the HRV concept can be utilized effectively in resource management, planning and policymaking (Romme et al. 2012): 1. HRV helps in identifying ecological conditions that will restore ecological resilience in the face of changing climate and fire regimes, 2. HRV helps in evaluating the ecological feasibility of management goals that society may find desirable, 3. HRV helps in designing management plans that maintain ecological integrity while producing economic commodities, and 4. HRV helps in educating the public and facilitating collaborative discourse and decision making about resource-management goals and methods.

[3] Modeling projected trends in state and transitions were derived through the use of the Vegetation Dynamics Development Tool (VDDT) (ESSA Technologies 2006). VDDT software is a non-spatial model that allows the user to model vegetation change over time as a series of vegetation states that differ in structure, composition, and cover and to specify the amount of time it takes to move from one vegetation state to another in the absence of disturbance. Various disturbance agents affecting the movement of vegetation between states (or transitions) are incorporated (e.g., mechanical vegetation treatments, surface fires, mixed-severity fires, stand-replacing fires, grazing, insect outbreaks, and drought events, etc.). By varying the types and rates of disturbance across the landscape, the effects of different disturbance regimes, such as historic and current fire regimes, or different management treatments, such as wildland fire to meet resource objectives, fire suppression, prescribed burning, grazing practices, and mechanical fuel treatments, on vegetation can be investigated (Schussman and Smith 2006a). Input data used in modeling came directly from forest management activities and fire data over the last 25 years.

are within the associated habitats. This is particularly important with potential changes in the climate. The intent is to re-establish the natural patterns and processes within these vegetation communities that allowed for natural resiliency. This is especially important when faced with potential changes in climate, uncharacteristic wildfire, and the presence of invasive plant species (the ASNFs has 59 known noxious and invasive weed species (White 2008) see the Invasive Species Specialist Report for more information)**.**

Desired conditions (DC), together with other plan components, constitute a framework for sustainability and articulate management intent over the life of the forest plan. DCs are the specific conditions of the vegetation resources on a landscape scale which meets the management objective as outlined in the forest plan. A comparison between a PNVTs' existing vegetation conditions were used to show the departure from DC and HRV (table 2). DC descriptions focus on characteristics important for managing PNVTs found on the ASNFs, including: vegetation composition and structure and how these attributes vary within a PNVT. This assessment focuses on the current vegetation conditions found within the administrative boundaries of the ASNFs relative to their HRV and the forests identified DCs.

Because vegetation DC for each PNVT have been identified at or near HRV, the assumption is still the same; the closer the composition, structure, and processes of the individual PNVT is to its HRV the more properly the PNVT is functioning, and the dependent species (plants and animals) are more secure within their habitat.

**Table 2. Departure rating (DI) of the PNVTs in relation to their defined desired condition (DC) and historic range of variability (HRV)**

| Potential Natural Vegetation Types (PNVT) and Percent Departure from Forest Plan Desired Conditions (DC) and Historic Range of Variability (HRV)† | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **No Departure (0-20%)** | **DI** | **Low Departure (21-40%)** | **DI** | **Moderate Departure (41-60%)** | **DI** | **High Departure (61-80%)** | **DI** | **Severe Departure (81-100%)** | **DI** |
| **Departure from Desired Condition (DC)‡** | | | | | | | | | |
| IC | 8 | MWRF | 21 | MSG | 54 | MPOW | 61 | | |
| CWRF | 20 | PJW | 26 | WMCF | 54 | GBG | 67 | | |
| | | MBDRF | 33 | SFF | 59 | DMCF | 67 | | |
| | | WCRA | 36 | | | PPF | 77 | | |
| | | | | | | SDG | 79 | | |
| **Departure from Historic Range of Variability (HRV)‡** | | | | | | | | | |
| IC | 8 | MWRF | 21 | MSG | 54 | WMCF | 61 | PPF | 94 |
| CWRF | 20 | PJW | 26 | | | SFF | 62 | | |
| | | MBDRF | 33 | | | GBG | 67 | | |
| | | WCRA | 36 | | | MPOW | 72 | | |
| | | | | | | DMCF | 77 | | |
| | | | | | | SDG | 79 | | |

†Departure from DC and HRV are based solely on overstory (woody vegetation) attributes of size class, cover class and species composition. Understory (herbaceous vegetation) is not factored into the departure calculation, so any departure rating accounts for only a portion of the total plant community structure, composition, and function

‡Within each departure class, the PNVTs are arranged by level of departure: least to greatest

In most cases, reference condition and DCs have been identified as the same target objective. However, as can be seen in the above table, departure from reference conditions and DCs are not equal for five of the 14 PNVTs; ponderosa pine, wet mixed conifer, dry mixed conifer, and spruce-fir forests, and Madrean pine-oak woodland. Southwestern Regional Office direction for DCs have been altered from reference condition for the ponderosa pine and dry mixed conifer forests to reflect contemporary landscape vegetation structural states important to northern goshawks and Mexican spotted owls. DCs have also been changed from reference condition within the Madrean pine-oak woodland to reflect contemporary landscape vegetation structural states important to Mexican spotted owls. DCs have also been altered from reference condition for the wet mixed conifer and spruce-fir forests to reflect areas absent the succession of aspen cover types, where even-aged conifer succession predominates. As an expression of socioeconomic sustainability, a minor percentage of areas without aspen cover types would be managed on shorter rotations than the historic stand replacement intervals (120 years versus 200+ years). This

results in DCs that have a somewhat higher proportion of early-successional vegetation structural states than reference conditions, a proportion of mid-successional vegetation structural states that is somewhat lower than reference conditions, and a proportion of late-successional vegetation structural states that is somewhat lower than reference conditions (Jack Triepke, Southwestern R3 Regional Ecologist, professional communication).

## PNVT Write-ups

Each individual PNVT write-up is organized under the following topics (see the 2008 Vegetation Specialist Report (ASNFs 2008a) for a more in-depth discussion of this topic):

*Setting:* PNVT descriptions were adapted from Vander Lee et al. (2006) with some modifications to fit specific situations occurring on the ASNFs. Within each PNVT there will be local variations in associated vegetation that are due to a combination of several factors; such as, topography, elevation, aspect, soil type, soil moisture and soil temperature, associated vegetation, and ambient air temperatures, as well as biotic influences. The ASNFs' Terrestrial Ecosystem Survey (ASTES) data (Laing et al. 1987) was used for PNVT delineation.

*Context/Niche:* Information regarding context and niche were derived from data provided by the Southwestern Regional Office (RO), Albuquerque, New Mexico in 2007.

*Vegetation States' Structure, Composition and Cover:* Projecting changes in overstory, or woody vegetation structure and composition over time is an important part of landscape-level analyses. Vegetation can change for a variety of reasons. Information regarding vegetative states' structure, composition and cover were derived from data provided by the RO in 2007, the ASNFs draft (2007) midscale vegetation analysis (updated in 2012 to reflect the effects of the Wallow Fire), and The Nature Conservancy (Schussman and Smith 2006b; Vander Lee et al. 2006).

*Trends and Projected Future Conditions:* Describes the projected future status of the PNVT assuming management consistent with Alternative A and the 3 action alternatives, and displays the extent of the PNVT within the planning area relative to the ecoregion section and subsections. This step involves projecting the conditions of the PNVT into the future (10, 15, 20, 30, 40, and 50 years). Comparing the projected future status of the characteristic to the HRV is designed to display the direction in which characteristics of the PNVT are headed and is essential in determining the status of ecosystem sustainability. Focus is on describing whether the alternatives are sufficient to maintain and/or move the PNVT towards DC and HRV. Information used to project trends and future conditions were derived from current ASNFs management and fire activities.

## Vegetation Analyses

Analyses were conducted on vegetation using PNVTs, existing mid-scale vegetation types found on the ASNFs[4] and soil types from Terrestrial Ecological Unit Inventory data for the ASNFs[5]. A comparison

[4] Mid-scale vegetation types were determined using satellite data and are mapped at the scale of 1:100,000. The mid-scale vegetation inventory for all ASNFs' vegetation types analyzed in this report was conducted in 2005 and 2006. As a result of the 2011 Wallow fire, the ASNFs' midscale mapping product was updated to reflect changed conditions. This product represents a rapid assessment done to help identify changed vegetation condition within the perimeter of the Wallow Fire. The assessment utilized mid-scale existing vegetation data products for vegetation dominance type, tree size, and overstory canopy cover map units as well as RAVG (Rapid Assessment of Vegetation Condition after Wildfire) data produced by the Remote Sensing Applications Center (RSAC) representing overstory canopy cover mortality classes. The datasets were combined using a standard rule-set, developed by the U.S. Forest Service Southwestern Regional Office, to determine where mid-scale map units

between PNVT, defined forest plan desired conditions, and existing vegetation was used to show the departure from desired conditions (DC), and to estimate trends and future conditions.
Projecting changes in vegetation structure and composition over time is an important part of landscape-level analyses. Vegetation can change for a variety of reasons such as human activity, fires, insects, pathogens, mammals, weather, or growth and competition. The interaction of these factors can be quite complex and it can be difficult to project the combined effects over long periods of time (ESSA Technologies 2007). Modeling projected trends in state and transitions (see appendix A for more information on state and transition modeling) were derived through the use of the Vegetation Dynamics Development Tool (VDDT), Version 6.0.25 (ESSA Technologies 2006). VDDT software is a non-spatial model that allows the user to model vegetation change over time as a series of vegetation states that differ in structure, composition, and cover and to specify the amount of time it takes to move (or transitions) from one vegetation state to another in the absence of disturbance[6]. Various disturbance agents affecting the movement (or transitions) of vegetation between states are incorporated (e.g., surface fires, stand-replacing fires, grazing, insect outbreaks, and drought events, vegetation treatments, etc.). By varying the types and rates of disturbance across the landscape, the effects of different disturbance regimes, such as historic and current fire regimes, or different management treatments, such as planned and unplanned fire ignitions, fire suppression, grazing practices, and mechanical fuel treatments, on vegetation can be investigated (Schussman and Smith 2006b; TNC 2006). Input data used in modeling came directly from forest management activities and fire data over the last 25 years.

State destinations and transition probabilities for vegetation treatments were derived from Forest Vegetation Simulator (FVS), modeling, Version 6.31. FVS is a distance-independent; individual-tree forest growth model widely used in the United States and is used to compare alternatives. State destinations for natural fires and fire treatments were derived from FVS, modeling, Version 2.02 and Fire and Fuel Extension (FFE) (Weisz et al. 2012).

Some of the drawbacks and limitations of VDDT modeling are:

- Many of the VDDT inputs used were derived from other modeling outputs, e.g., FVS timber harvest treatment state transition destinations and the probability of those outcomes
- Many of the VDDT inputs used were derived from incomplete data sources such as the Forest Service Activity Tracking (FACTS[7]) database
- VDDT is a non-spatial model intended mainly for broad scale analysis

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had changed according to fire severity. This outcome is intended as a rapid assessment of changed condition and does not represent an update of the official mid-scale map products.

[5] The Terrestrial Ecological Unit Inventory referenced in this document is specific to the ASNFs and is a classification of ecological types. It maps terrestrial ecological units based on soil types and existing vegetation (Laing et al. 1987).

[6] State and transition models are simple box-and arrow diagrams in which boxes represent observed or theoretical ecosystem states and arrows represent the observed or theoretical transitions among these states. These models are commonly used to conceptualize either formal mathematical models or the complex behavior of dynamic systems. They are essentially a means of mapping system behavior in the absence of adequate predictive models (Westoby et al. 1989).

[7] FACTS is an activity tracking system for all levels of the Forest Service. It supports timber sales in conjunction with TIM Contracts and Permits; tracks and monitors NEPA decisions; tracks KV trust fund plans at the timber sale level, reporting at the National level; and, it generates National, Regional, Forest, and/or District Reports. FACTS is a nationally supported application that tracks land based activities through the NEPA, Layout, and Accomplished stages of a project. The features in GIS represent the activity unit on which these activities occur and are depicted in GIS as polygons, lines or points. FACTS version 2.0 uses a total of three feature classes for each feature type - polygon, line, point. Within each feature class, there exists three "sub-types" to identify the stage an activity is in - NEPA, Layout, Accomplished. The appropriate stage of an activity unit is determined by the status of the project.

- VDDT projects changes in vegetative conditions in response to succession, disturbances, and management treatments, however, the VDDT model divides vegetation conditions within each PNVT into a small number of discrete states, and it is acknowledged that there is more variability within each state and within nature than has been modeled for forest plan revision.
- A small number of states were selected because the VDDT model is driven by the data available; the amount of available data was limited
- VDDT modeled the distribution of landscape states over time, and does not model the more detailed physical (soil, temperature, precipitation, aspect, elevation, productivity) chemical and biological dynamics of what is happening at each scale of spatial resolution
- VDDT is a long-range, broad scale, strategic model, and does not describe what is happening at a site specific level of detail to individual trees, groups of trees, etc.
- VDDT does not model detailed mechanisms of landscape change, but by calibrating the VDDT models with FVS model outputs (Weisz et al. 2011, Weisz and Vandendriesche 2012, Weisz et al. 2012), VDDT modeling takes advantage of some of the detailed mechanisms (mortality, regeneration, background dwarf mistletoe presence, natural growth, succession, etc.) that FVS considers
- VDDT models overstory structure, composition, and cover as defined by mid-scale vegetation mapping in great detail, but does not model the understory vegetation (for example, the species composition of grasses and forbs)
- VDDT models the probability and timing of events (such as fire behavior, management activities, insect and disease occurrences, etc.) based on empirical observations, but our current information on historical behavior and evidence cannot accurately predict future behavior due to climate change and other phenomena which may not have occurred within the realm of the statistical evidence which is available to us today

It is assumed the disturbances (e.g., management activities) selected for the VDDT model represent the majority of disturbances the ASNFs experience. There could be many variations to these disturbances; however these were not modeled in detail for this analysis. According to Lauenroth and Laycock (1989), and others, succession may follow multiple pathways and reach different end-points depending on the effects of disturbance on the life history characteristics of the vegetation; causing predictability to be limited by the importance of chance or infrequent events.

The following PNVTs were modeled using VDDT software: ponderosa pine, wet mixed conifer, dry mixed conifer, and spruce-fir forests; Madrean pine-oak, and piñon-juniper woodlands; Great Basin and semi-desert grasslands. State and transition modeling was not conducted for interior chaparral, and montane/subalpine grasslands, and the four riparian PNVTs. Separate, regionally consistent VDDTs models were not developed for montane/subalpine grasslands, and the four riparian PNVTs.

## Assumptions

In the analysis for this resource, the following assumptions have been made:

- Acreage within each PNVT is static because it is based on a combination of several factors; such as, topography, elevation, aspect, soil type, soil moisture and soil temperature, associated vegetation, and ambient air temperatures, as well as biotic influences. However, the acreage within each PNVT structural state may vary over time because of natural succession, management treatments, and other disturbance factors.
- The planning timeframe is 15 years; other timeframes were analyzed depending on the resource (usually a discussion of anticipated trends into the future). As mentioned earlier, the timeframes

analyzed in VDDT modeling were 10, 15 (planning period), 20, 30, 40, and 50 (modeling period) years.

- The kinds of resource-management activities allowed under the prescriptions are reasonably foreseeable future actions to achieve the goals and objectives. However, the specific location, design, and extent of such activities are generally not known at the time. The decisions are made on a site-specific (project-by-project) basis. Therefore, the discussions should refer to the potential for the effect to occur and are usually only estimates. The effects analyses are to be useful for comparing and evaluating alternatives on a forest-wide basis. It is not intended to be applied directly to specific locations on the Forests.
- The closer ecological composition, structure, and process are to their historic conditions, the more properly each vegetation type is functioning and the more secure dependent species (plants and animals) are within the associated habitats. This is especially important with potential changes in the climate.

## Revision Topics Addressed in this Analysis

Revision Topic 1: Maintenance and Improvement of Ecosystem Health

Issue: Vegetation Conditions

- PNVT percent departed from desired conditions and historic range of variability using the Departure Index (DI)
- Percent departed from desired conditions for acres of old/large trees, number of snags per acre and tons of coarse woody debris
- Acres of aspen-dominant and co-dominated forest types and current vegetation state size, composition and cover of aspen
- Vegetation overstory/understory relationships compared using acres of closed (> 30%) forest and woodland woody canopy cover and < 10 percent woody canopy cover within grasslands

## Summary of Alternatives

A summary of alternatives, including key differences among alternatives, is outlined in the Draft Environmental Impact Statement.

## Description of Affected Environment (Existing Condition)

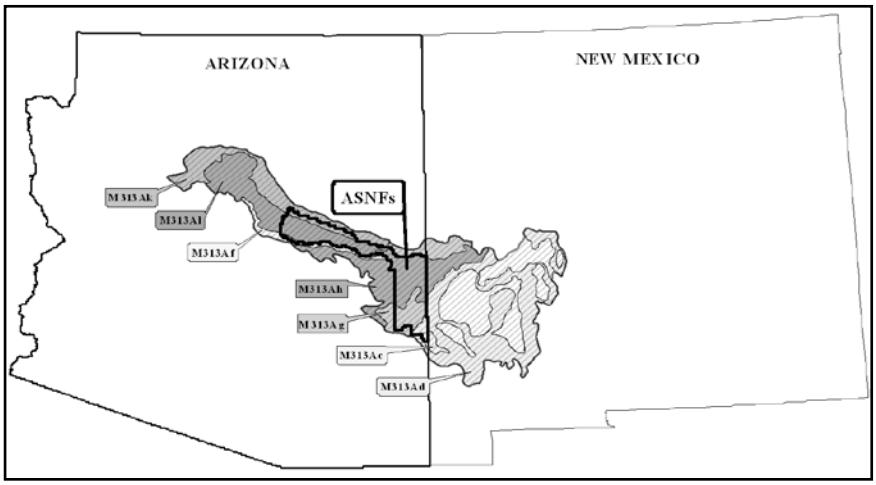
This assessment primarily focuses on the vegetation conditions found within the administrative boundaries of the ASNFs. An attempt has been made to identify the importance or "contribution to sustainability" of vegetation managed by the ASNFs by comparing the quantity and spatial extent of vegetation within and outside of the forests' administrative boundary. The following discussion places the ASNFs in the broader context of the surrounding landscape and uses a hierarchical framework of ecological map units including Ecoregion Provinces, Sections, and Subsections as described below.

A scale larger than the Forest is desirable to understand the environmental context, opportunities and limitations of National Forest System lands to contribute to ecological sustainability. Ecoregions are ecosystems of regional extent. Using the National Hierarchical Framework of Ecological Units[8] (Cleland

[8] In 1993, as part of the Forest Service's National Hierarchical Framework of Ecological Units (ECOMAP 1993), ecoregions were adopted for use in ecosystem management. The hierarchical interrelationships, or nesting, are as follows: 1) The United States is divided into three Domains (based on general climatic characteristics). The intermountain west (including Arizona and

et. al. 1997) an analysis of the landscapes surrounding the ASNFs was completed using the ecological section and subsection units. This broad-scale analysis was done to set the context for the contributions the ASNFs make to ecological sustainability. As described by Bailey (1983, 1985, 1991, and 1998) ecoregions distinguish areas that share common climatic and vegetation characteristics (Cleland et al. 1997). Ecoregions are subdivided into provinces, which are controlled primarily by continental weather patterns such as length of dry season and duration of cold temperatures. Provinces are also characterized by similar soils. Sections are a subdivision of provinces, described by broad areas of similar subregional climate, geomorphic process, geology, geologic origin, topography, and drainage networks. Such areas are often inferred by relating geologic maps to potential natural vegetation "series" groupings such as those mapped by Küchler (1964). Ecological subsections are a further division of sections, and described by areas with similar surface geology, geomorphic process, soil groups, subregional climate, and potential natural vegetation communities (McNab and Avers 1994). Because subsections are smaller in size they are more useful in planning at a smaller scale.

The ASNFs is located within the Arizona-New Mexico Mountains Semi-Desert-Open Woodland-Coniferous Forest-Alpine Meadow ecoregion province (M313) (McNab and Avers 1994); and is located entirely within the province's White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (M313A). In addition, the ASNFs is located within a portion of seven subsections in the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (map 1).




**Map 1. ASNFs in context to the land areas of the White Mountains-San Francisco Peaks-Mogollon Rim M313A ecoregion section (cross-hatched area) and the seven subsections in which it occurs, and the ecoregion section in context within Arizona and New Mexico**

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New Mexico) falls within the Dry Domain. The essential feature of the Dry Domain is that annual losses of water through evaporation at the earth's surface exceed annual water gains from precipitation; 2) Domains are further subdivided into Divisions, northeastern and eastern Arizona fall within the Tropical/Subtropical Steppe Division. Tropical steppes border the tropical deserts on both the north and south, and in places on the east as well. Locally because of altitude, plateaus and high plains within what would otherwise be desert have a semiarid steppe climate. The Tropical/Subtropical Steppe Division is further subdivided into a Mountain segment exhibiting altitudinal zonation and the climatic regime of the adjacent lowlands and is distinguished according to the character of altitudinal zonation; 3) Divisions are further subdivided into Provinces and central and eastern Arizona falls within the Arizona-New Mexico Mountains Semi desert--Open Woodland--Coniferous Forest--Alpine Meadow Province of the Mountain segmentation. This area consists mostly of steep foothills and mountains, but includes some deeply dissected high plateaus; 4) Provinces are further subdivided into Sections and the ASNFs falls entirely within the White Mountains-San Francisco Peaks-Mogollon Rim Section which extends from the south rim of the Grand Canyon to central New Mexico; and 5) Sections are further subdivided into Subsections. The ASNFs falls within a portion of seven Subsections.

Table 3 presents the relationship, in acres, of the ASNFs to the overall ecoregion section and its seven subsections (columns one and two). Overall, the section and the seven subsections total nearly 13.5 million acres. The ASNFs occupies 15 percent of these total acres. Column three displays the section and subsection percent contribution to the ASNFs' acreage, while column four displays the ASNFs' percent contribution to the section and seven subsections' acreages.

The remaining 85 percent of the lands within the ecoregion section are owned or managed by a diversity of entities; including the Coconino, Gila, Kaibab and Tonto National Forests, the states of Arizona and New Mexico, Bureau of Land Management, National Park Service, White Mountain Apache and San Carlos Apache Nations, and numerous private organizations and citizens.

**Table 3. Land area, in acres, of the ASNFs in relation to the land areas of the ecoregion section and seven subsections in which it occurs**

| Ecoregion Section and Subsection Code | Ecoregion Section and Subsection Name | Total area of the Ecoregion Section and Subsection (acres) | Total ASNFs area within the Section and Subsection (acres) | Ecoregion Section and Subsection contribution to ASNFs acreage (%) | ASNFs contribution to Ecoregion Section and Subsection acreage (%) |
|---|---|---|---|---|---|
| **Ecoregion Section** | | | | | |
| M313A | White Mountains-San Francisco Peaks-Mogollon Rim | 13,474,691 | 2,015,352 | 100 | 15.0 |
| **Ecoregion Subsections** | | | | | |
| M313Ac | Burro Mountains Oak-Juniper Woodland | 128,507 | 23,290 | 1.2 | 18.1 |
| M313Ad | Mogollon Mountains Woodland | 3,591,109 | 89,792 | 4.5 | 2.5 |
| M313Af | White Mountains Scarp Woodland-Coniferous Forest | 321,920 | 25,451 | 1.3 | 7.9 |
| M313Ag | White Mountains Woodland | 1,057,569 | 382,771 | 19.0 | 36.2 |
| M313Ah | White Mountains Coniferous Forest | 2,124,359 | 697,158 | 34.6 | 32.8 |
| M313Ak | Coconino Plateau Woodland | 1,610,862 | 180,849 | 9.0 | 11.2 |
| M313Al | Coconino Plateau Coniferous Forest | 1,974,415 | 616,042 | 30.6 | 31.2 |
| Other† | Located entirely within New Mexico | 2,665,951 | 0 | 0.0 | 0.0 |

†Other = Mangas High Plains Grassland Subsection M313Ab; Mogollon Mountains Coniferous Forest Subsection M313Ae; and San Francisco Peaks Coniferous Forest Subsection M313Am

Table 4 displays the major PNVTs (Vander Lee et al. 2006) found within the ASNFs and ecoregion section and what percent of each PNVT within the ecoregion section is contributed by the forests. In addition, the proportional representativeness within the forests and ecoregion section is presented (map 1).

The ASNFs contains very diverse floristic assemblages that occupy certain areas along an elevational gradient. At low elevations (3,500 - 6,100 feet), the ASNFs support semi-desert grassland and Madrean evergreen woodland biotic communities. Low to middle elevations (6,100 - 8,800 feet) support interior chaparral, Great Basin coniferous woodland, and plains and Great Basin grassland biotic communities. Rocky Mountain (petran) and Madrean montane coniferous forests, subalpine coniferous forests, alpine and subalpine grassland, and montane grassland biotic communities dominate middle to high elevations (8,800 -11,300 feet) and are found primarily in the northern two-thirds of the ASNFs. However, Rocky Mountain and Madrean montane coniferous forests are the largest and most widespread biotic community on the ASNFs. The ASNFs provides a wide range of habitats, both geographical and environmental, to which plants have been able to adapt. The A-SNFs contains more than 4,000 different plant species, subspecies and varieties representing vascular plants, lichens, mosses, and fungi.

**Table 4. Land area, in acres, of the ASNFs' major PNVTs in relation to the overall land area of the forests and their context, or "niche", and proportional representativeness within the ecoregion section**

| Potential Natural Vegetation Types (PNVT) | White Mountains-San Francisco Peaks-Mogollon Rim Ecoregion Section M313A | | | | | | | ASNFs' Proportional Representativeness Relative to the Ecoregion Section (ratios are based on comparison of percent displayed in columns 2b and 3b) | ASNFs' Proportional Contribution Relative to the Ecoregion Section (ratios are based on comparison of percent displayed in columns 4b and 4c) |
|---|---|---|---|---|---|---|---|---|---|
| | Total PNVT area contained within the ASNFs (column 2) | | Total PNVT area contained within ecoregion section (column 3) | | ASNFs' contribution to the PNVT total area within ecoregion section (column 4) | | | | |
| | acres (a) | percent (b) | acres (a) | percent† (b) | acres (a) | percent: on forests (b) | percent: in ecoregion (c) | | |
| **Forests** | | | | | | | | | |
| Ponderosa pine | 602,206 | 29.9 | 4,573,316 | 33.9 | 602,206 | 13.2 | 86.8 | 0.9:1 | 1:6.6 |
| Wet mixed conifer | 177,995 | 8.8 | 388,258 | 3.4 | 177,995 | 45.8 | 54.2 | 2.6:1 | 1:1.2 |
| Dry mixed conifer | 147,885 | 7.3 | 487,098 | 2.8 | 147,885 | 30.4 | 61.7 | 2.6:1 | 1:2.0 |
| Spruce-Fir | 17,667 | 0.9 | 38,748 | 0.3 | 17,667 | 45.6 | 54.4 | 3.0:1 | 1:1.2 |
| **Woodlands** | | | | | | | | | |
| Madrean pine-oak | 394,927 | 19.6 | 615,111 | 4.6 | 394,928 | 64.2 | 35.8 | 4.3:1 | 1:0.6 |
| Piñon-juniper | 222,166 | 11.0 | 2,919,950 | 21.7 | 222,155 | 7.6 | 92.4 | 0.5:1 | 1:12.1 |
| **Grasslands** | | | | | | | | | |
| Great Basin | 185,523 | 9.2 | 1,789,899 | 13.3 | 185,523 | 10.4 | 89.6 | 0.7:1 | 1:8.6 |
| Semi-desert | 106,952 | 5.3 | 761,965 | 5.7 | 106,952 | 14.0 | 86.0 | 0.9:1 | 1:6.1 |
| Montane/subalpine | 51,559 | 2.6 | 174,810 | 1.3 | 51,559 | 29.5 | 70.5 | 2.0:1 | 1:2.4 |
| **Chaparral** | | | | | | | | | |
| Interior | 55,981 | 2.8 | 233,468 | 1.7 | 55,981 | 24.0 | 76.0 | 1.6:1 | 1:3.2 |
| **Riparian Areas/Riparian Forests** | | | | | | | | | |
| Wetland/cienega | 17,900 | 0.9 | 27,925 | 0.1 | 17,900 | 64.1 | 35.9 | 9.0:1 | 1:0.6 |
| Cottonwood-willow | 15,876 | 0.8 | 19,621 | 0.2 | 15,876 | 80.9 | 19.1 | 4.0:1 | 1:0.2 |
| Mixed broadleaf deciduous | 9,657 | 0.5 | 28,239 | 0.1 | 9,657 | 34.2 | 65.8 | 5.0:1 | 1:1.9 |
| Montane willow | 4,808 | 0.2 | 21,930 | 0.0005 | 4,808 | 21.9 | 78.1 | 400.0:1 | 1:3.6 |

†Summation of this column does not equal 100% because there are other PNVTs within the ecoregion section that do not occur on the ASNFs, such as, alpine and tundra, desert communities, Gambel oak shrubland, Madrean encinal woodland, and sagebrush shrubland; which are not displayed

The majority of PNVTs (ten) have a greater proportional representation on the ASNFs than in the ecoregion section; this includes all of the riparian PNVTs. The ASNFs' top five biggest contributing PNVTs to the ecoregion section are: Montane Willow Riparian Forest, Wetland/Cienega Riparian Areas, Mixed Broadleaf Deciduous Riparian Forest, Madrean Pine-Oak Woodland, and Cottonwood-Willow Riparian Forest, from greatest to least, respectively.

## Spatial and Temporal Niche Analysis

As mentioned earlier, spatial niche analysis occurs within the context of the ecoregion section(s) and comes down to: when the bulk of the PNVT within the ecoregion section is located on-forest, sustainability analysis falls to a temporal niche analysis (focus is on conditions on-forest). When the bulk of the PNVT within the ecological section is located off-forest, the sustainability analysis falls to a spatial and temporal niche analysis (focus on conditions off-forest). For other PNVTs, ecological sustainability analysis will reflect the sum conditions of the PNVT both on- and off-forest (see the 2008 Vegetation Specialist Report (ASNFs 2008a) for a more in-depth discussion of this topic). See figure 1 for a graphic used to determine if the management of lands within the ASNFs is influential to the sustainability within the ecoregion section.

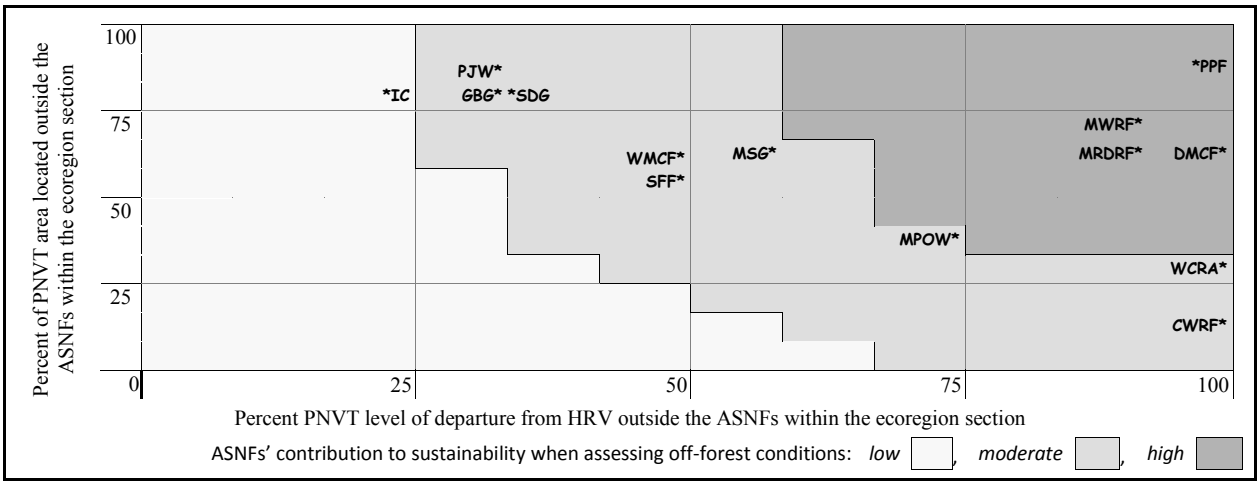



**Figure 1. Spatial niche analysis, potential ASNFs contribution to sustainability of PNVTs off-forests within the White Mountains-San Francisco Peaks-Mogollon Rim Ecoregion Section**

***Spatial Niche Analysis:*** As can be seen from table 3, the importance of the PNVTs within the ASNFs to the sustainability of ecosystems represented by these vegetation communities varies with amount and distribution within and outside of the ASNFs' boundaries. On one hand, the ponderosa pine Forest PNVT comprises nearly 30 percent of the ASNFs, and represents only about 13 percent of the overall ecoregion section acreage. A similar situation exists with the piñon-juniper woodland, and Great Basin and semi-desert grassland PNVTs in that these PNVTs represent a relatively small percentage of the forests and an even smaller percent of what the ecoregion section contains overall; 11 percent and eight percent, nine percent and 10 percent, and five percent and 14 percent, respectively. Because these PNVTs are such a relatively small percentage of what the ecoregion section contains, overall, the ability of the ASNFs to make a significant contribution to the ecological sustainability of these vegetation communities within the ecoregion section specifically and the Southwest in general is limited, but may be very important.

Conversely, all of the riparian forests and wetland/cienega riparian area PNVTs, individually, each make up less than two and one-half percent of the ASNFs, however, they represent a significant portion of the total acreage of these vegetation types within the ecoregion section. A similar situation exists with the Madrean pine-oak woodland, spruce-fir, wet mixed conifer, and dry mixed conifer forest PNVTs in that

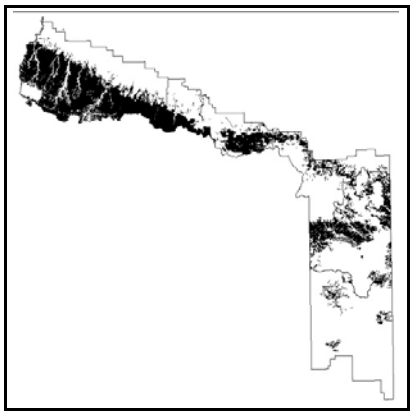
these PNVTs contribute a relatively large percentage of the ecoregion sections acreage; overall, for these vegetation communities. The management of these communities within the ASNFs is very influential and makes a significant contribution to the ecological sustainability of these PNVTs within the ecoregion section.

## Potential Natural Vegetation Types (PNVTs)

A summary of information regarding each of the PNVTs found on the ASNFs follows. Detailed PNVT assessments can be found in the 2008 Vegetation Specialist Report (ASNFs 2008a).

### Forested PNVTs

***Ponderosa pine forest*** (map 2): The ponderosa pine forest is widespread and at roughly 602,206 acres of NFS lands, or approximately 30 percent of the forests (table 4), represents the largest PNVT on the ASNFs.



**Map 2. General location of the ponderosa pine forest PNVT**

This PNVT generally occurs at elevations ranging from 6,000 to 9,000 feet on soils derived from igneous, metamorphic, and sedimentary parent material with good aeration and drainage. Ponderosa pine forest is typically bounded at the upper elevation by mixed conifer forest, and at the lower elevation by grassland, piñon-juniper forest, or chaparral, although extensive intergrading of species may occur at ecotone boundaries along gradients of slope, elevation, aspect, and moisture (Moir 1993). Generally, annual precipitation ranges from 17.3 to 27.6 inches, with 45 to 55 percent coming between October 1st and March 31st (table 5).

**Table 5. Ponderosa pine forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 41 | 45 | 17.3 | 27.6 | 45 - 55 | 39 - 47 | 6 - 14 | Nov 1st - Apr 30th | 100 - 130 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

The dominant species in this PNVT is ponderosa pine (*Pinus ponderosa* P. & C. Lawson var. *scopulorum* Engelm.) [9]. Other trees, such as Gambel oak (*Quercus gambelii* Nutt.), Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco var. *glauca* (Beissn.) Franco), piñon pine (*Pinus edulis* Engelm.), and junipers (*Juniperus* spp. L.) may be present. There is typically a shrubby understory; for example, currants/gooseberries (*Ribes* spp. L.), and buckbrush (*Ceanothus* spp. L.), mixed with a variety of grasses and forbs, such as Arizona fescue (*Festuca arizonica* Vasey), mountain muhly (*Muhlenbergia montana* (Nutt.) A.S. Hitchc.), pine dropseed (*Blepharoneuron tricholepis* (Torr.) Nash), blue grama (*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths), fleabanes (*Erigeron* spp. L.), pussytoes (*Antennaria* spp. Gaertn.), and others, although this type sometimes occurs as savannah with extensive grasslands interspersed between widely spaced clumps or individual trees.

[9] Plant names follow USDA Natural Resources Conservation Service's (NRCS) USDA PLANTS Database. The PLANTS Database provides standardized information about the vascular plants, mosses, liverworts, hornworts, and lichens of the United States and its territories.

This PNVT is adapted to drought during the growing season, and has evolved several mechanisms to tolerate frequent, low intensity surface fires.

The ASNFs' niche for this PNVT is approximately 13 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the Coconino Plateau Coniferous Forest and the White Mountains Woodland subsections, the ASNFs contribute 30 and 25 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the ponderosa pine forest PNVT is high (figure 2). Nearly 87 percent (table 4) of this PNVT is located off-forest and has a severe departure rating from HRV.

Ponderosa pine forest PNVT burn severity[10] acres produced by the 2011 Wallow Fire can be seen in table 6. Overall, the fire did not cause a significant impact to the ponderosa pine forest PNVT. Somewhat more than 21 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, less than 20 percent were burned, and of that; less than six percent (34,543 acres) were classified as undergoing a moderate to high severity burn.

**Table 6. 2011 Wallow Fire burn severity within the ponderosa pine forest PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 11,809 | 22,734 | 79,821 | 14,488 | 128,852 | | |
| Percent | 9.2 | 17.6 | 61.9 | 11.2 | 100 | | |
| **Total Ponderosa Pine Forest PNVT** | | | | | | | |
| Acres | 11,809 | 22,734 | 79,821 | 14,488 | 128,852 | 473,355 | 602,206 |
| Percent | 2.0 | 3.8 | 13.3 | 2.4 | 21.4 | 78.6 | 100 |

Current conditions within the ponderosa pine forest are highly departed from desired conditions (DC) and severely departed from historical range of variability (HRV) (table 2). With a Departure Index[11] (DI) of

[10] Vegetation Burn Severity: The effect of a fire on vegetative ecosystem properties, often defined by the degree of scorch, consumption, and mortality of vegetation and the projected or ultimate vegetative recovery (Lentile et al. 2006; Morgan et al. 2001). The vegetation burn severity of a fire depends on the fire intensity and the degree to which ecosystem properties are (or are not) fire resistant. For example, a fire of exactly the same fireline intensity might kill thin-barked trees but have little effect on thick-barked trees, or it may root-kill rather than canopy-kill trees, which would result in greater mortality than initially observed (Parsons et al. 2010). Burn severity indicators are classified and defined as follows (Parsons et al. 2010): 1) Low Soil Burn Severity - Surface organic layers are not completely consumed and are still recognizable. Structural aggregate stability is not changed from its unburned condition, and roots are generally unchanged because the heat pulse below the soil surface was not great enough to consume or char any underlying organics. The ground surface, including any exposed mineral soil, may appear brown or black (lightly charred), and the canopy and understory vegetation will likely appear "green." 2) Moderate Soil Burn Severity - Up to 80 percent of the pre-fire ground cover (litter and ground fuels) may be consumed but generally not all of it. Fine roots (~3/32 inch diameter) may be scorched but are rarely completely consumed over much of the area. The color of the ash on the surface is generally blackened with possible gray patches. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground. The prevailing color of the site is often "brown" due to canopy needle and other vegetation scorch. Soil structure is generally unchanged. 3) High Soil Burn Severity - All or nearly all of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is generally consumed and charring may be visible on larger roots. The prevailing color of the site is often "black" due to extensive charring. Bare soil or ash is exposed and susceptible to erosion, and aggregate structure may be less stable. White or gray ash (up to several centimeters in depth) indicates that considerable ground cover or fuels were consumed. Sometimes very large tree roots (> 3 inch diameter) are entirely burned extending from a charred stump hole. Soil is often gray, orange, or reddish at the ground surface where large fuels were concentrated and consumed.

[11] One of the simplest means of analyzing vegetative data is to look at the degree of association between sample sets and the level of similarity or dissimilarity between them (comparing current conditions to DC and HRV). Departure Indices (DI) were developed to measure the degree to which the defined DC and HRV sets of conditions, such as, amount and arrangement of vegetation successional structure, composition and cover classes, compare with the amount and arrangement of these same variables as they exist today. See appendix A table 4 for a more complete description of DIs and an explanation and example

77 and 94 percent, respectively, this PNVT is the most departed on the forests in relation to HRV and the 2nd most departed in respect to DC. With respect to the DI from desired conditions there is a considerable (56%) over-representation of all size and age trees, single or multi-storied with closed canopy cover (vegetation structural states G, H, I, L, and M) (see appendix B figure 1 and tables 1-10), as well as the existence of an atypical, early developmental state created by uncharacteristic wildfire represented by vegetation structural state N (11%). Historically, this forest type was characterized by open canopies which are now reflected in an under-representation (58%) of medium to very large size, single or multi-storied trees with open canopy cover (vegetation structural states D, E, J, and K). Historically these forests were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics. In addition, a more open canopy should promote an increase in shrubs and herbaceous understory diversity and abundance.

***Disturbances***

*Fire:* According to Smith (2006b), the effects of fire suppression and livestock grazing on understory and herbaceous vegetation has been reviewed by Korb and Springer (2003), and effects of tree thinning and prescribed burning by Abella (2004). Generally, as the overstory density has increased, both total cover and species richness have decreased (Korb and Springer 2003). Also, thinning and burning generally increase ground flora (understory and herbaceous) biomass, but composition and populations processes (such as recruitment) have been little studied in ponderosa pine forests (Abella 2004). Ponderosa pine forests in the Southwest generally experienced a high frequency, low intensity surface fire regime, although on a small scale, individual trees occasionally may have torched via fuel ladders carrying surface fire into the crowns over small areas (Weaver 1951, 1952; Cooper 1960; Dieterich 1980; Covington and Moore 1994; Swetnam and Baisan 1996; Vankat 2006). Beyond fire studies, little is known about historic disturbance factors that shaped ponderosa pine forests in historic times, because settlement and disturbance disruption occurred simultaneously. Based on its DI rating, this PNVT has a fire regime condition class[12] (FRCC) of 3. Historic fire return interval (the average number of years between fires) is estimated to have been between 2.1 and 17.1 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 8,950 to 13,450 acres; primarily mullein (*Verbascum thapsus* L.), weeping lovegrass (*Eragrostis curvula* (Schrad.) Nees), and bull thistle

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on how the DI was calculated for each PNVT.

[12] FRCC reflects the degree of departure of the PNVT's current fire regime from its reference condition (HRV) fire regime (Hann & Bunnell 2001, Hann et al. 2005). Condition classes rank the changes in the fire regime and the resulting proportions of vegetation states, and are represented by one of three classes (Schmidt et al. 2002): FRCC 1 - Within reference conditions (0-33 % departure). Fire regimes within or near historical range (e.g. fire frequencies have departed from historical range by no more than one return interval). There is a low risk of losing key ecosystem components. Vegetation attributes (composition and structure) are intact and functioning within historical range. These areas can be maintained within the historical fire regime by such treatments as fire use; FRCC 2 - moderately departed from reference conditions (34-66 % departure). Fire regimes have been moderately altered from their historical range (e.g. fire frequencies have either increased or decreased from range by more than one interval). Moderate changes in fire size, frequency intensity, severity or landscape pattern has resulted. There is a moderate risk of losing key ecosystem components. Vegetation attributes (composition and structure) have been moderately altered from the historical range. These areas may need moderate levels of restoration treatments, such as fire use, hand or mechanical treatments to be restored to historical regime; and FRCC 3 - severely departed from reference conditions (67-100 % departure). Fire regimes have been significantly altered from their historical range (e.g. fire frequencies have departed from historical range by multiple return intervals). Dramatic changes in fire size, frequency, intensity, severity or landscape pattern has resulted. Vegetation attributes (composition and structure) have been significantly altered from the historical range. These areas may need high levels of restoration treatments, such as hand or mechanical before fire is used to restore to historical fire regimes. The higher the condition class number the more altered the ecosystem is from reference condition.

(*Cirsium vulgare* (Savi) Ten.). See the Invasive Species Specialist Report for more information concerning invasive plants**.**

*Roads:* According to the forests' geographic information system (GIS) database, approximately 3,200 miles of roads and motorized trails have been constructed within this PNVT; this equates to 3.5 linear miles of road per square mile.

*Insects and Disease:* For thousands of years, Southwestern forest trees have been host to several species of insects, pathogenic fungi, and parasitic plants (Dahms and Geils 1997, Lynch et al. 2010). Unfortunately, the earliest reports of bark beetles on ponderosa pine date from the early 1900s, after settlement (Dahms and Geils 1997), so there are no accounts of historic insect outbreak periodicity. However, between 2000 and 2004, insects and disease have impacted (weakened and/or caused mortality) approximately 28 percent of this PNVT.

*Herbivory:* According to Smith (2006b), the disruption of historic fire regimes by introduced grazing animals has been well documented in southwestern ecosystems, and ponderosa pine forests were utilized as summer range for large numbers of sheep and cattle (Allen 1989; Covington and Moore 1994; Swetnam et al. 1999). Herbivory by cattle also reduces competition by grasses with conifer seedlings, allowing them to expand or encroach into grasslands (Dahm and Geils 1997). And according to Beschta et al. (2012), historical and contemporary livestock production, the most widespread and long-running commercial use of public lands, can alter vegetation, soils, hydrology, and wildlife species composition and abundances in ways that exacerbate the effects of climate change on these resources. Excess abundance of native ungulates (e.g., deer (*Odocoileus hemionus* and *O. virginianus*), or elk (*Cervus elaphus*)) and feral horses and burros (*Equus* spp.) also add to these impacts.

The most current ASNFs data (USFS 2007-2008) indicates that within the capable[13] grazing lands (94% of the total PNVT's area) associated with the ponderosa pine forest (table 7); approximately 85 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 14 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and pounds of vegetation growth, as well as species compositional changes, and possible changes in site potential.

[13] Grazing capability is a qualitative expression of the inherent ability of an ecosystem to support grazing use by various classes of livestock on a sustained yield basis; that is, maintaining the stability and productivity of the site. Soil stability determinations and site productivity evaluations are used in combination to determine and assign grazing capability. Capable areas are those which can be used by grazing animals under proper management without long-term damage to the soil resource or plant communities. Typically, this land is stable. Vegetative ground cover is maintaining site productivity and producing a minimum of 100 pounds of dried forage per acre per year. Soil loss as judged by available techniques is within tolerance (U.S. Forest Service 1999).

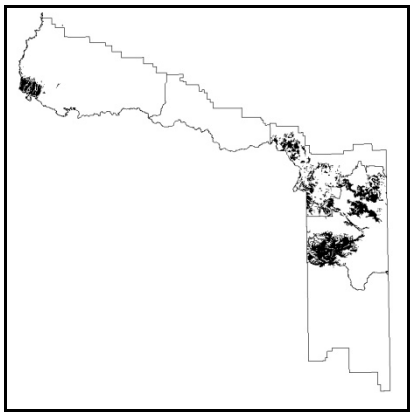
**Table 7. Ponderosa pine forest PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[14] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 34,902 | 5.8 | 80 | 0.0 | 6,776 | 1.2 | 76,353 | 13.5 | 394,874 | 70.1 | 85,409 | 15.2 | 3,812 | 0.6 | 602,206 |

*Threats*

The most important and far reaching threats under agency authority for this PNVT include managing the legacy of past livestock grazing, which removed fine fuels needed for carrying frequent, low intensity surface fires; forest management practices (vegetation treatments), which have changed forest age class distribution, composition, density, and cover values, and greatly reduced understory productivity; and fire suppression, which effectively ended the frequent fire regime typical of this forest type. There are also areas (roughly 6%) were the soils are in unsatisfactory condition[15]. Overall, based on VDDT modeling, under current management, there is a change in the DI from current to DC and HRV, which would indicate movement toward DC, and HRV, and a more properly functioning system. This trend appears to be consistent over all modeling periods out to 50 years. See appendix C for a more complete discussion of the threats affecting the ponderosa pine forest and the risks they pose to this PNVT.

***Wet mixed conifer forest*** (map 3): The wet mixed conifer forest is found primarily on the Alpine, Black Mesa, and Springerville RDs and at roughly 177,995 acres of NFS lands, or approximately 9 percent of the forests (table 4), represents the fifth largest PNVT on the ASNFs.



**Map 3. General location of the wet mixed conifer forest PNVT**

Wet mixed conifer forests range in elevation from approximately 9,000 to 11,500 feet along a variety of gradients including gentle to very steep mountain slopes. Generally, annual precipitation ranges from 22.8 to 31.9 inches, with 50 percent coming between October 1st and March 31st (table 8).

Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), blue spruce (*P. pungens* Engelm.), and subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.), or corkbark fir (*A. lasiocarpa* (Hook.) Nutt. var. *arizonica* (Merriam) Lemmon) dominate this PNVT either mixed or alone. Rocky Mountain Douglas-fir along with mixed conifer and quaking aspen stands may also be present in this system for

[14] Condition as evaluated and ranked by the Forest Service, is a subjective expression of the status or health of the vegetation and soil relative to the combined potential to produce a sound and stable biotic community. Soundness and stability are evaluated relative to a standard that encompasses the composition, density, and vigor of the vegetation, and physical characteristics of the soil (*Allotment Analysis Handbook* FSH 2209.21.40 R3, page 3 of 46). Although the *Allotment Analysis Handbook* FSH 2209.21 R3 was officially removed from the directive system, this definition is used because the above information was derived (collected, calculated, and evaluated) using the procedures outlined in the *Allotment Analysis Handbook* FSH 2209.21 R3 over a number of years. Excellent, good, fair, poor, and very poor are adjective descriptions of range condition; while, high, moderately high, moderately low, and low are ecological condition ratings (*Allotment Analysis Handbook* FSH 2209.21.40 R3, page 22 of 46).

[15] Soil condition (refined) is a qualitative rating developed within the Southwestern Region of the Forest Service that provides an overall picture of soil condition vital in sustaining ecosystems. It is based on three soil functions; the ability of soil to resist erosion, to infiltrate water, and to recycle nutrients. From Forest Service Handbook (FSH 2509.18 R-3 Supplement), soil condition class Unsatisfactory is defined as - Indicators signify that loss of soil function has occurred. Degradation of vital soil functions result in the inability of soil to maintain resource values, sustain outputs, and recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration designed to recover soil functions.

long periods without regeneration. Herbaceous species may include but are not limited to red baneberry (*Actaea rubra* (Ait.) Willd.), starry false Solomon's seal (*Maianthemum stellatum* (L.) Link), sprucefir fleabane (*Erigeron eximius* Greene), blackberry (*Rubus pedatus* Sm.), and subalpine lupine (*Lupinus arcticus* S. Wats. ssp. *subalpinus* (Piper & B.L. Robins.) D. Dunn).

**Table 8. Wet mixed conifer forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 36 | 43 | 22.8 | 31.9 | 50 | 55 - 67 | 20 - 39 | Oct 1st - Apr 30th | 70 - 90 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

The ASNFs' niche for this PNVT is approximately 46 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and White Mountains Scarp Woodland-Coniferous Forest subsections, the ASNFs contribute 93 and 74 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the wet mixed conifer forest PNVT is moderate (figure 2). With nearly 54 percent (table 4) of this PNVT located off-forest and having a high departure rating from HRV.

Wet mixed conifer forest PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 9. Overall, the fire did cause a significant impact to the wet mixed conifer forest PNVT. Somewhat more than 75 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 82 percent were burned, and of that; 50 percent (67,244 acres) were classified as experiencing a moderate to high severity burn.

**Table 9. 2011 Wallow Fire burn severity within the wet mixed conifer forest PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 47,409 | 19,835 | 43,494 | 23,702 | 134,440 | | |
| Percent | 35.3 | 14.8 | 32.4 | 17.6 | 100 | | |
| **Total Wet Mixed Conifer Forest PNVT** | | | | | | | |
| Acres | 47,409 | 19,835 | 43,494 | 23,702 | 134,440 | 43,555 | 177,995 |
| Percent | 26.6 | 11.1 | 24.4 | 13.3 | 75.5 | 24.5 | 100 |

Current conditions within the wet mixed conifer forest are moderately departed from DC and highly departed with respect to HRV (table 2). With a DI of 54 and 61 percent, respectively, this PNVT is the 6th most departed on the forests from DC[16] and 7th most departed from HRV, respectively. With respect to the DI there is an over-representation (37%) of vegetation structural states that are lacking aspen regeneration (vegetation structural states I, J, K, L, M, N, O, P, Q, R, and S) due to the presence of elk (see appendix B figure 2 and tables 11-20) and a sizeable under-representation (38%) of large to very large size, single- or multi-storied trees with closed canopy cover (vegetation structural states E and F). Historically these forests were dominated by very shade tolerant, shade tolerant, and mixed shade tolerant shrub and tree species with closed canopy characteristics.

### *Disturbances*

*Fire:* Historic fire regimes of the spruce-fir with wet mixed conifer forest in the Southwest are typically of a mixed severity regime, with FRI ranging from 8-30 years for low intensity surface and ground fires, and

[16] Wet mixed conifer forest PNVT has the equivelant departure from DC as the montane/subalpine grasslands PNVT.

upwards of 150 to 400 years for high intensity, stand replacing crown fires (Fulé et al. 2003, Swetnam et al. 2005, Vankat 2006). Based on its DI rating, this PNVT has a FRCC of 2. Historic fire return interval is estimated to have been between 150 and 400 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 490 to 750 acres; primarily mullein and bull thistle.

*Roads:* According to the forests' GIS database, approximately 840 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 3.0 linear miles of road per square mile.

*Insects and Disease:* Historically, spruce beetles (*Dendroctonus rufipennis*) have had the greatest impact on wet mixed conifer forests of the central and southern Rocky Mountains, and in the Southwest (Alexander 1987). Historic photographs and tree-ring analysis indicate that there have been six major outbreaks since the middle 1800s, and between 1850 and 1880 a very large-scale outbreak affected forests from northern New Mexico to northern Colorado (Baker and Veblen 1990). These outbreaks are considered part of the natural variability of spruce-fir with wet mixed conifer forests, and spruce beetles likely persist in small windthrow areas (Veblen et al. 1991) and in live trees (Veblen et al. 1994).

*Herbivory*: The disruption of historic fire regimes by introduced grazing animals has been well documented in southwestern ecosystems, and high elevation wet mixed conifer forests were well utilized as summer range for large numbers of sheep and cattle (Carlson 1969; Allen 1989; Covington and Moore 1994; Bahre 1998; Swetnam et al. 1999).

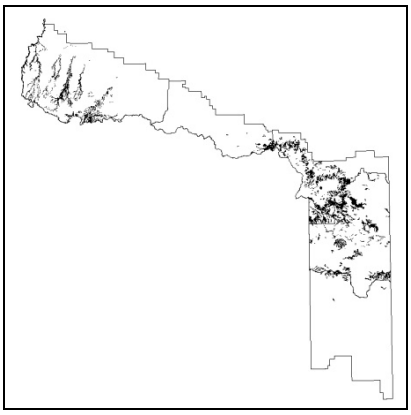
The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (45% of the total PNVT's area) associated with the wet mixed conifer forest (table 10); approximately 75 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 21 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and pounds of vegetation growth, as well as species compositional changes, and possible changes in site potential.

**Table 10. Wet mixed conifer forest PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 97,266 | 54.6 | 89 | 0.1 | 2,827 | 3.5 | 17,119 | 21.4 | 48,496 | 60.6 | 11,533 | 14.4 | 665 | 0.4 | 177,995 |

The most important and far reaching threat under agency authority for this PNVT is the potential for human-caused fires, and forest management practices (vegetation treatments), which have changed forest age class distribution, composition, density, and cover value. Overall, based on VDDT modeling, under current management, there is a change in the DI from current to DC and HRV, which would indicate continued reduction in departure with movement toward DC, and HRV, and a more properly functioning system. These trends appear to stabilize after 50 years. See appendix C for a more complete discussion of the threats affecting the wet mixed conifer forest and the risks they pose to this PNVT.

***Dry mixed conifer forest*** (map 4): The dry mixed conifer forest is widespread and at roughly 147,885 acres of NFS lands, or approximately 7 percent of the forests (table 4), represents the sixth largest PNVT on the ASNFs.



**Map 4. General location of the dry mixed conifer forest PNVT**

This PNVT contains a mix of dominant and co-dominant species in both dry and moister environments in the Rocky Mountain (petran), Madrean montane and subalpine coniferous forest biotic communities at elevations between 7,500 and 10,000 feet. Dominant and co-dominant vegetation varies in relation to elevation and moisture availability. Generally, annual precipitation ranges from 15.7 to 31.9 inches, with 45-55 percent coming between October 1st and March 31st (table 11).

This PNVT is situated between the lower-drier ponderosa pine, and pine-oak forests, and higher-moister wet mix conifer and spruce-fir forests. In the lower and drier elevation portions within this PNVT, to a greater or lesser degree, Gambel oak, ponderosa pine, piñon and alligator juniper (*Juniperus deppeana* Steud.) may co-dominate.

**Table 11. Dry mixed conifer forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 37 | 50 | 15.7 | 31.9 | 45 - 55 | 39 - 59 | 14 - 35 | Oct 1st - Apr 30th | 70 - 130 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

Other vegetation that may be present but does not co-dominate in these higher and mesic areas includes both Engelmann and blue spruce. The understory vegetation is comprised of a wide variety of shrubs, grasses, sedges (*Carex* spp. L.), rushes (*Juncus* spp. L.), and forbs; the composition depends on soil type, aspect, elevation, disturbance history and other factors.

The ASNFs' niche for this PNVT is approximately 30 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and Coconino Plateau Coniferous Forest subsections, the ASNFs contribute 67 and 59 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the dry mixed conifer forest PNVT is high (figure 2). With nearly 62 percent (table 4) of this PNVT located off-forest and having a high departure rating from HRV.

Dry mixed conifer forest PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 12. Overall, the fire did cause a significant impact to the wet mixed conifer forest PNVT. Somewhat more than 52 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 81 percent were burned, and of that; 41 percent (31,665 acres) were classified as undergoing a moderate to high severity burn.

**Table 12. 2011 Wallow Fire burn severity within the dry mixed conifer forest PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 19,412 | 12,253 | 31,462 | 14,813 | 77,940 | | |
| Percent | 24.9 | 15.7 | 40.4 | 19.0 | 100 | | |
| **Total Dry Mixed Conifer Forest PNVT** | | | | | | | |
| Acres | 19,412 | 12,253 | 31,462 | 14,813 | 77,940 | 69,946 | 147,885 |
| Percent | 13.1 | 8.3 | 21.3 | 10.0 | 52.7 | 47.3 | 100 |

Current conditions within the dry mixed conifer forest are highly departed from DC and HRV (table 2). With a DI of 67 and 77 percent, respectively, this PNVT is the 3rd most departed on the forests from both DC and HRV. With respect to the DI there is an over-representation (56%) of all size and age trees, single or multi-storied with closed canopy cover (vegetation structural states G, H, I, L, and M) (see appendix B figure 3 and tables 21-30), as well as the existence of an atypical, early developmental state created by uncharacteristic wildfire represented by vegetation structural state N (25%). Historically, this forest type was characterized by open canopies which are now reflected in an under-representation (52%) of medium to very large size, single or multi-storied trees with open canopy cover (vegetation structural states D, E, J, and K). Historically these forests were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics. In addition, a more open canopy should promote an increase in shrubs and herbaceous understory diversity and abundance.

### *Disturbances*

*Fire:* According to Smith (2006c), the disruption of historic fire regimes by introduced grazing animals has been well documented in southwestern ecosystems, and high elevation mixed conifer forests were well utilized as summer range for large numbers of sheep and cattle (Carlson 1969; Allen 1989; Covington and Moore 1994; Swetnam et al. 1999). Little is known about pre-settlement processes in mixed conifer forests, except regarding fire, drought, insects, and their interaction. Prior to Euro-American settlement times, the fire regime of mixed conifer forests was a mixture of infrequent, small patch size, high intensity crown fires interspersed with more frequent, widespread and low intensity surface fires (Touchan et al. 1996). Based on its DI rating, this PNVT has a FRCC of 3. Historic fire return interval is estimated to have been between 10 and 22 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 2,650 to 4,000 acres; primarily mullein and bull thistle. See the Invasive Species Specialist Report for more information concerning invasive plants**.**

*Roads:* According to the forests' GIS database, approximately 520 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 2.3 linear miles of road per square mile.

*Insects and Disease:* According to Smith (2006c); Swetnam and Lynch (1989) found that there have been eight or nine outbreaks of western spruce budworm (*Choristoneura occidentalis*) since 1700, with average return intervals of 30 to 40 years. Western spruce budworm populations periodically increase to outbreak proportions, and cause extensive defoliation, tree mortality and altered succession in several mixed conifer species. Lynch and Swetnam (1992) studied several old-growth mixed conifer sites in New Mexico and found evidence of multiple outbreaks of western spruce budworm, but found that outbreaks were not focused on old-growth stands. Several other species of insects as well as fungi currently make use of mixed conifer tree species. Between 2000 and 2004, insects and disease have impacted approximately 47 percent of this PNVT.

*Herbivory:* It has been suggested (Smith 2006c) that the extinction of large carnivores such as the Mexican wolf (*Canis lupus baileyi*) and grizzly bear (*Ursus arctos horribilis*) has affected at least one component of the mixed conifer forest, quaking aspen, which experiences increased mortality due to high levels of herbivory by native and introduced (elk) ungulates, and livestock. Predator control has allowed herbivores to increase in numbers, and to exert longer duration and higher intensity grazing and browsing effects on select vegetation types, especially aspen (Shepperd and Fairweather 1994; Romme et al. 1995; Kay 1997; Ripple et al. 2001).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (71% of the total PNVT's area) associated with the dry mixed conifer forest (table 13); approximately 79 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 19 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 13. Dry mixed conifer forest PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 43,469 | 29.4 | 60 | 0.1 | 2,001 | 1.9 | 19,838 | 19.2 | 47,819 | 46.2 | 33,851 | 32.7 | 847 | 0.6 | 147,885 |

The most important and far reaching threats under agency authority for this PNVT include managing the legacy of past livestock grazing, which removed fine fuels needed for carrying frequent, low intensity surface fires; forest management practices (vegetation treatments), which have changed forest age class distribution, composition, density, and cover values, and greatly reduced understory productivity; and fire suppression, which effectively ended the frequent fire regime typical of this forest type. There are also areas (roughly 24%) were the soils are in unsatisfactory condition. Overall, based on VDDT modeling, under current management, there is a change in the DI from current to DC and HRV, which would indicate movement toward DC, and HRV, and a more properly functioning system. This trend appears to be consistent over all modeling periods out to 50 years. See appendix C for a more complete discussion of the threats affecting the dry mixed conifer forest and the risks they pose to this PNVT.

***Spruce-fir forest*** (map 5): The spruce-fir forest is found on the Alpine and Springerville RDs and at roughly 17,667 acres of NFS lands, or approximately 1 percent of the forests (table 4), is the smallest of the forest types, and represents the eleventh largest PNVT on the ASNFs.

**Map 5. General location of the spruce-fir forest PNVT**

Also known as subalpine conifer forests, spruce-fir with wet mixed conifer forests range in elevation from approximately 9,000 to 11,300 feet along a variety of gradients including gentle to very steep mountain slopes. Generally, annual precipitation ranges from 26.8 to 36.2 inches, with 50 percent coming between October 1st and March 31st (table 14).

Englemann spruce, blue spruce, and subalpine fir or corkbark fir dominate this PNVT either mixed or alone. Rocky Mountain Douglas-fir along with mixed conifer and quaking aspen stands may also be present in this system for long periods without regeneration. Understory herbaceous species may include but are not limited to red

baneberry, starry false Solomon's seal, sprucefir fleabane (*Erigeron eximius* Greene), blackberry, and subalpine lupine.

**Table 14. Spruce-fir forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 32 | 37 | 26.8 | 36.2 | 50 | 67 - 71 | 39 - 47 | Oct 1st - Apr 30th | 60 - 70 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

The ASNFs' niche for this PNVT is approximately 46 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and White Mountains Scarp Woodland-Coniferous Forest subsections, the ASNFs contribute 93 and 74 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the spruce-fir forest PNVT is moderate (figure 2). With nearly 54 percent (table 4) of this PNVT located off-forest and having a moderate departure rating from HRV.

Spruce-fir forest PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 15. Overall, the fire did cause a significant impact to the spruce-fir forest PNVT. Somewhat more than 71 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 81 percent were burned, and of that; 50 percent (6,336 acres) were classified as experiencing a moderate to high severity burn.

**Table 15. 2011 Wallow Fire burn severity within the spruce-fir forest PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 3,874 | 2,462 | 3,897 | 2,423 | 12,656 | | |
| Percent | 30.6 | 19.5 | 30.8 | 19.1 | 100 | | |
| **Total Spruce-Fir Forest PNVT** | | | | | | | |
| Acres | 3,874 | 2,462 | 3,897 | 2,423 | 12,656 | 5,010 | 17,667 |
| Percent | 21.9 | 13.9 | 22.1 | 13.7 | 71.6 | 28.4 | 100 |

Current conditions within the spruce-fir forest are moderately departed from DC and highly departed from HRV (table 2). With a DI of 59 and 62 percent, respectively, this PNVT is the 5th most departed on the forests from DC and the 6th most departed from HRV. With respect to the DI there is an over-representation (29%) of vegetation structural states that are lacking aspen regeneration (vegetation structural states I, J, K, L, M, N, O, P, Q, R, and S) due to the presence of elk browsing (see appendix B figure 4 and tables 31-40). There is a sizable (43%) under-representation of large to very large size trees, single- or multi-stored with closed canopies (vegetation structural states E and F). Historically these forests were dominated by very shade tolerant, shade tolerant, and mixed shade tolerant shrub and tree species with closed canopy characteristics.

### *Disturbances*

*Fire:* Historic fire regimes of the spruce-fir with wet mixed conifer forest in the Southwest are typically of a mixed severity regime, with a fire return interval ranging from 8-30 years for low intensity surface and ground fires, and upwards of 150 to 400 years for high intensity, stand replacing crown fires (Fulé et al. 2003; Swetnam et al. 2005; Vankat 2006). Based on its DI rating, this PNVT has a FRCC of 2. Historic fire return interval is estimated to have been between 150 and 400 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 490 to 750 acres; primarily mullein and bull thistle.

*Roads:* According to the forests' GIS database, approximately 15 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 0.5 linear miles of road per square mile.

*Insects and Disease:* Historically, spruce beetles (*Dendroctonus rufipennis*) have had the greatest impact on wet mixed conifer forests of the central and southern Rocky Mountains, and in the Southwest (Alexander 1987). Historic photographs and tree-ring analysis indicate that there have been six major outbreaks since the middle 1800s, and between 1850 and 1880 a very large-scale outbreak affected forests from northern New Mexico to northern Colorado (Baker and Veblen 1990). These outbreaks are considered part of the natural variability of spruce-fir with wet mixed conifer forests, and spruce beetles likely persist in small windthrow areas (Veblen et al. 1991) and in live trees (Veblen et al. 1994).

*Herbivory*: The disruption of historic fire regimes by introduced grazing animals has been well documented in southwestern ecosystems, and high elevation wet mixed conifer forests were well utilized as summer range for large numbers of sheep and cattle (Carlson 1969; Allen 1989; Covington and Moore 1994; Bahre 1998; Swetnam et al. 1999).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (12% of the total PNVT's area) associated with the spruce-fir forest (table 16); approximately 24 percent of the herbaceous understory is in moderately low ecological condition or poor range condition, while only 22 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

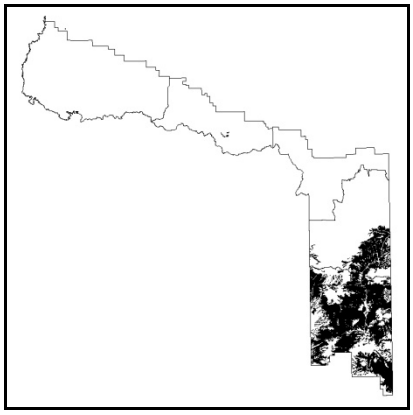
**Table 16. Spruce-fir forest PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 15,454 | 87.5 | 0 | 0.0 | 1,205 | 54.5 | 481 | 21.8 | 524 | 23.7 | 0 | 0.0 | 3 | 0.0 | 17,667 |

The most important and far reaching threat under agency authority for this PNVT is the potential for human-caused fires, and forest management practices (vegetation treatments), which have changed forest age class distribution, composition, density, and cover value. Overall, based on VDDT modeling, under current management, there is a change in the DI from current to DC and HRV, which would indicate continued reduction in departure with movement toward DC, and HRV, and a more properly functioning system. The trend towards DC appears to begin around 10 years and the trend toward HRV appears to stabilize after 50 years. See appendix C for a more complete discussion of the threats affecting the spruce-fir forest and the risks they pose to this PNVT.

## Woodland PNVTs

***Madrean pine-oak woodland*** (map 6): The Madrean pine-oak woodland is found primarily below the Mollogon Rim on the Alpine and Clifton RDs closely associated with the semi-desert grasslands. At roughly 394,927 acres of NFS lands, or approximately 20 percent of the forests (table 4), Madrean pine-oak woodland represents the second largest PNVT on the ASNFs (table 4). Madrean pine-oak woodland usually occupy foothills and mountains ranging from approximately 4,000 to 7,000 feet in elevation This PNVT is bounded by semi-desert grasslands at the lowest elevations and montane forests at the higher elevations.



**Map 6. General location of the Madrean pine-oak woodland PNVT**

Madrean pine-oak is dominated by open to closed canopy of evergreen oaks such as Arizona white oak (*Quercus arizonica* Sarg.), Emory oak (*Q. emoryi* Torr.), gray oak (*Q. grisea* Liebm.), and wavy leaf oak (*Q. turbinella* Greene), alligator juniper, and various other conifers. On the ASNFs the most common conifer is the piñon. However, Rocky Mountain Douglas-fir, ponderosa pine, Chihuahuan pine (*Pinus leiophylla* Schiede & Deppe var. *chihuahuana* (Engelm.) Shaw), and border pine (*Pinus discolor* D.K. Bailey & Hawksw.) may also be present. In addition, annual and perennial grasses, forbs, half-shrubs and shrubs can be found beneath the woodland overstory.

Climate generally consists of mild winters and wet summers with mean annual precipitation ranging from about ten to 25 inches; half of the precipitation typically occurs in summer, with the remainder occurring during the winter and spring. Generally, annual precipitation ranges from 13.4 to 25.2 inches, with 40-45 percent coming between October 1st and March 31st (table 17).

**Table 17. Madrean pine-oak woodland PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 48 | 61 | 13.4 | 25.2 | 40 - 45 | 4 - 24 | 0 - 5 | Dec 1st - Mar 15th | 130 - 180 |

†Winters can be mild or cold depending on elevation and aspect
‡Snowfall moisture is included in average annual precipitation data

The ASNFs' niche for this PNVT is approximately 64 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and the Burro Mountains Oak-Juniper Woodland subsections, the ASNFs contribute 96 and 78 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the Madrean pine-oak woodland PNVT is high (figure 2). With nearly 36 percent (table 4) of this PNVT located off-forest and having a high departure rating from HRV.

Madrean pine-oak woodland PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 18. Overall, the fire did not cause a substantial impact to the Madrean pine-oak woodland PNVT. Somewhat more than 13 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 50 percent were burned, and of that; 11 percent (6,013 acres) were classified as undergoing a moderate to high severity burn.

**Table 18. 2011 Wallow Fire burn severity within the Madrean pine-oak woodland PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 1,246 | 4,767 | 20,396 | 26,679 | 53,088 | | |
| Percent | 2.3 | 9 | 38.4 | 50.3 | 100 | | |
| **Total Madrean Pine-Oak Woodland PNVT** | | | | | | | |
| Acres | 1,246 | 4,767 | 20,396 | 26,679 | 53,088 | 341,839 | 394,927 |
| Percent | 0.3 | 1.2 | 5.2 | 6.8 | 13.4 | 86.6 | 100 |

Current conditions within the Madrean pine-oak woodland are highly departed from both DC and HRV (table 2). With a DI of 61 and 72 percent, respectively, this PNVT is the 4th most departed on the forests from both DC and HRV. With respect to the DI there is a considerable (59%) over-representation of small to very large size trees with closed canopy cover (vegetation structural states F and G) (see appendix B figure 5 and table 41-50). Historically, this woodland type was characterized by open canopies which are now reflected in a noteworthy (60%) under-representation of seedling, saplings, small, and medium to very large size, single or multi-storied trees with open canopy cover (vegetation structural states B, C, and D). Historically these woodlands were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics. In addition, a more open canopy should promote an increase in herbaceous understory diversity and abundance.

### *Disturbances*

*Fire:* Madrean pine oak woodland has been shown (Schussman and Gori 2006) to trend away from woodland with an open pine dominated overstory and oak understory to dense woodland with oaks and other sprouting tree species dominating the overstory (Barton et al. 2001; Barton 2002; Fulé and Covington 1998). This change in density and species composition is the result of switching from centuries of predominantly low intensity frequent surface fires to decades without fire followed by stand replacing fires (Fulé and Covington 1998; Barton 2002). Frequent low intensity surface fires allow fire resistant pines to dominate a site and maintain an open stand structure. Additionally, short fire-free periods, between 20 and 30 years in length, are necessary to allow for periodic pine regeneration (Barton et al. 2001).

The recent shift in fire regimes has been more conducive to the reduction of pine species and regeneration of oak and other sprouting species. According to Schussman and Gori (2006), it is well documented through fire scar data that prior to about 1880, low intensity surface fires frequently burned through the Madrean pine-oak woodland between early spring and summer, primarily as a result of lightning ignitions (Swetnam et al. 1992; Kaib et al. 1996; Swetnam and Baisan 1996; Fulé et al. 2005).

The continuity of fire scars between lower and higher elevations suggests that fire sizes were large enough to span the entire elevational distribution of the pine-oak woodlands and that fire ignitions coming from semi-desert grasslands and/or montane conifer systems were not uncommon (Swetnam et al. 1992; Kaib et al. 1996; Fulé and Covington 1997, 1998; Fulé et al. 2005). Passive fire suppression through livestock grazing in the late 1800s through today, as well as active suppression, has resulted in drastically reduced fire return intervals and increased fire severity in Madrean pine-oak woodland (Barton 1999, Swetnam and Baisan 1996). Based on its DI rating, this PNVT has a FRCC of 3. Historic fire return interval is estimated to have been between 3 and 8 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 8,950 to 13,450 acres; primarily mullein and weeping lovegrass and Lehmann lovegrass (*Eragrostis lehmanniana* Nees). According to

LANDFIRE (2007), Lehmann lovegrass was purposely introduced into North America in the 1930s, and has spread to the lower and drier edge of Madrean pine-oak woodland. By continuing to spread and therefore, add fine fuel, it may contribute to significantly increased fire frequency in this system. Lehmann lovegrass may have an advantage over native grasses following fire.

*Roads:* According to the forests' GIS database, approximately 145 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 0.2 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 16 percent of this PNVT.

*Herbivory:* While the level of resource competition between Coues white-tailed deer and livestock is unclear, it is clear that Coues white-tailed deer did/do have an impact on browse species and would have been responsible for decreasing shrub cover, to some extent, in Madrean pine-oak woodland. In contrast, livestock grazing has decrease grass cover and so their impact on the Madrean pine-oak woodland would be different than that of white-tailed deer, the dominant native herbivore (Schussman and Gori 2006).

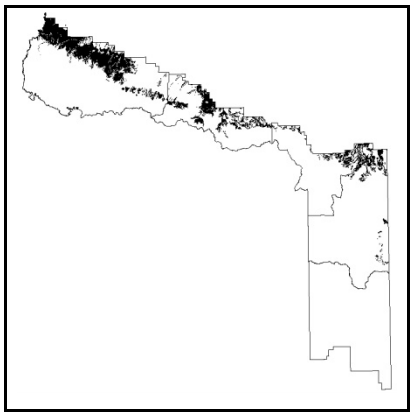
The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (46% of the total PNVT's area) associated with the Madrean pine-oak woodland (table 19); approximately 47 percent of the herbaceous understory is in moderately low ecological condition or poor range condition, while nearly 51 percent is in moderately high to high ecological condition fair to good range condition. Moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 19. Madrean pine-oak woodland PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 171,651 | 43.5 | 0 | 0.0 | 24,074 | 11.4 | 83,437 | 39.6 | 98,703 | 46.9 | 4,312 | 2.0 | 12,749 | 3.2 | 394,927 |

The most important and far reaching threats under agency authority for this PNVT include managing the legacy of past livestock grazing, which removed fine fuels needed for carrying frequent, low intensity surface fires; forest management practices, which have changed woodland age class distribution, composition, density, and cover values, and greatly reduced understory productivity; and fire suppression, which effectively ended the frequent fire regime typical of this woodland, and the introduction of invasive plants. There are also areas (roughly 38%) were the soils are in impaired and/or unsatisfactory condition, and another 58 percent are classified as inherently unstable. Overall, based on VDDT modeling, under current management, there is very little change in the DI from current to DC and HRV, which would indicate continued high departure with little or no movement toward DC, and HRV, and a more properly functioning system. This trend appears to stabilize after 60 years. See appendix C for a more complete discussion of the threats affecting the Madrean pine-oak woodland and the risks they pose to this PNVT.

***Piñon-juniper woodland*** (map 7): The piñon-juniper woodland occurs primarily along the forests' northern boundary closely associated with the Great Basin grasslands. At roughly 222,166 acres of NFS lands, or approximately 11 percent of the forests (table 4), the piñon-juniper woodland represents the third largest PNVT on the ASNFs.



**Map 7. General location of the piñon-juniper woodland PNVT**

This PNVT is characterized by a series of vegetation states that move from herbaceous dominated to shrub-dominated to tree-dominated over time after a high severity stand replacing fire. The type, including its various vegetation states, occurs on deep, fine-textured soils in valley bottoms and on gentle plains with few barriers to fire spread; it is common in areas where most of the annual precipitation comes in the winter. Generally, annual precipitation ranges from 11.0 to 22.0 inches, with 40-45 percent coming between October 1st and March 31st (table 20). It is mostly found on lower slopes of mountains and in upland rolling hills at approximately 4,500 to 7,500 feet in elevation. The most common conifer is piñon. The juniper component is a mix of, to a greater or lesser degree, oneseed juniper *Juniperus monosperma* (Engelm.) Sarg.), Utah juniper (*J. osteosperma* (Torr.) Little), alligator juniper, and Rocky Mountain juniper. In addition, annual and perennial grasses and grass-like plants, forbs, half-shrubs and shrubs can be found beneath the woodland overstory.

**Table 20. Piñon-juniper woodland PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 41 | 45 | 11.0 | 22.0 | 40 - 45 | 31 - 39 | 0 - 6 | Dec 1st - Mar 15th | 140 - 150 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

The ASNFs' niche for this PNVT is approximately eight percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the Coconino Plateau Coniferous Forest and White Mountains Coniferous Forest subsections, the ASNFs contribute 58 and 24 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the piñon-juniper woodland PNVT is moderate (figure 2). With nearly 92 percent (table 4) of this PNVT located off-forest and having a low departure rating from HRV.

Piñon-juniper woodland PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 21. Overall, the fire did not cause a substantial impact to the Piñon-juniper woodland PNVT. Roughly eight percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, approximately 47 percent were burned, and of that; nearly 16 percent (2,808 acres) were classified as experiencing a moderate to high severity burn.

**Table 21. 2011 Wallow Fire burn severity within the piñon-juniper woodland PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 583 | 2,225 | 5,587 | 9,389 | 17,784 | | |
| Percent | 3.3 | 12.5 | 31.4 | 52.8 | 100 | | |
| **Total Piñon-Juniper Woodland PNVT** | | | | | | | |
| Acres | 583 | 2,225 | 5,587 | 9,389 | 17,784 | 204,382 | 222,166 |
| Percent | 0.3 | 1.0 | 2.5 | 4.2 | 8.0 | 92.0 | 100 |

Current conditions within the piñon-juniper woodland are at a low departure from both DC and HRV (table 2) with a DI of 26 percent, this PNVT is the 9th and 11th most departed from DC and HRV on the forests, respectively. With respect to the DI there is an over-representation (19%) of medium to very large size trees with open canopy cover (vegetation structural state D) (see appendix B figure 6 and tables 51-60), and an under-representation (25%) of early successional, seedlings, sapling and small size trees with open or closed canopy cover (vegetation structural states B, C, E and F). Historically these woodlands were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics. In addition, a more open canopy should promote an increase in herbaceous understory diversity and abundance.

***Disturbances***

Based on published literature, climate variation, insect outbreaks, fire and seed dispersal by birds and small mammals appear to be the most important natural disturbances that determined the historical structure of Piñon-Juniper woodlands and the distribution and abundance of these stands or patches across the landscape (Gori and Bate 2007).

*Climate:* According to Gori and Bate (2007), significant expansions and contractions in the distribution of piñon-juniper woodland also occurred over the last 4,000 years and have been documented by studies of packrat middens, dry caves, pollen cores, lake and wetland sediments and archaeological sites (Van Devender et al. 1984; Mehringer and Wigand 1990; Gottfried et al.1995). In general, during periods when the climate became wetter, piñon and juniper moved down mountain slopes into more xeric communities and grasses increased, and when the climate became drier and warmer, piñon-juniper declined but grasses persisted. After 500 BP (before present), increased winter precipitation led to a re-expansion of piñon-juniper woodland that sharply increased after 1700 and again in the early 1900s (Davis and Turner 1986; Mehringer and Wigand 1990; Ghil and Vautgard 1991; Eisenhart 2004).

*Drought:* According to the Gori and Bate (2007), the recent drought, which began in the mid-1990s, has also resulted in regional die-offs of piñon and, to a lesser extent, juniper during the extreme drought years of 1996 and 2002-2003 (Ogle et al. 2000; Breshears et al. 2005; Mueller et al. 2005a; Gitlin et al. 2006). Drought-induced changes in the composition and cover of piñon-juniper woodlands may have a number of important ecological effects including significant changes in carbon stores and dynamics (Breshears and Allen 2002); increased solar radiation and ground temperatures (Martens et al. 2000); increased water runoff and erosion (Allen and Breshears 1998; McAuliffe et al. 2006); changes in the genetic structure of piñon and other populations (Mitton and Duran 2004); unfavorable recruitment conditions for piñon including a reduction in nurse plants, mycorrhizal fungal inoculum, and seed dispersal by birds (Christensen and Whitham 1991; 1993, Swaty et al. 2004; Haskins and Gehring 2005; Mueller et al. 2005a); and potentially large changes in the composition and function of associated biotic communities (Brown et al. 2001; Ruel and Whitham 2002; Whitham et al. 2003; Mueller et al. 2005b).

*Fire:* According to the Gori and Bate (2007), piñon-juniper grass savanna (and open woodland) is thought to have been maintained historically by frequent, low-severity surface fires. Piñon-juniper woodland developed after infrequent stand-replacing fire and was most likely maintained by patchy mixed-severity fires that occurred with moderate to low frequency (Arnold et al. 1964; Tausch and West 1988; Despain and Mosley 1990; Huffman et al. 2006a). Persistent piñon-juniper woodland developed under an historic regime of infrequent high severity, stand replacing fire (Tress and Klopatek 1987; Miller 1999; Floyd et al. 2000, 2004; Muldavin et al. 2003; Romme et al. 2003). Based on its DI rating, this PNVT has a FRCC of 1. Historic fire return interval is estimated to have been between 6 and 400 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 2,450 to 3,700 acres; primarily mullein and weeping lovegrass.

*Roads:* According to the forests' GIS database, approximately 520 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 1.5 linear miles of road per square mile.

*Insect and Disease:* According to Gori and Bate (2007); Ronco (1990), Gottfried et al. (1995), Negrón (1995), Rogers (1995), Weber et al. (1999), and Shaw (2005) all provide lists of insects, pathogens, and plant parasites that attack piñon and juniper. Although the life cycles of these pests are known in some detail, little information exists on their impacts to piñon populations locally or regionally or on the environmental factors that control their populations, including outbreaks. Between 2000 and 2004, insects and disease have impacted approximately 38 percent of this PNVT.

*Herbivory:* The disruption of historical fire regimes that followed the introduction of livestock (and the drought of the 1890s) has been documented in historical accounts and fire-history reconstructions in piñon-juniper savanna and open woodland (upper and lower ecotones) and in shrub woodland at the ecotone with ponderosa pine forest (Leopold 1924; Bahre 1985; Allen 1989; Despain and Mosley 1990; Bahre 1991; Kaib et al. 1996; Swetnam and Baisan 1996; Baisan and Swetnam 1997; Brown et al. 2001; Muldavin et al. 2003; Huffman et al. 2006a). These reconstructions show the virtual cessation of surface and mixed-severity fires in piñon-juniper woodlands between 1890 and 1905. The decline in herbaceous cover due to livestock grazing in concert with the disruption of the fire regime has been cited in a number of studies as the primary causative factor for the observed increase in tree densities in many piñon-juniper systems over the last 120 years (Cottam and Stewart 1940; Johnsen 1962; Arnold et al. 1964; Dwyer and Pieper 1967; Blackburn and Tueller 1970; West et al. 1975; Burkhardt and Tisdale 1976; Tausch et al. 1981; Gottfried 1987; Gottfried et al. 1995; Huffman et al. 2006ab). The primary management objective for these activities was to increasing forage production for livestock grazing (Gori and Bate 2007).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (96% of the total PNVT's area) associated with the piñon-juniper woodland (table 22); approximately 91 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 8 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 22. Piñon-juniper woodland PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 7,504 | 3.4 | 18 | 0.0 | 1,265 | 0.6 | 17,363 | 8.2 | 164,152 | 77.6 | 28,773 | 13.6 | 3,091 | 1.4 | 222,166 |

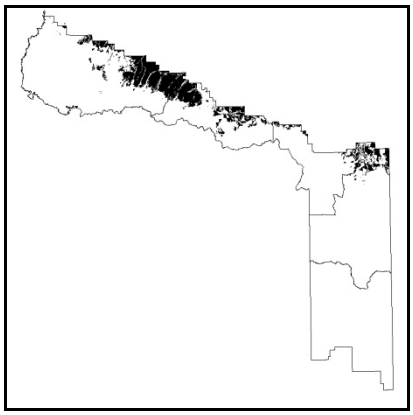
*Other Disturbances:* Other disturbances have included cabling or chaining; bulldozing; clearing or thinning with hand axes or motorized saws; and herbicide application. Current, estimates of the number of acres treated are lacking on the ASNFs, however, state-wide, by 1961, roughly 1.2 million acres of piñon-juniper woodland had been cleared in Arizona (Cotner 1963, Gori and Bate 2007). These were very common management activities on the forests between 1950 and 1970 and to a limited extent, continue today.

The most important and far reaching threats under agency authority for this PNVT include managing the legacy of past livestock grazing, which removed fine fuels needed for carrying frequent, low intensity surface fires; forest management practices, which have changed woodland age class distribution, composition, density, and cover values, and greatly reduced understory productivity; and fire suppression,

which effectively ended the frequent fire regime typical of this woodland, and the introduction of invasive plants. There are also areas (roughly 73%) were the soils are in impaired condition, and another 10 percent are classified as inherently unstable. Overall, based on VDDT modeling, under current management, there is considerable change in the DI from current to DC and HRV, which would indicate a continued trend in departure movement away from DC, and HRV, and a more improperly functioning system. This trend appears to be constant from 15 to 50 years. See appendix C for a more complete discussion of the threats affecting the piñon-juniper woodland and the risks they pose to this PNVT.

## Grassland PNVTs

***Great Basin grassland*** (map 8): The Great Basin grassland occurs primarily along the forests' northern boundary closely associated with the piñon-juniper woodland. At roughly 185,523 acres of NFS lands or, approximately 9 percent of the forests (table 4), the Great Basin grassland represents the fourth largest PNVT on the ASNFs.



**Map 8. General location of the Great Basin grassland PNVT**

Rain, temperature and soils limit this PNVT to lower elevations with vegetation coverage consisting of mostly grasses and forbs with interspersed shrubs. These grasslands are higher in elevation and climatically cooler and moister than semi-desert grasslands and are adjacent to and intermingle with piñon-juniper savanna ecosystems. Generally, annual precipitation ranges from 11.8 to 18.1 inches, with 40 percent coming between October 1st and March 31st (table 23).

Grass species may include but are not limited to: Indian ricegrass (*Achnatherum hymenoides* (Roemer & J.A. Schultes) Barkworth), threeawns (*Aristida* spp. L), blue grama, needle and thread *Hesperostipa comata* (Trin. & Rupr.) Barkworth), New Mexico feathergrass (*Hesperostipa neomexicana* (Thurb. ex Coult.) Barkworth), green needlegrass (*Nassella viridula* (Trin.) Barkworth), muhlys (*Muhlenbergia* spp. Schreb.), James' galleta (*Pleuraphis jamesii* Torr.), big bluestem (*Andropogon gerardii* Vitman), little bluestem (*Schizachyrium scoparium* (Michx.) Nash), western wheatgrass (*Pascopyrum smithii* (Rydb.) A. Löve), and sand dropseed (*Sporobolus cryptandrus* A.S. Hitchc.).

Shrub species may include but are not limited to: Saltbush (*Atriplex* spp. L.), jointfir (*Ephedra* spp. L.), rabbitbrush (*Chrysothamnus* Nutt.), snakeweed (*Gutierrezia* spp. Lag.), winterfat (*Krascheninnikovia lanata* (Pursh) A.D.J. Meeuse & Smit), juniper, and wax currant (*Ribes cereum* Dougl.). This PNVT may also include areas that are dominated by a variety of forbs.

The ASNFs' niche for this PNVT is approximately ten percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the Coconino Plateau Coniferous Forest and White Mountains Coniferous Forest subsections, the ASNFs contribute 59 and 38 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the Great Basin grassland PNVT is moderate (figure 2). With nearly 90 percent (table 4) of this PNVT located off-forest and having a low departure rating from HRV.

**Table 23. Great Basin grassland PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 46 | 52 | 11.8 | 18.1 | 40 | 0 - 31 | 0 | - | 150 - 160 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

Great Basin grassland PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 24. Overall, the fire did not cause a substantial impact to the Great Basin grassland PNVT. Roughly six percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, approximately 57 percent were burned, and of that; slightly more than six percent (413 acres) were classified as undergoing a moderate to high severity burn.

**Table 24. 2011 Wallow Fire burn severity within the Great Basin grassland PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 88 | 325 | 3,311 | 2,854 | 6,579 | | |
| Percent | 1.3 | 4.9 | 50.3 | 43.4 | 100 | | |
| **Total Great Basin Grassland PNVT** | | | | | | | |
| Acres | 88 | 325 | 3,311 | 2,854 | 6,579 | 178,944 | 185,523 |
| Percent | 0.0 | 0.2 | 1.8 | 1.5 | 3.5 | 96.5 | 100 |

Current conditions within the Great Basin grassland are highly departed from both DC and HRV (table 2) with a DI of 67 percent; this PNVT is the 3rd and 5th most departed from DC and HRV, respectively, on the forests. With respect to the DI there is a considerable (66%) over-representation of encroaching shrubs and trees of all sizes with open and closed canopies (vegetation structural states C and D) (see appendix B figure 7 and tables 61-68) and a noteworthy (63%) under-representation of open, dense stands of perennial grasses and forbs with less than ten percent woody canopy cover (vegetation structural state B). There is also an uncharacteristic state where various noxious weeds and invasive plants makeup a significant portion of the herbaceous vegetation composition represented by vegetation structural state E (roughly 3,700 acres); a more open canopy should promote an increase in herbaceous diversity and abundance.

### *Disturbances*

*Fire:* Based on its DI; this PNVT has a FRCC of 3. Historic fire return interval is estimated to have been between 10 and 30 years (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 2,970 to 4,425 acres; primarily mullein, weeping lovegrass, cheatgrass and bull thistle.

*Roads:* According to the forests' GIS database, approximately 555 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 1.9 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 15 percent of this PNVT.

*Herbivory:* According to Fletcher and Robbie (2004), one situation that makes grassland particularly vulnerable to degradation is a higher complement of cool season grasses, which are more sought after by livestock and are less resistant to grazing than warm season grasses, coupled with the soils prone to erosion across the majority of the Great Basin grassland. The complement of factors degrading other

grasslands - mainly interruption of the fire regime and heavy use by livestock during dry years - may have caused greater change here than even in the semi-desert grassland. Acre for acre, the Great Basin grassland prior to Euro-American settlement condition had greater hydrologic function (infiltration) and higher primary productivity than the semi-desert grassland.

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (99% of the total PNVT's area) associated with the Great Basin grassland (table 25); approximately 90 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 10 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 25. Great Basin grassland PNVT grazing capability and range condition data**

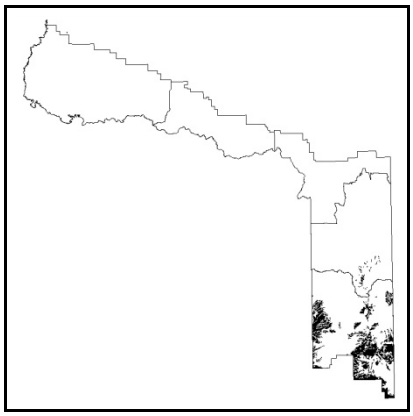
| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 627 | 0.3 | 0 | 0.0 | 1,187 | 0.7 | 17,767 | 9.9 | 128,068 | 71.2 | 32,896 | 18.3 | 4,979 | 2.7 | 185,523 |

At present, much of this grassland more closely resembles woodland than grassland. Overall, approximately 68 percent or nearly 126,156 acres of this PNVT have been encroached, to a lesser or greater degree by woody species, primarily piñon and juniper. According to Vander Lee et al. (2006) approximately 70 percent (88,309 acres) of these invaded acres may be non-restorable to their former grassland state. Historically these grasslands were dominated by herbaceous vegetation.

The most important threats under agency authority to this PNVT include fire suppression, which effectively ended the frequent fire regime typical of this grassland, woody species encroachment and establishment, human-caused fires, roads, highways and energy corridors, noxious weeds and invasive plants, and livestock grazing. These threat types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Continuation of current management along with ecological threshold changes (woody species encroachment, loss of understory productivity, loss of soil and soil productivity (there are also areas (roughly 94%) were the soils are in impaired and/or unsatisfactory condition) is not likely to move this PNVT towards DC and HRV. Overall, based on VDDT modeling, under current management, there is considerable change in the DI from current to DC and HRV, which would indicate a continued trend in departure movement away from DC, and HRV, and a more improperly functioning system. These trends appear to be constant from 30 to 50 years. See appendix C for a more complete discussion of the threats affecting the Great Basin grassland and the risks they pose to this PNVT.

According to Gori and Enquist (2003), changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacey 1995). Finch (2004) identified and summarized the major threats to grassland biological diversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, erosion, and habitat fragmentation.

***Semi-desert grassland*** (map 9): This PNVT occurs primarily on the Clifton RD closely associated with the Madrean pine-oak woodland. At roughly 106,952 acres of NFS lands, or approximately 5 percent of the forests (table 4), the semi-desert grassland represents the seventh largest PNVT on the ASNFs.



**Map 9. General location of the semi-desert grassland PNVT**

This PNVT occurs below the Mogollon Rim at elevations ranging from 3,200 to 4,500 feet. These grasslands are bounded by Chihuahuan Desert at the lowest elevations and Madrean pine-oak woodland or interior chaparral at the higher elevations. Generally, annual precipitation ranges from 12.6 to 21.3 inches, with 40 percent coming between October 1st and March 31st (table 26).

Species composition and dominance varies across the broad range of soils and topography. Dominant grassland associations/types are black grama (*Bouteloua eriopoda* (Torr.) Torr.) grassland, blue grama/hairy grama (*Bouteloua hirsuta* Lag.) grassland, tobossa (*Pleuraphis mutica* Buckl.) grassland, giant sacaton (*Sporobolus giganteus* Nash) grassland, and mixed native perennial grassland. Shrubs may also inhabit these grasslands and their abundance and species composition also varies.

**Table 26. Semi-desert grassland PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 54 | 63 | 12.6 | 21.3 | 40 | 0 - 8 | 0 | - | 170 - 200 |

†Winters are mild
‡Snowfall moisture is included in average annual precipitation data

The ASNFs' niche for this PNVT is approximately 14 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and Burro Mountains Oak-Juniper Woodland subsections, the ASNFs contribute 58 and 24 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the semi-desert grassland PNVT is moderate (figure 2). With nearly 86 percent (table 4) of this PNVT located off-forest and having a low departure rating from HRV.

Semi-desert grassland PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 27. Overall, the fire did not cause a substantial impact to the semi-desert grassland PNVT. Less than two percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, approximately 59 percent were burned, and of that; nearly 19 percent (287 acres) were classified as experiencing a moderate to high severity burn.

**Table 27. 2011 Wallow Fire burn severity within the semi-desert grassland PNVT**

| | Burn Severity by Soil Burn Severity Class Within Fire Perimeter | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | high | moderate | low | unburned | total | | |
| Acres | 35 | 251 | 606 | 624 | 1,517 | | |
| Percent | 2.3 | 16.5 | 40.0 | 41.2 | 100 | | |
| **Total Semi-desert Grassland PNVT** | | | | | | | |
| Acres | 35 | 251 | 606 | 624 | 1,517 | 105,435 | 106,952 |
| Percent | 0.0 | 0.2 | 0.6 | 0.6 | 1.4 | 98.6 | 100 |

Current conditions within the semi-desert grassland are highly departed from DC and HRV (table 2) with a DI of 79 percent; this PNVT is the 1st and 2nd most departed from DC and HV, respectively, on the

forests. With respect to the DI there is a considerable (77%) over-representation of encroaching shrubs and trees of all sizes with open and closed canopies (vegetation structural states C and D) (see appendix B figure 8 and tables 69-76) and a major (81%) under representation of open, dense stands of perennial grasses and forbs (late successional) with less than ten percent woody canopy cover (vegetation structural states A and B). There is also an uncharacteristic state where various noxious weeds and invasive plants makeup a significant portion of the herbaceous vegetation composition represented by vegetation structural state E (roughly 2,100 acres); a more open canopy should promote an increase in herbaceous diversity and abundance.

***Disturbances***

*Fire:* According to Gori and Enquist (2003) and Schussman (2006a), it is documented, through direct and indirect evidence, that fire played a key role in semi-desert grasslands in southeastern Arizona before 1890 (Humphrey 1953; Wright 1960; Bahre 1985; McPherson 1995; Kaib et al. 1996; Turner et al. 2003). Specifically, stand replacing fires swept across the grasslands between June and July at intervals of every 2.5 to 10 years and covered hundreds of square miles at a time (Kaib et al. 1996; McPherson 1995; Bahre 1985). Passive fire suppression, through livestock grazing beginning in the late 1800s as well as active suppression increasing over the last 120 years, has resulted in reduced fire return intervals in semi-desert grassland (Davis et al. 2002; Kaib et al. 1996; McPherson 1995). Based its DI rating, this PNVT has a FRCC of 3. Historic fire return interval is estimated to have been between 2.5 and 10 years (Vander-Lee et al. 2006).

Lack of fire has been implicated in the increased density and cover of mesquite, juniper, broom snakeweed (*Gutierrezia sarothrae* (Pursh) Britton & Rusby), burrowed (*Isocoma tenuisecta* Greene), creosote bush (*Larrea tridentata* (DC.) Coville), and cacti (Buffington and Herbel 1965; Gori and Enquist 2003; Hennessy et al. 1983; Humphrey and Mehrhoff 1958; Muldavin et al. 2002; Turner et al. 2003). This increase in woody species has been documented both with and without the presence of livestock grazing and has not been convincingly tied to climatic changes (McPherson and Weltzin 1998, 2000; Turner et al. 2003). Ultimately, the increase in trees and shrubs has changed vegetation in the semi-desert grasslands from a predominantly open perennial grass system to mixed shrub, tree, and perennial grass system with multiple areas having been converted to shrublands (Gibbens et al. 2005; Gori and Enquist 2003), and woodlands (Vander Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 1,730 to 2,470 acres; primarily mullein, Lehmann lovegrass, and field bindweed (*Convolvulus arvensis* L.).

*Roads:* According to the forests' GIS database, approximately 100 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 0.6 linear miles of road per square mile.

*Insect and Disease:* Between 2000 and 2004, insects and disease have impacted approximately seven percent of this PNVT.

*Herbivory:* Native herbivores in the semi-desert grasslands range from insects and rodents to pronghorn antelope and deer (Finch 2004).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (80% of the total PNVT's area) associated with the semi-desert grassland (table 28); approximately 61 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 35 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground

cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

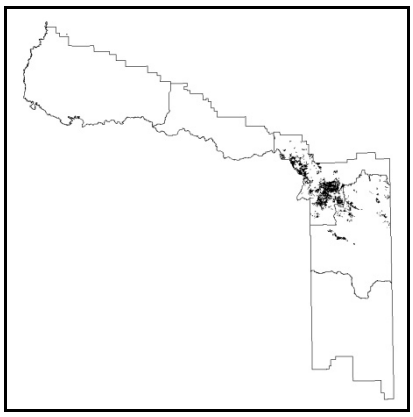
**Table 28. Semi-desert grassland PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 21,301 | 19.9 | 0 | 0.0 | 3,236 | 4.4 | 25,533 | 34.7 | 42,987 | 58.4 | 1,859 | 2.5 | 12,035 | 11.3 | 106,592 |

At present, much of this grassland more closely resembles woodland than grassland. Overall, approximately 80 percent or nearly 85,562 acres of this PNVT have been encroached, to a lesser or greater degree by woody species, primarily juniper and mesquite. According to Vander Lee et al. (2006) approximately 36 percent (30,802 acres) of these invaded acres may be non-restorable to their former grassland state. Historically these grasslands were dominated by herbaceous vegetation.

The threats to semi-desert grassland are the same as those listed for Great Basin grassland. Continuation of current management along with ecological threshold changes, such as woody species encroachment, loss of understory productivity, loss of soil and soil productivity (there are also areas (roughly 41%) were the soils are in impaired and/or unsatisfactory condition, and another 52 percent are classified as inherently unstable) is not likely to move this PNVT towards DC and HRV. Overall, based on VDDT modeling, under current management, there is considerable change in the DI from current to DC and HRV, which would indicate a continued trend in departure movement away from DC, and HRV, and a more improperly functioning system. These trends appear to be constant to 50 years. See appendix C for a more complete discussion of the threats affecting the semi-desert grassland and the risks they pose to this PNVT.

***Montane/subalpine grasslands*** (map10): This PNVT occurs primarily on the Alpine and Springerville RDs and at roughly 51,559 acres of NFS lands, or approximately 3 percent of the forests (table 4), is the smallest of the grassland types, and represents the ninth largest PNVT on the ASNFs.



**Map 10. General location of the montane/subalpine grasslands PNVT**

This PNVT contains a mix of dominant and co-dominant species in both dry and moister environments. This PNVT typically occurs at elevations ranging from approximately 7,500 to 11,000 feet on gentle to steep gradient slopes. Generally, annual precipitation ranges from 19.7 to 30.7 inches, with 50-55 percent coming between October 1st and March 31st (table 29).

Soils in swales and on riparian benches are usually moist throughout the year, and often harbor several plant associations with varying dominant grasses and herbaceous species. Upland and swale vegetation composition are characterized by different dominant species.

Common species at higher elevations in more mesic sites include tufted hairgrass (*Deschampsia cespitosa* (L.) Beauv.), non-native Canada bluegrass (*Poa compressa* L.) and Kentucky bluegrass, sheep fescue (*Festuca ovina* L.), Nebraska sedge (*Carex nebrascensis* Dewey), yarrow (*Achillea millefolium* L.), dryspike sedge (*Carex siccata* Dewey), and Baltic rush (*Juncus balticus* L.).

The more xeric upland sites at the higher elevations are dominated by mutton bluegrass (*Poa fendleriana* L.), Arizona fescue, pine dropseed, mountain muhly, White Mountain sedge (*Carex geophila* Mackenzie),

sheep fescue, woolly cinquefoil (*Potentilla hippiana* Lehm.), and small-leaf pussytoes (*Antennaria parvifolia* Nutt.).

Common species at lower elevations in more mesic sites include Canada and Kentucky bluegrass, spike muhly (*Muhlenbergia wrightii* Vasey ex Coult.), spreading fleabane (*Erigeron flagellaris* Gray), annual muhly (*Muhlenbergia minutissima* (Steud.) Swallen), white clover (*Trifolium repens* L.), yarrow, and dandelion (*Taraxacum officinale* L.).

**Table 29. Montane/subalpine grasslands PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 36 | 43 | 19.7 | 30.7 | 50 - 55 | 47 - 63 | 15 - 35 | Oct 1st - Apr 30th | 80 - 100 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

The more xeric upland sites at lower elevations are dominated by pine dropseed, blue grama, spreading fleabane, prairie junegrass (*Koeleria macrantha* (Ledeb.) J.A. Schultes), White Mountain sedge, non-native Canada bluegrass, annual muhly, and Fendler's sandwort (*Arenaria fendleri* Gray).

Size of montane/subalpine grasslands range from small park-like openings to extensive landscapes covering several thousand acres. Trees occur along the periphery of these grasslands; primarily ponderosa pine, southwestern white pine, Engelmann spruce, and subalpine fir, depending on elevation and moisture gradient. Some shrubs may also be present.

The ASNFs' niche for this PNVT is approximately 30 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and White Mountains Coniferous Forest subsections, the ASNFs contribute 96 and 74 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the montane/subalpine grasslands PNVT is moderate (figure 2). With roughly 70 percent (table 4) of this PNVT located off-forest and having a moderate departure rating from HRV.

Montane/subalpine grassland PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 30. Overall, the fire did cause a significant impact to the montane/subalpine grassland PNVT. Somewhat more than 70 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 80 percent were burned, and of that; five percent (1,855 acres) were classified as undergoing a moderate to high severity burn.

**Table 30. 2011 Wallow Fire burn severity within the montane/subalpine grassland PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 176 | 1,679 | 27,422 | 7,159 | 36,436 | | |
| Percent | 0.5 | 4.6 | 75.3 | 19.6 | 100 | | |
| **Total Montane/Subalpine Grassland PNVT** | | | | | | | |
| Acres | 176 | 1,679 | 27,422 | 7,159 | 36,436 | 15,020 | 51,559 |
| Percent | 0.3 | 3.3 | 53.2 | 13.9 | 70.7 | 29.1 | 100 |

Current conditions within the montane/subalpine grasslands are moderately departed from DC (table 2) with a DI of 54 percent from both DC[17] and HRV; this PNVT is the 6th and 8th most departed from DC

[17] Montane/subalpine grasslands PNVT has the equivelant departure from DC as the wet mixed conifer forest PNVT.

and HV, respectively, on the forests. With respect to the DI there is an over-representation (50%) of mid development (mid successional), open canopy (herbaceous vegetation) (vegetation structural state B), encroaching shrubs and trees of all sizes with open and closed canopies (vegetation structural state D) (see appendix B figure 9), and an important (41%) under-representation of late development (late successional), open canopy (herbaceous vegetation) vegetation structural state C). There is also an uncharacteristic state where various noxious weeds and invasive plants makeup a significant portion of the herbaceous vegetation composition represented by vegetation structural state E (roughly 520 acres). Overall, approximately ten percent or nearly 5,156 acres of this PNVT have been encroached, to a lesser or greater degree by woody species, primarily mixed conifer, ponderosa pine and piñon-juniper, depending on elevation and slope aspect.

***Disturbances***

*Fire:* Most grassland is subject to invasion by woody vegetation, and montane/subalpine grasslands are found within a mosaic of reproductive coniferous forests. However, fire is acknowledged to be the most influential force in checking tree invasion or encroachment (Daubenmire 1968; Allen 1984). Adjacent grasslands, with drier microclimates and annual accumulation of fuels are assumed to have burned at least as frequently as surrounding forest types (Allen 1984). During these grassland fires, young tree seedlings would have been killed due to the intensity of fire behavior in grassland fuels, maintaining intact grasslands (Daubenmire 1968). Based its DI rating, this PNVT has a FRCC of 2. Historic fire return interval is estimated to have been between 2 and 400 years depending on the adjacent forest type (Vander-Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 1,100 to 1,650 acres; primarily mullein and bull thistle. However, according to White (2002), non-native Kentucky and Canada bluegrasses are dominant species within the floristic assemblages of these grasslands. In addition, another six non-native grass species have become naturalized within these grassland communities. All eight of these cool-season, perennial, non-native grasses have been seeded by the USDA Forest Service for either: 1) rehabilitation of skid trails, logging roads, landings, fire lines and severely burned areas, 2) riparian and meadow restoration, and/or 3) forage enhancement for domestic livestock (Jardine and Anderson 1919; Sampson 1923; USDA Forest Service 1937; White 2002).

*Roads:* According to the forests' GIS database, approximately 170 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 2.1 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 13 percent of this PNVT.

*Herbivory:* Smith (2007) could find no studies that documented herbivory as an important historical ecological determinant for the montane/subalpine grasslands. Turner and Paulsen (1976), and Vankat (2006) accept that herbivores did use grasslands for forage, including mule deer, Merriam's elk, pronghorn, and various rodents and insects. Different grazers show preference for different species of grasses, grasslike plants and/or forbs, and reduce the more palatable species with high variability spatially and temporally, but little is known about direct effects on high elevation grasslands.

The most current ASNFs data (White, 2002; USFS 2007-2008) indicates that within the capable grazing lands (99% of the total PNVT's area) associated with the montane/subalpine grasslands (table 31); approximately 20 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while nearly 80 percent is in moderately high to high ecological condition or fair to good range condition. Low to moderately low ecological conditions have resulted in

lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

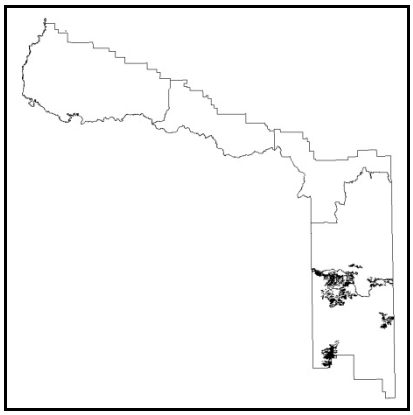
**Table 31. Montane/subalpine grasslands PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 307 | 0.7 | 1,860 | 3.7 | 3,756 | 7.4 | 34,607 | 68.4 | 8,899 | 17.6 | 1,438 | 2.8 | 628 | 1.2 | 51,559 |

The threats to montane/subalpine grasslands are the same as those listed for Great Basin and semi-desert grasslands. A Region 3 VDDT model was not developed for this PNVT, however, continuation of current management along with ecological threshold changes, such as woody species encroachment, loss of understory productivity, loss of soil and soil productivity (there are also areas (roughly 8%) where the soils are in impaired condition) is likely to continue to move this PNVT way DC and HRV. See appendix C for a more complete discussion of the threats affecting the montane/subalpine grasslands and the risks they pose to this PNVT.

## Chaparral PNVT

***Interior chaparral*** (map 11): This PNVT occurs primarily on the Clifton RD and at roughly 55,981 acres of NFS lands, or approximately 3 percent of the forests (table 4), represents the eighth largest PNVT on the ASNFs. This PNVT is typically found on mountain foothills and lower slopes where low-elevation desert landscapes transition into Madrean pine-oak woodlands.



**Map 11. General location of the interior chaparral PNVT**

Interior chaparral consists of mixed shrub associations including but not limited to the following species: Manzanita (*Arctostaphylos* spp. Adans.), desert ceanothus (*Ceanothus greggii* Gray), mountain mahogany (*Cercocarpus montanus* Raf.), silktassles (*Garrya* spp. Dougl. ex Lindl.), Stansbury cliffrose (*Purshia stansburiana* (Torr.) Henrickson), yerba de pasmo (*Baccharis pteronioides* DC.), evergreen oaks, various cactus such as prickly pear (*Opuntia* spp. P. Mill.), cholla (*Cylindropuntia* spp. (Engelm.) Kreuzinger), hedgehog cactus (*Echinocereus* spp. Engelm.), and globe cactus (*Mammillaria* spp. Haw.), Arizona cypress (*Cupressus arizonica* Greene), and sumacs (*Rhus* spp. L.). Grasses typically include bullgrass (*Muhlenbergia emersleyi* Vasey) and longtongue muhly (*M. longiligula* A.S. Hitchc.).

Generally, annual precipitation ranges from 17.3 to 23.6 inches, with 45 percent coming between October 1st and March 31st (table 32).

**Table 32. Interior chaparral PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 41 | 54 | 17.3 | 23.6 | 45 | 12 - 39 | 0 - 6 | Dec 1st - Mar 31st | 130 - 160 |

†Winters can be mild or cold depending on elevation and aspect
‡Snowfall moisture is included in average annual precipitation data

The ASNFs' niche for this PNVT is approximately 24 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and White Mountains Coniferous Forest subsections, the ASNFs contribute 78 and 61 percent of this PNVT, respectively. The ASNFs' contribution to the sustainability of the interior chaparral PNVT is low (figure 2). With 76 percent (table 4) of this PNVT located off-forest and having a low departure rating from HRV.

Interior chaparral grassland PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 33. Overall, the fire did not cause a substantial impact to the interior chaparral PNVT. Somewhat more than 18 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 61 percent were burned, and of that; 28 percent (2,783 acres) were classified as experiencing a moderate to high severity burn.

**Table 33. 2011 Wallow Fire burn severity within the interior chaparral PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 357 | 2,426 | 3,266 | 3,900 | 9,949 | | |
| Percent | 3.6 | 24.4 | 32.8 | 39.2 | 100 | | |
| **Total Interior Chaparral PNVT** | | | | | | | |
| Acres | 357 | 2,426 | 3,266 | 3,900 | 9,949 | 46,032 | 55,981 |
| Percent | 0.6 | 4.3 | 5.8 | 7.0 | 17.8 | 82.2 | 100 |

Current conditions within the interior chaparral are not departed from DC and HRV (table 2) with a DI of 8 percent for both, making it the least departed PNVT on the forests for DC and HRV, respectively (see appendix B figure 10). With respect to DI, there is a small over-representation (8 percent) of early development (early seral) open canopy herbaceous dominated conditions in a historically shrub dominated vegetation type.

### *Disturbances*

*Fire:* Given the relatively less frequent and broad fire return interval (20 to 100) that chaparral shrublands are adapted to, the last 120 years of fire suppression has had less effect on chaparral than frequent fire regime adapted PNVTs. In general, structural changes, such as changes from a grass dominated structure to a shrub dominated one, have not occurred within chaparral. The only change that has been documented within this PNVT is an increase in shrub cover densities within already existing chaparral stands (Huebner et al. 1999; Huebner and Vankat 2003). Based its DI rating, this PNVT has a FRCC of 1. Historic fire return interval is estimated to have been between 20 and 100 years (Vander-Lee et al. 2006).

*Non-native Invasive Plants:* Non-native invasive plants have become established and infest roughly 100 to 150 acres; primarily mullein.

*Roads:* According to the forests' GIS database, approximately 5 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 0.1 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 19 percent of this PNVT.

*Herbivory:* Mule deer, white-tailed deer, and black bears are key herbivores in interior chaparral. Deer eat a variety of forbs, shrubs and browse, as well as mast and other fruits (Baker 1999, Cable 1975). Conversion treatments of chaparral to grassland were shown to increase forage for deer, elk, and cattle. However, the decrease in protective cover following conversion was also shown to negatively affect deer, especially when treatments occurred on large landscape scales (Baker 1999, Cable 1975). Additionally,

cover and food for black bear is best when there are shrubs and low trees due to presence of numerous mast and fruit producing species (Baker 1999).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (44% of the total PNVT's area) associated with the interior chaparral (table 34); approximately 45 percent of the herbaceous understory is in moderately low ecological condition or poor range condition, while nearly 52 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 34. Interior chaparral PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 31,403 | 56.1 | 0 | 0.0 | 299 | 1.4 | 11,756 | 53.8 | 9,789 | 44.8 | 0 | 0.0 | 2,734 | 4.9 | 55,981 |

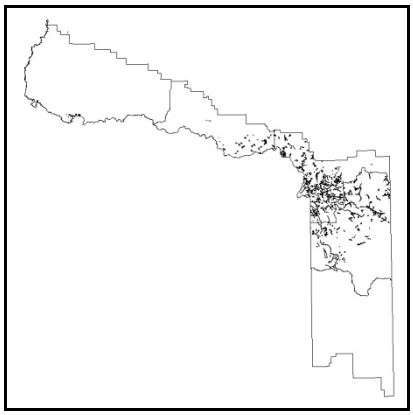
The most important and far reaching threat under agency authority for this PNVT is the potential for human-caused fires, invasive species establishment, livestock grazing, loss of soil and soil productivity (there are also areas (19%) where the soils are in unsatisfactory condition, and another 81 percent are classified as inherently unstable). Under current management risks are addressed. See appendix C for a more complete discussion of the threats affecting the interior chaparral and the risks they pose to this PNVT.

## Riparian PNVTs

Riparian areas are of primary importance because of the scarcity of water in the Southwest. All of the riparian PNVTs are unique in the fact that they represent a very small portion (less than three percent total) of the ASNFs' land area. However, the ASNFs are responsible for the management of the majority of this type within the landscape of the ecoregion (table 4). These areas on the ASNFs are a focal point for humans, terrestrial wildlife, and livestock activities, as well as species that are obligate-dependence on wetland, riparian and aquatic habitats. Therefore, both demand and impacts are high. Currently, 72 to 75 percent of riparian communities on the ASNFs are either functioning-at-risk or non-functioning[18]. In addition, monitoring across the forests has found that riparian area soils and herbaceous vegetation (sedges, grasses, forbs) and deciduous trees and shrubs (cottonwood, willow) receive far greater impacts from grazing and browsing ungulates, both domestic and wild, as compared to uplands.

[18] Functional-At-Risk (FAR): Riparian-wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation. Non-functional (NF): Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and are not reducing erosion, improving water quality, etc. (USDI BLM 1993, 1994, 1998, 1999, 2003).

***Wetland/cienega riparian areas*** (map 12): This PNVT occurs primarily on the Alpine, Lakeside, and Springerville RDs and at roughly 17,900 acres of NFS lands, or approximately 1 percent of the forests (table 4), represents the tenth largest PNVT on the ASNFs. This PNVT is associated with perennial springs or headwater streams, bogs, and fens where ground water intersects the surface and creates pools of standing water, sometimes with channels flowing between pools. Generally, annual precipitation ranges from 19.7 to 31.5 inches, with 50-55 percent coming between October 1st and March 31st (table 35).



**Map 12. General location of the wetland/cienega riparian areas PNVT**

Although wetland/cienegas are often wet, they might not be wet year-round. In fact, some of the most important wetland/cienegas are only seasonally wet. Wetland/cienegas are the link between the land and the water. They are transition zones where the flow of water, the cycling of nutrients, and the energy of the sun meet to produce a unique ecosystem characterized by hydrology, soils, and vegetation - making these areas very important features of a watershed.

**Table 35. Wetland/cienega riparian areas PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 34 | 43 | 19.7 | 31.5 | 50 - 55 | 47 - 67 | 14 - 39 | Nov 1st - Apr 30th | 70 - 100 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

Some vegetation types found in wetland/cienegas include saltgrass (*Distichlis spicata* (L.) Greene), yerba mansa (*Anemopsis californica* (Nutt.) Hook. & Arn.), sacaton (*Sporobolus airoides* (Torr.) Torr.), giant sacaton, and bog alkaligrass (*Puccinellia parishii* A.S. Hitchc.) in more saline areas at lower elevations. At medium and higher elevations tufted hairgrass, mannagrasses (*Glyceria* spp. R. Br.), non-native Canada and Kentucky bluegrass, rushes, sedges, flat sedges (*Cyperus* spp. L.), and spikerushes (*Eleocharis* spp. R. Br.) can be found, and deep pools support a variety of other aquatic vegetation

The ASNFs' niche for this PNVT is approximately 64 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Coniferous Forest and White Mountains Scarp Woodland-Coniferous Forest subsections, the ASNFs contribute 95 and 79 percent of this PNVT, respectively. With 36 percent (table 4) of this PNVT located off-forest and having an overall estimated moderate departure rating from HRV; nevertheless, given the importance of riparian areas in the Southwest in general and the forests specifically, the ASNFs' contribution to the sustainability of the wetland/cienega riparian areas PNVT is high (figure 2). Historically these riparian areas were dominated by herbaceous vegetation.

Wetland/cienega riparian areas PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 36. Overall, the fire did cause a significant impact to the wetland/cienega riparian areas PNVT. Approximately 60 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 73 percent were burned, and of that; slightly more than ten percent (1,200 acres) were classified as undergoing a moderate to high severity burn.

**Table 36. 2011 Wallow Fire burn severity within the wetland/cienega riparian areas PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | High | Moderate | Low | Unburned | Total | | |
| Acres | 441 | 759 | 7,406 | 3,212 | 11,818 | | |
| Percent | 3.7 | 6.4 | 62.7 | 27.2 | 100 | | |
| **Total Wetland/Cienega Riparian Areas PNVT** | | | | | | | |
| Acres | 441 | 759 | 7,406 | 3,212 | 11,818 | 6,082 | 17,900 |
| Percent | 2.5 | 4.2 | 41.4 | 17.9 | 66.0 | 34.0 | 100 |

Current conditions within wetland/cienega riparian areas are rated at low departure from DC and HRV (table 2) with a DI of 36 percent for both DC and HRV; this PNVT is the 7th and 9th most departed from DC and HV, respectively, on the forests. With respect to the DI there is an under-representation (27%) of mid development (mid successional), open canopy (herbaceous vegetation) (vegetation structural state B), and an over-representation (37%) of encroaching shrubs and trees of all sizes with open and closed canopies (vegetation structural states C and D) (see appendix B figure 11). Historically, wetland/cienega riparian areas were capable of producing herbaceous vegetation that provided from 95 to 100 percent ground cover. Today ground cover provided by herbaceous vegetation ranges from 55 to 100 percent (Laing et al. 1989). This is a decline in herbaceous cover ranging from 0 to 42 percent; a more open canopy should promote an increase in herbaceous diversity and abundance.

### *Disturbances*

*Fire:* The moisture associated with riparian areas promotes lower fire frequency compared with adjacent uplands, and rapid recovery from fire events. Wet meadow types seldom burn (LANDFIRE 2007f). However, fire behavior in these systems is strongly influenced by the adjacent PNVTs.

*Hydrologic Events:* Hydrological events were the major disturbance agents in these systems.

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 250 to 350 acres; primarily mullein and bull thistle. However, many of these areas are dominated by non-native Canada and Kentucky bluegrass.

*Roads:* According to the forests' GIS database, approximately 70 miles of roads and motorized trails have been constructed within this PNVT; this equates to roughly 2.5 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 23 percent of this PNVT.

*Herbivory:* Because these areas have water available, and have the potential to produce from 3,895 to 4,810 pounds of herbaceous vegetation per acre, they are areas of concentrated livestock use as well as wild ungulates. According to White (2002), livestock and elk grazing have been major negative influences in the alteration of structure, composition and function of the vegetation community. The majority of this PNVT has very low to low ecological similarity with historic conditions (White 2002).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (94% of the total PNVT's area) associated with wetland/cienegas riparian areas (table 37); approximately 44 percent of the herbaceous understory is in moderately low ecological condition or poor range condition, while nearly 46 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 37. Wetland/cienega riparian areas PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 1,013 | 5.7 | 52 | 0.3 | 816 | 5.0 | 7,445 | 45.5 | 7,227 | 44.2 | 823 | 5.0 | 524 | 2.9 | 17,900 |

*Other disturbances:* As a result of this PNVT's landscape position and its close association with water and runoff, it is directly and cumulatively affected by all of the threats and risks from adjacent, upland, PNVTs.

Changes in the structure and function of wetland/cienega systems have been noted as the primary cause of the loss of biological diversity within these systems. The causes of adverse change in the ecological character of wetland/cienegas can be grouped in five broad categories: 1) changes to the water regime; 2) water pollution; 3) physical modification; 4) exploitation of biological products; and 5) introduction of invasive species (Bodner and Simms 2008).

The most important threats under agency management authority to all of the riparian areas and riparian forest PNVTs include fire suppression which has allowed non-riparian species expansion into these communities, inundation (diversions, dams and impoundments (Krueper 1995)) which has allowed for de-watering and drying of these communities below these structures, human-caused fires, and roads, highways and energy corridors, and livestock grazing (Krueper 1995), and wild ungulates. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. A Region 3 VDDT model was not developed for this PNVT, however, continuation of current management along with ecological threshold changes (upland woody species encroachment, loss of understory productivity, loss of soil and soil productivity (27% of the soils are rated as being impaired), and the inability to reverse the malfunctioning physical processes within these riparian areas is likely to continue to move this PNVT away from DC and HRV. See appendix C for a more complete discussion of the threats affecting the wetland/cienega riparian areas and the risks they pose to this PNVT.

***Cottonwood-willow riparian forest*** (map 13): This PNVT occurs primarily on the Alpine, Black Mesa and Lakeside RDs along approximately 800 miles of rivers and streams. At roughly 15,876 acres of NFS lands, or approximately 1 percent of the forests (table 4), represents the largest PNVT on the ASNFs. Generally, annual precipitation ranges from 11.0 to 24.0 inches, with 40-55 percent coming between October 1st and March 31st (table 38).

**Map 13. General location of the cottonwood-willow riparian forest PNVT**

Dominant woody species include narrowleaf cottonwood and a variety of willow; Bebb (*Salix bebbiana* Sarg.), greenleaf (*S. lucida* Muhl. ssp. *caudata* (Nutt.) E. Murr.), and dewystem (*S. irrorata* Anderss.). Various grasses and forbs are usually present.

These areas are often subjected to water withdrawal, heavy grazing and recreational pressure and can be profoundly degraded and the water table can be severely depleted. Vegetation can be dependent upon annual or periodic flooding for growth and reproduction, especially at lower elevations.

The ASNFs' niche for this PNVT is approximately 81 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the Coconino Plateau Woodland and Coconino Plateau Coniferous Forest subsections, the ASNFs contribute 92 and 82 percent of this PNVT,

respectively. With 19 percent (table 4) of this PNVT located off-forest and having an overall estimated low departure rating from HRV; nevertheless, given the importance of riparian areas in the Southwest in general and the forests specifically, the ASNFs' contribution to the sustainability of the cottonwood-willow riparian forest PNVT is high (figure 2).

**Table 38. Cottonwood-willow riparian forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 41 | 54 | 11.0 | 24.0 | 40 - 55 | 0 - 47 | 0 - 16 | Nov 1st - Apr 30th | 100 - 150 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

Cottonwood-willow riparian forest PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 39. Overall, the fire did not cause a substantial impact to the cottonwood-willow riparian forest PNVT. Approximately 11 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 56 percent were burned, and of that; slightly more than 14 percent (249 acres) were classified as experiencing a moderate to high severity burn.

**Table 39. 2011 Wallow Fire burn severity within the cottonwood-willow riparian forest PNVT**

| | Burn Severity by Soil Burn Severity Class within fire perimeter | | | | | outside fire perimeter | total PNVT |
|---|---|---|---|---|---|---|---|
| | high | moderate | low | unburned | total | | |
| Acres | 72 | 176 | 731 | 759 | 1,738 | | |
| Percent | 4.2 | 10.1 | 42.0 | 43.7 | 100 | | |
| **Total Cottonwood-Willow Riparian Forest PNVT** | | | | | | | |
| Acres | 72 | 176 | 731 | 759 | 1,738 | 14,137 | 15,876 |
| Percent | 0.5 | 1.1 | 4.6 | 4.8 | 11.0 | 89.0 | 100 |

Current conditions within the cottonwood-willow riparian forest are not departed from DC and HRV (table 2) with a DI of 20 percent for both, making it the 12th and 13th most departed PNVT on the forests for DC and HRV, respectively. With respect to the DI there is an under-representation (20%) of small size trees with open and closed canopies (vegetation structural states B) (see appendix B figure 12), and over-representation (16%) of medium to very large size trees with open and closed canopies (vegetation structural state C). These conditions are indicative of and older stand structure which lacks young tree recruitment. Historically these forests were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics allowing for an abundance of herbaceous species. Generally, cottonwood-willow riparian forests were capable of producing herbaceous vegetation that provided from 65 to 90 percent ground cover. Today ground cover provided by herbaceous vegetation ranges from 35 to 80 percent (Laing et al. 1989). This is a decline in herbaceous cover ranging from 11 to 46 percent.

### *Disturbances*

*Fire:* The moisture associated with riparian areas promotes lower fire frequency compared with adjacent uplands, and rapid recovery from fire events. Wet meadow/riparian types seldom burn (LANDFIRE 2007f). However, fire behavior in these systems is strongly influenced by the adjacent uplands. Based on a departure index rating of 42 percent (tables 96 and 98), this PNVT has a FRCC of 2. Historic fire return interval is estimated to have been infrequent - similar to adjacent PNVT fire regimes (Vander Lee et al. 2006) as compared to the forests' current fire return intervals. Fire severity was lower than current condition, with stand replacing fires rarely occurring. In riparian systems the pre-burn herbaceous plant community is not permanently destroyed, and rapidly recovers. Recovery is possible within a single

growing season. Woody species (i.e., cottonwood, willows) can be top-killed, but generally resprout within a short period of time.

*Hydrological Events:* Hydrological events are the major disturbance agents in these systems.

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 100 to 150 acres; consisting primarily of mullein, salt cedar and weeping lovegrass.

*Roads:* Approximately 50 miles of roads have been constructed within this PNVT; this equates to nearly 1.9 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 16 percent of this PNVT.

*Herbivory:* Because these areas have water available, and have the potential to produce from 340 to 1,265 pounds of herbaceous vegetation per acre, they are areas of concentrated livestock use as well as wild ungulates. Livestock and elk grazing have been major negative influences in the alteration of structure, composition and function of the vegetation community.

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (97% of the total PNVT's area) associated with the cottonwood-willow riparian forest (table 40); approximately 89 percent of the herbaceous understory is in low to moderately low ecological condition very poor to poor range condition, while only 10 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 40. Cottonwood-willow riparian forest PNVT grazing capability and range condition data**

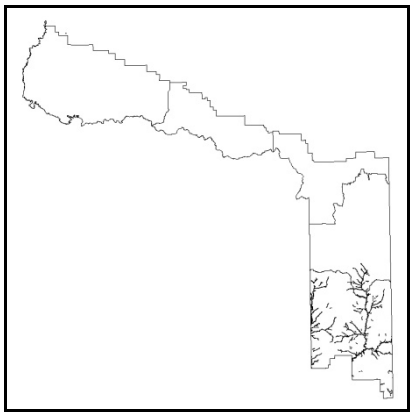
| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 427 | 2.7 | 0 | 0.0 | 111 | 0.7 | 1,542 | 10.3 | 8,839 | 59.0 | 4,496 | 30.0 | 461 | 2.9 | 15,876 |

*Wildlife:* Beaver were historically important in many of these cottonwood-willow riparian systems.

*Other disturbances:* As a result of this PNVT's landscape position and its close association with water and runoff, it is directly and cumulatively affected by all of the threats and risks from adjacent, upland, PNVTs.

The threats to cottonwood-willow riparian forests are the same as those listed for wetland/cienega riparian areas. A Region 3 VDDT model was not developed for this PNVT, however, continuation of current management along with ecological threshold changes, such as upland woody species encroachment, loss of understory productivity, loss of soil and soil productivity (100% of the soils are rated as being impaired and/or unsatisfactory), and the inability to reverse the malfunctioning physical processes within these riparian areas is likely to move this PNVT away from DC and HRV**.** See appendix C for a more complete discussion of the threats affecting the cottonwood-willow riparian forest and the risks they pose to this PNVT.

***Mixed broadleaf deciduous riparian forest*** (map 14): This PNVT occurs primarily on the Alpine and Clifton RDs along approximately 860 miles of rivers and streams. At roughly 9,657 acres of NFS lands, or approximately 0.5 percent of the forests (table 4), represents the 13th largest PNVT on the ASNFs. Generally, annual precipitation ranges from 11.0 to 24.0 inches, with 40-55 percent coming between October 1st and March 31st (table 41).



**Map 14. General location of the mixed broadleaf deciduous riparian forest PNVT**

The vegetation is a mix of riparian woodlands and shrublands with a variety of vegetation associations. The dominant vegetation is likely to depend upon a suite of site-specific characteristics including elevation, substrate, stream gradient, and depth to groundwater. For example, one vegetation association is dominated by bigtooth maple (*Acer grandidentatum* Nutt.) with mixed stands of Emory oak and scattered conifers (pines and junipers).

Other sites can be dominated by a mixture of the following woody species: boxelder (*Acer negundo* L.), Fremont cottonwood (*Populus fremontii* S. Wats.), Arizona sycamore (*Platanus wrightii* S. Wats.), velvet ash (*Fraxinus velutina* Torr.), Arizona walnut (*Juglans major* (Torr.) Heller), desert willow (*Chilopsis linearis* (Cav.) Sweet), and willow species (*Salix* spp. L.), as well as numerous shrub, grass and forb species.

The PNVT often contains several species of oak and conifers (pines and junipers) from upstream and adjacent uplands. Vegetation can be dependent upon annual or periodic flooding for growth and reproduction, especially at lower elevations.

The ASNFs' niche for this PNVT is approximately 34 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Woodland and White Mountains Coniferous Forest subsections, the ASNFs contribute 86 and 83 percent of this PNVT, respectively. With 66 percent (table 4) of this PNVT located off-forest and having an overall estimated low departure rating from HRV; nevertheless, given the importance of riparian areas in the Southwest in general and the forests specifically, the ASNFs' contribution to the sustainability of the mixed broadleaf deciduous riparian forest PNVT is high (figure 2).

**Table 41. Mixed broadleaf deciduous riparian forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 54 | 61 | 12.6 | 19.7 | 40 | 0 - 8 | 0 | - | 170 - 200 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

Mixed broadleaf deciduous riparian forest PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 42. Overall, the fire did not cause a substantial impact to the mixed broadleaf deciduous riparian forest PNVT. Approximately five percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 49 percent were burned, and of that; nearly six percent (27 acres) were classified as undergoing a moderate to high severity burn.

**Table 42. 2011 Wallow Fire burn severity within the mixed broadleaf deciduous riparian forest PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 0 | 27 | 212 | 251 | 491 | | |
| Percent | 0.1 | 5.6 | 43.2 | 51.1 | 100 | | |
| **Total Mixed Broadleaf Deciduous Riparian Forest PNVT** | | | | | | | |
| Acres | 0 | 27 | 212 | 251 | 491 | 9,166 | 9,657 |
| Percent | 0.0 | 0.3 | 2.2 | 2.6 | 5.1 | 94.9 | 100 |

Current conditions within the mixed broadleaf deciduous riparian forest are at a low departure from DC and HRV (table 2) with a DI of 33 percent, this PNVT is 8$^{th}$ and 10$^{th}$ most departed on the forests for DC and HRV, respectively. With respect to the DI there is an over-representation (31%) of seedlings, saplings, and small to medium size trees with closed canopies (vegetation structural state B) (see appendix B figure 13) and an under-representation (29%) of seedlings, saplings, and small to very large size trees with open canopies (vegetation structural states C and D). Historically these forests were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics allowing for an abundance of herbaceous species. Generally, mixed broadleaf deciduous riparian forests were capable of producing herbaceous vegetation that provided from 25 to 90 percent ground cover. Today ground cover provided by herbaceous vegetation ranges from 5 to 20 percent (Laing et al. 1989). This is a decline in herbaceous cover ranging from 78 to 80 percent.

### *Disturbances*

*Fire:* The moisture associated with riparian areas promotes lower fire frequency compared with adjacent uplands, and rapid recovery from fire events. Wet meadow/riparian types seldom burn (LANDFIRE 2007f). However, Fire behavior in these systems is strongly influenced by the adjacent uplands. Based on a departure index rating of 28 percent (tables 82 and 84), this PNVT has a FRCC of 1. In riparian systems the pre-burn herbaceous plant community is not permanently destroyed, and rapidly recovers. Recovery is possible within a single growing season. Woody species (i.e., willows, boxelder) can be top-killed, but generally resprout within a short period of time.

*Hydrological Events:* Hydrological events are the major disturbance agents in these systems.

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 500 to 750 acres; primarily salt cedar and mullein.

*Roads:* Approximately 20 miles of roads have been constructed within this PNVT; this equates to nearly 1.4 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 11 percent of this PNVT.

*Herbivory:* Because these areas have water available, and have the potential to produce from 490 to 740 pounds of herbaceous vegetation per acre, they are areas of concentrated livestock use as well as wild ungulates. Livestock and elk grazing have been major negative influences in the alteration of structure, composition and function of the vegetation community.

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (85% of the total PNVT's area) associated with the mixed broadleaf deciduous riparian forest (table 43); approximately 62 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while nearly 39 percent is in moderately high to high ecological

condition or fair to good range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 43. Mixed broadleaf deciduous riparian forest PNVT grazing capability and range condition data**

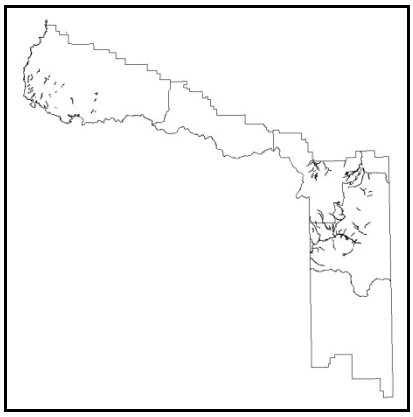
| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 1,476 | 15.3 | 0 | 0.0 | 1,209 | 16.5 | 1,619 | 22.0 | 4,172 | 56.8 | 348 | 4.7 | 833 | 8.6 | 9,657 |

*Wildlife:* Beaver were historically important in many of these cottonwood-willow riparian systems.

*Other disturbances:* As a result of this PNVT's landscape position and its close association with water and runoff, it is directly and cumulatively affected by all of the threats and risks from adjacent, upland, PNVTs.

The threats to mixed broadleaf deciduous riparian forest are the same as those listed for wetland/cienega riparian areas and cottonwood-willow riparian forests. A Region 3 VDDT model was not developed for this PNVT, however, continuation of current management along with ecological threshold changes, such as upland woody species encroachment, loss of understory productivity, loss of soil and soil productivity (73% of the soils are rated as being impaired and/or unsatisfactory), and the inability to reverse the malfunctioning physical processes within these riparian areas is likely to move this PNVT away from DC and HRV**.** See appendix C for a more complete discussion of the threats affecting the mixed broadleaf deciduous riparian forest and the risks they pose to this PNVT.

***Montane willow riparian forest*** (map 15): This PNVT occurs primarily on the Alpine, Black Mesa and Springerville RDs along approximately 1,130 miles of rivers and streams. At roughly 4,808 acres of NFS lands, or approximately 0.2 percent of the forests (table 4), represents the smallest PNVT on the ASNFs. Generally, annual precipitation ranges from 19.7 to 30.7 inches, with 50-55 percent coming between October 1st and March 31st (table 44).



**Map 15. General location of the montane willow riparian forest PNVT**

At the lowest elevations the dominant woody vegetation includes Fremont cottonwood, Arizona sycamore, Arizona walnut, velvet ash, and soapberry (*Sapindus saponaria* L.). Shrubs include a variety of willows, chokecherry (*Prunus virginiana* L.), and Arizona alder (*Alnus oblongifolia* Torr.).

A variety of herbaceous species are usually present. At higher elevations, this PNVT is found along streambanks, seeps, fens, and isolated springs narrowleaf cottonwood (*Populus angustifolia* James) may be present. In addition, this PNVT can be shrub and herb dominated. Dominant shrubs may include thinleaf alder (*Alnus incana* (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung), birch (*Betula* spp. L.), redosier dogwood (*Cornus sericea* L.), and a variety of willows. In many high elevations situations within this PNVT the herbaceous species component is dominated by nonnative Kentucky and Canada bluegrass.

The ASNFs' niche for this PNVT is approximately 22 percent of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section (table 4). Within the White Mountains Coniferous Forest and Coconino Plateau Coniferous Forest subsections, the ASNFs contribute 63 and 53 percent of this PNVT, respectively. With 78 percent (table 4) of this PNVT located off-forest and having an overall estimated

high departure rating from HRV; nevertheless, given the importance of riparian areas in the Southwest in general and the forests specifically, the ASNFs' contribution to the sustainability of the montane willow riparian forest PNVT is high (figure 2).

**Table 44. Montane willow riparian forest PNVT temperature and moisture data**

| Average Annual Air Temperature† (° F) | | Average Annual Precipitation (inches) | | | Average Snowfall‡ (inches) | | | Number of Frost-free Days per Year |
|---|---|---|---|---|---|---|---|---|
| low | high | low | high | percent occurring between Oct 1st and Mar 31st | annual | accumulation | major accumulation period | |
| 37 | 46 | 19.7 | 30.7 | 50 - 55 | 47 - 63 | 14 - 35 | Oct 1st - Apr 30th | 80 - 100 |

†Winters are cold
‡Snowfall moisture is included in average annual precipitation data

Montane willow riparian forest PNVT burn severity acres produced by the 2011 Wallow Fire can be seen in table 45. Overall, the fire did cause a significant impact to the montane willow riparian forest PNVT. Approximately 69 percent of this PNVT was within the perimeter of the Wallow Fire. Of the acres within the fire perimeter, roughly 69 percent were burned, and of that; nearly 19 percent (620 acres) were classified as experiencing a moderate to high severity burn.

**Table 45. 2011 Wallow Fire burn severity within the montane willow riparian forest PNVT**

| | Burn Severity by Soil Burn Severity Class | | | | | Outside Fire Perimeter | Total PNVT |
|---|---|---|---|---|---|---|---|
| | Within Fire Perimeter | | | | | | |
| | high | moderate | low | unburned | total | | |
| Acres | 196 | 424 | 1,674 | 1,041 | 3,336 | | |
| Percent | 5.9 | 12.7 | 50.2 | 31.2 | 100 | | |
| **Total Montane Willow Riparian Forest PNVT** | | | | | | | |
| Acres | 196 | 424 | 1,674 | 1,041 | 3,336 | 1,472 | 4,808 |
| Percent | 4.1 | 8.8 | 34.8 | 21.6 | 69.4 | 30.6 | 100 |

Current conditions within the montane willow riparian forest are at a low departure from DC and HRV (table 2) with a DI of 21 percent, this PNVT is the 10th and 12th most departed PNVT on the forests for DC and HRV, respectively. With respect to the DI there is an over-representation (21%) of seedlings, saplings, and small to very large size trees with open and closed canopies (vegetation structural state B) (see appendix B figure 14) and an under-representation (21%) of herbaceous vegetation, and seedlings and saplings with open canopies (vegetation structural state A). Historically these forests were dominated by very shade intolerant and shade intolerant shrub and tree species with open canopy characteristics allowing for an abundance of herbaceous species. Generally, montane willow riparian forests were capable of producing herbaceous vegetation that provided from 70 to 90 percent ground cover. Today ground cover provided by herbaceous vegetation ranges from 55 to 90 percent (Laing et al. 1989). This is a decline in herbaceous cover ranging from 0 to 21 percent.

### *Disturbances*

*Fire:* The moisture associated with riparian areas promotes lower fire frequency compared with adjacent uplands, and rapid recovery from fire events. Wet meadow/riparian types seldom burn (LANDFIRE 2007f). However, fire behavior in these systems is strongly influenced by the adjacent uplands. Ninety-two percent of this PNVT is within FRCCs 2 and 3.

*Hydrological Events:* Hydrological events are the major disturbance agents in these systems.

*Non-native Invasive Plants:* Non-native invasive plants infest roughly 500 to 750 acres; primarily salt cedar and mullein.

*Roads:* Approximately 25 miles of roads have been constructed within this PNVT; this equates to nearly 3.4 linear miles of road per square mile.

*Insects and Disease:* Between 2000 and 2004, insects and disease have impacted approximately 11 percent of this PNVT.

*Herbivory:* Because these areas have water available, and have the potential to produce from 140 to 1,255 pounds of herbaceous vegetation per acre, they are areas of concentrated livestock use as well as wild ungulates. According to White (2002), livestock and elk grazing have been major influences in the alteration of structure, composition and function of the vegetation community. The majority of this PNVT has very low to low ecological similarity with historic conditions (White 2002).

The most current ASNFs data (USFS 2007-2008) indicates that within the capable grazing lands (85% of the total PNVT's area) associated with the montane willow riparian forest (table 46); approximately 84 percent of the herbaceous understory is in low to moderately low ecological condition or very poor to poor range condition, while only 13 percent is in moderately high ecological condition or fair range condition. Low to moderately low ecological conditions have resulted in lower levels of herbaceous vegetation ground cover and lower levels of growth, as well as species compositional shifts, and possible changes in site potential.

**Table 46. Montane willow riparian forest PNVT grazing capability and range condition data**

| No Capability Grazing Lands | | Vegetation Adjective/Ecological Condition Ratings[11] of Capable Grazing Lands | | | | | | | | | | No Data | | Total Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | excellent/high | | good/high | | fair/moderately high | | poor/moderately low | | very poor/low | | | | |
| acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | acres | % | |
| 1,368 | 28.5 | 0 | 0.0 | 101 | 3.1 | 428 | 13.1 | 1,868 | 57.1 | 872 | 26.7 | 171 | 3.6 | 4,808 |

*Wildlife:* Beaver were historically important in many of these cottonwood-willow riparian systems.

*Other disturbances:* As a result of this PNVT's landscape position and its close association with water and runoff, it is directly and cumulatively affected by all of the threats and risks from adjacent, upland, PNVTs.

The threats to montane willow riparian forest are the same as those listed for wetland/cienega riparian areas and cottonwood-willow and mixed broadleaf deciduous riparian forests. A Region 3 VDDT model was not developed for this PNVT, however, continuation of current management along with ecological threshold changes, such as upland woody species encroachment, loss of understory productivity, loss of soil and soil productivity (72% of the soils are rated as being impaired and/or unsatisfactory), and the inability to reverse the malfunctioning physical processes within these riparian areas is likely to continue to move this PNVT away from DC and HRV**.** See appendix C for a more complete discussion of the threats affecting the montane willow riparian forest and the risks they pose to this PNVT.

### Threats and Risks to PNVTs

The threats to the PNVTs from disturbances pose the following risks, many of these risks when functioning together are additive and have compounding affects with negative consequences to ecological composition, structure, function and processes. Specifically by affecting:

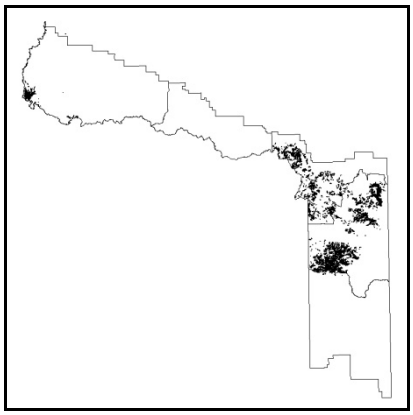
- Vegetation health (e.g., resulting in atypical composition, structure, and function of both the overstory and understory vegetation);
- Soil compaction, erosion, sedimentation and loss of soil fertility
- Altered watershed and hydrologic functions

- Reduced water quality and quantity
- Riparian, aquatic and terrestrial site loss, and/or degradation and fragmentation of these habitats within these PNVT
- Altered fire regime, uncharacteristic wildfire, and inability to re-establish natural wildfire processes
- Introduction and spread of invasive plants
- Modification of natural processes and changes in ecological potentials
- Species extinction and/or reduction in population(s) and/or habitat(s)

Additionally, climate influences a variety of ecological processes. Because of the unidentified aspects about the complex interactions between the spatial and temporal variability of climate, ecosystem processes, disturbance regimes, hydrology, and forest management activities, the true consequences of the risks posed by the threats are unknown.

## Quaking Aspen

Quaking aspen (aspen) (*Populus tremuloides* Michx.) occurs as a species (vegetation type) primarily within the conifer forest types (PPF, WMCF, DMCF, and SFF PNVTs) and is found primarily on the Alpine, Black Mesa, and Springerville RDs (map 16). As a species, aspen is adapted to a much broader range of environmental conditions than most plant species associated with it. This highly variable ecological community can be comprised mostly of aspen (roughly 24,000 acres) or aspen co-dominating with few to several conifer species (roughly 52,000 acres). At lower elevations conifers include ponderosa pine, Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco var. *glauca* (Beissn.) Franco), and white fir (*Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.*)*. At mid-elevations conifers include Rocky Mountain Douglas-fir, white fir, blue spruce (*Picea pungens* Engelm.), southwestern white pine (*Pinus strobiformis* Engelm.), and ponderosa pine (*Pinus ponderosa* Lawson & C. Lawson var. *scopulorum* Engelm.). Rocky Mountain juniper (*Juniperus scopulorum* Sarg.) can also be present. At higher elevations conifers include Rocky Mountain Douglas-fir, southwestern white pine, subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.), corkbark fir (*A. lasiocarpa* (Hook.) Nutt. var. *arizonica* (Merriam) Lemmon), and Engelmann spruce (*Picea engelmannii* Parry ex Engelm.).



**Map 16. General location of quaking aspen**

Aspen may exist in single-storied or, more commonly, multi-storied stands depending on disturbance history and local stand dynamics. Aspen stands are usually closed canopied. Due to its high productivity and structural diversity, aspen is capable of supporting the broadest array of plant and animal species of any forest type in the West, and is considered second only to riparian areas in its support of biodiversity (Mueggler 1985; Kay 1997; Chong et al. 2001). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer (Betters 1983). This herbaceous layer may be dense or sparse, depending on soil type and moisture conditions, dominated by grasses and grass-like plants or forbs. Some of the species typically found associated with aspen include bracken fern (*Pteridium aquilinum* (L.) Kuhn), grassleaf pea (*Lathyrus graminifolius* (S. Watson) T.G. White), Fendler's meadow rue (*Thalictrum fendleri* Engelm. ex A. Gray), deer's ears (*Frasera speciosa* Douglas ex Griseb.), yarrow (*Achillea millefolium* L. var. *occidentalis* DC.), violet (*Viola* L. spp.), paintbrush (*Castilleja* Mutis ex L. f. spp.), arnica (*Arnica* L. spp.), and a variety of grasses and sedges. Decaying coarse woody debris is common.

According to Simard et al. (2001), aspen have a role in early succession. Aspen leaves are very rich in nutrients and have a high photosynthesis rate and are high in nitrogen. When their litter falls to the forest floor their nutrients are cycled back into the soil for the conifers to pick up. Aspen are a very shade intolerant pioneer tree on burned areas, forming clonal thickets of short-lived trees subsequently replaced by conifers (Little 1976). According to Bartos and Mueggler (1981), aspen reaches maturity in 80 to 120 years, with a few individual trees reaching 300 years or more in age (Jones and Schier 1985). Relatively pure aspen stands may function as natural fire breaks across the landscape, support watershed stability, and contribute to scenic landscapes.

Aspen primarily reproduces asexually from underground root suckers that are stimulated by hormonal changes within an adult tree affected by disturbance (Bartos 2001). However, reproduction by sexual means or seed production does occur (Romme et al. 1997; Quinn and Wu 2001; Smith 2006a; Vance et al. 2010ab). According to Vance et al. (2010ab), natural seedling establishment is limited to years of viable seed production and seedling recruitment is limited to sites where there is adequate soil moisture following seed dispersal in early summer.

Aspen is a disturbance dependent species adapted to fire and windthrow. Without periodic fire or with high levels of herbivory, conifers will replace aspen. As a result, this type is significantly altered today and is very difficult to identify because of conifer encroachment. The presence of even a single aspen tree in a conifer stand provides strong evidence that the area historically supported aspen. Mature aspen canopies also reduce frost damage to seedlings in the understory by restricting radiant heat loss during the night and improving air temperatures at seedling height. Because of its communal root system, aspen is mechanically stable, and its presence may increase resistance of neighboring conifers to windthrow (Simard et al. 2001).

Fire regimes for aspen are determined by the adjacent forest type, ranging from 2 to 20 years fire return interval at low elevation in ponderosa pine to 10 to 30 years for mixed conifer at middle elevations, up to 30 to 400 years for spruce-fir forests. Both spruce-fir and mixed conifer forests have mixed severity fire regimes, experiencing both frequent, low-intensity surface fires, as well as infrequent, stand-replacing crown fires. Overall, aspen is an important successional community in ponderosa pine, mixed conifer, and spruce-fir forests. Aspen is primarily affected by fire, wind, insects, disease, pathogens, herbivores, and climate interactions.

The decline in aspen throughout its western range is an ecological concern. This declining trend has been noted for the past 50 years, but aspen mortality has become more pronounced since about 2002. Not only are trees dying, but their clonal root systems are dying as well. Several factors have been hypothesized as causal agents in the decline of aspen: climate change, fire suppression, conifer competition, ungulate browsing, drought, insects, and pathogens (UFRWG 2010; Crawford 2011). As a consequence of the 2011 Wallow Fire, the acreage dominated by aspen is expected to increase on the ASNFs. However, given all of the agents of decline mentioned previously, the longevity of this increase in aspen is unknown.

Under HRV, aspen comprised roughly 50,200 acres on the ASNFs, with approximately 37,400 acres in wet mixed conifer and 2,300 acres in spruce-fir forest with the remainder of 10,500 acres in ponderosa pine and dry mixed conifer. Currently there is roughly 76,500 acres of aspen on the forests.

As a direct result of the 2011Wallow Fire, roughly 33 percent of the aspen overstory was eliminated and those acres are now being recruited into the seedling/sapling size class with open canopy characteristics, largely through clonal root sprouting (additional acres, previously unoccupied may be established through seed production and seedling recruitment). The majority (34%) of the trees in the remaining aspen overstory are ten inches or greater in diameter and exist in a closed canopy condition (table 47). This would indicate that most of the remaining aspen on the ASNFs are mature trees and are being over-topped

by conifers within the individual forest types. The greatest acreage of aspen is located within the wet mixed conifer forest PNVT. However; as a percentage, the spruce-fir forest PNVT contain the greatest proportion, at nearly 33 percent. Proportionally, at one-percent the ponderosa pine forest PNVT contains the least aspen, although its overall aspen acreage is slightly more than that found in the spruce-fir forest PNVT.

**Table 47. Current state (post-2011 Wallow Fire) of aspen on the ASNFs**

| Aspen Vegetation Structural States | Current Amount (acres) and Type of the ASNFs' Forested PNVT Containing Aspen | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ponderosa pine 602,206 | | wet mixed conifer 177,995 | | dry mixed conifer 147,885 | | spruce-fir 17,667 | | total 945,753 | |
| | current amount of aspen within each forested PNVT | | | | | | | | | |
| | acres | %† | acres | % | acres | % | acres | % | acres | % |
| | **5,988** | **1.0** | **50,355** | **28.3** | **14,287** | **9.7** | **5,875** | **33.3** | **76,506** | **8.1** |
| **Herbaceous vegetation** | | | | | | | | | | |
| grass, forb, shrub with very open (< 10%) overstory canopy cover | 0 | 0.0 | 35 | 0.1 | 0 | 0.0 | 2 | 0.0 | 37 | 0.0 |
| **Seedling and sapling size (less than 5-inch diameter) trees, plus recently burned acres** | | | | | | | | | | |
| open (≤ 30%) woody canopy cover | 380 | 6.3 | 20,542 | 40.8 | 1,389 | 9.7 | 2,627 | 44.7 | 24,938 | 32.6 |
| closed (> 30%) woody canopy cover | 213 | 3.6 | 3,087 | 6.1 | 319 | 2.2 | 522 | 8.9 | 4,142 | 5.4 |
| **Small size (5-inch to 9.9-inch diameter) trees** | | | | | | | | | | |
| open canopy cover | 461 | 7.7 | 1,124 | 2.2 | 800 | 5.6 | 77 | 1.3 | 2,462 | 3.2 |
| closed canopy cover | 2,175 | 36.3 | 6,993 | 13.9 | 3,350 | 23.4 | 856 | 14.6 | 13,374 | 17.5 |
| **Medium size (10-inch to 19.9-inch diameter) trees** | | | | | | | | | | |
| open canopy cover | 556 | 9.3 | 2,153 | 4.2 | 1,704 | 11.9 | 187 | 3.2 | 4,550 | 5.9 |
| closed canopy cover | 1,865 | 32.1 | 14,002 | 27.8 | 6,001 | 42.0 | 1,417 | 24.1 | 23,285 | 30.4 |
| **Large to very large size (greater than or equal to 20-inch diameter) trees** | | | | | | | | | | |
| open canopy cover | 152 | 31.1 | 263 | 0.5 | 230 | 1.6 | 48 | 0.8 | 693 | 0.9 |
| closed canopy cover | 186 | 3.1 | 2,205 | 4.4 | 495 | 3.5 | 138 | 2.4 | 3,025 | 4.0 |

†Percent represents what portion the aspen acres contribute to the total forest PNVT acres in which it occurs

The Forests' objective is to have aspen dominate or co-dominate acres within the forest types, representing a range of size and age classes to maintain a viable aspen community of at least 50,200 acres during the planning period. The DCs for aspen are that the species is occurring throughout the forested landscapes, are successfully regenerating and recruiting into older and larger size classes. Size classes have a natural distribution, with the greatest number of stems being in the smaller size classes.

### Threats and Risks to Aspen

Many of the threats to the forested PNVTs from disturbances pose the following risks to aspen as well, many of these risks when functioning together are additive and have compounding affects with negative consequences to ecological composition, structure, function and processes. Specifically by affecting:

- Vegetation health (e.g., resulting in atypical composition, structure, and function of both the overstory and understory vegetation)
- Soil compaction, erosion, sedimentation and loss of soil fertility
- Altered watershed and hydrologic functions
- Reduced water quality and quantity
- Degradation and fragmentation of these habitats within these PNVT
- Altered fire regime, uncharacteristic wildfire, and inability to re-establish natural wildfire processes
- Introduction and spread of invasive plants
- Modification of natural processes and changes in ecological potentials

Additionally, climate influences a variety of ecological processes. Because of the unidentified aspects about the complex interactions between the spatial and temporal variability of climate, ecosystem

processes, disturbance regimes, hydrology, and forest management activities, the true consequences of the risks posed by the threats are unknown.

### Overstory/Understory Herbaceous Vegetation Cover Relationship

Ponderosa pine (Smith 2006b) and dry mixed conifer (Smith 2006c) forests, both woodlands (Fulé and Covington 1998; Barton 2002; Schussman and Gori 2006; Gori and Bate 2007), and the three grasslands (Gori and Enquist 2003; Schussman 2006a; Vander Lee et al. 2006) on the ASNFs developed with frequent, low-intensity fires. Fire is acknowledged to be the most influential force in checking woody species invasion or encroachment (Daubenmire 1968, Allen 1984) into grasslands. The removal of the natural process of fire by human suppression efforts, the introduction of livestock, shifts in climate, atmospheric $CO_2$ enrichment, and reduced soil moisture have disrupted these ecosystems in many ways, including the loss of much grassy vegetation as woody plants have expanded in distribution and increased in density. According to Archer (1994), shifts in grass and woody plant abundance have broad implications for the following:

- Biodiversity
- Primary and secondary productivity
- Soil development and stability
- Livestock and wildlife composition a and carrying capacity
- Recreational opportunities
- Water quality and water distribution
- Global climate feedback by affecting carbon sequestration, non-methane hydrocarbon emissions, and biophysical land surface-atmosphere interactions (albedo, evapotranspiration, surface roughness, boundary layer dynamics)

Ecologically, the most far reaching, long term negative affect due to shifts in grass and woody plant abundance is concurrent loss of soil, soil productivity, and species diversity. Additionally, as mentioned earlier, from 10-94 percent of the grassland soils are in impaired and/or unsatisfactory condition; much of this can be attributed directly to the loss of the herbaceous vegetation. According to Friedel (1991), once grass has been displaced, this alteration may result in a transition across a threshold to woody vegetation that is difficult to reverse. A second threshold may occur when soil erosion irreversibly alters the physical, chemical and biological properties of the soil (CRC 1994). Soil erosion thereby irreversible alters the kind and amount of vegetation a site can support and the attainment of ecological goals necessary for achieving desired conditions (Baker et al. 1995).

Increasing densities of established forest and woodland stands, and encroachment of new forest and woodland stands into grasslands have reduced the amount of available herbaceous understory vegetation (Cooper 1960; Clary 1971; Allen 1998) since the arrival of Euro-Americans. The relationship of overstory/understory vegetation is well documented in forests (Cooper 1960; Moir 1966; Betters 1983; Clary 1983; Ffolliott 1983; Larson and Wolters 1983; Mitchell 1983; Thill et al. 1983; Griffis et al. 2001; Abella 2004; among others), woodlands (Jameson 1967, 1971; Gallina and Ffolliott 1983; Pieper 1983, 1990, 1995; McPherson and Weltzin 1998; among others), and grasslands (Campbell and Bomberger 1934; Hennessy et al. 1983; Friedel 1991; McDaniel et al. 1993; Livingston et al. 1997; Brockway et al. 2002; among others). Herbaceous vegetation cover and production within all PNVTs on the ASNFs is departed from potential (table 48); anywhere from 1 to 87 percent, and 8 to 91 percent, for cover and production, respectively. Overall, the least departure from potential in herbaceous cover and production has occurred in the spruce-fir forest, while the greatest departure from potential in herbaceous cover and production has occurred in the montane willow riparian forest.

Understory vegetation is an important response variable to monitor after mechanical tree removal and prescribed burning treatments designed to restore composition and structure and/or remove overstory woody vegetation for grassland restoration. According to Abella (2004), understanding vegetation responses to thinning and burning is fundamental to better comprehend the ecology of southwest forests and woodlands (McClaran and McPherson 1999; Platt 1999), and is of practical importance for predicting vegetation changes after treatments to improve outcomes of ecological restoration.

**Table 48. Current and potential understory vegetation cover and production by PNVT**

| Potential Natural Vegetation Type (PNVT) | Average Low and High Understory Vegetation Ground Cover† (grasses, forbs, grass-like plants) | | | Average Low and High Understory Herbage Production† (lb grasses, forbs, grass-like plants) | | |
|---|---|---|---|---|---|---|
| | current (%) (a) | potential (%) (b) | average % difference between columns (a & b) | current (estimated lb) (c) | potential† (lb) (d) | average % difference between columns (c & d) |
| **Forests** | | | | | | |
| Ponderosa pine | 45 - 78 | 76 - 93 | 27 | 255 - 390 | 415 - 630 | 39 |
| Wet mixed conifer | 73 - 94 | 94 - 98 | 13 | 60 - 140 | 70 -165 | 16 |
| Dry mixed conifer | 57 - 89 | 81 - 100 | 19 | 205 - 500 | 280 - 680 | 27 |
| Spruce-fir | 90 - 95 | 96 - 100 | 6 | 25 - 50 | 25 - 50 | 8 |
| **Woodlands** | | | | | | |
| Madrean pine-oak | 6 - 35 | 20 - 52 | 43 | 100 - 155 | 495 - 740 | 79 |
| Piñon-juniper | 17 - 37 | 58 - 78 | 60 | 100 - 225 | 430 - 770 | 73 |
| **Grasslands** | | | | | | |
| Great Basin | 23 - 45 | 52 - 74 | 46 | 260 - 440 | 765 - 1,305 | 66 |
| Semi-desert | 7 - 16 | 21 - 31 | 56 | 50 - 105 | 460 - 940 | 89 |
| Montane/subalpine | 28 - 36‡ | 86 - 99 | 65 | 845 - 990 | 2,675 - 3,130 | 68 |
| **Chaparral** | | | | | | |
| Interior | 23 - 41 | 29 - 56 | 25 | 5 - 55 | 20 - 175 | 68 |
| **Riparian Areas/Forests** | | | | | | |
| Wetland/cienega | 30 - 41‡ | 96 - 100 | 64 | 1,375 - 1,700 | 3,895 - 4,810 | 65 |
| Cottonwood-willow | 33 - 55 | 61 - 87 | 41 | 150 - 555 | 340 - 1,265 | 56 |
| Mixed broadleaf deciduous | 5 - 18 | 15 - 78 | 75 | 55 - 85 | 490 - 740 | 88 |
| Montane willow riparian | 6 - 12 | 47 - 88 | 87 | 15 - 115 | 140 - 1,255 | 91 |

†Values derived from Terrestrial Ecosystem Survey of the ASNFs (Laing et al. 1987)
‡Data from White 2004

Trees limit the establishment, growth and development of understory vegetation. Trees do this in several ways; above ground, for example, there is light interception (shading), rain and snow interception, temperature modification, litter, allelopathy[19], and site occupation. Below ground, such as, site occupation, competition for soil moisture, nutrients and minerals, and allelopathy. Historically, ponderosa pine and dry mixed conifer forests, and piñon-juniper and Madrean pine-oak woodlands were generally characterized by open (10-30%) canopies; and Great Basin, semi-desert, and montane/subalpine grasslands were generally characterized by very open (less than 10%) woody canopy cover with a majority of the overall landscape covered by grasses and forbs.

Understory herbaceous vegetation provided the fine fuels that maintained and supported the natural fire regimes (periodic (relatively frequent), low-intensity fires) needed to renew these frequent fire forest, woodland, and grassland PNVTs. In addition, understory vegetation, and grassland vegetation both provide habitat, hiding and thermal cover, nesting sites, and food sources for a myriad of dependent plant and animal species.

[19]Allelopathy (the suppression of neighboring plants) is the secreation into the environment by one plant of a toxic substance that inhibits the germination or growth of other potential competitor plants of the same or another species (Lapedes 1974).

The desired conditions for understory vegetation within the forest, woodland, and riparian vegetation types have the composition, structure, and function of the herbaceous and shrub (where appropriate) layers to provide for a balance of species within these communities and promote a greater level of ecosystem health. The desired conditions for the grassland communities have the composition, structure, and function and to promote a greater level of ecosystem health, namely by removing woody vegetation and invasive species.

## Environmental Consequences

The underlying assumption is, that for each PNVT the closer their ecological composition, structure, and processes are to their reference conditions (having a low departure indices[20] (DI) versus a high DI), the more properly each PNVT is functioning and the more secure dependent species (plants and animals) are within the associated habitats. This is particularly important with potential changes in the climate. The intent is to re-establish the natural patterns and processes within these vegetation communities that allowed for natural resiliency; especially important when faced with, uncharacteristic wildfire, and the presence of invasive plant species, and coupled with climate change.

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the land management plan does not authorize or mandate any ground-disturbing actions there can be no direct effects. However, there may be implications, or longer term environmental consequences, of managing the forests under this programmatic framework.

Programmatic plan alternatives describe differing means for achieving desired conditions. Therefore the programmatic EIS more correctly identifies environmental consequences for choosing one alternative over another, rather than the more site specific environmental effects.

### Relationship to Desired Conditions (percent departure)

The values presented either come directly from the VDDT model outputs, and other information derived from research (when available) or professional judgment. For a list of management treatments and acres treated by PNVT see appendix C, tables 1 through 3. The following indicators will be used to compare alternatives: relationship to desired conditions (percent departure); acres of aspen; percent grassland restoration; and reduction in overstory as it relates to understory herbaceous composition and production.

[20] Departure Index (DI) measures the degree to which the state composition, structure and cover between current and reference conditions are dissimilar is being used as an inference of sustainability; the lower the DI - the closer to reference conditions – the greater the sustain ability. The DIs are: 1) within reference condition (0-20%), minimal risk of losing key ecosystem components. Vegetation attributes (composition and structure) are intact and functioning within reference conditions. These areas can be maintained within the historical fire regime by such treatments as fire use; 2) Low departure (21-40%), low risk of losing key ecosystem components. Vegetation attributes (composition and structure) have been somewhat altered from reference conditions. These areas may need some level of restoration treatments, such as fire use, hand or mechanical treatments to be restored to reference conditions; 3) Moderate departure (41-60%), moderate risk of losing key ecosystem components. Vegetation attributes (composition and structure) have been moderately altered from reference conditions. These areas may need moderate levels of restoration treatments, such as fire use, hand or mechanical treatments to be restored to reference conditions; 4) High departure (61-80%), high risk of losing key ecosystem components. Vegetation attributes (composition and structure) have been quite altered from reference conditions. These areas may need greater levels of restoration treatments to be restored to reference conditions; and 5) Severe departure (81-100%), great risk of losing key ecosystem components. Vegetation attributes (composition and structure) have been significantly altered from reference conditions. These areas may need very high levels of restoration treatments, such as hand or mechanical before fire is used to restore to reference conditions. The higher the condition class number the more altered the ecosystem is from reference conditions. The DI provides a quantitative value used for reference and comparison in discussions regarding the PNVTs. Current DI can also be compared to results derived from modeling potential change.

All of the data that was derived from VDDT modeling and used to provide information for the following discussion can be found in the project record.

## Forested PNVTs

### *Ponderosa pine forest:*

*Annual Vegetation Treatment Objectives (see appendix D for a detailed description of the individual treatments and the annual acres of each treatment by PNVT by alternative)*

| Alternative | High Acre Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 7,119 | 3,150 |
| B | 11,025 | 11,025 | 1,552 | 1,575 | 6,289 | 6,300 | - | - |
| C | 24,255 | 10,187 | 2,426 | 1,040 | 13,341 | 5,614 | - | - |
| D | 9,450 | 22,050 | 1,417 | 3,308 | 5,434 | 12,679 | - | - |

*Vegetation Outcome*

After one planning cycle (15 years.), the proposed high acre treatment objectives under alternative C produces the greatest movement toward DC, from the current rating of 77 to 52 (table 49). This is a change of one departure class, from high to moderate. Under this alternative there is the greatest overall reduction in the representation of all size and age trees, single or multi-storied with closed canopy cover (combined values of vegetation structural states G, H, I, L, M). And the greatest overall increase in representation of medium to very large size, single or multi-storied trees with open canopy cover (combined values of vegetation structural states D, E, J, and K). Reduction in overstory canopy cover will favor shade intolerant and very shade intolerant species, including the herbaceous vegetation understory.

**Table 49. Fifteen-year planning period ponderosa pine forest PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average proposed treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each PPF Vegetation Structural State | | | | | | | | | | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | DC | HRV |
| *Desired Condition* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *0*$^{N}$ | - |
| *Current Condition* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *77*$^{H}$ | *94*$^{S}$ |
| C High Treatment (6.0) | 8 | 4 | 5 | 6 | 11 | 5 | 11 | 7 | 3 | 7 | 14 | 11 | 5 | 2 | 52$^{M}$ | 75$^{H}$ |
| C Average (3.4) | 6 | 4 | 4 | 5 | 10 | 5 | 12 | 9 | 5 | 6 | 10 | 14 | 9 | 2 | 60$^{M}$ | 81$^{S}$ |
| D High Treatment (5.3) | 5 | 3 | 4 | 5 | 14 | 3 | 8 | 8 | 19 | 4 | 4 | 12 | 8 | 3 | 61$^{H}$ | 82$^{S}$ |
| B High Treatment (3.9) | 5 | 4 | 4 | 6 | 11 | 5 | 11 | 9 | 5 | 6 | 9 | 14 | 9 | 2 | 63$^{H}$ | 80$^{H}$ |
| B Average (2.3) | 5 | 3 | 4 | 5 | 9 | 5 | 12 | 10 | 6 | 5 | 7 | 16 | 11 | 2 | 63$^{H}$ | 83$^{S}$ |
| Alternative A (1.8) | 5 | 3 | 3 | 5 | 10 | 5 | 12 | 10 | 9 | 4 | 6 | 15 | 11 | 3 | 65$^{H}$ | 84$^{S}$ |
| D Average (3.1) | 5 | 3 | 3 | 4 | 11 | 4 | 10 | 9 | 14 | 4 | 4 | 14 | 11 | 3 | 66$^{H}$ | 85$^{S}$ |
| C Low Treatment (0.7) | 4 | 3 | 3 | 4 | 8 | 5 | 13 | 10 | 7 | 4 | 6 | 17 | 13 | 2 | 69$^{H}$ | 86$^{S}$ |
| B Low Treatment (0.6) | 5 | 3 | 3 | 4 | 8 | 5 | 13 | 11 | 7 | 4 | 5 | 17 | 13 | 2 | 69$^{H}$ | 87$^{S}$ |
| D Low Treatment (0.8) | 5 | 2 | 3 | 4 | 8 | 4 | 13 | 10 | 10 | 4 | 4 | 17 | 13 | 3 | 70$^{H}$ | 87$^{S}$ |

†Departure from DC and HRV Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

The proposed average acre treatment objectives under alternative C produce the second greatest movement toward DC, from the current rating of 77 to 60. This is also a change of one departure class, from high to moderate. The proposed high acre treatment objectives under alternative D produce the third greatest movement toward DC, from the current rating of 77 to 61. However, this does not change its high departure rating. The proposed high and average acre treatment objectives under alternative B produce the

fourth greatest movement toward DC, from the current rating of 77 to 63. However, this does not change the high departure rating. The low acre treatment objectives proposed under alternatives B, C and D, and the average acre treatment objectives proposed under alternative D provide less movement towards DC than alternative A. For more information regarding ponderosa pine vegetation structural state model run outcomes see appendix B tables 1 through 10.

Figure 2 displays the long-term trend toward DC for all ponderosa pine forest alternatives, based on their proposed average acre treatments. All alternatives produce reductions in departure from DC immediately, and continue to trend in movement toward DC through all modeling periods (out to 50 years). All alternatives move from a high to moderate departure class. Overall, alternatives A, B and C produce the greatest movement towards DC, respectively; followed by alternative D.

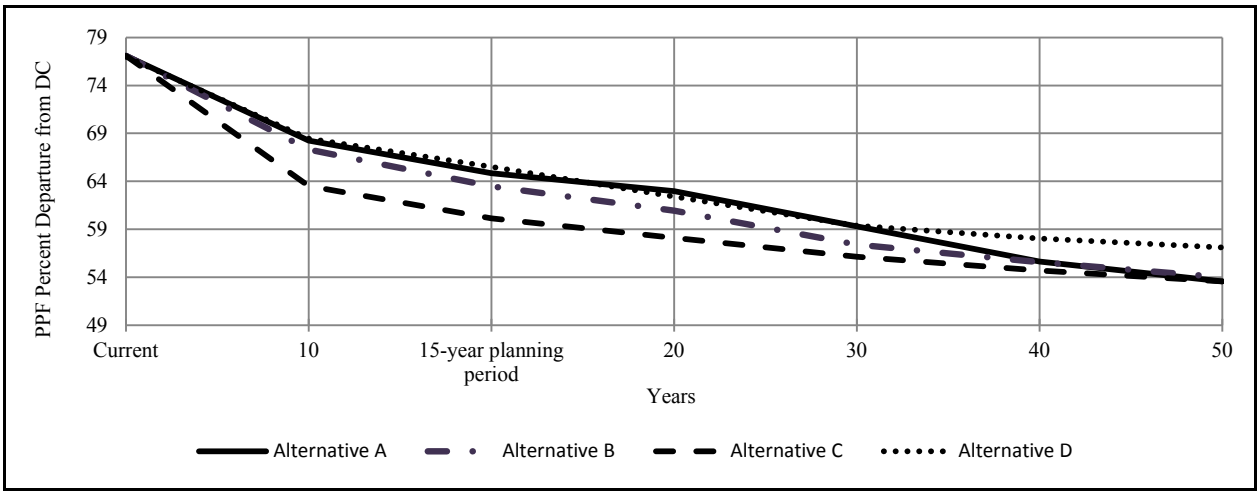



**Figure 2. Departure from DC trend comparisons for the ponderosa pine forest PNVT by alternative, over a 50-year time period, for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

After one planning period (15 years.), the proposed high acre treatment objectives under alternative C also produces the greatest movement toward HRV, from the current rating of 94 to 75 (table 20). This is a change of one departure class, from severe to high. The proposed high acre treatment objectives under alternative B produce the second greatest movement toward HRV, from the current rating of 94 to 80. This is also a change of one departure class, from severe to high. The proposed average acre treatment objectives under alternative C produce the third greatest movement toward HRV, from the current rating of 94 to 81. However, this does not change its severe departure rating. The low acre treatment objectives proposed under each of the action alternatives, and the average acre treatment objectives proposed under alternative D provide less movement towards HRV than alternative A.

Figure 3 displays the long-term trend toward HRV for all ponderosa pine forest alternatives, based on their proposed average acre treatments. All alternatives produce reductions in departure from HRV immediately, and continue to trend in movement toward HRV through all modeling periods (out to 50 years). All alternatives move from a severe to high departure class. Overall, alternative D produces the greatest movement towards HRV over the other alternatives.

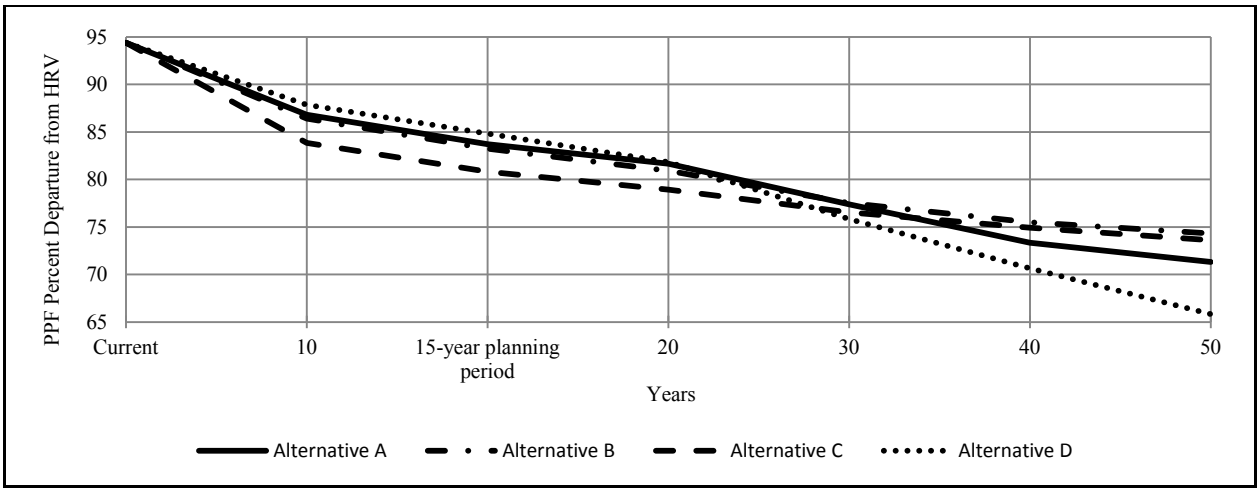



**Figure 3. Departure from HRV trend comparisons for the ponderosa pine forest PNVT by alternative, over a 50-year time period, for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then B, and finally A. In addition, by the end of the 15-year planning period, alternative C also does more to address the threats and risks when assessing movement toward HRV, but followed by alternative B, then D, and finally A. By the end of the 50-year modeling period, alternative B does more to address the threats and risks when assessing movement toward DC, followed by alternative C, and finally, by the equally rated alternatives A and D. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by alternative B, then C, and finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then A, and finally D. By the end of the 50-year modeling period, the equally rated alternatives A, B and C do more to address the threats and risks when assessing movement toward DC, than alternative D. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by alternative A, and finally, by the equally rated alternatives B and C.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by the equally rated alternatives B and C, and finally D. In addition, by the end of the 15-year planning period, alternative A also does more to address the threats and risks when assessing movement toward HRV, but followed by alternative C, then B, and finally D. Furthermore, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement toward DC, followed by alternative C, then B, and finally D. In addition, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement toward HRV, but followed by the equally rated alternatives C and D, and finally B.

*Large/Old Trees, Snags and Coarse Woody Debris*

In brief, large trees/old trees contribute to old growth forest conditions. According to Binkley et al. (2007), ecological processes are the driving forces behind any ecosystem, those processes are reflected and supported by the composition of the ecosystem, that is by the living and non-living entities that exist in the ecosystem. Old-growth forests, by definition, have old/large trees, but the presence of old/large trees is just the beginning of a description of the composition of an old-growth forest (Binkley et al. 2007). Old growth forests are a significant and unique part of the diverse ecological web formed by natural forest landscapes. Human activities or natural disturbances in one part of the forest landscape can affect many other parts of the landscape (Silva Ecosystem Consultants 1992). As an important part of the landscape ecology of natural forests, old growth provides unique resources for plants and animals (including people) within the landscape (Harris 1984; Franklin et al. 1986). Old growth forests are also important because we do not fully understand their functions, the life forms they support, or their importance to the ecology of ASNFs.

Ecologically, a dead tree is as important to the forest ecosystem as a live one (Franklin et al. 1989), and according to Marcot (2002), provide several key ecological functions that influence the ecosystem through trophic relations, species interactions, soil aeration, primary cavity and burrow excavation, and dispersal of fungi, lichens, seeds, fruits, plants, and invertebrates. Snags (standing dead trees) and rotting logs are essential to healthy forest ecosystems in several ways: Snags provide homes for birds that eat insects. When they fall and become coarse woody debris, they provide habitat for small animals and insects. When these logs rot they store water and provide nutrients for the continued growth of the forest. Dead wood rotting on the forest floor eventually gets incorporated into the soil. This underground wood feeds many insects and bacteria which provide nitrogen to feed the trees and other plants in the forest. Underground wood is the major source of nitrogen for dry forests.

The importance of coarse woody debris in forests has been partially documented, although much remains to be discovered (Stevens 1997). What is known of these roles is divided into four, inter-related categories: 1) the role in productivity of forest trees; 2) the role in providing habitat and structure to maintain biological diversity; 3) the role in geomorphology of streams and slopes; and 4) the role in long-term carbon storage. The importance of each of these roles to an ecosystem varies throughout the forests by natural disturbance type, biogeoclimatic zone and moisture regime (Stevens 1997).

*Large/Old Trees:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 50). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative D proposed average acre treatment objectives, alternative A, alternative D proposed low acre treatment objectives, alternative B proposed average acre treatment objectives, alternative C proposed low acre treatment objectives, alternative B proposed high acre treatment objectives, alternative B proposed low acre treatment objectives, alternative C proposed average acre treatment objectives, and finally, alternative C proposed high acre treatment objectives. By the end of the 50-year modeling period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention. However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative D proposed average acre treatment objectives, alternative A, alternative D proposed low acre treatment objectives, alternative B proposed high acre treatment objectives, alternative C proposed low acre treatment objectives, alternative B proposed average acre treatment objectives, alternative B proposed low acre treatment objectives, alternative C proposed average acre treatment objectives, and finally, alternative C proposed high acre treatment objectives.

**Table 50. Acres of large/old trees, number of snags greater than 18 inch diameter (dbh) per acre, and tons of the three size classes of coarse woody debris per acre by the end of the 15-year planning period and the 50-year modeling period within the ponderosa pine forest PNVT on the ASNFs**

| Alternative | PPF Vegetation Structural States E, I, K, M | Across All PPF Vegetation Structural States | | | | | |
|---|---|---|---|---|---|---|---|
| | | number of snags/acre (dbh) | | tons of coarse woody debris (diameter/acre) | | | |
| | acres of large/old trees | 5" – 17.9" | ≥ 18" | ≤ 3" | > 3" & ≤ 12" | > 12" | total |
| *Desired Condition* | *424,555* | *Non-defined†* | *average 1 - 2* | *range from 3 - 10* | | | |
| *Current Condition* | *175,013* | *10.9* | *3.1* | *4.4* | *6.5* | *2.9* | *13.8* |
| **15-year Planning Period** | | | | | | | |
| Alternative A | 219,145 | 10.3 | 3.7 | 4.6 | 7.1 | 3.5 | 15.2 |
| B High Treatment | 202,935 | 9.9 | 3.6 | 4.5 | 6.9 | 3.4 | 14.8 |
| B Average Treatment | 206,655 | 10.4 | 3.5 | 4.4 | 6.7 | 3.4 | 14.5 |
| B Low Treatment | 201,048 | 10.9 | 3.5 | 4.6 | 7.0 | 3.3 | 14.9 |
| C High Treatment | 199,004 | 8.9 | 3.6 | 4.5 | 6.7 | 3.4 | 14.6 |
| C Average Treatment | 200,026 | 9.8 | 3.5 | 4.0 | 6.3 | 3.3 | 13.6 |
| C Low Treatment | 204,795 | 10.9 | 3.5 | 4.7 | 7.0 | 3.4 | 15.1 |
| D High Treatment | 270,289 | 9.4 | 4.1 | 4.7 | 7.4 | 3.6 | 15.7 |
| D Average Treatment | 241,884 | 10.1 | 3.8 | 4.7 | 7.5 | 3.8 | 16.0 |
| D Low Treatment | 213,478 | 10.8 | 3.6 | 4.7 | 7.2 | 3.4 | 15.3 |
| **50-year Modeling Period** | | | | | | | |
| Alternative A | 281,337 | 9.9 | 4.4 | 5.9 | 7.7 | 4.1 | 16.7 |
| B High Treatment | 238,992 | 9.2 | 4.1 | 4.4 | 7.0 | 3.8 | 15.2 |
| B Average Treatment | 237,166 | 10.1 | 4.0 | 4.7 | 7.3 | 3.8 | 15.8 |
| B Low Treatment | 235,339 | 10.9 | 3.9 | 5.0 | 7.5 | 3.8 | 16.3 |
| C High Treatment | 205,515 | 8.5 | 3.8 | 4.0 | 6.3 | 3.5 | 13.8 |
| C Average Treatment | 221,966 | 9.7 | 3.9 | 4.5 | 6.9 | 3.7 | 15.0 |
| C Low Treatment | 238,417 | 10.8 | 4.0 | 4.9 | 7.5 | 3.8 | 16.3 |
| D High Treatment | 405,289 | 8.2 | 5.5 | 5.2 | 8.3 | 5.0 | 18.5 |
| D Average Treatment | 342,964 | 9.3 | 4.9 | 5.2 | 8.1 | 4.5 | 17.8 |
| D Low Treatment | 280,639 | 10.6 | 4.3 | 5.2 | 7.9 | 4.1 | 17.2 |

†Proposed Forest Plan desired conditions for ponderosa pine forest do not specify any DCs for this size class of snags; data is provide for additional information only

*Snags (18 inches and larger):* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for the number of snags 18 inches or greater per acre (table 50). However, the low acre treatment objectives proposed under both alternatives B and C provide the greatest movement toward DCs. This is followed equally by the alternative B proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative C proposed high acre treatment objectives, alternative C proposed average acre treatment objectives, and alternative D proposed low acre treatment objectives, then alternative A, alternative D proposed high acre treatment objectives, and finally, alternative D proposed average acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs than they were at the end of the 15-year planning period.

*Coarse Woody Debris:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for the amount of coarse woody debris per acre (table 50). However, the proposed average acre treatment objectives under alternatives C would provide the greatest movement toward DCs. This is followed by alternative B proposed average acre treatment objectives, alternative C proposed high acre treatment objectives, alternative B proposed high acre treatment objectives, alternative B proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, alternative A, alternative D proposed low acre treatment objectives, alternative D proposed high acre treatment objectives, and finally, alternative D proposed average acre treatment objectives. By the end of the 50-year modeling period, all alternatives, except alternative C proposed high acre treatment objectives, are even further departed from DCs than they were at the end of the 15-year planning period.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-

year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative A, then B, and finally C. In addition, by the end of the 50-year modeling period, alternative D also does more, when assessing movement toward DC for acres of large/old trees per acre, but followed by alternative B, then C, and finally A. By the end of the 15-year planning period, the equally rated alternatives B and C do more, when assessing movement toward DC for number of large snags per acre, followed by alternative A, and finally D. However, by the end of the 50-year modeling period, alternative C does more, when assessing movement toward DC for number of large snags per acre, followed by alternative B, then A, and finally D. By the end of the 15-year planning period and the 50-year modeling period, alternative C does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then A, and finally D.

For the proposed average acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative A, then B, and finally C. By the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for number of large snags per acre, followed by alternative C, then A, and finally D. However, by the end of the 50-year modeling period, alternative C does more, when assessing movement toward DC for number of large snags per acre, followed by alternative B, then A, and finally D. By the end of the 15-year planning period and the 50-year modeling period, alternative C does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then A, and finally D.

For the proposed low acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative A does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative D, then C, and finally B. By the end of the 15-year planning period, the equally rated alternatives B and C do more, when assessing movement toward DC for number of large snags per acre, followed by alternative D, and finally A. However, by the end of the 50-year modeling period, alternative B does more, when assessing movement toward DC for number of large snags per acre, followed by alternative C, then D, and finally A. By the end of the 15-year planning period, alternative B does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative C, then A, and finally D. However, by the end of the 50-year modeling period, the equally rated alternatives B and C do more, when assessing movement toward DC for number of large snags per acre, followed by alternative A, and finally D.

***Wet mixed conifer forest:***

*Annual Vegetation Treatment Objectives*

| Alternative | High Acre Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 2,147 | 950 |
| B | 3,325 | 3,325 | 475 | 475 | 1,900 | 1,900 | - | - |
| C | 7,315 | 3,135 | 731 | 313 | 4,023 | 1,725 | - | - |
| D | 2,851 | 6,650 | 428 | 998 | 1,640 | 3,824 | - | - |

*Vegetation Outcome*

After one planning period (15 years.), the average acre treatment objectives under alternative A produce the greatest movement toward DC, from the current rating of 54 to 49 (table 51). However, this does not produce a change in the departure class; it remains moderate. Under this alternative there is the greatest overall reduction in the representation of vegetation structural states that are lacking aspen regeneration (combined values of vegetation structural states K, L, M, N, O, and Q). And the greatest overall increase

in representation of medium to very large size, single or multi-storied trees with open canopy cover (combined values of vegetation structural states E and F). Reduction in overstory canopy cover will favor aspen and mixed-shade tolerant species, including the herbaceous vegetation understory; however, this is inappropriate for later seral states of this PNVT. This forest type is supposed to be dense with closed canopy. Aspen is only dominant following high severity disturbances in the early seral conditions.

**Table 51. Fifteen-year planning period wet mixed conifer forest PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | DC | HRV |
| *Desired Condition* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0*$^{N}$ | - |
| *Current Conditions* | *13* | *28* | *4* | *5* | *1* | *1* | *1* | *10* | *0* | *0* | *13* | *6* | *5* | *1* | *1* | *1* | *10* | *0* | *0* | *54*$^{M}$ | *61*$^{H}$ |
| Alternative A (1.9) | 0 | 29 | 15 | 8 | 1 | 3 | 6 | 4 | 2 | 8 | 1 | 5 | 4 | 1 | 2 | 7 | 3 | 1 | 2 | 49$^{M}$ | 46$^{M}$ |
| D High Treatment (5.3) | 0 | 22 | 7 | 9 | 1 | 3 | 3 | 6 | 4 | 3 | 1 | 11 | 6 | 1 | 3 | 11 | 5 | 2 | 2 | 50$^{M}$ | 47$^{M}$ |
| B High Treatment (4.0) | 0 | 23 | 9 | 9 | 1 | 3 | 4 | 4 | 2 | 4 | 1 | 12 | 7 | 1 | 3 | 12 | 3 | 1 | 2 | 52$^{M}$ | 44$^{M}$ |
| D Average (4.9) | 0 | 23 | 8 | 8 | 1 | 3 | 3 | 5 | 3 | 3 | 1 | 13 | 7 | 1 | 3 | 12 | 5 | 1 | 2 | 52$^{M}$ | 47$^{M}$ |
| B Average (2.3) | 0 | 24 | 9 | 8 | 1 | 2 | 3 | 4 | 2 | 3 | 0 | 14 | 7 | 1 | 3 | 12 | 4 | 1 | 2 | 53$^{M}$ | 46$^{M}$ |
| B Low Treatment (0.6) | 0 | 24 | 9 | 7 | 1 | 2 | 3 | 3 | 2 | 2 | 0 | 15 | 8 | 1 | 3 | 13 | 5 | 1 | 2 | 54$^{M}$ | 47$^{M}$ |
| D Low Treatment (4.4) | 0 | 24 | 8 | 7 | 1 | 2 | 3 | 4 | 2 | 2 | 0 | 15 | 8 | 1 | 3 | 13 | 5 | 1 | 2 | 54$^{M}$ | 46$^{M}$ |
| C Low Treatment (0.8) | 0 | 24 | 9 | 6 | 1 | 2 | 3 | 3 | 2 | 2 | 0 | 15 | 8 | 1 | 3 | 13 | 4 | 1 | 2 | 55$^{M}$ | 47$^{M}$ |
| C High Treatment (6.3) | 1 | 20 | 9 | 5 | 1 | 3 | 4 | 3 | 2 | 6 | 2 | 14 | 7 | 0 | 3 | 15 | 2 | 1 | 2 | 56$^{M}$ | 51$^{M}$ |
| C Average (3.6) | 1 | 22 | 9 | 6 | 1 | 2 | 4 | 3 | 2 | 4 | 1 | 14 | 7 | 1 | 3 | 14 | 3 | 1 | 2 | 56$^{M}$ | 49$^{M}$ |

†Departure from DC and HRV Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

The proposed high acre treatment objectives under alternative D produce the second greatest movement toward DC, from the current rating of 54 to 50. However, this does not produce a change in the departure class; it remains moderate. The proposed high acre treatment objectives under alternative B and the average acre treatment objectives under alternative D produce the third greatest movement toward DC, from the current rating of 54 to 52. Again, this does not produce a change in the departure classes; they remain moderate. The proposed alternative B low and average acre treatment objectives, all aspects of alternatives C, and the proposed low acre treatment objectives in alternative D produce less change or no change in the movement towards DC when compared to alternative A. For more information regarding wet mixed conifer vegetation structural state model run outcomes see appendix B tables 11 through 20.

Figure 4 displays the long-term trend in relation to DC for all wet mixed conifer forest alternatives, based on their proposed average acre treatments. Alternative A produces the greatest DC departure reduction during the planning period and continues throughout all modeling periods. Alternatives B and D produce some movement toward DC. Alternative C continues to trend away from DC throughout all modeling periods.

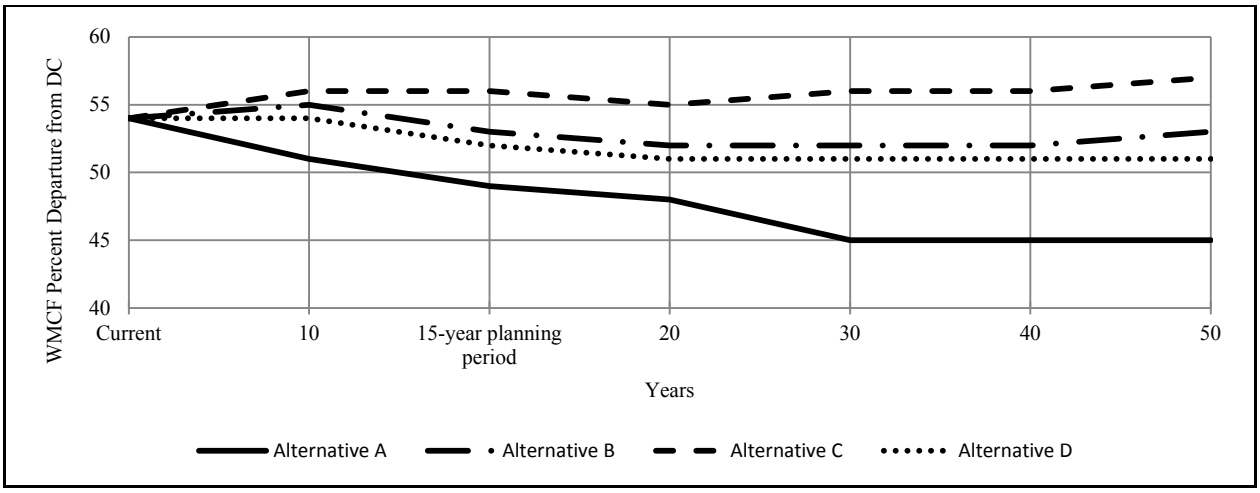



**Figure 4. Departure from DC trend comparisons for wet mixed conifer forest PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

After one planning period (15 years.), the proposed high acre treatment objectives under alternative B produces the greatest movement toward HRV, from the current rating of 61 to 44 (table 51). This is a change of one departure class, from high moderate. The treatment objectives under alternative A, the proposed average acre treatment objectives under alternative B, and the proposed low acre treatment objectives under alternative D all produce the same departure from HRV, from 61 to 46. This is a change of one departure class, from high moderate. The proposed high acre treatment objectives under alternative C produce the least movement towards HRV, from 61 to 51; however, this does lowers its high departure rating to moderate.

Figure 5 displays the long-term trend in relation to HRV for all wet mixed conifer forest alternatives, based on their proposed average acre treatments. All alternatives produce a decline in departure from high to moderate. Alternatives A and B produce the greatest HRV departure reduction during the planning period. All alternatives maintain a moderate departure throughout the modeling periods.

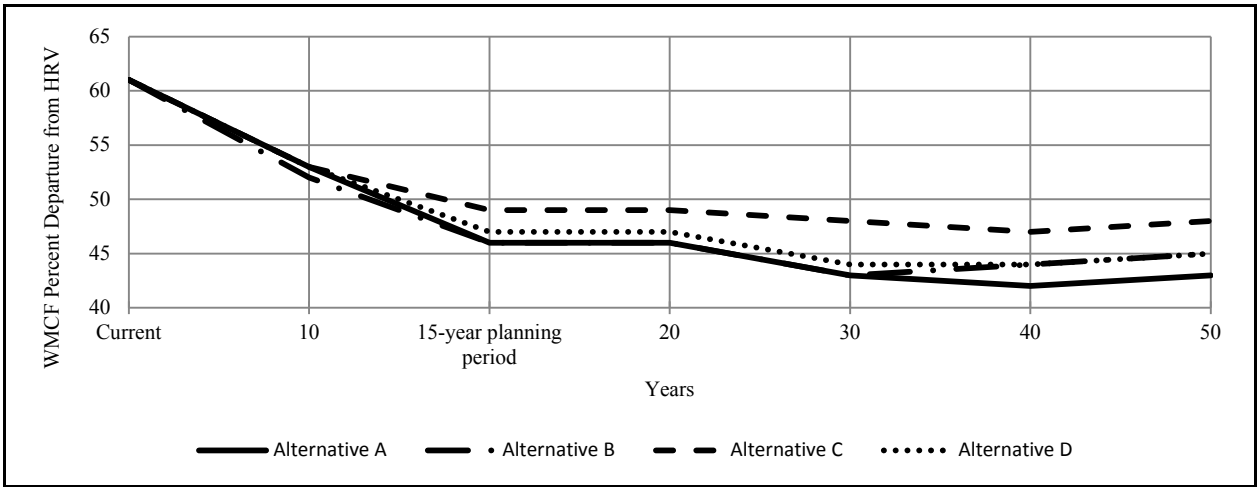



**Figure 5. Departure from HRV trend comparisons for wet mixed conifer forest PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then B, and finally C. However, by the end of the 15-year planning period, alternative B does more to address the threats and risks when assessing movement toward HRV, followed by alternative A, then D, and finally C. by the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then B, and finally C. In addition, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement toward HRV, but followed by the equally rated alternatives B and D, and finally C.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then B, and finally C. However, by the end of the 15-year planning period, the equally rated alternatives A and B do more to address the threats and risks when assessing movement toward HRV, followed by alternative D, and finally C. By the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then B, and finally C. In addition, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement toward HRV, but followed by the equally rated alternatives B and D, and finally C.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by the equally rated alternatives B and D, and finally C. However, by the end of the 15-year planning period, the equally rated alternatives A and D do more to address the threats and risks when assessing movement toward HRV, followed by the equally rated alternatives B and C. by the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then B, and finally C. In addition, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement toward HRV, but followed by alternative D, and finally, the equally rated alternatives B and C.

*Large Trees/Old Trees, Snags and Coarse Woody Debris*

*Large/Old Trees:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 52). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative C proposed high acre treatment objectives, alternative B proposed high acre treatment objectives, alternative D proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative B proposed average acre treatment objectives, alternative A, alternative D proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, and finally, alternative B proposed low acre treatment objectives. By the end of the 50-year modeling period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention. However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative D proposed average acre treatment objectives, alternative B proposed high acre treatment objectives, alternative C proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative A, alternative D proposed low acre treatment objectives, alternative B proposed low acre

treatment objectives, and finally, alternative C proposed low acre treatment objectives.

**Table 52. Acres of large/old trees, number of snags greater than 18 inch diameter (dbh) per acre, and tons of the three size classes of coarse woody debris per acre by the end of the 15-year planning period and the 50-year modeling period within the wet mixed conifer forest PNVT on the ASNFs**

| Alternative | WMCF Vegetation Structural States E, F, I, J, N, O, R, S | Across All WMCF Vegetation Structural States | | | | | |
|---|---|---|---|---|---|---|---|
| | | number of snags/acre (dbh) | | tons of coarse woody debris (diameter/acre) | | | |
| | acres of large/old trees | 5" - 17.9" | ≥ 18" | ≤ 3" | > 3" & ≤ 12" | > 12" | total |
| *Desired Condition* | *80,543* | *≥ 20†* | *average 1 - 5* | *range from 5 - 40* | | | |
| *Current Condition* | *20,058* | *25.4* | *9.8* | *4.4* | *6.5* | *2.9* | *13.8* |
| **15-year Planning Period** | | | | | | | |
| Alternative A | 36,004 | 23.0 | 10.0 | 9.5 | 18.6 | 12.7 | 40.7 |
| B High Treatment | 39,080 | 23.9 | 10.4 | 9.6 | 18.5 | 12.7 | 40.8 |
| B Average Treatment | 36,238 | 23.3 | 10.0 | 9.5 | 18.4 | 12.6 | 40.5 |
| B Low Treatment | 33,396 | 22.7 | 9.7 | 9.4 | 18.3 | 12.5 | 40.2 |
| C High Treatment | 39,966 | 23.7 | 10.7 | 9.2 | 17.7 | 12.3 | 39.3 |
| C Average Treatment | 36,729 | 23.3 | 10.2 | 9.3 | 18.0 | 12.3 | 39.2 |
| C Low Treatment | 33,492 | 22.8 | 9.7 | 9.4 | 18.2 | 12.5 | 40.1 |
| D High Treatment | 41,950 | 24.3 | 11.0 | 9.7 | 19.2 | 13.3 | 42.2 |
| D Average Treatment | 37,689 | 23.6 | 10.4 | 9.6 | 18.7 | 12.9 | 41.2 |
| D Low Treatment | 33,428 | 22.9 | 9.8 | 9.4 | 18.3 | 12.6 | 40.3 |
| **50-year Modeling Period** | | | | | | | |
| Alternative A | 45,522 | 25.0 | 11.4 | 10.1 | 19.5 | 13.5 | 43.0 |
| B High Treatment | 51,037 | 25.5 | 12.0 | 10.2 | 19.3 | 13.9 | 43.4 |
| B Average Treatment | 46,288 | 24.6 | 11.4 | 10.0 | 19.1 | 13.7 | 42.8 |
| B Low Treatment | 41,540 | 23.8 | 10.8 | 9.8 | 18.8 | 13.5 | 42.1 |
| C High Treatment | 46,305 | 24.6 | 11.7 | 9.6 | 18.3 | 13.2 | 41.1 |
| C Average Treatment | 43,819 | 24.1 | 11.2 | 9.7 | 18.5 | 13.2 | 41.4 |
| C Low Treatment | 41,333 | 23.7 | 10.8 | 9.7 | 18.6 | 13.3 | 41.6 |
| D High Treatment | 58,547 | 26.6 | 13.2 | 10.6 | 20.5 | 14.7 | 45.7 |
| D Average Treatment | 51,279 | 25.5 | 12.1 | 10.2 | 19.8 | 14.1 | 44.1 |
| D Low Treatment | 44,012 | 24.3 | 11.1 | 9.9 | 19.0 | 13.6 | 42.5 |

†Proposed Forest Plan mid-scale DCs (100 to 1,000 acres) for wet mixed conifer forest are for 20 or more snags > 8" in dbh per acre. Available data ranges from "small" (> 5"and ≤ 10" dbh), "large" (> 10" and ≤ 18" dbh), and "extra-large" (> 18" dbh): so there is no way to examine exactly how many 8" or greater diameter snags per acre there are currently, or would be under the proposed high, low and average acre treatments objectives by the end of the 15-year planning period or the 50-year modeling period). Data is provide for additional information only

*Snags (18 inches or larger):* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for the number of snags 18 inches or greater per acre (table 52). However, the low acre treatment objectives proposed under both alternatives B and C provide the greatest movement toward DCs. This is followed by alternative A, alternative B proposed high acre treatment objectives, alternative C proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative D proposed low acre treatment objectives, alternative C proposed average acre treatment objectives, and then alternative D proposed high acre treatment objectives, and finally, alternative D proposed average acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs than they were at the end of the 15-year planning period.

*Coarse Woody Debris:* By the end of the 15-year planning period, five alternatives' proposed acre treatment objectives would achieve the DCs for the amount of coarse woody debris per acre (table 52). They are: alternative C proposed high, average, and low acre treatment objectives, alternative B proposed low acre treatment objectives, and finally, alternative D proposed low acre treatment objectives. Those alternatives not meeting DCs for the amount of coarse woody debris per acre are: alternative A, alternative B proposed high and average acre treatment objectives, and finally, alternative D proposed high, and average acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs than they were at the end of the 15-year planning period.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the

proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative D does more when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. In addition, by the end of the 50-year modeling period, alternative D also does more when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then C, and finally A. By the end of the 15-year planning period, alternative A does more when assessing movement toward DC for number of large snags per acre, followed by alternative B, then C, and finally D. In addition, by the end of the 50-year modeling period alternative A also does more when assessing movement toward DC for number of large snags per acre, followed by alternative C, then B, and finally D. By the end of the 15-year planning period, alternative C does more when assessing movement toward DC for tons of coarse woody debris per acre, followed by the equally rated alternatives A and B, and finally D. However, by the end of the 50-year modeling period, alternative C does more when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative A, then B, and finally D.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative D does more when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. In addition, by the end of the 50-year modeling period, alternative D also does more when assessing movement toward DC for acres of large/old trees per acre, but followed by alternative B, then C, and finally A. By the end of the 15-year planning period, alternative A does more when assessing movement toward DC for number of large snags per acre, followed by alternative B, then C, and finally D. However, by the end of the 50-year modeling period, alternative C does more when assessing movement toward DC for number of large snags per acre, followed by the equally rated alternatives A and B, and finally D. By the end of the 15-year planning period and the 50-year modeling period, alternative C does more when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then A, and finally D.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative A does more when assessing movement toward DC for acres of large/old trees per acre, followed by alternative D, then C, and finally B. In, addition, by the end of the 50-year modeling period, alternative A also does more when assessing movement toward DC for acres of large/old trees per acre, but followed by alternative D, then B, and finally C. By the end of the 15-year planning period, the equally rated alternatives B and C do more when assessing movement toward DC for number of large snags per acre, followed by alternative A, and finally D. In addition, by the end of the 50-year modeling period, the equally rated alternatives B and C also do more when assessing movement toward DC for number of large snags per acre, but followed by alternative D, and finally A. By the end of the 15-year planning period and the 50-year modeling period, alternative C does more when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then D, and finally A.

***Dry mixed conifer forest:***

*Annual Vegetation Treatment Objectives*

| Alternative | High Acre treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 1,808 | 800 |
| B | 2,772 | 2,910 | 396 | 416 | 1,584 | 1,663 | - | - |
| C | 6,160 | 2,772 | 616 | 277 | 3,388 | 1,525 | - | - |
| D | 2,400 | 5,880 | 360 | 881 | 1,380 | 3,381 | - | - |

*Vegetation Outcome*

After one planning period (15 years.), the proposed high acre treatment objectives under alternative C produces the greatest movement toward DC, from the current rating of 67 to 49 (table 53). This is a change of one departure class, from high to moderate. Under this alternative there is the greatest overall reduction in the representation of all size and age trees, single or multi-storied with closed canopy cover (combined values of vegetation structural states G, H, I, L, M). And the greatest overall increase in representation of medium to very large size, single or multi-storied trees with open canopy cover (combined values of vegetation structural states D, E, J, and K). Reduction in overstory canopy cover will favor shade intolerant and very shade intolerant species, including the herbaceous vegetation understory.

**Table 53. Fifteen-year planning period dry mixed conifer forest PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each DMCF Vegetation Structural State | | | | | | | | | | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | DC | HRV |
| *Desired Condition* | *0* | *5* | *3* | *4* | *15* | *4* | *3* | *2* | *6* | *11* | *30* | *4* | *13* | *0* | *0*$^{N}$ | - |
| *Current Condition* | *3* | *1* | *2* | *3* | *1* | *3* | *14* | *8* | *2* | *3* | *1* | *26* | *9* | *25* | *67*$^{H}$ | *77*$^{H}$ |
| C High Treatment (6.4) | 3 | 1 | 1 | 3 | 2 | 30 | 11 | 5 | 3 | 6 | 14 | 10 | 6 | 5 | 49$^{M}$ | 44$^{M}$ |
| B High Treatment (4.1) | 3 | 1 | 1 | 3 | 4 | 28 | 10 | 8 | 4 | 5 | 9 | 13 | 7 | 5 | 53$^{M}$ | 48$^{M}$ |
| C Average (3.6) | 3 | 1 | 1 | 3 | 2 | 29 | 11 | 8 | 4 | 5 | 9 | 14 | 7 | 5 | 54$^{M}$ | 51$^{M}$ |
| B Average (2.4) | 3 | 1 | 1 | 3 | 4 | 28 | 11 | 8 | 4 | 4 | 6 | 14 | 7 | 5 | 56$^{M}$ | 52$^{M}$ |
| D High Treatment (3.9) | 3 | 2 | 1 | 5 | 3 | 24 | 9 | 8 | 11 | 4 | 4 | 13 | 7 | 6 | 56$^{M}$ | 52$^{M}$ |
| A Average (1.8) | 2 | 1 | 1 | 3 | 5 | 27 | 11 | 9 | 4 | 3 | 4 | 16 | 7 | 6 | 57$^{M}$ | 54$^{M}$ |
| D Average (2.2) | 3 | 1 | 1 | 4 | 3 | 26 | 10 | 10 | 8 | 4 | 3 | 15 | 7 | 6 | 58$^{M}$ | 54$^{M}$ |
| C Low Treatment (0.8) | 2 | 1 | 1 | 2 | 1 | 28 | 12 | 10 | 5 | 3 | 4 | 17 | 8 | 5 | 59$^{M}$ | 58$^{M}$ |
| D Low Treatment (0.6) | 2 | 1 | 1 | 3 | 2 | 27 | 11 | 11 | 5 | 3 | 3 | 18 | 8 | 6 | 59$^{M}$ | 56$^{M}$ |
| B Low Treatment (0.7) | 2 | 0 | 1 | 2 | 4 | 28 | 12 | 9 | 5 | 3 | 3 | 16 | 8 | 6 | 60$^{M}$ | 57$^{M}$ |

† Departure from DC and HRV Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

The proposed high acre treatment objectives under alternative B produce the second greatest movement toward DC, from the current rating of 67 to 53. This is a change of one departure class, from high to moderate. The proposed average acre treatment objectives under alternative C produce the third greatest movement toward DC, from the current rating of 67 to 54. This is also a change of one departure class, from high to moderate. The low acre treatment objectives proposed under each of the action alternatives, and the average acre treatment objectives proposed under alternative D provide less movement towards DC than alternative A. For more information regarding dry mixed conifer vegetation structural state model run outcomes see appendix B tables 21 through 30.

Figure 6 displays the long-term trend toward DC for all dry mixed conifer forest alternatives, based on their proposed average acre treatments. All alternatives produce reductions in departure from DC immediately, and continue to trend in movement toward DC through all modeling periods. They all move from a high to moderate departure. Overall, alternative A produces the greatest movement towards DC over the other alternatives. This is followed equally by alternatives B and C, and finally by alternative D.

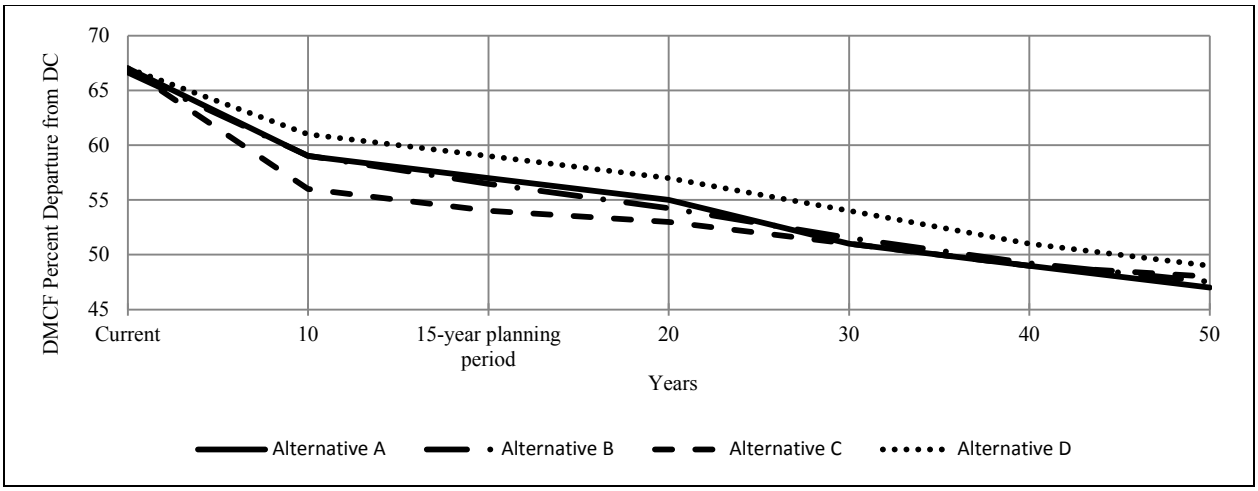



**Figure 6. Departure from DC trend comparisons for dry mixed conifer forest PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

After one planning period (15 years.), the proposed high acre treatment objectives under alternative C also produces the greatest movement toward HRV, from the current rating of 77 to 44 (table 53). This is a change of one departure class, from high moderate. The proposed high acre treatment objectives under alternative B produce the second greatest movement toward HRV, from the current rating of 77 to 49. This is also a change of one departure class, from high to moderate. The proposed average acre treatment objectives under alternative C produce the third greatest movement toward HRV, from the current rating of 77 to 51. This also lowers its high departure rating. The low acre treatment objectives proposed under each of the action alternatives, and the average acre treatment objectives proposed under alternative D provide less movement towards HRV than alternative A.

Figure 7 displays the long-term trend toward HRV for all dry mixed conifer forest alternatives, based on their proposed average acre treatments. All alternatives produce reductions in departure from HRV immediately, and continue to trend in movement toward HRV through all modeling periods. They all move from a high to moderate departure rating. Overall, alternative B produces the greatest movement towards HRV over the other alternatives.

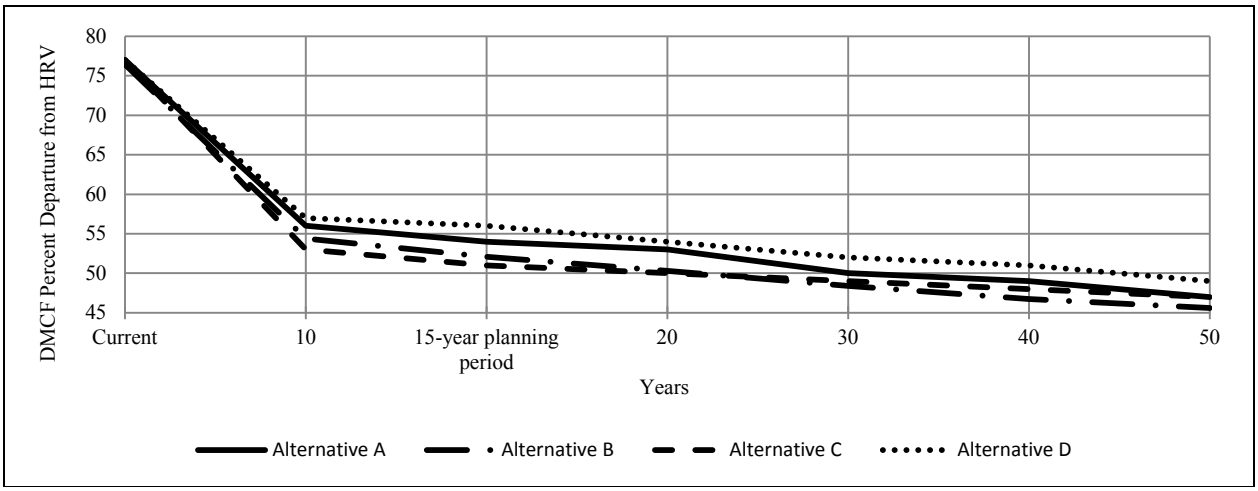



**Figure 7. Departure from HRV trend comparisons for dry mixed conifer forest PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then D, and finally A. However, by the end of the 50-year modeling period, alternative B does more to address the threats and risks when assessing movement toward DC and HRV, followed by alternative A, then D, and finally C.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then A, and finally D. However, by the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally D. In addition, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement toward HRV, but followed by the equally rated alternatives B and D, and finally C.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by the equally rated alternatives C and D, and finally B. In addition, by the end of the 15-year planning period, alternative A also does more to address the threats and risks but when assessing movement toward HRV, but followed by alternative D, then B, and finally C. Furthermore, by the end of the 50-year modeling period, alternative A also does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally D.

*Large/Old Trees, Snags and Coarse Woody Debris*

*Large/Old Trees:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 54). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative C proposed high acre treatment objectives, alternative B proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative D proposed average acre treatment objectives, alternative A, alternative B proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, and finally, alternative D proposed low acre treatment objectives. By the end of the 50-year modeling period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention. However, the proposed high acre treatment objectives under alternatives B would provide the greatest movement toward DCs. This is followed by alternative D proposed high acre treatment objectives, alternative C proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative D proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative B proposed low acre treatment objectives, alternative A, alternative C proposed low acre treatment objectives, and finally, alternative D proposed low acre treatment objectives.

*Snags (18 inches or larger):* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for the number of snags 18 inches or greater per acre (table 54). However, the low acre treatment objectives proposed under alternatives D would provide the greatest movement toward DCs. This is followed by alternative C proposed low acre treatment objectives, alternative D proposed average

acre treatment objectives and alternative B proposed low acre treatment objectives, alternative C proposed average acre treatment objectives, alternative A, alternative B proposed average acre treatment objectives, alternative D proposed high acre treatment objectives, and finally, alternative B proposed high acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs than they were at the end of the 15-year planning period.

**Table 54. Acres of large/old trees, number of snags greater than 18 inch diameter (dbh) per acre, and tons of the three size classes of coarse woody debris per acre by the end of the 15-year planning period and the 50-year modeling period within the dry mixed conifer forest PNVT on the ASNFs**

| Alternative | DMCF Vegetation Structural States E, I, K, M | Across All DMCF Vegetation Structural States | | | | | |
|---|---|---|---|---|---|---|---|
| | | number of snags/acre (dbh) | | tons of coarse woody debris (diameter/acre) | | | |
| | acres of large/old trees | 5" - 17.9" | ≥ 18" | ≤ 3" | > 3" & ≤ 12" | > 12" | total |
| *Desired Condition* | *84,295* | *non-defined†* | *average 3* | *range from 5 - 15* | | | |
| *Current Condition* | *17,618* | *19.9* | *4.9* | *10.1* | *10.5* | *5.4* | *26.0* |
| **15- year Planning Period** | | | | | | | |
| Alternative A | 30,071 | 21.9 | 7.9 | 7.3 | 11.5 | 6.3 | 25.2 |
| B High Treatment | 34,905 | 21.5 | 8.3 | 7.0 | 10.9 | 6.0 | 23.9 |
| B Average Treatment | 32,618 | 21.7 | 8.1 | 7.3 | 11.3 | 6.3 | 24.9 |
| B Low Treatment | 29,606 | 21.9 | 7.9 | 7.5 | 11.8 | 6.6 | 25.9 |
| C High Treatment | 36,116 | 20.4 | 8.4 | 6.8 | 10.4 | 5.7 | 22.9 |
| C Average Treatment | 31,648 | 20.9 | 8.0 | 7.2 | 11.2 | 6.2 | 24.6 |
| C Low Treatment | 27,179 | 21.5 | 7.5 | 7.6 | 12.0 | 6.7 | 26.3 |
| D High Treatment | 36,995 | 20.2 | 8.2 | 7.2 | 11.6 | 6.6 | 25.4 |
| D Average Treatment | 31,598 | 20.8 | 7.7 | 7.4 | 11.8 | 6.6 | 25.9 |
| D Low Treatment | 26,201 | 21.4 | 7.3 | 7.6 | 12.0 | 6.7 | 26.3 |
| **50-year Modeling Period** | | | | | | | |
| Alternative A | 45,736 | 23.8 | 9.6 | 7.6 | 11.7 | 6.6 | 25.9 |
| B High Treatment | 55,479 | 23.9 | 10.5 | 7.4 | 11.3 | 6.3 | 25.1 |
| B Average Treatment | 50,623 | 23.8 | 10.1 | 7.7 | 11.8 | 6.6 | 26.0 |
| B Low Treatment | 45,767 | 23.7 | 9.7 | 7.9 | 12.2 | 7.0 | 27.0 |
| C High Treatment | 50,934 | 22.4 | 10.1 | 7.3 | 11.0 | 6.1 | 24.4 |
| C Average Treatment | 47,074 | 22.6 | 9.6 | 7.7 | 11.8 | 6.7 | 26.1 |
| C Low Treatment | 43,214 | 22.8 | 9.1 | 8.1 | 12.6 | 7.2 | 27.9 |
| D High Treatment | 54,132 | 23.1 | 10.0 | 7.5 | 12.0 | 6.8 | 26.4 |
| D Average Treatment | 47,985 | 23.0 | 9.5 | 7.8 | 12.4 | 7.1 | 27.3 |
| D Low Treatment | 41,838 | 22.9 | 9.0 | 8.1 | 12.8 | 7.4 | 28.3 |

†Proposed Forest Plan desired conditions for dry mixed conifer forest do not specify any DCs for this size class of snags; data is provide for additional information only

*Coarse Woody Debris:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for the amount of coarse woody debris per acre (table 54). However, the proposed high acre treatment objectives under alternatives B would provide the greatest movement toward DCs. This is followed by alternative C proposed high acre treatment objectives, alternative C proposed average acre treatment objectives, alternative B proposed average acre treatment objectives, alternative A, alternative D proposed high acre treatment objectives, equally by alternative B proposed low acre treatment objectives and alternative D proposed average acre treatment objectives, and finally, equally by alternative C proposed low acre treatment objectives and alternative D proposed low acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs than they were at the end of the 15-year planning period.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. However, by the end of the 50-year modeling period, alternative B does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative D, then C, and finally A. By the end of the 15-year

planning period and the 50-year modeling period, alternative A does more, when assessing movement toward DC for number of large snags per acre, followed by alternative D, then C, and finally B. By the end of the 15-year planning period, alternative B does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative C, then A, and finally D. However, by the end of the 50-year modeling period, alternative C does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then A, and finally D.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative B does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then D, and finally A. In addition, by the end of the 50-year modeling period, alternative B also does more, when assessing movement toward DC for acres of large/old trees per acre, but followed by alternative D, then C, and finally A. By the end of the 15-year planning period and the 50-year modeling period, alternative D does more, when assessing movement toward DC, for number of large snags per acre, followed by the equally rated alternatives A and C, and finally B. By the end of the 15-year planning period, alternative C does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then A, and finally D. However, by the end of the 50-year modeling period, alternative A does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then C, and finally D.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative A does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then C, and finally D. However, by the end of the 50-year modeling period, alternative B does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative A, then C, and finally D. By the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for number of large snags per acre, followed by alternative C, then B, and finally D. In addition, by the end of the 50-year modeling period, alternative D also does more, when assessing movement toward DC for number of large snags per acre, but followed by alternative C, then A, and finally B. By the end of the 15-year planning period, alternative A does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, and finally by the equally rated alternatives C and D. In addition, by the end of the 50-year modeling period, alternative A also does more, when assessing movement toward DC for tons of coarse woody debris per acre, but followed by alternative B, then C, and finally D.

***Spruce-fir forest:***

*Annual Vegetation Treatment Objectives*

| Alternative | High Acres Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | | | 108 | 100 |
| B | 95 | 606 | 14 | 87 | 55 | 347 | - | - |
| C | 208 | 892 | 16 | 93 | 112 | 493 | - | - |
| D | 36 | 964 | 6 | 145 | 21 | 555 | - | - |

*Vegetation Outcome*

After one planning period (15 years.), all four alternatives produce trends moving away from DC and change one departure class, from moderate to high (table 55). Within the planning cycle no alternative produces a reduction in the representation of vegetation structural states that are lacking aspen regeneration (combined values of vegetation structural states K, L, M, N, O, and Q), or an increase in representation of medium to very large size, single or multi-storied trees with open canopy cover

(combined values of vegetation structural states E and F). In addition, there is no reduction in overstory canopy cover to favor aspen and mixed-shade tolerant species, including the herbaceous vegetation understory; however, this is inappropriate for later seral states of this PNVT. This forest type is supposed to be dense with closed canopy. Aspen is only dominant following high severity disturbances in the early seral conditions.

**Table 55. Fifteen-year planning period spruce-fir forest PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | DC | HRV |
| *Desired Condition* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0*$^{N}$ | - |
| *Current Conditions* | *14* | *33* | *15* | *6* | *1* | *1* | *0* | *3* | *0* | *0* | *14* | *4* | *6* | *1* | *0* | *1* | *3* | *0* | *0* | *59*$^{M}$ | *62*$^{H}$ |
| C High Treatment (7.4) | 0 | 31 | 5 | 9 | 2 | 2 | 3 | 5 | 6 | 4 | 1 | 14 | 5 | 1 | 1 | 3 | 6 | 2 | 1 | 63$^{H}$ | 54$^{M}$ |
| B High Treatment (4.2) | 0 | 33 | 6 | 8 | 1 | 1 | 3 | 4 | 4 | 3 | 0 | 16 | 5 | 1 | 1 | 3 | 6 | 3 | 2 | 64$^{H}$ | 54$^{M}$ |
| D High Treatment (4.0) | 0 | 31 | 5 | 9 | 1 | 2 | 3 | 5 | 6 | 3 | 0 | 13 | 5 | 1 | 1 | 3 | 7 | 3 | 1 | 64$^{H}$ | 53$^{M}$ |
| C Average (4.1) | 0 | 32 | 6 | 7 | 1 | 1 | 3 | 4 | 4 | 3 | 0 | 18 | 5 | 1 | 1 | 3 | 6 | 2 | 1 | 65$^{H}$ | 55$^{M}$ |
| D Average (2.2) | 0 | 33 | 6 | 7 | 1 | 1 | 3 | 4 | 4 | 2 | 0 | 17 | 5 | 0 | 1 | 3 | 7 | 2 | 1 | 65$^{H}$ | 55$^{M}$ |
| B Average (2.1) | 0 | 34 | 6 | 6 | 1 | 1 | 3 | 4 | 4 | 2 | 0 | 19 | 5 | 1 | 1 | 3 | 6 | 3 | 1 | 66$^{H}$ | 55$^{M}$ |
| C Low Treatment (0.7) | 0 | 34 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 22 | 6 | 0 | 1 | 3 | 6 | 2 | 1 | 67$^{H}$ | 57$^{M}$ |
| D Low Treatment (0.4) | 0 | 35 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 21 | 5 | 0 | 1 | 2 | 6 | 2 | 1 | 67$^{H}$ | 56$^{M}$ |
| Alternative A (1.2) | 0 | 40 | 12 | 6 | 2 | 1 | 4 | 1 | 1 | 0 | 1 | 13 | 5 | 2 | 2 | 7 | 3 | 2 | 0 | 68$^{H}$ | 58$^{M}$ |
| B Low Treatment (2.5) | 0 | 35 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 22 | 5 | 1 | 1 | 3 | 6 | 3 | 1 | 68$^{H}$ | 56$^{M}$ |

†Departure from DC and HRV Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

However, of all of the alternatives, the proposed high acre treatment objectives under alternative C produce the smallest increase in departure, from the current rating of 59 to 63. The proposed high acre treatment objectives under alternatives B and D produce the next smallest increase, from the current rating of 59 to 64. The average acre treatment objectives under alternatives A and the proposed low acre treatment objectives in alternative B produce the greatest departure, from the current rating of 59 to 68. As mentioned earlier, these are all changes of one departure class, from moderate to high. For more information regarding spruce-fir vegetation structural state model run outcomes see appendix B tables 31 through 40.

Figure 8 displays the long-term trend in relation to DC for all spruce-fir forest alternatives, based on their proposed average acre treatments. At first, all alternatives produce increases in departure from DC immediately; however, at year 10 the trend reverses and all alternatives begin trending toward DC throughout all modeling periods. At the end of the modeling period (50 years.), Alternative D produces the greatest movement toward DC. By the end of the modeling period all alternatives have move from a moderate to a high departure rating.

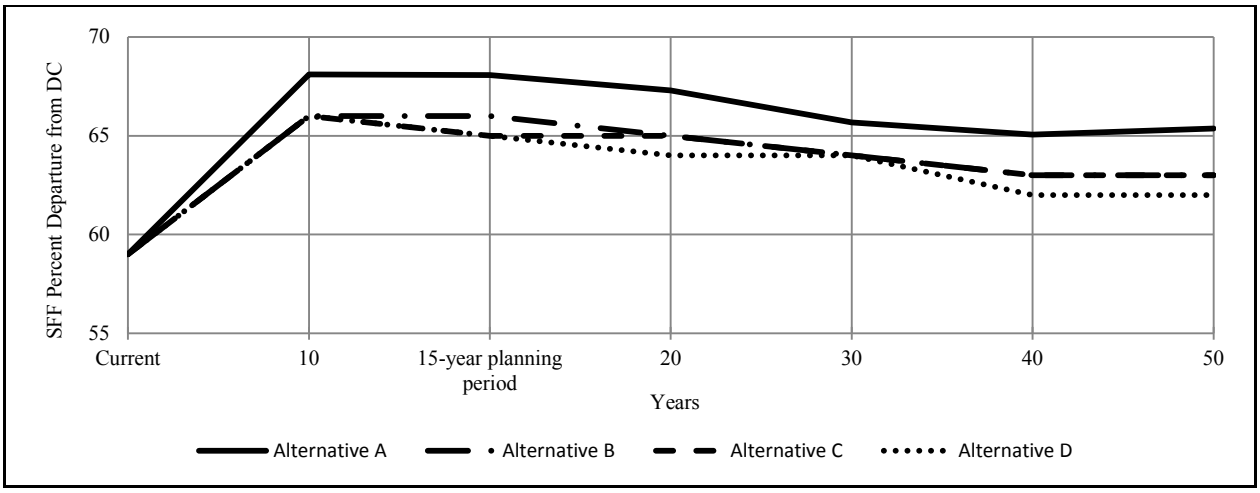



**Figure 8. Departure from DC trend comparisons for spruce-fir forest PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

After one planning period (15 years.), the proposed high acre treatment objectives under alternative D produces the greatest movement toward HRV, from the current rating of 62 to 53 (table 55). This is a change of one departure class, from high moderate. The proposed high acre treatment objectives under alternatives B and C produce the second greatest movement toward HRV, from their current rating of 77 to 54. This is also a change of one departure class, from high to moderate. The proposed low acre treatment objectives under alternative C and the treatment objectives in alternative A produce the least movement toward HRV, from the current rating of 62 to 57 and 58, respectively. However, this lowers their high departure ratings to moderate.

Figure 9 displays the long-term trend toward HRV for all spruce-fir forest alternatives, based on their proposed average acre treatments. All alternatives produce reductions in departure from HRV immediately, and continue to trend in movement toward HRV through all modeling periods. They all move from a high to moderate departure. Overall, alternatives B, C, and D produce the greatest movement towards HRV over alternative A, however all the action alternatives differ by only one percentage point.

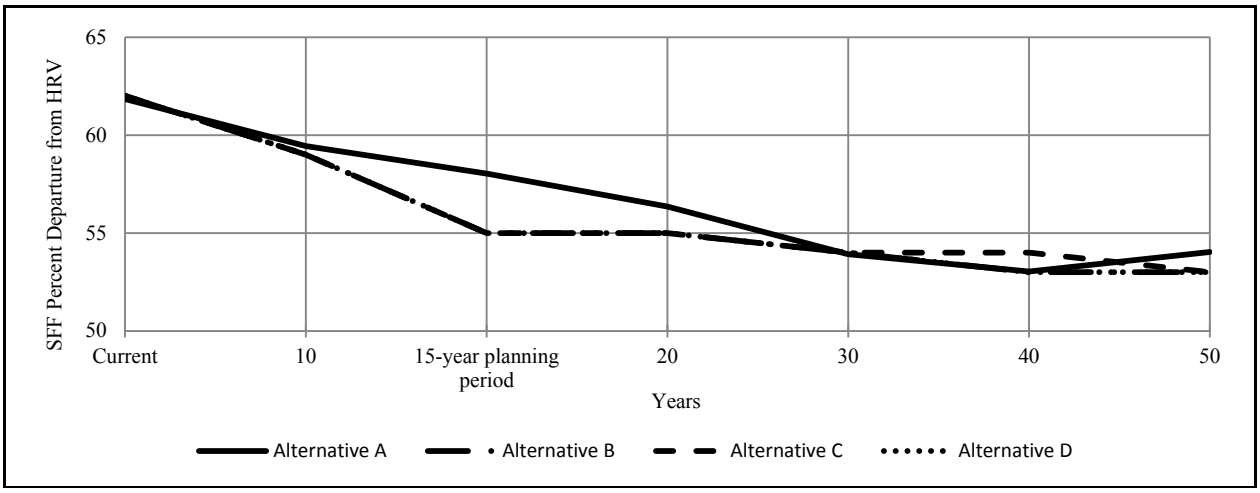



**Figure 9. Departure from HRV trend comparisons for spruce-fir forest PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement toward DC, followed by the equally rated alternatives B and D, and finally A. However, by the end of the 15-year planning period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by the equally rated alternatives B and C, and finally A. By the end of the 50-year modeling period, the equally rated alternatives C and D do more to address the threats and risks when assessing movement toward DC, followed by alternative B, and finally A. However, by the end of the 50-year modeling period, alternative C does more to address the threats and risks when assessing movement toward HRV, followed by the equally rated alternatives B and D, finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives C and D do more to address the threats and risks when assessing movement toward DC, followed by alternative B, and finally A. However, by the end of the 15-year planning period, the equally rated alternatives B, C, and D equally do more to address the threats and risks when assessing movement toward HRV, followed by alternative A. By the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward DC, followed by the equally rated alternatives B and C, and finally A. However, by the end of the 50-year modeling period, the equally rated alternatives B, C, and D do more to address the threats and risks when assessing movement toward HRV, followed by alternative A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives C and D do more to address the threats and risks when assessing movement toward DC, followed by alternative A, and finally B. However, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement toward HRV, followed by alternative C, and finally A. By the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward DC, followed by the equally rated alternatives A and B, and finally C. However, by the end of the 50-year modeling period, the equally rated alternatives B and C do more to address the threats and risks when assessing movement toward HRV, followed by the equally rated alternatives A and D.

*Large/Old Trees, Snags and Coarse Woody Debris*

*Large/Old Trees:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 56). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative C proposed high acre treatment objectives, alternative B proposed high acre treatment objectives, alternative D proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative B proposed average acre treatment objectives, alternative A, alternative D proposed low acre treatment objectives, alternative B proposed low acre treatment objectives, and finally, alternative C proposed low acre treatment objectives. By the end of the 50-year modeling period, four alternatives' proposed acre treatment objectives would achieve the DCs. They are: alternatives B, C, and D high acre treatment objectives, and alternative D average acre treatment objectives. These are followed by alternative C proposed average acre treatment objectives, alternative B proposed average acre treatment objectives, alternative D proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, alternative A, and finally, alternative D proposed low acre treatment objectives.

*Snags (18 inches or larger):* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of snags 18 inches or greater per acre (table 56). However, the low acre treatment objectives proposed under alternative B provides the greatest movement toward desired conditions. This is followed by alternative C proposed low acre treatment objectives, alternative A and alternative D proposed low acre treatment objectives, alternative B proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative D proposed average acre treatment objectives, alternative B proposed high acre treatment objectives, alternative C proposed high acre treatment objectives, and finally alternative D proposed high acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs than they were at the end of the 15-year planning period.

*Coarse Woody Debris:* By the end of the 15-year planning period, only the proposed high acre treatment objectives under alternatives D would achieve DCs for the amount of coarse woody debris per acre (table 56). This is followed by alternative C proposed low acre treatment objectives, alternative B proposed low acre treatment objectives, alternative D proposed low acre treatment objectives, alternative A, alternative B proposed acreage acre treatment objectives, alternative C proposed acreage acre treatment objectives, alternative D proposed acreage acre treatment objectives, alternative B proposed high acre treatment objectives, and finally, alternative C proposed high acre treatment objectives. By the end of the 50-year modeling period, all alternatives are even further departed from DCs for the amount of coarse woody debris per acre than they were at the end of the 15-year planning period.

**Table 56. Acres of large/old trees, number of snags greater than 18 inch diameter (dbh) per acre, and tons of the three size classes of coarse woody debris per acre by the end of the 15-year planning period and the 50-year modeling period within the spruce-fir forest PNVT on the ASNFs**

| Alternative | Vegetation Structural States E, F, I, J, N, O, R, S | Across All SFF Vegetation Structural States | | | | | |
|---|---|---|---|---|---|---|---|
| | | number of snags/acre dbh | | tons of coarse woody debris (diameter/acre) | | | |
| | acres of large/old trees | 5" - 17.9" | ≥ 18" | ≤ 3" | > 3" & ≤ 12" | > 12" | total |
| *Desired Condition* | *7,067* | *13 - 30* | *1 - 3* | *range from 5 - 40* | | | |
| *Current Condition* | *1,829* | *24.7* | *8.4* | *10.1* | *20.7* | *7.4* | *38.2* |
| **15-year Planning Period** | | | | | | | |
| Alternative A | 3,660 | 32.6 | 13.1 | 12.8 | 25.4 | 11.4 | 49.7 |
| B High Treatment | 4,344 | 32.9 | 14.6 | 13.2 | 26.5 | 12.4 | 52.1 |
| B Average Treatment | 3,970 | 32.7 | 13.8 | 13.0 | 25.9 | 11.9 | 50.7 |
| B Low Treatment | 3,596 | 32.6 | 12.9 | 12.8 | 25.3 | 11.3 | 49.5 |
| C High Treatment | 4,525 | 32.9 | 15.1 | 13.2 | 26.7 | 12.8 | 52.6 |
| C Average Treatment | 4,029 | 32.7 | 14.1 | 13.0 | 26.0 | 12.0 | 51.0 |
| C Low Treatment | 3,533 | 32.6 | 13.0 | 12.7 | 25.3 | 11.3 | 49.4 |
| D High Treatment | 4,587 | 32.7 | 15.2 | 13.3 | 26.9 | 12.8 | 53.0 |
| D Average Treatment | 4,090 | 32.5 | 14.1 | 13.0 | 26.1 | 12.1 | 51.2 |
| D Low Treatment | 3,593 | 32.3 | 13.1 | 12.7 | 25.4 | 11.4 | 49.5 |
| **50-year modeling Period** | | | | | | | |
| Alternative A | 5,723 | 30.7 | 17.4 | 14.2 | 28.5 | 14.4 | 57.1 |
| B High Treatment | 7,599 | 29.3 | 21.1 | 15.5 | 31.2 | 17.1 | 63.8 |
| B Average Treatment | 6,655 | 30.0 | 19.3 | 14.8 | 29.9 | 15.7 | 60.4 |
| B Low Treatment | 5,712 | 30.6 | 17.4 | 14.2 | 28.5 | 14.3 | 57.0 |
| C High Treatment | 8,133 | 29.0 | 22.4 | 15.9 | 32.1 | 18.0 | 66.0 |
| C Average Treatment | 6,928 | 29.8 | 19.9 | 15.0 | 30.3 | 16.2 | 61.5 |
| C Low Treatment | 5,724 | 30.5 | 17.5 | 14.2 | 28.5 | 14.4 | 57.1 |
| D High Treatment | 8,619 | 28.4 | 23.1 | 16.1 | 32.6 | 18.6 | 67.3 |
| D Average Treatment | 7,316 | 29.4 | 20.5 | 15.2 | 30.7 | 16.6 | 62.6 |
| D Low Treatment | 6,017 | 30.4 | 17.8 | 14.4 | 28.8 | 14.6 | 57.8 |

†Proposed Forest Plan mid-scale DCs (100 to 1,000 acres) for spruce-fir forest are for 13 - 30 snags > 8" in dbh per acre. Available data ranges from "small" (> 5"and ≤ 10" dbh), "large" (> 10" and ≤ 18" dbh), and "extra-large" (> 18" dbh): so there is no way to examine exactly how many 8" or greater diameter snags per acre there are currently, or would be under the proposed high, low and average acre treatments objectives by the end of the 15-year planning period or the 50-year modeling period). Data is provide for additional information only

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. However, by the end of the 50-year modeling period, the equally rated alternatives B, C and D do more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative A. By the end of the 15-year planning period and 50-year modeling period, alternative A does more, when assessing movement toward DC for number of large snags per acre, followed by alternative B, then C, and finally D. By the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative A, then B, and finally C. However, by the end of the 50-year modeling period, alternative A does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then C, and finally D.

For the proposed average acre treatment objectives, by the end of the 15-year planning period and 50-year modeling period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. By the end of the 15-year planning period and 50-year modeling period, alternative A does more, when assessing movement toward DC for number of large snags per acre, followed by alternative B, then C, and finally A. By the end of the 15-year planning period and 50-year modeling period, alternative A does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then C, and finally D.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative A does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then D, and finally C. However, by the end of the 50-year modeling period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then A, and finally B. By the end of the 15-year planning period, alternative B does more, when assessing movement toward DC for number of large snags per acre, followed by alternative C, and finally, by the equally rated alternatives A and D. However, by the end of the 50-year modeling period, the equally rated alternatives A and B do more, when assessing movement toward DC for the number of large snags per acre, but followed by alternative C, and finally D. By the end of the 15-year planning period, alternative C does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then D, and finally A. However, by the end of the 50-year modeling period, alternative B does more, when assessing movement toward DC, for tons of coarse woody debris per acre, followed by the equally rated alternatives A and C, and finally D.

***Forested PNVTs:*** Figure 10 displays the summary of long-term trends in relation to DC for the collective forested PNVTs under all alternatives, modeled in VDDT, based on their proposed average acre treatments. All action alternatives produce reductions in departure from DC immediately and continue across all modeling periods. Alternative C produces the greatest movement towards DC by the end of the planning period. However, by the end of the 50 year modeling period, alternatives A produce the greatest movement towards DC; however, all alternatives are within four percentage points of one another.

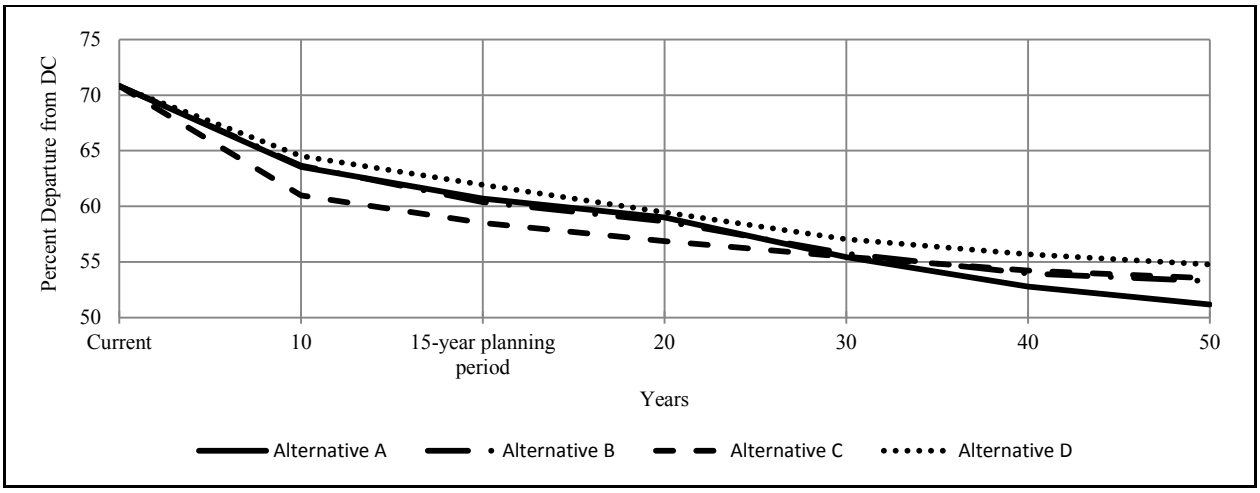



**Figure 10. Departure from DC trend comparisons for all forested PNVTs by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

Figure 11 displays the summary of long-term trends in relation to HRV for the collective forest PNVTs under all alternatives, modeled in VDDT, based on their proposed average acre treatments. All alternatives produce reductions in departure from HRV immediately and continue across all modeling periods. Alternative C produces the greatest movement towards HRV by the end of the planning period. By the end of the 50-year modeling period, alternative D produces the greatest movement towards HRV.

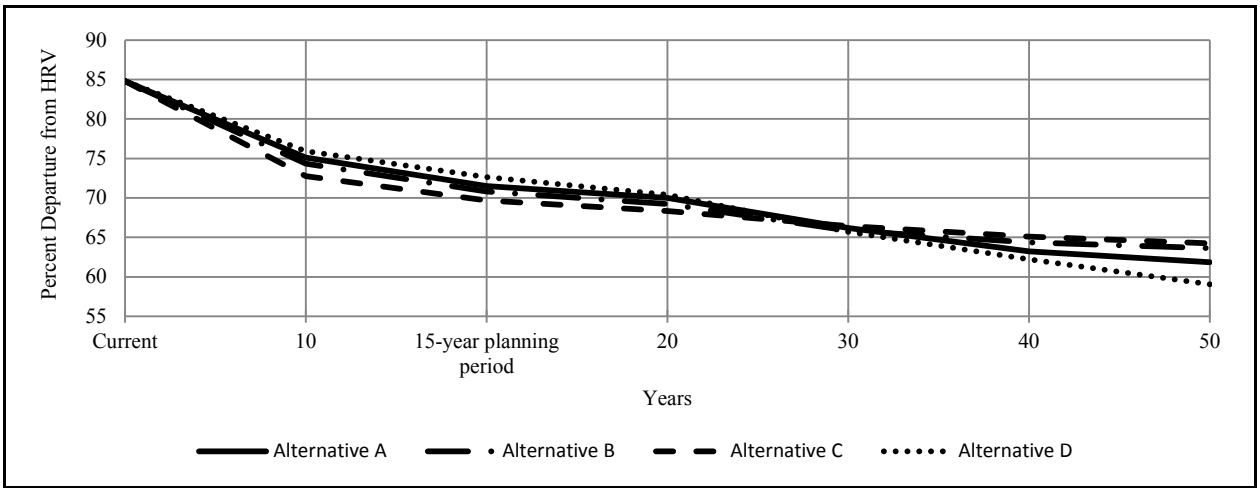



**Figure 11. Departure from HRV trend comparisons for all forest PNVTs by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then A, and finally D. In addition, by the end of the 15-year planning period, alternative C does more to address the threats

and risks when assessing movement toward HRV, but followed by the equally rated alternatives A and B, and finally D. By the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally D. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by alternative A, and finally, by the equally rated alternatives B and C.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then A, and finally D. In addition, by the end of the 15-year planning period, alternative C also does more to address the threats and risks when assessing movement toward HRV, but followed by the equally rated alternatives A and B, and finally D. By the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally D. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by alternative A, and finally by the equally rated alternatives B and C.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternatives C does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then A, and finally D. In addition, by the end of the 15-year planning period, alternatives C also does more to address the threats and risks when assessing movement toward HRV, but followed by the equally rated alternatives A and B, and finally D. By the end of the 50-year modeling period, alternative A does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally D. By the end of the 50-year modeling period, alternatives D does more to address the threats and risks when assessing movement toward HRV, followed by alternative A, and finally, by the equally rated alternatives B and C.

## Woodland PNVTs

### *Madrean pine-oak woodland:*

*Annual Vegetation Treatment Objectives*

| Alternative | High Acre Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 0 | 1,063 |
| B | 0 | 11,143 | 0 | 3,714 | 0 | 7,429 | - | - |
| C | 0 | 5,000 | 0 | 1,250 | 0 | 3,125 | - | - |
| D | 0 | 22,335 | 0 | 3,722 | 0 | 13,029 | - | - |

*Vegetation Outcome*

After one planning cycle, the proposed high acre treatment objectives under alternative D produce the greatest movement toward DC, from the current rating of 61 to 28 (table 57). This is a change of two departure classes, from high to low. Under this alternative there is the greatest overall increase in the representation of seedling, saplings, small, and medium to very large size, single or multi-storied trees with open canopy cover (vegetation structural states B, C, and D). And the greatest reduction in closed canopy structural states (vegetation structural states F and G). Reduction in overstory canopy cover will favor shade intolerant and very shade intolerant species, including the herbaceous vegetation understory.

**Table 57. Fifteen-year planning period Madrean pine-oak woodland PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each MPOW Vegetation Structural State | | | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | DC | HRV |
| *Desired Condition* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *0*$^{N}$ | - |
| *Current Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *61*$^{H}$ | *72*$^{H}$ |
| D High Treatment (5.6) | 6 | 2 | 14 | 34 | 1 | 17 | 26 | 28$^{L}$ | 38$^{L}$ |
| B High Treatment (2.8) | 5 | 2 | 10 | 25 | 1 | 23 | 35 | 41$^{M}$ | 52$^{M}$ |
| D Average (3.3) | 5 | 2 | 10 | 25 | 1 | 23 | 35 | 41$^{M}$ | 51$^{M}$ |
| B Average (1.9) | 5 | 1 | 8 | 20 | 1 | 26 | 39 | 47$^{M}$ | 58$^{M}$ |
| C High Treatment (1.3) | 8 | 1 | 7 | 18 | 1 | 27 | 37 | 50$^{M}$ | 61$^{H}$ |
| B Low Treatment (0.9) | 4 | 1 | 6 | 15 | 1 | 28 | 44 | 54$^{M}$ | 65$^{H}$ |
| D Low Treatment (0.9) | 4 | 1 | 6 | 17 | 1 | 28 | 44 | 54$^{M}$ | 65$^{H}$ |
| C Average (0.8) | 6 | 1 | 6 | 16 | 1 | 29 | 41 | 55$^{M}$ | 66$^{H}$ |
| Alternative A (0.3) | 6 | 1 | 4 | 12 | 1 | 31 | 44 | 59$^{M}$ | 70$^{H}$ |
| C Low Treatment (0.3) | 4 | 1 | 5 | 13 | 1 | 31 | 46 | 59$^{M}$ | 70$^{H}$ |

†Departure from DC and HRV Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

The proposed high acre treatment objectives under alternative B and the average acre treatment objectives under alternative D produce the second greatest movement toward DC, from their current ratings of 61 to 41. This is a change of one departure classes, from high to moderate. The treatment objectives under alternative A and the proposed low acre treatment objectives under alternative C produce the least movement toward DC, from the current rating of 61 to 59. However this does provide a change in their departure class, from high to moderate. For more information regarding Madrean pine-oak vegetation structural state model run outcomes see appendix B tables 41 through 50.

Figure 12 displays the long-term trend in relation to DC for all Madrean pine-oak woodland alternatives, based on their average acre treatments. All action alternatives produce reductions in departure from DC immediately; however, alternative D has the greatest movement during the planning cycle and across all modeling periods (at which point it has dropped two departure classes). Alternatives B, C, and A lag behind, respectively, however, alternative B also decreases two departure classes while alternatives A and C each decrease by one departure class.

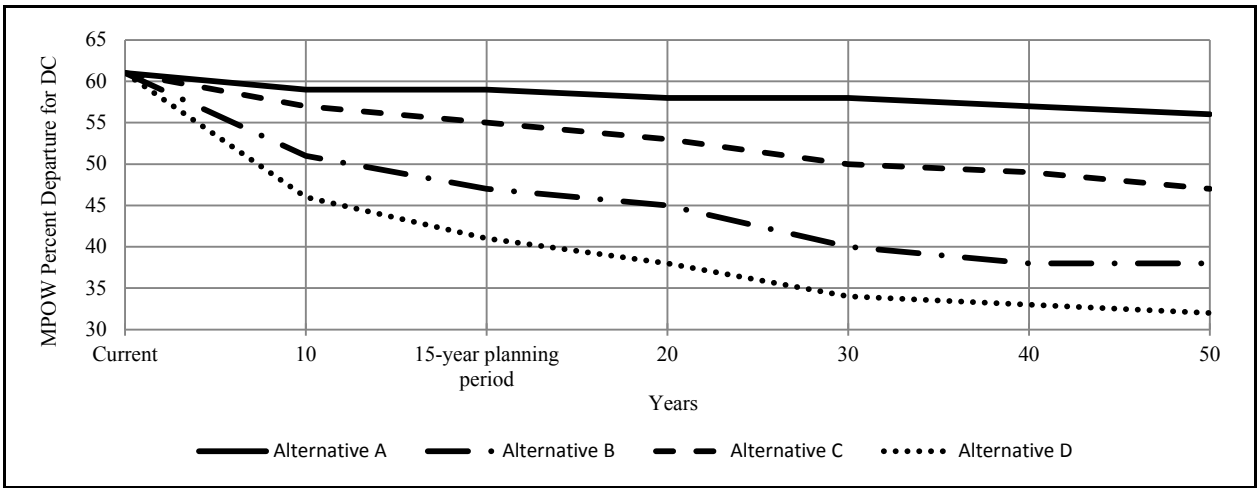



**Figure 12. Departure from DC trend comparisons for Madrean pine-oak woodland PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

Figure 13 displays the long-term trend in relation to HRV for all Madrean pine-oak woodland alternatives, based on their average acre treatments. All alternatives produce reductions in departure from HRV immediately; however, alternative D has the greatest movement during the planning cycle and across all modeling periods (at which point it has dropped one departure classes. Alternatives B, C, and A lag behind, respectively, however, alternative B and C also decrease one departure classes while alternatives A remains highly departed.

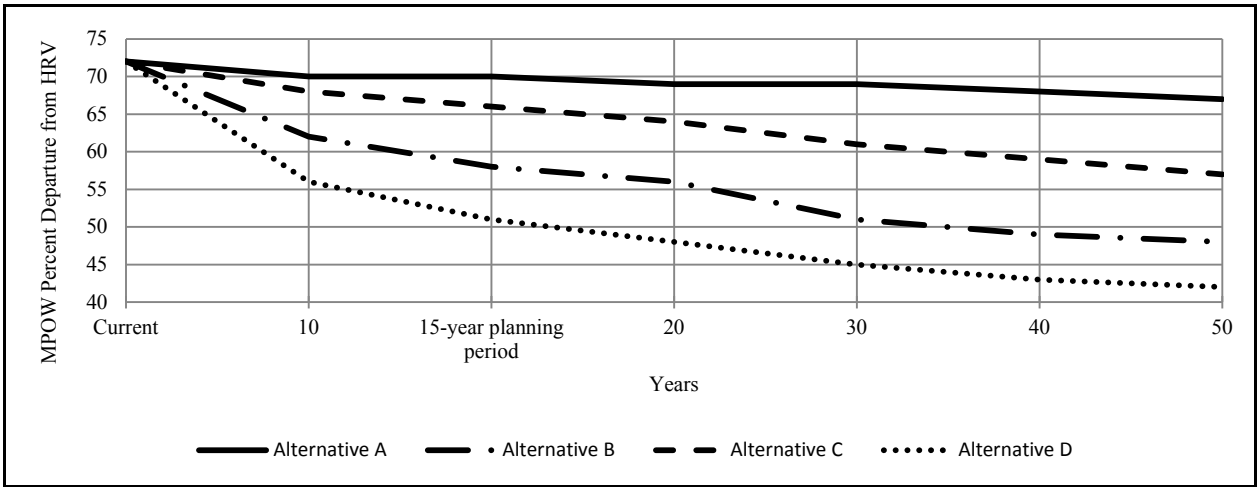



**Figure 13. Departure from HRV trend comparisons for Madrean pine-oak woodland PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by the equally rated alternatives A and C. In addition, by the end of the 50-year modeling period, the equally rated alternatives B and D also do more to address the threats and risks when assessing movement towards both DC and HRV, but followed by alternative C, and finally A.

*Large/Old Trees, Snags and Coarse Woody Debris*

*Large/Old Trees:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 58). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by

alternative D proposed average acre treatment objectives, alternative D proposed low acre treatment objectives, alternative B proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative B proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, alternative C proposed average acre treatment objectives, alternative A, and finally, alternative C proposed high acre treatment objectives. By the end of the 50-year modeling period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 58). However, the proposed low acre treatment objectives under alternatives C would provide the greatest movement toward DCs. This is followed by alternative D proposed low acre treatment objectives, alternative B proposed low acre treatment objectives, alternative A, alternative B proposed average acre treatment objectives, alternative D proposed average acre treatment objectives, alternative B proposed high acre treatment objectives, alternative D proposed high acre treatment objectives, alternative C proposed average acre treatment objectives, and finally, alternative C proposed high acre treatment objectives.

**Table 58. Acres of large/old trees, number of snags greater than 18 inch diameter (dbh) per acre, and tons of the three size classes of coarse woody debris per acre by the end of the 15-year planning period and the 50 modeling period within the Madrean pine-oak woodland PNVT on the ASNFs**

| Alternative | Vegetation Structural States D, G | Across All Vegetation Structural States | | | | | |
|---|---|---|---|---|---|---|---|
| | | number of snags/acre dbh | | tons of coarse woody debris (diameter/acre) | | | |
| | acres of large/old trees | 5" - 17.9" | ≥ 18" | ≤ 3" | > 3" & ≤ 12" | > 12" | total |
| *Desired Condition* | *222,147* | *non-defined†* | *1 - 2* | *range from 1 - 5* | | | |
| *Current Condition* | *119,259* | *3.7* | *0.9* | *0.3* | *1.3* | *0.8* | *2.4* |
| **15- year Planning Period** | | | | | | | |
| Alternative A | 167,913 | 11.5 | 1.4 | 3.4 | 3.6 | 2.1 | 9.0 |
| B High Treatment | 176,473 | 9.6 | 1.3 | 2.8 | 3.0 | 1.8 | 7.6 |
| B Average Treatment | 176,088 | 10.4 | 1.4 | 3.1 | 3.2 | 1.9 | 8.2 |
| B Low Treatment | 175,703 | 11.3 | 1.4 | 3.3 | 3.5 | 2.1 | 8.9 |
| C High Treatment | 162,582 | 10.1 | 1.3 | 3.0 | 3.1 | 1.9 | 8.0 |
| C Average Treatment | 171,142 | 10.9 | 1.3 | 3.2 | 3.4 | 2.0 | 8.6 |
| C Low Treatment | 174,370 | 11.7 | 1.4 | 3.4 | 3.6 | 2.1 | 9.2 |
| D High Treatment | 178,991 | 8.0 | 1.3 | 2.4 | 2.5 | 1.5 | 6.4 |
| D Average Treatment | 178,695 | 9.6 | 1.3 | 2.8 | 3.0 | 1.8 | 7.6 |
| D Low Treatment | 178,399 | 11.2 | 1.4 | 3.3 | 3.5 | 2.1 | 8.8 |
| **50-year Modeling Period** | | | | | | | |
| Alternative A | 211,099 | 11.8 | 1.4 | 3.4 | 3.9 | 2.2 | 9.4 |
| B High Treatment | 204,553 | 8.1 | 1.3 | 2.4 | 2.6 | 1.5 | 6.5 |
| B Average Treatment | 208,640 | 9.3 | 1.3 | 2.7 | 3.0 | 1.7 | 7.5 |
| B Low Treatment | 212,728 | 10.6 | 1.4 | 3.1 | 3.4 | 2.0 | 8.4 |
| C High Treatment | 181,775 | 8.4 | 1.2 | 2.5 | 2.7 | 1.6 | 6.8 |
| C Average Treatment | 197,666 | 10.0 | 1.3 | 2.9 | 3.2 | 1.9 | 8.0 |
| C Low Treatment | 213,557 | 11.6 | 1.4 | 3.3 | 3.8 | 2.1 | 9.2 |
| D High Treatment | 199,932 | 6.4 | 1.2 | 1.9 | 2.0 | 1.2 | 5.2 |
| D Average Treatment | 206,700 | 8.4 | 1.3 | 2.5 | 2.7 | 1.6 | 6.8 |
| D Low Treatment | 213,468 | 10.5 | 1.4 | 3.0 | 3.4 | 1.9 | 8.4 |

†Proposed Forest Plan desired conditions for dry mixed conifer forest do not specify any DCs for this size class of snags; data is provide for additional information only

*Snags (18 inches or larger):* By the end of the 15-year planning period, all of the alternatives would achieve the DCs for number of snags 18 inches or greater per acre (table 58). By the end of the 50-year modeling period, all alternatives would continue to maintain DCs for number of snags 18 inches or greater per acre.

*Coarse Woody Debris:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for the amount of coarse woody debris per acre (table 58). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative B proposed average acre treatment objectives and alternative D proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative B

proposed high acre treatment objectives, alternative C proposed high acre treatment objectives, alternative D proposed low acre treatment objectives, alternative B proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, and finally, alternative A. By the end of the 50-year modeling period, none of the alternatives would achieve the DCs for the amount of coarse woody debris per acre (table 58). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative B proposed high acre treatment objectives, alternative C proposed high acre treatment objectives and alternative D proposed average acre treatment objectives, alternative B proposed average acre treatment objectives, alternative C proposed average acre treatment objectives and alternative B proposed low acre treatment objectives and alternative D proposed low acre treatment objectives, alternative C proposed low acre treatment objectives, and finally, alternative A.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then A, and finally C. However, by the end of the 50-year modeling period, alternative A does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then D, and finally C. By the end of the 15-year planning period and the 50-year modeling period, all of the alternatives are rated as equal, when assessing movement toward DC for number of large snags per acre. By the end of the 15-year planning period and the 50-year modeling period, alternative D does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then C, and finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then C, and finally A. However, by the end of the 50-year modeling period, alternative A does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative B, then D, and finally C. By the end of the 15-year planning period and by the end of the 50-year modeling period, all of the alternatives are rated as equal, when assessing movement toward DC for number of large snags per acre. By the end of the 15-year planning period and the 50-year modeling period, alternative D does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then C, and finally A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. However, by the end of the 50-year modeling period, alternative C does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative D, then B, and finally A. By the end of the 15-year planning period and the 50-year modeling period, all of the alternatives are rated as equal, when assessing movement toward DC for number of large snags per acre. By the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, and finally, by the equally rated alternatives A and C. However, by the end of the 50-year modeling period, the equally rated alternatives B and D do more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative C, and finally A.

***Piñon-juniper woodland:***

*Annual Vegetation Treatment Objectives*

| Alternative | High Acre Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 500 | 713 |
| B | 2,341 | 1,412 | 780 | 470 | 1,561 | 941 | - | - |
| C | 4,213 | 600 | 1,053 | 150 | 2,633 | 375 | - | - |
| D | 4,042 | 3,443 | 673 | 575 | 2,358 | 2,009 | - | - |

*Vegetation Outcome*

After one planning period, the proposed high acre treatment objectives under alternative C produce the greatest movement toward DC, from the current rating of 26 to 18 (table 59). There is a change in departure class from low to no departure. Under this alternative there is the greatest overall increase in the representation of seedling, saplings, small, and medium to very large size, single or multi-storied trees with open canopy cover (vegetation structural states B, C, and D), and the greatest reduction in closed canopy vegetation structural state G. Reduction in overstory canopy cover will favor shade intolerant and very shade intolerant species, including the herbaceous vegetation understory.

All proposed acre treatments under alternatives B and D, and the proposed average acre treatment objectives under alternative and C produce movement toward DC, from the current rating of 26 to 19s and 20s. These are all changes in departure class from low to no departure. The treatment objectives under alternative A and the proposed low acre treatment objectives under alternative C do not change departure class.

**Table 59. Fifteen-year planning period piñon-juniper woodland PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each PJW Vegetation Structural State | | | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | DC | HRV |
| *Desired Condition* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *0*$^{N}$ | - |
| *Current Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *26*$^{L}$ | *26*$^{L}$ |
| C High Treatment (2.2) | 7 | 5 | 4 | 54 | 3 | 6 | 22 | 18$^{N}$ | 18$^{N}$ |
| B High Treatment (1.7) | 5 | 5 | 4 | 56 | 4 | 6 | 21 | 19$^{N}$ | 19$^{N}$ |
| C Average (1.4) | 6 | 4 | 3 | 52 | 3 | 7 | 25 | 19$^{N}$ | 19$^{N}$ |
| D High Treatment (3.4) | 9 | 5 | 4 | 60 | 4 | 4 | 14 | 19$^{N}$ | 19$^{N}$ |
| D Average (2.0) | 7 | 5 | 3 | 56 | 3 | 5 | 20 | 19$^{N}$ | 19$^{N}$ |
| B Low Treatment (0.6) | 5 | 4 | 2 | 52 | 3 | 7 | 26 | 20$^{N}$ | 20$^{N}$ |
| B Average (1.2) | 5 | 4 | 3 | 54 | 4 | 6 | 24 | 20$^{N}$ | 20$^{N}$ |
| D Low Treatment (0.6) | 6 | 4 | 2 | 51 | 3 | 7 | 26 | 20$^{N}$ | 20$^{N}$ |
| Alternative A (0.2) | 6 | 4 | 2 | 48 | 3 | 8 | 29 | 21$^{L}$ | 21$^{L}$ |
| C Low Treatment (0.5) | 5 | 4 | 2 | 49 | 3 | 8 | 28 | 21$^{L}$ | 21$^{L}$ |

†Departure from DC and HRV Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

Figure 14 displays the long-term trend in relation to DC and HRV for all piñon-juniper woodland alternatives, based on their average acre treatments. All alternatives produce reductions in departure from DC and HRV immediately; however, around 15 to 20 years all alternatives start trending away from DC and HRV. Alternative D maintains a lower departure trend than the other alternatives, while alternative A maintains a higher departure trend than alternatives B and C. Alternative D maintains the lowest departure rating across all modeling periods, followed by alternatives B, C and then A. Alternatives D, and B end in a low departure class while alternative C, and alternative A end in a moderate departure class. However, it appears that around 15 years trend changes in all alternatives and management changes would be needed to reset movement toward DCs within this PNVT. For more information regarding piñon-juniper vegetation structural state model run outcomes see appendix B tables 51 through 60.

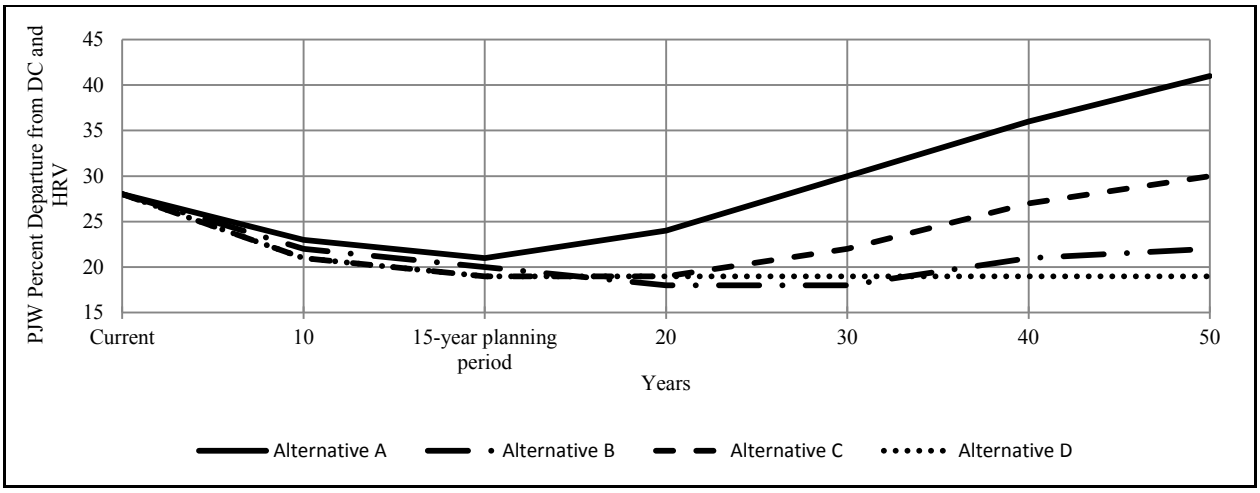



**Figure 14. Departure from DC and HRV trend comparisons for piñon-juniper woodland PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement towards both DC and HRV, followed by the equally rated alternatives B and D, and finally A. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A .

For the proposed average acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives C and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, and finally A. However, risks by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, and followed by alternative B, then C, and finally A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by the equally rated alternatives A and C. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A.

*Large/Old Trees, Snags and Coarse Woody Debris*

*Large/Old Trees:* By the end of the 15-year planning period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention (table 60). However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative C proposed high acre treatment objectives, alternative B proposed high acre treatment objectives, alternative D proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative D proposed low acre treatment objectives, alternative A, alternative C proposed low acre treatment objectives, alternative B proposed average acre treatment objectives, and

finally, alternative B proposed low acre treatment objectives. By the end of the 50-year modeling period, none of the alternatives would achieve the DCs for number of acres of large/old tree retention. However, the proposed high acre treatment objectives under alternatives D would provide the greatest movement toward DCs. This is followed by alternative C proposed high acre treatment objectives, alternative D proposed average acre treatment objectives, alternative C proposed average acre treatment objectives, alternative B proposed high acre treatment objectives, alternative B proposed average acre treatment objectives, alternative D proposed low acre treatment objectives, alternative B proposed low acre treatment objectives, alternative A, and finally, alternative C proposed low acre treatment objectives.

**Table 60. Acres of large/old trees, number of snags greater than 18 inch diameter (dbh) per acre, and tons of the three size classes of coarse woody debris per acre by the end of the 15-year planning period and the 50-year modeling period within the piñon-juniper woodland PNVT on the ASNFs**

| Alternative | Vegetation Structural States D, G | Across All Vegetation Structural States | | | | | |
|---|---|---|---|---|---|---|---|
| | | number of snags/acre dbh | | tons of coarse woody debris (diameter/acre) | | | |
| | acres of large/old trees | 5" - 17.9" | ≥ 18" | ≤ 3" | > 3" & ≤ 12" | > 12" | total |
| *Desired Condition* | *99,971* | *non-defined†* | *1 - 2* | *range from 2 - 5* | | | |
| *Current Condition* | *139,845* | *6.6* | *1.5* | *0.6* | *2.2* | *1.4* | *4.2* |
| **15- year Planning Period** | | | | | | | |
| Alternative A | 128,541 | 8.7 | 1.4 | 0.7 | 2.9 | 1.4 | 5.0 |
| B High Treatment | 128,307 | 7.2 | 1.4 | 0.7 | 2.4 | 1.3 | 4.4 |
| B Average Treatment | 129,806 | 7.7 | 1.4 | 0.7 | 2.6 | 1.4 | 4.6 |
| B Low Treatment | 129,844 | 8.2 | 1.4 | 0.7 | 2.7 | 1.4 | 4.8 |
| C High Treatment | 125,196 | 7.6 | 1.4 | 0.7 | 2.5 | 1.3 | 4.5 |
| C Average Treatment | 128,408 | 8.1 | 1.4 | 0.7 | 2.8 | 1.4 | 5.0 |
| C Low Treatment | 129,768 | 8.6 | 1.4 | 0.7 | 2.8 | 1.4 | 4.9 |
| D High Treatment | 124,493 | 6.0 | 1.4 | 0.6 | 2.1 | 1.2 | 3.9 |
| D Average Treatment | 128,357 | 7.1 | 1.4 | 0.6 | 2.4 | 1.3 | 4.3 |
| D Low Treatment | 128,508 | 8.2 | 1.4 | 0.7 | 2.7 | 1.4 | 4.8 |
| **50-year Modeling Period** | | | | | | | |
| Alternative A | 121,558 | 12.0 | 1.3 | 0.9 | 3.8 | 1.6 | 6.3 |
| B High Treatment | 118,483 | 8.1 | 1.3 | 0.7 | 2.7 | 1.3 | 4.7 |
| B Average Treatment | 119,829 | 9.3 | 1.3 | 0.8 | 3.0 | 1.4 | 5.2 |
| B Low Treatment | 121,175 | 10.5 | 1.3 | 0.8 | 3.3 | 1.5 | 5.7 |
| C High Treatment | 113,981 | 9.3 | 1.3 | 0.8 | 3.0 | 1.4 | 5.1 |
| C Average Treatment | 117,971 | 10.3 | 1.3 | 0.8 | 3.3 | 1.4 | 5.6 |
| C Low Treatment | 121,961 | 11.3 | 1.3 | 0.9 | 3.6 | 1.5 | 6.0 |
| D High Treatment | 109,376 | 5.8 | 1.3 | 0.6 | 1.9 | 1.1 | 3.7 |
| D Average Treatment | 114,984 | 7.9 | 1.3 | 0.7 | 2.6 | 1.3 | 4.6 |
| D Low Treatment | 120,593 | 10.1 | 1.3 | 0.8 | 3.2 | 1.5 | 5.5 |

†Proposed Forest Plan desired conditions for dry mixed conifer forest do not specify any DCs for this size class of snags; data is provide for additional information only

*Snags (18 inches or larger):* By the end of the 15-year planning period, all of the alternatives would achieve the DC for number of snags 18 inches or greater per acre (table 60). By the end of the 50-year modeling period, all alternatives would continue to maintain DCs for number of snags 18 inches or greater per acre.

*Coarse Woody Debris:* By the end of the 15-year planning period, all of the alternatives would achieve the DC for the amount of coarse woody debris per acre (table 60). By the end of the 50-year modeling period, only the following alternatives would maintain DC for the amount of coarse woody debris per acre: alternative D proposed high acre treatment objectives, alternative D proposed average acre treatment objectives, alternative B proposed high acre treatment objectives, and alternative C proposed high acre treatment objectives.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-

year planning period and the 50-year modeling period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then B, and finally A. by the end of the 15-year planning period and by the end of the 50-year modeling period, all of the alternatives are rated as equal, when assessing movement toward DC for number of large snags per acre. By the end of the 15-year planning period, all of the alternatives are rated as equal, when assessing movement toward DC for tons of coarse woody debris per acre. However, by the end of the 50-year modeling period, the equally rated alternatives B and D do more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative C, and finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative C, then A, and finally B. In addition, by the end of the 50-year modeling period, alternative D also does more, when assessing movement toward DC for acres of large/old trees per acre, but followed by alternative C, then B, and finally A. By the end of the 15-year planning period and the 50-year modeling period, all of the alternatives are rated as equal, when assessing movement toward DC for number of large snags per acre. By the end of the 15-year planning period, all of the alternatives are rated as equal, when assessing movement toward DC for tons of coarse woody debris per acre. However, by the end of the 50-year modeling period, alternative D does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative C, then B, and finally A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative D does more, when assessing movement toward DC for acres of large/old trees per acre, followed by alternative A, then C, and finally B. In addition, by the end of the 50-year modeling period, alternative D also does more, when assessing movement toward DC for acres of large/old trees per acre, but followed by alternative B, then A, and finally C. By the end of the 15-year planning period and by the end of the 50-year modeling period, all of the alternatives are rated as equal, when assessing movement toward DC for number of large snags per acre. By the end of the 15-year planning period, all of the alternatives are rated as equal, when assessing movement toward DC for tons of coarse woody debris per acre. However, by the end of the 50-year modeling period alternative D does more, when assessing movement toward DC for tons of coarse woody debris per acre, followed by alternative B, then C, and finally A.

***Woodland PNVTs:*** Figure 15 displays the summary of long-term trends in relation to DC for the collective woodland PNVTs under all alternatives, modeled in VDDT, based on their proposed average acre treatment objectives. All alternatives produce reductions in departure from DC immediately. Alternative D produces the greatest movement towards DC by the end of the planning period going from a moderate to low departure rating, followed by alternative B (going from a moderate to low, as well), and then alternative C. Alternative A provides no movement toward DC after the 15-year planning period. Both alternatives C and A remain moderately departed by the end of the 50-year modeling period.

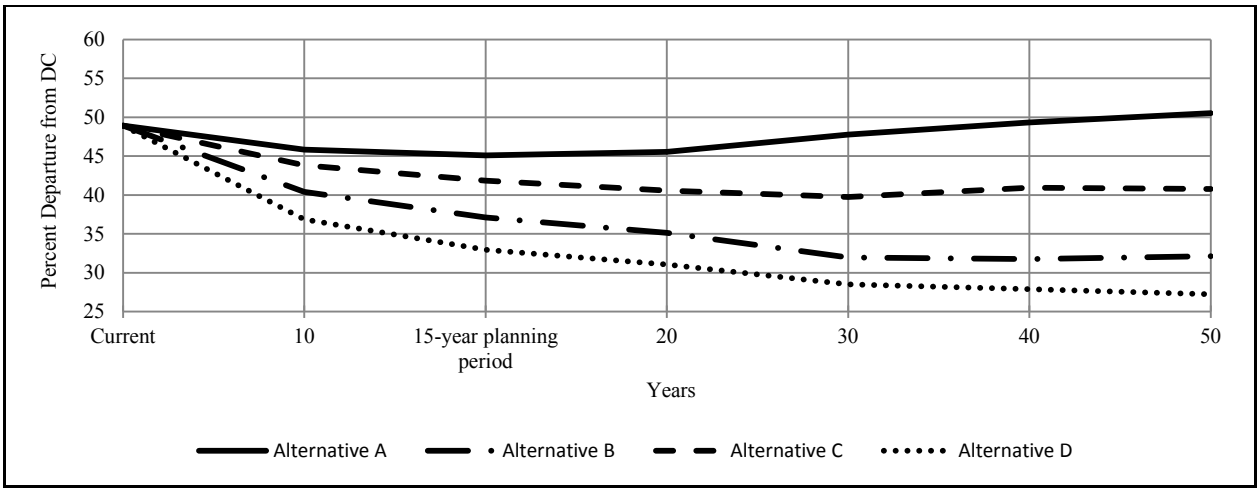



**Figure 15. Departure from DC trend comparisons for all woodland PNVTs by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

Figure 16 displays the summary of long-term trends in relation to HRV for the collective woodland PNVTs under all alternatives, modeled in VDDT, based on their average acre treatments. All alternatives produce reductions in departure from HRV immediately. Alternative D produces the greatest movement towards DC by the end of the planning period going from a moderate to low departure rating, followed by alternative B (going from a moderate to low, as well), and then alternative C. Alternative A provides no movement toward HRV by the end of the 15-year planning period. Both alternatives C and A remain moderately departed by the end of the 50-year modeling period.

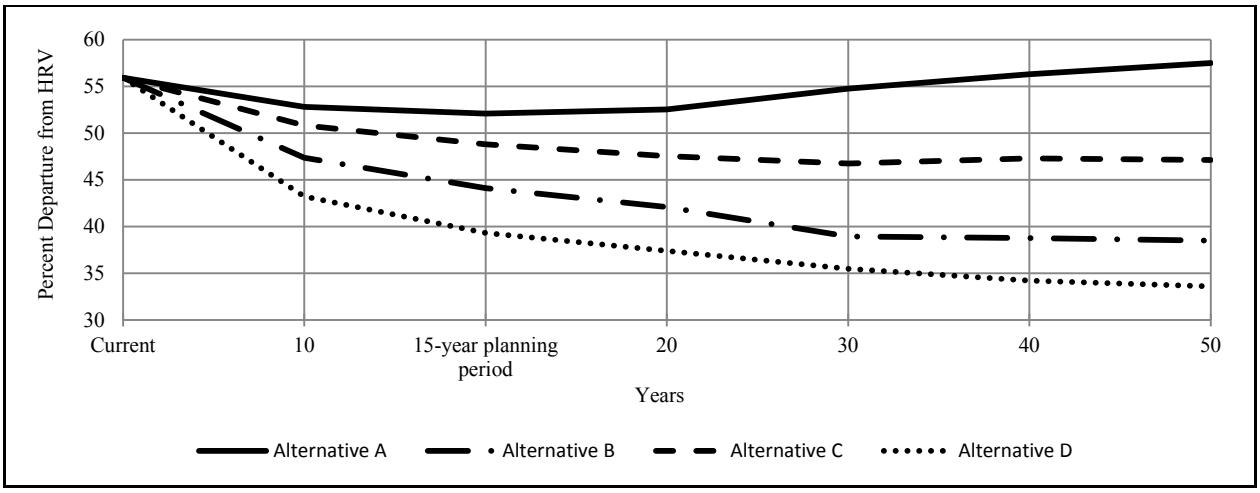



**Figure 16. Departure from HRV trend comparisons for all woodland PNVTs by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period and by the end of the 50-year

modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period and by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by the equally rated alternatives A and C. By the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally A. However, by the end of the 50-year modeling period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement toward HRV, followed by alternative C, and finally A.

## Grassland PNVTs

### *Great Basin grassland:*

*Annual Vegetation Treatment Objectives*

| Alternative | High Acre Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 500 | 41 |
| B | 10,269 | 10,000 | 5,135 | 5,000 | 7,702 | 7,500 | - | - |
| C | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| D | 6,161 | 14,000 | 3,081 | 7,000 | 4,621 | 10,500 | - | - |

*Vegetation Outcome*

After one planning period (15 years.), the proposed high acre treatment objectives under alternative D produce the greatest movement toward DC, from the current rating of 67 to 8 (table 61). This is a change of four departure classes, from high to no departure. Under this alternative there is the greatest overall reduction in woody vegetation encroachment (vegetation structural states C and D) and a return to historic grassland conditions, dense stands of perennial grasses and forbs with less than ten percent woody canopy cover (vegetation structural state B). Reduction in overstory canopy cover will favor shade intolerant and very shade intolerant herbaceous species.

**Table 61. Fifteen-year planning period Great Basin grassland PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each GBG Vegetation Structural State | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | DC | HRV |
| *Desired Condition* | *5* | *73* | *20* | *2* | *0* | *0*$^{N}$ | |
| *Current Conditions* | 1 | 10 | 69 | 18 | 2 | *67*$^{H}$ | *67*$^{H}$ |
| D High Treatment (10.9) | 0 | 70 | 19 | 8 | 2 | 8$^{N}$ | 8$^{N}$ |
| B High Treatment (11.0) | 0 | 75 | 15 | 7 | 2 | 9$^{N}$ | 9$^{N}$ |
| B Average (8.3) | 0 | 65 | 21 | 12 | 2 | 17$^{N}$ | 17$^{N}$ |
| D Average (8.2) | 0 | 60 | 25 | 13 | 2 | 19$^{N}$ | 19$^{N}$ |
| B Low Treatment (5.5) | 0 | 54 | 26 | 18 | 2 | 24$^{L}$ | 24$^{L}$ |
| D Low Treatment (5.4) | 0 | 49 | 31 | 18 | 2 | 29$^{L}$ | 29$^{L}$ |
| Alternative A (0.2) | 0 | 15 | 43 | 40 | 2 | 63$^{H}$ | 63$^{H}$ |
| Alternative C (0.2) | 0 | 15 | 43 | 40 | 2 | 63$^{H}$ | 63$^{H}$ |

†Departure from DC Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

The proposed high acre treatment objectives under alternative B produce the second greatest movement toward DC, from the current rating of 67 to 9. This is also a change of four departure classes, from high to no departure. The proposed average acre treatment objectives under alternative B produce the third greatest movement toward DC, from the current rating of 67 to 17. This is a change of three departure classes, from high to low. Alternatives A and C stay highly departed from DC and HRV. For more information regarding Great Basin vegetation structural state model run outcomes see appendix B tables 61 through 68.

Figure 17 displays the long-term trend in relation to DC and HRV for all Great Basin grassland alternatives, based on their average acre treatments. Both alternatives B and D produce reductions in departure from DC and HRV immediately, from high to no departure and remain there throughout the 50-year modeling period. Both alternatives A and C produce movement away from DC and HRV.

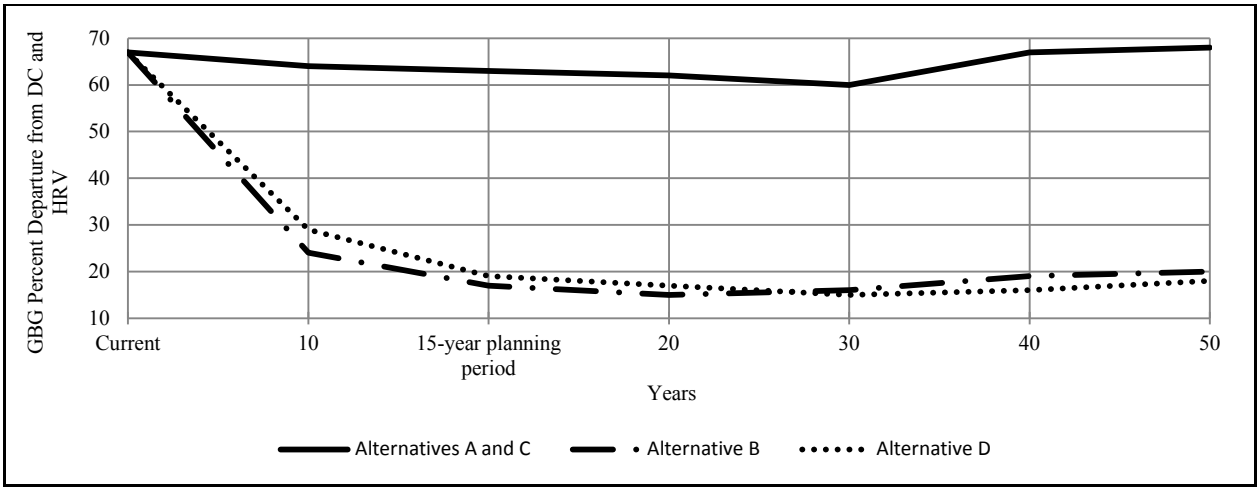



**Figure 17. Departure from DC and HRV trend comparisons for Great Basin grassland PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period,

by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, and finally, the equally rated alternatives A and C.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative B does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative D, and finally, the equally rated alternatives A and C. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, and finally, the equally rated alternatives A and C.

For the proposed low acre treatment objectives, when assessing movement towards both DC and HRV, alternative B does more to address the threats and risks by the end of the 15-year planning period and by the end of the 50-year modeling period followed by alternative D, then equally by alternatives A and C.

***Semi-desert grassland:***

*Annual Vegetation Treatment Objectives*

| Alternative | High Acre Treatment Objectives | | Low Acre Treatment Objectives | | Average Acre Treatment Objectives | | Alternative A Treatment Acres | |
|---|---|---|---|---|---|---|---|---|
| | mechanical | burning | mechanical | burning | mechanical | burning | mechanical | burning |
| A | - | - | - | - | - | - | 0 | 27 |
| B | 0 | 3,000 | 0 | 2,000 | 0 | 2,500 | - | - |
| C | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| D | 0 | 3,000 | 0 | 2,000 | 0 | 2,500 | - | - |

*Vegetation Outcome*

After one planning period, the proposed high acre treatment objectives under both Alternatives B and D produce the greatest movement toward DC and HRV, from the current rating of 78 to 66 (table 62). However, there is no change in departure class, and the grassland remains highly departed. Under these alternatives there is the greatest overall reduction in woody vegetation encroachment (vegetation structural states C and D) and some movement to historic grassland conditions, dense stands of perennial grasses and forbs with less than ten percent woody canopy cover (vegetation structural state B). Reduction in overstory canopy cover will favor shade intolerant and very shade intolerant herbaceous species.

**Table 62. Fifteen-year planning cycle semi-desert grassland PNVT departure from DC and HRV comparisons by alternative for the proposed high, low and average acre treatment objectives; alternatives are arranged in the order of departure from DC (lowest to highest)**

| Alternative and Percent Acres Treated Annually (arranged from least to most departed from DC) | Percent Within Each SDG Vegetation Structural State | | | | | Overall Departure† | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | DC | HRV |
| *Desired Condition* | *24* | *76* | *0* | *0* | *0* | *0*$^{N}$ | - |
| *Current Conditions* | *4* | *15* | *22* | *57* | *2* | *79*$^{H}$ | *79*$^{H}$ |
| B High Treatment (2.8) | 1 | 34 | 25 | 39 | 2 | 66$^{H}$ | 66$^{H}$ |
| D High Treatment (2.8) | 1 | 34 | 25 | 39 | 2 | 66$^{H}$ | 66$^{H}$ |
| B Average (2.3) | 1 | 30 | 24 | 44 | 2 | 68$^{H}$ | 68$^{H}$ |
| D Average (2.3) | 1 | 30 | 24 | 44 | 2 | 68$^{H}$ | 68$^{H}$ |
| B Low Treatment (1.8) | 0 | 29 | 23 | 45 | 2 | 70$^{H}$ | 70$^{H}$ |
| D Low Treatment (1.8) | 0 | 29 | 23 | 45 | 2 | 70$^{H}$ | 70$^{H}$ |
| Alternative A (0.0) | 0 | 16 | 21 | 61 | 2 | 84$^{S}$ | 84$^{S}$ |
| Alternative C (0.0) | 0 | 16 | 21 | 61 | 2 | 84$^{S}$ | 84$^{S}$ |

† Departure from DC Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

The proposed average acre treatment objectives under alternatives B and D produce the second greatest movement toward DC and HRV, from the current rating of 78 to 68. Again, there is no change in departure class, and the grassland remains highly departed. Alternatives A and C continue to trend away from DC and HRV For more information regarding semi-desert vegetation structural state model run outcomes see appendix B tables 69 through 76.

Figure 18 displays the long-term trend in relation to DC and HRV for all semi-desert grassland alternatives, based on their average acre treatments. Both alternatives B and D produce reductions in departure from DC and HRV from high to moderate by year 30, and the departure class remains the same throughout the modeling period. Alternatives A and C produce movement away from DC and transition from highly to severely departed.

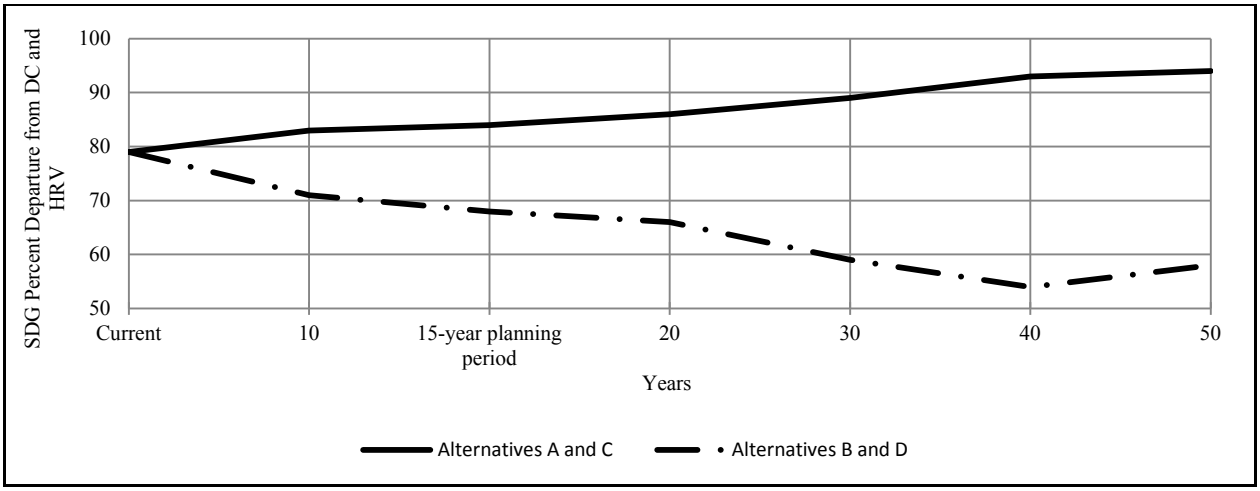



**Figure 18. Departure from DC and HRV trend comparisons for semi-desert grassland PNVT by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high,

average, and low acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by the equally rated alternatives A and C.

***Grassland PNVTs:*** Figure 19 displays the summary of long-term trends in relation to DC and HRV for the collective grassland PNVTs under all alternatives, modeled in VDDT, based on their average acre treatments. Both Alternatives B and D produce reductions in departure from DC and HRV immediately, from high to no departure and remain in this departure class out to 50 years. This trend reflects the greater influence of the trends and conditions within the Great Basin grassland as opposed to the semi-desert grasslands. Both Alternatives A and C produce movement away from DC and HRV and transition from highly to severely departed.

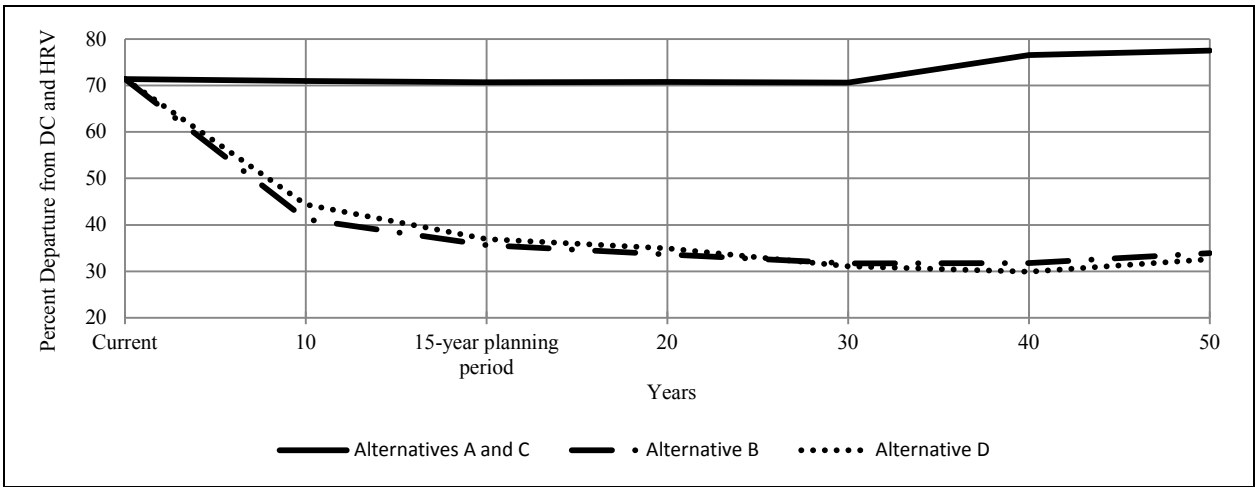



**Figure 19. Departure from DC and HRV trend comparisons for all grassland PNVTs by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high, average, and low acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, and finally, the equally rated alternatives A and C.

## Summary of Modeling Results Relative to Desired Conditions and Historic Range of Variability

*All Modeled PNVTs:* When comparing the alternative proposed average acre treatment objectives, after one planning cycle, across all modeled PNVTs (this includes the four forest, two woodland, and two grassland PNVTs), all four alternatives display a reduction in departure from DC; from a high to moderate departure (table 63). In relation to HRV, alternatives B and D display a reduction from a high to moderate departure. Both alternatives A and C remain highly departed. See appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and 50-

year modeling period, by alternative proposed high and low acre treatment objectives and alternative A.

Numerically, all of the alternatives produce some movement toward DC/HRV by the end of the 15-year planning period. However, alternative D produces the greatest movement in the direction toward DC/HRV (from 64% DC-73% HRV (existing condition) to 48% DC-56% HRV), when considering the modeling results across all eight PNVTs. Alternative B produces the second greatest movement in the direction toward DC/HRV from existing conditions to 49% DC-56% HRV, when considering the modeling results across all eight PNVTs; however, the only difference between alternatives D and B is one percentage point for movement toward DC; they are equal in movement toward HRV. Qualitatively, these are both movements from high departure to moderate departure in relation to both DC and HRV.

By the end of the 15-year planning period, alternative C produces the third greatest movement in the direction toward DC/HRV from existing conditions to 55% DC-63% HRV), when considering the modeling results across all eight PNVTs. Alternative A produces the least movement in the direction toward DC/HRV from existing conditions to 57% DC-65% HRV; however, the only difference between alternatives C and A is two percentage points for both DC and HRV. Qualitatively, there is no change in departure class in relation to both DC and HRV for either alternative C or alternative A, when considering the modeling results across all eight PNVTs.

When comparing the alternative proposed average acre treatments, by the end of the 50-year modeling period, for all modeled PNVTs, all four alternatives display a reduction in departure from DC; from a high to moderate departure rating (table 64). In relation to HRV, Alternatives B and D display a reduction from a high to moderate departure rating. Both Alternatives A and C remain highly departed; alternative A slightly more than alternative C.

Numerically, all of the alternatives produce some movement toward DC/HRV by the end of the 50-year modeling period. However, alternative D produces the greatest movement in the direction toward DC/HRV (from 64% DC-73% HRV (existing condition) to 42% DC-46% HRV). Alternative B produces the second greatest movement in the direction toward DC/HRV from existing conditions to 43% DC-51% HRV; however, the difference between alternatives D and B is one and five percentage point for DC and HRV, respectively. Qualitatively, these are movements from high departure to moderate departure in relation to both DC and HRV for both alternatives D and B.

By the end of the 50-year modeling period, alternative C produces the third greatest movement in the direction toward DC/HRV from existing conditions to 53% DC-61% HRV. Alternative A produces the least movement in the direction toward DC/HRV from existing conditions to 55% DC-63% HRV; however, the only difference between alternatives C and A is two percentage points for DC and HRV. Qualitatively, these are movements from high departure to moderate departure in relation to both DC. Qualitatively, there is no change in departure class in relation to HRV for either alternative C or alternative A; they remain highly departed.

The greater movements toward DC and HRV for alternatives D and B than those produced by alternatives C and A can be primarily attributed to two factors: 1) the proposed 2.4- to 4.2-fold increase in acre treatments within the Madrean pine-oak woodland not included in alternative C, and the 7.0- to 12.3-fold increase in acre treatments not included in alternative A; and 2) the proposed 19,682 to 19,803 acre treatments in the Great Basin and semi-desert grasslands that are not included in alternative C or alternative A. The amount and extent of the proposed treatments within these three highly departed PNVTs has a substantial influence on the overall rate and extent of progress in movement in relation to DC/HRV among the action alternatives, as well as the no-action alternative.

**Table 63. Comparisons of the departures from DC and HRV at the end of the 15-year planning period, by alternative proposed average† acre treatment objectives and alternative A (the lower the departure‡ value the closer to DC and HRV)**

| Alternative | Forested PNVT Group | | | | | | | | | | Woodland PNVT Group | | | | | | Grassland PNVT Group | | | | | | All Modeled PNVTs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF | | WMCF | | DMCF | | SFF | | All modeled forest | | MPOW | | PJW | | All modeled woodland | | GBG | | SDG | | All modeled grassland | | All modeled PNVTs | |
| | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| *Current Condition* | *77$^{H}$* | *94$^{S}$* | *54$^{M}$* | *61$^{H}$* | *67$^{H}$* | *77$^{H}$* | *59$^{M}$* | *62$^{H}$* | *71$^{H}$* | *85$^{S}$* | *61$^{H}$* | *72$^{H}$* | *28$^{L}$* | *28$^{L}$* | *49$^{M}$* | *56$^{M}$* | *67$^{H}$* | *67$^{H}$* | *79$^{H}$* | *79$^{H}$* | *71$^{H}$* | *71$^{H}$* | *64$^{H}$* | *73$^{H}$* |
| A | 65$^{H}$ | 84$^{S}$ | **49$^{M}$** | **46$^{M}$** | 57$^{M}$ | 54$^{M}$ | 68$^{H}$ | 58$^{M}$ | 61$^{H}$ | 71$^{H}$ | 59$^{M}$ | 70$^{H}$ | 21$^{L}$ | 21$^{L}$ | 45$^{M}$ | 52$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 57$^{M}$ | 65$^{H}$ |
| B | 63$^{H}$ | 83$^{S}$ | 53$^{M}$ | **46$^{M}$** | 56$^{M}$ | 52$^{M}$ | 66$^{H}$ | **55$^{M}$** | 60$^{M}$ | 71$^{H}$ | 47$^{M}$ | 58$^{M}$ | 20$^{N}$ | 20$^{N}$ | 37$^{L}$ | 44$^{M}$ | **17$^{N}$** | **17$^{N}$** | **68$^{H}$** | **68$^{H}$** | **36$^{L}$** | **36$^{L}$** | 49$^{M}$ | **56$^{M}$** |
| C | **60$^{M}$** | **81$^{S}$** | 56$^{M}$ | 49$^{M}$ | **54$^{M}$** | **51$^{M}$** | **65$^{H}$** | **55$^{M}$** | **58$^{M}$** | **70$^{H}$** | 55$^{M}$ | 66$^{H}$ | **19$^{N}$** | **19$^{N}$** | 42$^{M}$ | 49$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 55$^{M}$ | 63$^{H}$ |
| D | **66$^{H}$** | 85$^{S}$ | 52$^{M}$ | 47$^{M}$ | 59$^{M}$ | 56$^{M}$ | **65$^{H}$** | **55$^{M}$** | 62$^{H}$ | 73$^{H}$ | **41$^{M}$** | **51$^{M}$** | **19$^{N}$** | **19$^{N}$** | **33$^{L}$** | **39$^{L}$** | 19$^{N}$ | 19$^{N}$ | **68$^{H}$** | **68$^{H}$** | 37$^{L}$ | 37$^{L}$ | **48$^{M}$** | **56$^{M}$** |

†See appendix F tables 1 and 3 for comparisons of the departures from DC and HRV by the end of the 15-year planning period, by alternative proposed high and low acre treatment objectives and alternative A
‡Departure Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

**Table 64. Comparisons of the departures from DC and HRV at the end of the 50-year modeling period, by alternative proposed average† acre treatment objectives and alternative A (the lower the departure‡ value the closer to DC and HRV)**

| Alternative | Forested PNVT Group | | | | | | | | | | Woodland PNVT Group | | | | | | Grassland PNVT Group | | | | | | All Modeled PNVTs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF | | WMCF | | DMCF | | SFF | | All modeled forest | | MPOW | | PJW | | All modeled woodland | | GBG | | SDG | | All modeled grassland | | All modeled PNVTs | |
| | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| *Current Condition* | *77$^{H}$* | *94$^{S}$* | *54$^{M}$* | *61$^{H}$* | *67$^{H}$* | *77$^{H}$* | *59$^{M}$* | *62$^{H}$* | *71$^{H}$* | *85$^{S}$* | *61$^{H}$* | *72$^{H}$* | *28$^{L}$* | *28$^{L}$* | *49$^{M}$* | *56$^{M}$* | *67$^{H}$* | *67$^{H}$* | *79$^{H}$* | *79$^{H}$* | *71$^{H}$* | *71$^{H}$* | *64$^{H}$* | *73$^{H}$* |
| A | **54$^{M}$** | 71$^{H}$ | **45$^{M}$** | **43$^{M}$** | **47$^{M}$** | 47$^{M}$ | 65$^{H}$ | 54$^{M}$ | **51$^{M}$** | 62$^{H}$ | 56$^{M}$ | 67$^{H}$ | 41$^{M}$ | 41$^{M}$ | 51$^{M}$ | 57$^{M}$ | 68$^{H}$ | 68$^{H}$ | 94$^{S}$ | 94$^{S}$ | 78$^{H}$ | 78$^{H}$ | 55$^{M}$ | 63$^{H}$ |
| B | **54$^{M}$** | 74$^{H}$ | 53$^{M}$ | 45$^{M}$ | 48$^{M}$ | **46$^{M}$** | 63$^{H}$ | **53$^{M}$** | 53$^{M}$ | 64$^{H}$ | 38$^{L}$ | 48$^{M}$ | 22$^{L}$ | 22$^{L}$ | 32$^{L}$ | 38$^{L}$ | 20$^{N}$ | 20$^{N}$ | **58$^{M}$** | **58$^{M}$** | 34$^{L}$ | 34$^{L}$ | 43$^{M}$ | 51$^{M}$ |
| C | **54$^{M}$** | 74$^{H}$ | 57$^{M}$ | 48$^{M}$ | 48$^{M}$ | 47$^{M}$ | 63$^{H}$ | **53$^{M}$** | 54$^{M}$ | 64$^{H}$ | 47$^{M}$ | 57$^{M}$ | 30$^{L}$ | 30$^{L}$ | 41$^{M}$ | 47$^{M}$ | 68$^{H}$ | 68$^{H}$ | 94$^{S}$ | 94$^{S}$ | 78$^{H}$ | 78$^{H}$ | 53$^{M}$ | 61$^{H}$ |
| D | 57$^{M}$ | **66$^{H}$** | 51$^{M}$ | 45$^{M}$ | 49$^{M}$ | 49$^{M}$ | **62$^{H}$** | **53$^{M}$** | 55$^{M}$ | **59$^{M}$** | **32$^{L}$** | **42$^{M}$** | **19$^{N}$** | **19$^{N}$** | **27$^{L}$** | **34$^{L}$** | **18$^{N}$** | **18$^{N}$** | **58$^{M}$** | **58$^{M}$** | **33$^{L}$** | **33$^{L}$** | **42$^{M}$** | **46$^{M}$** |

†See appendix F tables 2 and 4 for comparisons of the departures from DC and HRV by the end of the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A
‡Departure Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

Figure 20 displays the summary of long-term trends in relation to DC for the collective ASNFs modeled PNVTs under all alternatives, modeled in VDDT, based on their proposed average acre treatments. All alternatives produce reductions in departure from DC immediately (by the end of the 15-year planning period), from high to moderate departure. Alternatives A and C "plateau-out" about 30 years and remain moderately departed across the remaining modeling periods. Alternatives B and D level out about 40 years out and remain moderately departed by the end of the 50-year modeling period.

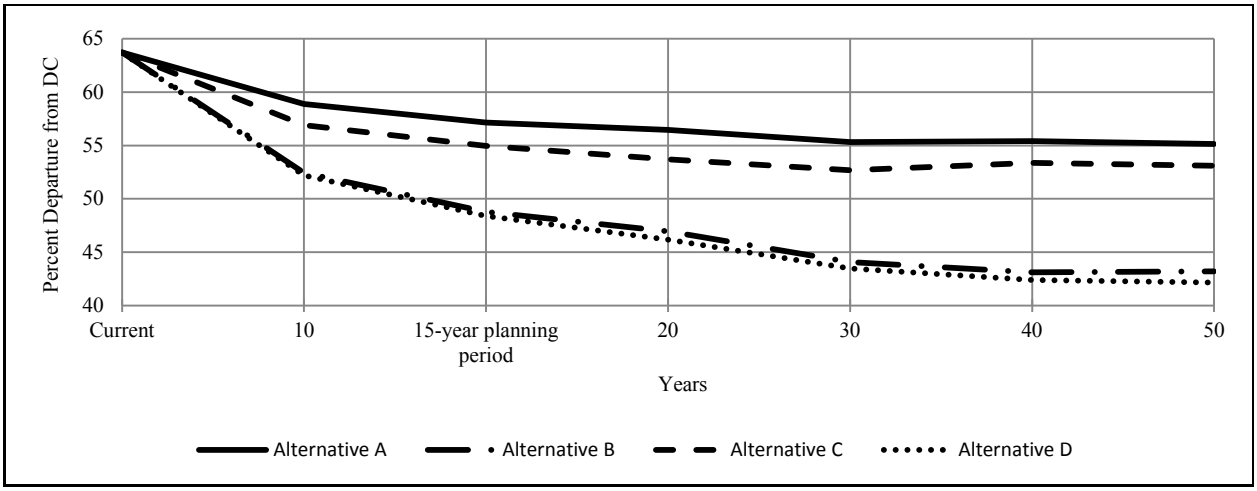



**Figure 20. Departure from DC trend comparisons for all ASNFs PNVTs modeled by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

Figure 21 displays the summary of long-term trends in relation to HRV for the collective ASNFs modeled PNVTs under all alternatives, modeled in VDDT, based on their proposed average acre treatments. All alternatives produce reductions in departure from HRV immediately (by the end of the 15-year planning period). Alternatives B and D transition from high to moderate departure at year ten; while alternatives A and C remain highly departed to the end of the 50-year modeling period.

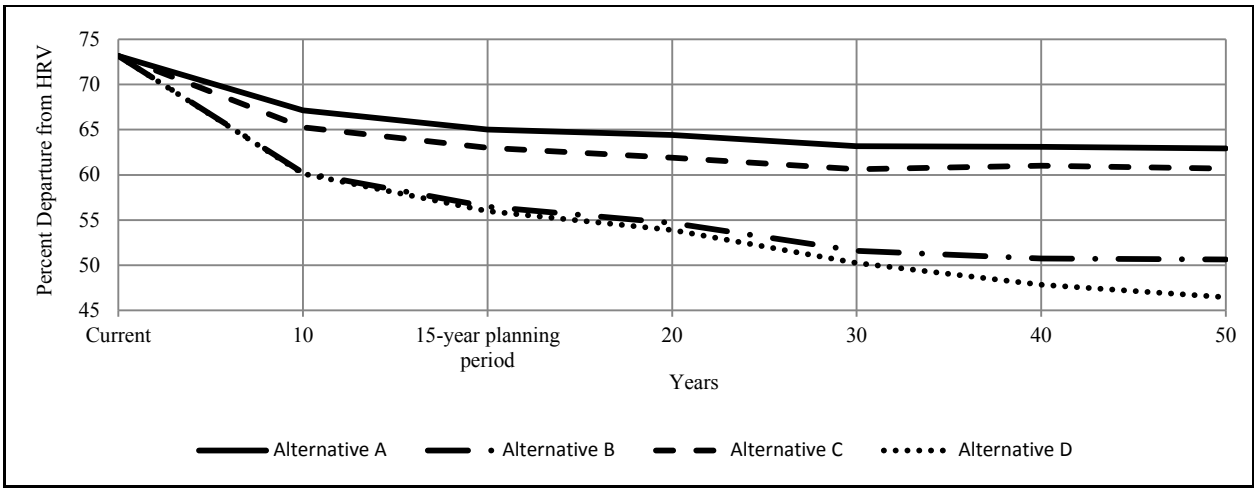



**Figure 21. Departure from HRV trend comparisons for all ASNFs PNVTs modeled by alternative over a 50-year time period for alternative A and the average of the proposed high and low acre treatment objectives for alternatives B, C, and D**

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators

between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6, and appendix F tables 1 through 4 for comparisons of the departures from DC and HRV by the end of the 15-year planning period and the 50-year modeling period, by alternative proposed high and low acre treatment objectives and alternative A), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternative C does more to address the threats and risks when assessing movement toward DC, followed by alternative A, then B, and finally D. However, by the end of the 15-year planning period, alternative A does more to address the threats and risks when assessing movement toward HRV, followed by alternative C, then B, and finally D. By the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally A. However, by the end of the 50-year modeling period, alternative B does more to address the threats and risks when assessing movement toward HRV, followed by alternative D, then C, and finally A.

For the proposed average acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative B, then C, and finally A. However, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement toward HRV, followed by alternative C, and finally A. Furthermore, by the end of the 50-year modeling period, alternative B does more to address the threats and risks when assessing movement toward HRV, followed by alternative D, then C, and finally A.

For the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative B does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then C, and finally A. However, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement toward HRV, followed by alternative C, and finally A. In addition, by the end of the 15-year planning period and the 50-year modeling period, the equally rated alternatives B and D also do more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative C, and finally A.

## PNVTs Not Modeled with VDDT

### Grassland PNVT

***Montane/subalpine grasslands:***

*Annual Vegetation Treatment Objectives*

There are no specific objectives regarding this PNVT in alternative A other than a general statement on eliminating tree encroachment to maintain grasslands as suitable range. The action alternatives would treat approximately 500 acres per year to restore grassland conditions.

| Alternative | Annual Average Acre Treatment Objectives | | Alternative A Treatment Acre Objectives | |
|---|---|---|---|---|
| | mechanical | burning | mechanical | burning |
| A | - | - | 0 | 0 |
| B | 500 | 0 | - | - |
| C | 500 | 0 | - | - |
| D | 500 | 0 | - | - |

*Vegetation Outcome*

Alternatives B, C and D would provide equal benefit to the montane/subalpine grasslands. These alternatives have a 500 acre annual treatment objective through the planning period; specifically, under alternative C for commercial tree removal where encroachment in the grasslands has occurred and under alternatives B and D for grassland restoration. Although not quantified, burning (planned and unplanned) would also be emphasizes under alternatives C and D. At this treatment rate, treating the 10 percent tree encroached area of this PNVT will take roughly 11 years to complete. Alternative B primarily emphasizes restoration treatments within the Great Basin and semi-desert grasslands and would provide some restoration benefits on an opportunity basis.

The departure from DC within these grasslands is rated at moderate and trending away. While removal of encroaching trees would be beneficial, they are a minor contributor to overall departure. In a study conducted on the ASNFs, White (2002) found significant changes had occurred in these grasslands between 1913 and 1998 in soil surface cover, exposed soil, herbaceous vegetation composition and cover, and dominant species composition that were not related to woody species encroachment. White determined that ungulate grazing (both livestock and wildlife) were the principle causal factors responsible for these changes; followed by fire suppression. The proposed treatment objectives under all action alternatives would not change this PNVT's departure classification.

Changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacey 1995, Gori and Enquist 2003). Finch (2004) identified and summarized the major threats to grassland biological diversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, and introduction of non-native vegetation, woody species encroachment, erosion, and habitat fragmentation.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high, average, and low acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives B, C and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by alternative A.

## Chaparral PNVT

***Interior chaparral:***

*Annual Vegetation Treatment Objectives*

There are no specific objectives regarding this PNVT in alternative A or the action alternatives and the overstory and understory structure and function of the interior chaparral ecosystem would not change during the course of the planning period.

*Vegetation Outcome*

Since chaparral is rated at not being departed from DC/HRV, the management approach under all alternatives is to maintain this condition into the future, primarily by fire (planned and unplanned).

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high, average, and low acre treatment objectives, by

the end of the 15-year planning period, alternatives A, B, C and D equally address the threats and risks when assessing movement towards both DC and HRV.

### Riparian Areas/Riparian Forest PNVTs (see the Riparian Specialist Report for a description of riparian conditions)

***Wetland/cienegas riparian areas, mixed broadleaf deciduous, montane willow, and cottonwood-willow riparian forests:***

*Annual Vegetation Treatment Objectives*

| Alternative | Treatment Objectives | | |
|---|---|---|---|
| | mechanical treatment acres | burning treatment acres | number of wetland/cienegas restored |
| A | 0 | 0 | 0 |
| B Average | 0 | 350 | 15 |
| C Average | 0 | 0 | 0 |
| D Average | 0 | 450 | 15 |

*Vegetation Treatment Outcome*

As mentioned earlier, these riparian PNVTs are rated as no departure (CWRF) to low departure MWRF, MBDRF, and WCRA). There are no specific objectives regarding treating the vegetation structure and compositions of these PNVTs in alternatives A or C. Alternatives B and D propose to restore 200 to 500, and 300 to 600 acres annually (B and D, respectively). Alternatives B and D also have an objective to restore 5 to 25 wetland/cienegas riparian areas during the planning period, and would therefore, have a greater benefit.

If proposed treatments include removal of non-riparian woody and herbaceous species, alternatives B and D would provide the greater benefit to all of the riparian PNVTs. All action alternatives also propose to reduce animal damage on five miles of riparian area annually. This should reduce ungulate damage to willows and other riparian woody species.

Changes in the structure and function of wetland/cienega systems have been noted as the primary cause of the loss of biological diversity within these systems. The causes of adverse change in the ecological character of wetland/cienegas can be grouped in five broad categories:

- Changes to the water regime
- Water pollution
- Physical modification
- Exploitation of biological products
- Introduction of invasive species

Again, alternatives B and D have an objective to restore 5 to 25 wetland/cienegas riparian areas during the planning period, and would therefore, have a greater benefit than either alternative A or C.

The riparian areas and riparian forest PNVTs have some of the highest road and motorized trail densities on the forests; ranging from 1.4 (MBDRF), 1.9 (CWRF), 2.5 (WCRA) to 3.4 (MWRF) linear miles of road and motorized trails per square mile. Rehabilitating land that has been roaded is difficult at best. However, all action alternatives proposed to remove roads and unauthorized routes during the planning period.

| Objective Description | Alternative | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Minimum amount of NFS roads or trails that negatively impact streams or riparian areas to be relocated, repaired, improved, or decommissioned | 0 | 4 | 0 | 4 |
| Average amount of unauthorized roads or trails that negatively impact streams or riparian areas to be removed | 0 | 2 | 3 | 3 |

In this regard, alternative D would produce the greatest benefit by removing the most roads, followed by Alternatives B and C. Alternative A does not contain specific objectives to remove roads for the benefit of riparian areas.

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high, average, and low acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement towards both DC and HRV, followed by the equally rated alternatives A and C.

*Overall Evaluation of PNVT Vegetation Movement towards Desired Conditions and Historic Range of Variability (see appendix E for further information)*

*Desired Conditions*: The overall evaluation of the alternatives regarding all ASNFs PNVTs for the proposed high acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward DC, followed by alternative B, then C, and finally A.

The overall evaluation of the alternatives regarding all ASNFs PNVTs for the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative B does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then C, and finally A. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward DC, followed by alternative B, and finally, the equally rated alternatives A and C.

The overall evaluation of the alternatives regarding all ASNFs PNVTs for the proposed low acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternative B does more to address the threats and risks when assessing movement toward DC, followed by alternative D, then C, and finally A.

*Historic Range of Variability*: The overall evaluation of the alternatives regarding all ASNFs PNVTs for the proposed high acre treatment objectives, by the end of the 15-year planning period, the equally rated alternatives B and D do more to address the threats and risks when assessing movement toward HRV, followed by alternative C, and finally A However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by alternative B, then C, and finally A.

The overall evaluation of the alternatives regarding all ASNFs PNVTs for the proposed average acre treatment objectives, by the end of the 15-year planning period, alternative B does more to address the threats and risks when assessing movement toward HRV, followed by alternative D, then C, and finally A. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by alternative B, then C, and finally, A.

The overall evaluation of the alternatives regarding all ASNFs PNVTs for the proposed low acre treatment objectives, by the end of the 15-year planning period, alternative B does more to address the threats and risks when assessing movement toward HRV, followed by alternative D, then C, and finally A. However, by the end of the 50-year modeling period, alternative D does more to address the threats and risks when assessing movement toward HRV, followed by the equally rated alternatives A and C.

## Quaking Aspen

*Maintain and Regenerate*

All alternatives have the objective to retain aspen on the landscape. This would entail actions to maintain and regenerate aspen at the desired condition level of 50,200 acres or more during the planning period. Aspen readily regenerates with disturbance like fire. Actions to maintain aspen include fencing and removal of conifer encroachment within aspen clones.

Table 65 shows that aspen is maintained at a level above DC under all alternatives during the planning cycle (15 years). Alternative A maintains the greatest amount of aspen with 71,076 acres at the end of the planning period, followed by the proposed low acre treatment objectives under alternative B with 70,711 acres. The proposed high acre treatment objectives under alternative C produce the greatest reduction, 20.2 percent at the end of the planning cycle, followed by the proposed high acre treatment objectives under alternative D with 19.2 percent at the end of the planning cycle. However, all alternatives have aspen levels above DC ranging from a low of 121.6 percent to a high of 141.6 percent for the proposed high acre treatment acres under alternative C and the average acre treatment objectives in alternative A, respectively.

It is recognized that the level of aspen, as a consequence of forest management and activities, shown in table 65 will be further affected by non-federal actions. A primary example of aspen loss not related to forest management and activities, commonly occurring now, include ungulate browsing of aspen seedlings and saplings, insects and disease, and sudden aspen decline (SAD).

**Table 65. Comparisons of the trend in aspen in relation to DC acres by alternative for the proposed high, low and average acre treatment objectives, and alternative A, for the 15-year planning period and the 50-year modeling period; alternatives are arranged from the most to least aspen acres by the end of the 15-year planning period**

| Alternative (arranged from the most to least aspen acres at 15 years) | Aspen | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 15-year planning period | | | 50-year modeling period | | |
| | acres | percent | acres | % reduction from current acres | percent of minimum DC | acres | % reduction from current acres | percent of minimum DC |
| *Desired Condition* | *50,200 acres or more* | | | | | | | |
| *Current Condition* | *76,500* | *100* | | | | | | |
| Alternative A | | | 71,076 | 7.1 | 141.6 | 58,870 | 23.1 | 117.3 |
| B Low Treatment | | | 70,711 | 7.6 | 140.9 | 57,946 | 24.3 | 115.4 |
| C Low Treatment | | | 70,542 | 7.8 | 140.5 | 56,966 | 25.5 | 113.5 |
| D Low Treatment | | | 69,241 | 9.5 | 137.9 | 56,597 | 26.0 | 112.7 |
| B Average | | | 68,204 | 10.9 | 135.9 | 54,333 | 29.0 | 108.2 |
| C Average | | | 65,796 | 14.0 | 131.1 | 51,532 | 32.6 | 102.7 |
| B High Treatment | | | 65,696 | 14.1 | 130.9 | 50,720 | 33.7 | 101.0 |
| D Average | | | 65,517 | 14.4 | 130.5 | 50,450 | 34.1 | 100.5 |
| D High Treatment | | | 61,793 | 19.2 | 123.1 | 44,304 | 42.1 | 88.3 |
| C High Treatment | | | 61,049 | 20.2 | 121.6 | 46,098 | 39.7 | 91.8 |

†Data is post 2011 Wallow Fire

At the end of the 50-year modeling period, all alternatives apart from the proposed high acre treatment acre objectives in both alternatives C and D maintain aspen at levels above DC.

Figure 22 illustrates the long-term trends in aspen acres under all alternative proposed average acre treatment acre objectives. Alternative A maintains the greatest number of aspen acres; however, this is roughly a 23 percent reduction from current levels. This is followed by alternatives B, C and D with reductions of 29.0, 32.6, and 34.1 percent, respectively. However, all alternative proposed average acre treatment acre objectives still provide for aspen acreage at levels above DC.

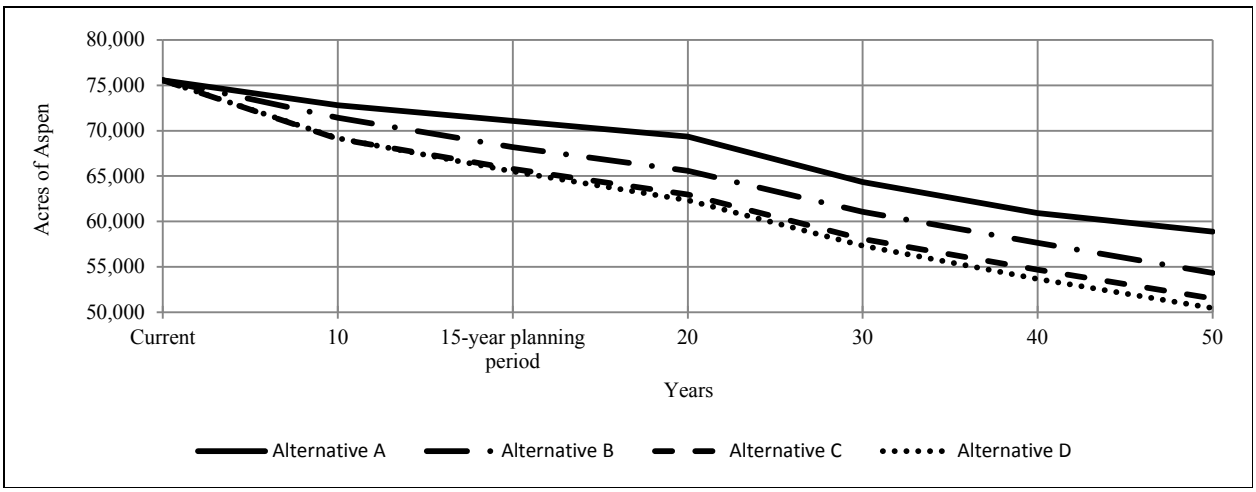



**Figure 22. Comparisons of the trend in acres of aspen, between alternatives, across the 50-year modeling period, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

In summary (for a complete display of the tabular summations of the 15-year planning period and 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6), for the proposed high acre treatment objectives, by the end of the 15-year planning period, alternatives A, B, C and D equally address the maintenance of aspen within DC levels. However, by the end of the 50-year modeling period, alternatives A and B equally address the maintenance of aspen within DC levels, while alternatives C and D do not.

For the proposed average acre treatment objectives, by the end of the 15-year planning period, alternatives A, B, C and D equally address the maintenance of aspen within DC levels. However, by the end of the 50-year modeling period, alternatives A and B equally address the maintenance of aspen within DC levels, while alternatives C and D do not.

For the proposed low acre treatment objectives, by the end of the 15-year planning period and the 50-year modeling period, alternatives A, B, C and D equally address the maintenance of aspen within DC levels.

## Overstory/Understory Herbaceous Vegetation Cover Relationship

According to Copper (1960), the composition and quality of the herbaceous vegetation is governed by livestock grazing, fire and the density of the forest canopy. One of the most distinctive features of frequent-fire forests, woodlands, and grasslands of the ASNFs is the major contribution that the understory vegetation (grasses, forbs, shrubs) makes to ecosystem diversity and productivity. According to Laughlin and Grace (2006), in the absence of fire, the density of overstory trees increases, which can

reduces the diversity of understory vegetation 10-30 percent. Restoration efforts on the ASNFs should focus on the enhancement and/or recovery of native herbaceous species.

The following discussion presents potential changes in the relations between overstory and understory vegetation due to the different proposed alternative acre treatment levels. Jameson (1967) studying the overstory/understory relationships in ponderosa pine forests in northern Arizona found a greater than 2.3- to 3.4-fold increase in understory vegetation production between open (30% or less) and closed (greater than 30%) canopy sites. Reduction in overstory canopy cover would increase understory species diversity.

Tree canopy closure in southwestern ponderosa pine old-growth stands ranges from 17 to 30 percent (Laughlin et al. 2006), which suggests that understory patches may have comprised greater than 70 percent of the forested landscape. Moore and Deiter (1992) reported that understory vegetation response to the overstory reduction appeared to be dependent on understory plant type. They found that overstory density effects on understory production were most predictable for the herbaceous plants (i.e., grasses, sedges, and forbs) while shrubs showed only a slight response to changing overstory density. To what extent the understory vegetation responses to overstory removal, also depends on the health and condition of the existing understory community and its ability to respond, as well as, available seed bank, and soil productivity. In a study conducted in a ponderosa pine forest in northern Arizona, Springer (1999) found that overstory canopy type has a significant influence on the species in the soil seed bank. In general, annual and biennial species were found in greater numbers in the soil seed bank as opposed to perennials. This is troubling for all of the PNVTs where long-term, established herbage production in response to overstory removal is of concern.

The ecological ramifications of the loss of understory vegetation are hard to quantify; however, there are relationships between composition, structure, and processes that continually act upon one another to keep these communities functioning in a healthy manner. Pellant et al. (2005) define the three attributes of community health that can be directly related to loss of vegetation composition and structure: 1) soil and site stability; 2) integrity of the biotic; and 3) hydrologic function of the community. According to the Jacoby (1989), the degree to which these three attributes, as well as the ecological processes of the ecological system are in equilibrium and sustained is an indicator of overall health of the system.

The importance of this is, successional changes within plant communities are linked to soil fertility, where lower successional stages are associated with soil erosion and the loss of topsoil in which nutrients are concentrated (Humphreys 1997). Successional changes are linked directly to the integrity of the biotic community.

Integrity of the biotic community is defined as the capacity of a site to support characteristic functional and structural communities within the context of normal variability to withstand and recover from disturbance events (Pellant et al. 2005). Ecological processes functioning within a normal range of variability will support specific plant communities, however, when the biotic integrity of a site has been impaired changes within the functional and structural community can take place (Pellant et al. 2005). According to Tilman (1997), species structural and functional diversity are the principle factors for plant productivity. Consistent with McLaren (2006), species composition very probably plays an important role in determining ecosystem function because species differ in their traits. The effect of the loss of a species on an ecosystem is the result of both the loss of the direct effects of the organism on ecosystem functioning, and the response of other organisms to that loss. These effects and responses occur through numerous mechanisms (e.g., species can directly affect soil nutrient and water content through varying root mass). In addition, specific species can alter plant community composition through varying competitive abilities and facilitative effects, which in turn may affect ecosystem function. Vegetation species compositional shifts have occurred within these PNVTs (White 2002; Vander Lee et al. 2006).

As overstory canopy cover moves towards desired conditions; (reduction in overstory canopy cover), and with the reintroduction of periodic fire within the ponderosa pine and dry mixed conifer forests, Madrean pine-oak and piñon-juniper woodlands, and Great Basin and semi-desert grasslands there would be an expected increase in understory species diversity, cover, composition and production. Laughlin et al. (2005) found that, low-intensity surface fire is an important ecological process in lower montane and subalpine forests that maintains understory communities within the range of natural variability and appears to promote species diversity. According to several authors (Bailey and Copeland 1961; Blackburn et al. 1986; Knight 1993), species composition is a clear indicator of hydrologic function. Hydrologic function is defined as the capacity of a site to capture, store and release moisture and as the ability to withstand and recover from capacity reducing events (Pellant et al. 2005).

Shifts in compositions that change the vegetative structure from herbaceous species to woody species, has a direct effect on levels of surface runoff and soil loss (McGinty et al. 1995). As sediment production increases, total biomass decreases (Throw et al. 1986; Throw 1991). Species compositional shifts have already occurred within these PNVTs and they exhibit moderate to high departure from DC/HRV. Functionally, the advantage of increased efficiency of water use is in conserving soil moisture and delaying the effects of drought (Long 1999). A reduction in nutrient availability also occurs in dry soils (Chapin 1991).

The significance of changes in vegetation composition and structure is the relation to ecosystem function and process-litter and root biomass of herbaceous vegetation builds and enriches soils at a far greater rate than within adjacent forested or woodland sites (Aber and Melillo 1991) or areas that are now occupied by tree encroachment. Within southwestern ponderosa pine forests, Kaye and Hart (1998) reported that net rates of nitrogen transformation beneath relict grassy openings were twice those beneath post-settlement pines. Other studies have identified some understory vegetation components that may function as major community and ecosystem drivers (Nilsson and Wardle 2005).

## Forested PNVTs

***Ponderosa pine forest:*** Ponderosa pine is a naturally open canopied forest and desired conditions are to have 90 percent (541,985 acres) of this PNVT with open canopy cover. By the end of the 15 year planning period all alternatives proposed average acre treatment objectives produce a reduction in closed canopy acres (figure 23); however, alternative C reduces the closed canopy cover on the greatest number of acres, from 410,912 to 324,765 acres, a 21 percent reduction (table 66); alternatives B, A, and D follow with 13, 10, and 8 percent reductions, respectively. See appendix G tables 1 and 2 for more information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for ponderosa pine.

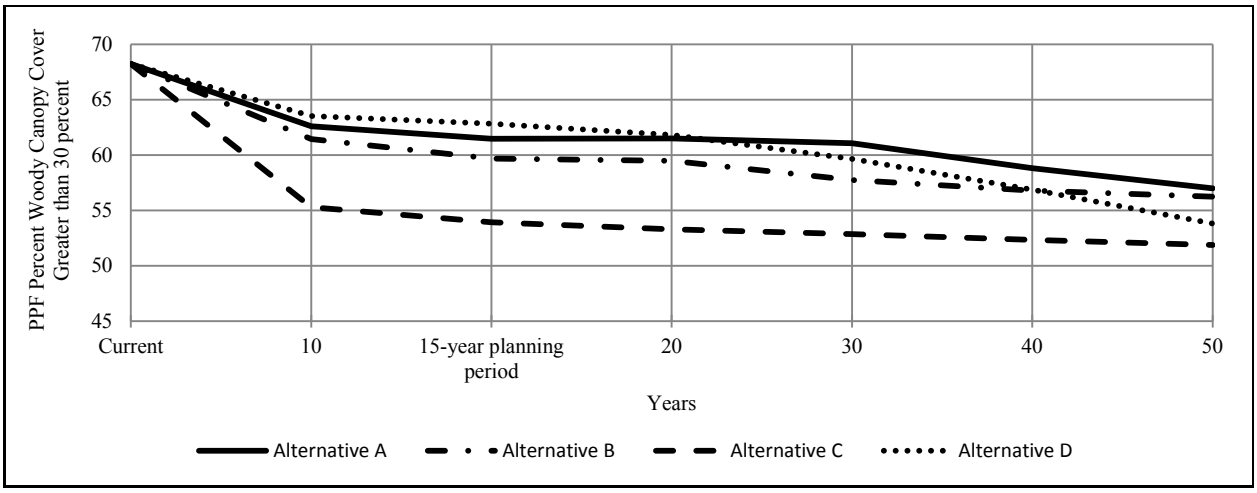



**Figure 23. Percent of ponderosa pine forest PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

At the end of 50 years all the alternatives have reduced closed canopy acres by 24, 21, 18, and 16 percent for alternatives C, D, B, and A, respectively. It would appear that under all alternatives, insufficient acres would be treated within this PNVT to achieve the desired conditions over time.

Understory vegetation cover has been directly related to time since fire and ponderosa pine basal area (Laughlin et al. 2005). As a result of canopy cover reductions through mechanical thinning and introduction of periodic fire on a regular basis, within this PNVT there should be an increase in understory plant cover, richness, diversity, and heterogeneity. With expected increases in herbaceous plant vigor through decreased competition for sunlight and moisture, and more rapid nutrient cycling by fire there could be greater herbage growth. Current average herbaceous cover ranging from 45-78 percent and average estimated production ranging from 255-390 pounds per acre have the potential to increase by as much as 27 and 39 percent for cover and production, respectively (table 48). Given the opportunity to respond to overstory canopy reductions, the existing understory state of affairs where low and moderately-low ecological conditions or very poor and poor range conditions occur on more than 480,000 acres, should enable some movement to higher ecological levels and closer to desired conditions.

**Table 66. Comparisons, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A, by the end of the 15-year planning period and the 50-year modeling period, of the percentage and acreage changes in closed woody canopy cover† within the historically open forest (PPF and DMCF), and the historically closed forest (WMCF and SFF) PNVTs**

| Years | Alternative Percents and Acres Display the Amount of Change within Each PNVT that has Closed Woody Canopy Cover Greater than 30 Percent (arrows indicate direction of change in woody canopy cover; ↑ up, or ↓ down) | | | |
|---|---|---|---|---|
| | alternative A | alternative B average | alternative C average | alternative D average |
| **Ponderosa pine forest PNVT current conditions: 602,206 acres of which 68% or 410,912 acres with woody canopy cover > 30%** | | | | |
| 15 | 10%↓ (370,119 acres) | 13%↓ (359,445 acres) | **21%↓ (324,765 acres)** | 8%↓ (378,270 acres) |
| 50 | 16%↓ (343,281 acres) | 18%↓ (338,631 acres) | **24%↓ (312,530 acres)** | 21%↓ (324,026 acres) |
| **Dry mixed conifer forest PNVT current conditions: 147,885 acres of which 61% or 90,210 acres with woody canopy cover > 30%** | | | | |
| 15 | 23%↑ (110,914 acres) | 20%↑ (107,956 acres) | **19%↑ (107,217 acres)** | 25%↑ (112,393 acres) |
| 50 | 21%↑ (109,435 acres) | **20%↑ (107,695 acres)** | 22%↑ (110,174 acres) | 26%↑ (113,871 acres) |
| **Open canopy forest types (PPF+DMCF): 750,091 acres of which 67% or 501,122 acres with woody canopy cover > 30%** | | | | |
| 15 | 4%↓ (481,033 acres) | 7%↓ (467,401 acres) | **14%↓ (431,982 acres)** | 2%↓ (490,662 acres) |
| 50 | 10%↓ (452,716 acres) | 11%↓ (447,327 acres) | **16%↓ (422,704 acres)** | 13%↓ (437,897 acres) |
| **Wet mixed conifer forest PNVT current conditions: 177,995 acres of which 61% or 101,457 acres with woody canopy cover > 30%** | | | | |
| 15 | **12%↑ (113,917 acres)** | **12%↑ (113,917 acres)** | 5%↑ (106,797 acres) | **12%↑ (113,917 acres)** |
| 50 | 18%↑ (119,257 acres) | **19%↑ (121,037 acres)** | 14%↑ (115,697 acres) | 18%↑ (120,147 acres) |
| **Spruce-fir forest PNVT current conditions: 17,667 acres of which 61% or 10,777 acres with woody canopy cover > 30%** | | | | |
| 15 | **11%↑ (12,014 acres)** | **11%↑ (11,925 acres)** | 9%↑ (11,749 acres) | 10%↑ (11,837 acres) |
| 50 | **2%↑ (10,954 acres)** | 3%↓ (10,424 acres) | 4%↓ (10,335 acres) | 7%↓ (9,982 acres) |
| **Closed canopy forest types (WMCF+SFF): 195,662 acres of which 57% or 112,234 acres with woody canopy cover > 30%** | | | | |
| 15 | **12%↑ (125,930 acres)** | **12%↑ (125,842 acres)** | 6%↑ (118,546 acres) | **12%↑ (125,754 acres)** |
| 50 | 16%↑ (130,210 acres) | **17%↑ (131,460 acres)** | 12%↑ (126,032 acres) | 16%↑ (130,128 acres) |

†Woody canopy closure classes are: 0 to < 10% is defined as very open canopy; 10 to ≤ 30% is defined as open canopy; and > 30% is defined as closed canopy. Under HRV and for DC ponderosa pine and dry mixed conifer forests should exhibit open canopies (10 to ≤ 30% woody canopy cover). Therefore, the lower the amounts of closed woody canopy cover, the closer these two PNVTs are to their HRV and forest plan DCs. Under HRV and for DC wet mixed conifer and spruce-fir forests should exhibit closed canopies (> 30% woody canopy cover). Therefore, the higher the amount of closed woody canopy cover, the closer these two PNVTs are to their HRV and forest plan DCs

***Wet mixed conifer forest:*** Wet mixed conifer is a naturally closed canopy forest and desired conditions are to have 79 percent (140,616 acres) of this PNVT with closed canopy cover. By the end of the 15-year planning period, all alternative proposed average acre treatment objectives would produce increases in closed canopy acres (figure 24). Alternatives A, B, and D would equally increase closed canopy acres from 101,457 to 113,917, a nearly 12 percent increase (table 66). Alternative C would increase closed canopy acres from 101,457 to 106,797, a five percent increase. At the end of 50 years all the alternatives have increased closed canopy acres by 19, 18, 18, and 14 percent for alternatives B, A, D, and C, respectively. It would appear that under all alternatives, too many acres would be treated within this PNVT to achieve desired conditions over time. See appendix G tables 1 and 2 for more information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for wet mixed conifer.

As a result of canopy cover increases within this PNVT there is very little likelihood in a change occuring in understory plant cover, richness, diversity, and heterogeneity from current conditions. Current average herbaceous cover ranging from 73-94 percent and average estimated production ranging from 60-140 pounds per acre would not have the potential to increase by as much as 13 and 16 percent for cover and production, respectively (table 48). Overstory canopy increase would facilitate minimal, if any, movement of the existing understory situation where low and moderately-low ecological conditions occur on more than 60,000 acres, to higher ecological levels and closer to desired conditions; in fact, the opposite is more likely to occur.

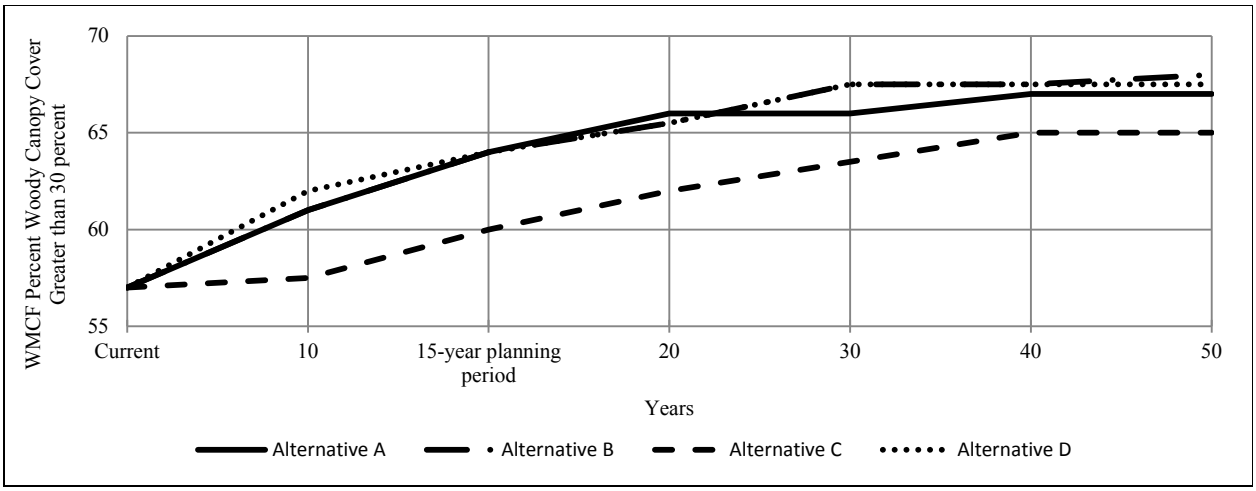



**Figure 24. Percent of wet mixed conifer forest PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

***Dry mixed conifer forest:*** Dry mixed conifer is a naturally open canopied forest and desired conditions are to have 68 percent (100,562 acres) of this PNVT with open canopy cover. However, within the planning period all alternatives proposed average acre treatment objectives produce increases in closed canopy acres (figure 25). Alternatives C yield the smallest increase in closed canopy acres, from 90,210 to 107,217 acres, a 19 percent increase (table 66); alternatives B and A follow with 20 and 23 percent increases, respectively. At the end of 50 years all the alternatives have augmented closed canopy acres by 20, 21, 22, and 26 percent for alternatives B, A, C, and D, respectively, from current conditions. It would appear that under all alternatives, insufficient acres would be treated within this PNVT to achieve the desired conditions. See appendix G tables 1 and 2 for more information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for dry mixed conifer.

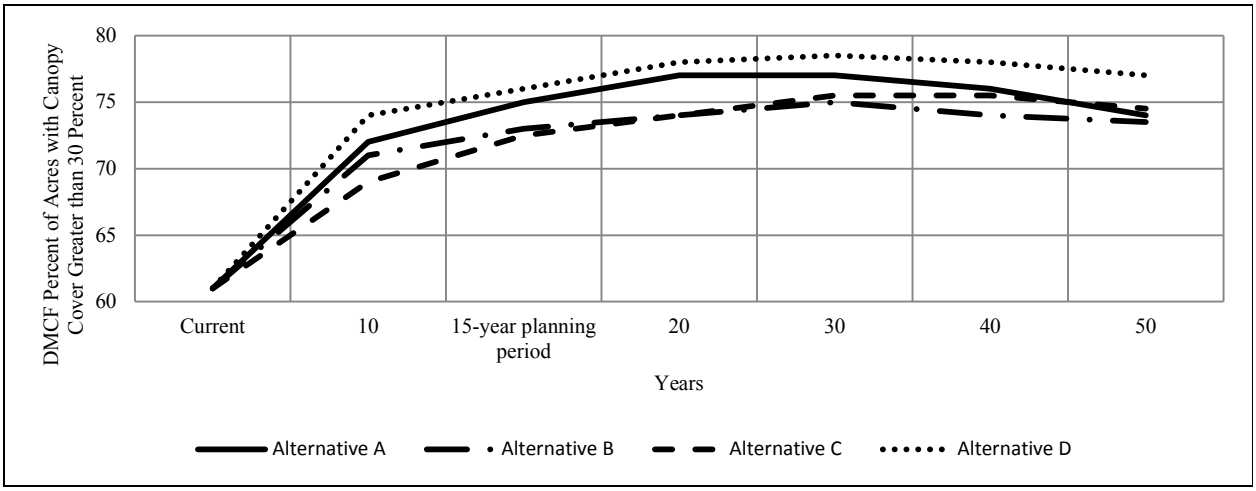



**Figure 25. Percent of dry mixed conifer forest PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

As a result of canopy cover increases within this PNVT there is very little likelihood in a change occuring in understory plant cover, richness, diversity, and heterogeneity from current conditions. Current average herbaceous cover ranging from 57-89 percent and average estimated production ranging from 205-500 pounds per acre would not have the potential to increase by as much as 19 and 27 percent for cover and production, respectively (table 48). Overstory canopy increase would facilitate minimal, if any, movement of the existing understory situation where low and moderately-low ecological conditions occur on more than 81,000 acres, to higher ecological levels and closer to desired conditions; in fact, the opposite is more likely to occur.

When combining the two naturally open forest types (ponderosa pine and dry mixed conifer) to assess canopy cover changes, alternative C results in the greatest overall reduction (14%) in closed canopy acres within the planning period; followed by alternatives B, A and D with seven, four and two percent, respectively. By the end of the 50 year modeling period Alternative C again results in the greatest overall reduction (16%) in closed canopy acres; followed by alternatives D, B, and A with 13, 11 and 10 percent, respectively.

***Spruce-fir forest:*** Spruce-fir is a naturally closed canopy forest and desired conditions are to have no more than 19 percent (3,357 acres) of this PNVT with open canopy cover. By the end of the 15-year planning period, all alternative proposed average acre treatment objectives would produce an increase in closed canopy acres (figure 26). Alternative A would produce the greatest increase in closed canopy acres from 10,777 to 12,014 acres, an 11 percent increase (table 66). Alternative B would increase closed canopy acres to 11,925, a nearly 11 percent increase. Alternative B would increase closed canopy acres to 11,925, a nearly 11 percent increase. Alternative D would provide a roughly10 percent increase in closed canopy acres (from 10,777 to 11,837). Alternative C would increase closed canopy acres the least from 10,777 to 11,749 acres, a nine percent increase. Desired conditions for this PNVT are to have roughly 81 percent or 14,310 acres with closed canopy cover. However, at the end of 50 years, only alternative A would result in an increase (2%) in closed canopy acres. Alternatives B, C, and D would produce further decreases in closed canopy by 3, 4, and 7 percent, respectively. It would appear that under all alternatives, too many acres would be treated within this PNVT to achieve and maintain desired conditions over time. Reduction in canopy cover is likely the result of the number of years that it would require to treat this entire PNVT under the various alternative proposed treatment objective acres; 83 years, 41 years, 28 years, and 33 years for A, B, C, and D, respectively. See appendix G tables 1 and 2 for more information

regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for spruce-fir.

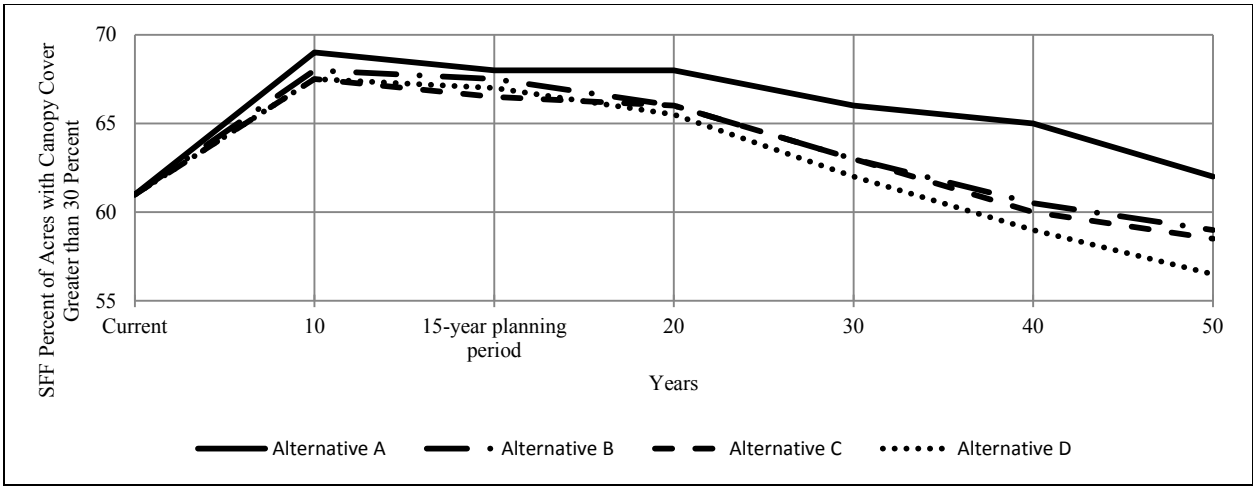



**Figure 26. Percent of spruce-fir forest PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

As a result of canopy cover increases through mechanical thinning and introduction of some underburning, within this PNVT there should be a small increase (at least in the short-term) in understory plant cover, richness, diversity, and heterogeneity because of more rapid nutrient cycling by fire; there could be greater herbage growth. Current average herbaceous cover ranging from 90-95 percent and average estimated production ranging from 25-50 pounds per acre have the potential to increase by as much as 6 and 8 percent for cover and production, respectively (table 48). Overstory canopy decrease may facilitate minimal movement of the existing understory situation where low and moderately-low ecological conditions occur on more than 500 acres, to higher ecological levels and closer to potential.

When combining the two naturally closed forest types (wet mixed conifer and spruce-fir) to assess canopy cover changes, alternative C results in the smallest overall increase (6%) within the planning period; followed equally by alternatives A, B, and D with 12 percent increases. By the end of the 50-year modeling period alternative C again results in the smallest overall increase (12%) in closed canopy acres; followed equally by alternatives A and D with a 16 percent increase, and finally by alternative B with a 17 percent increase in closed canopy acres.

## Woodland PNVTs

***Madrean pine-oak woodland:*** Madrean pine-oak is naturally an open canopy woodland and desired conditions are to have less than 21 percent (82,935 acres) of this PNVT with closed canopy cover. Within the planning period all alternative proposed average acre treatment objectives produce reductions in closed canopy acres (figure 27). However, alternative D reduces the closed woody canopy cover on the greatest number of acres, from 308,927 to 231,032 acres, a 25 percent reduction (table 67), and alternatives B, C and A follow with 15, 8, and 3 percent reductions, respectively. At the end of 50 years all alternatives have reduced closed woody canopy acres by 42, 32, 24 and 6 percent for alternatives D, B, C, and A, respectively. Because this PNVT is predominately roadless (93%) and has no suitable lands for timber production or mechanical harvest treatments, fire is the only management tool available. It would appear that under all alternatives, insufficient acres would be treated or fire treatments are only partially effective within this PNVT to achieving the desired conditions. See appendix G tables 3 and 4 for more

information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for Madrean pine-oak.

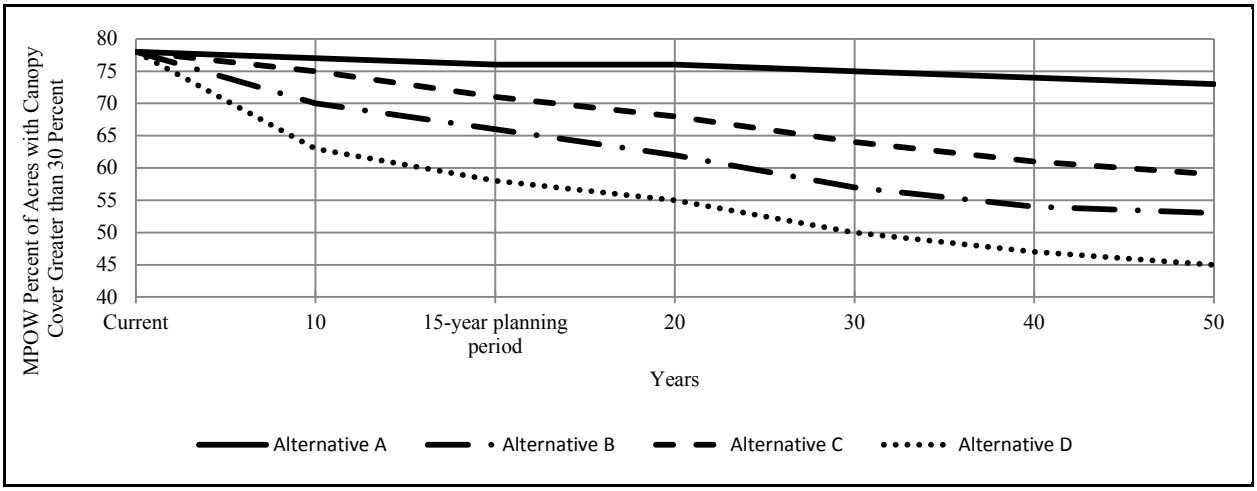



**Figure 27. Percent of Madrean pine-oak woodland PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

As a result of canopy cover reductions through thinning with periodic fire on a regular basis, within this PNVT there should be some increase in understory plant cover, richness, diversity, and heterogeneity. With expected increases in herbaceous plant vigor through decreased competition for sunlight and moisture, and more rapid nutrient cycling by fire there could be greater herbage growth. Current average herbaceous cover ranging from 6-35 percent and average estimated production ranging from 100-155 pounds per acre have the potential to increase by as much as 43 and 79 percent for cover and production, respectively (table 48). Given the opportunity to respond to overstory canopy reduction, the existing understory state of affairs where low and moderately-low ecological conditions or very poor and poor range conditions occur on more than 100,000 acres, should enable some movement to higher ecological levels and closer to desired conditions.

**Table 67. Comparisons, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A, by the end of the 15-year planning period and the 50-year modeling period, of the percentage and acreage changes in closed woody canopy cover† within the historically open woodland (MPOW and PJW), and grassland (GBG and SDG) PNVTs**

| Years | Alternative Percents and Acres Display the Amount of Change within Each PNVT that has Closed Woody Canopy Cover Greater than 30 Percent in Woodland and Greater than 10 Percent in Grassland (arrows indicate direction of change in woody canopy cover; ↑ up, ↓ down, or ↔ no change) | | | |
|---|---|---|---|---|
| | alternative A | alternative B average | alternative C average | alternative D average |
| **Madrean pine-oak woodland PNVT current conditions: 394,927 acres of which 78% or 308,043 acres with woody canopy cover > 30%** | | | | |
| 15 | 3%↓ (300,145 acres) | 15%↓ (260,652 acres) | 8%↓ (282,373 acres) | **25%↓ (231,032 acres)** |
| 50 | 6%↓ (288,297 acres) | 33%↓ (207,337 acres) | 24%↓ (233,007 acres) | **42%↓ (177,717 acres)** |
| **Piñon-juniper woodland PNVT current conditions: 222,166 acres of which 22% or 48,877 acres with woody canopy cover > 30%** | | | | |
| 15 | 82%↑ (88,866 acres) | 52%↑ (74,426 acres) | 61%↑ (78,869 acres) | **32%↑ (64,428 acres)** |
| 50 | 191%↑ (142,186 acres) | 116%↑ (105,529 acres) | 145%↑ (119,970 acres) | **70%↑ (83,312 acres)** |
| **Woodland total current conditions (MPOW+PJW): 617,093 acres of which 58% or 356,920 acres with woody canopy cover > 30%** | | | | |
| 15 | 9%↑ (389,011 acres) | 6%↓ (335,077 acres) | 1%↑ (361,242 acres) | **17%↓ (295,460 acres)** |
| 50 | 21%↑ (430,483 acres) | 12%↓ (312,866 acres) | 1%↓ (352,977 acres) | **27%↓ (261,029 acres)** |
| **Great Basin grassland current conditions: 185,523 acres of which 89% or 165,190 acres with woody canopy cover > 10%** | | | | |
| 15 | 5%↓ (157,757 acres) | **63%↓ (61,223 acres)** | 7%↓ (153,984 acres) | 57%↓ (70,499 acres) |
| 50 | 2%↓ (162,647 acres) | 56%↓ (73,282 acres) | 8%↓ (152,129 acres) | **58%↓ (69,571 acres)** |
| **Semi-desert grassland current conditions: 106,952 acres of which 79% or 84,492 acres with woody canopy cover > 10%** | | | | |
| 15 | 6%↑ (89,840 acres) | **16%↓ (70,588 acres)** | 4%↑ (87,701 acres) | **16%↓ (70,588 acres)** |
| 50 | 19%↑ (100,535 acres) | **30%↓ (59,358 acres)** | 16%↑ (98,398 acres) | **30%↓ (59,358 acres)** |
| **Grassland total current conditions (GBG+SDG): 292,475 acres of which 85% or 249,682 acres with woody canopy cover > 10%** | | | | |
| 15 | 1%↓ (246,597 acres) | **47%↓ (131,811 acres)** | 3%↓ (241,685 acres) | 43%↓ (141,087 acres) |
| 50 | 5%↑ (263,182 acres) | 47%↓ (132,640 acres) | 0%↔ (250,525 acres) | **48%↓ (128,929 acres)** |

† Woody canopy closure classes are: 0 to < 10% is defined as very open canopy; 10 to ≤ 30% is defined as open canopy; and > 30% is defined as closed canopy. Under HRV and for DC Madrean pine-oak and piñon-juniper woodlands should exhibit open canopies (10 to ≤ 30% woody canopy cover). Under HRV and for DC Great Basin and semi-desert grasslands should exhibit very open canopies (0 to ≤ 10% woody canopy cover); grasslands, by definition, should not be dominated by woody species canopy cover. Therefore, the lower the amounts of closed woody canopy cover, the closer these four PNVTs are to their HRV and forest plan DCs

***Piñon-juniper woodland:*** The majority of the piñon-juniper on the ASNFs is naturally open canopy woodland and desired conditions are to have less than 28 percent (62,204 acres) of this PNVT with closed woody canopy cover. Unfortunately, within the planning period all alternative proposed average acre treatment objectives produce an increase in closed canopy acres (figure 28). However, alternative D yields the smallest increase in closed canopy acres, from 48,877 to 64,428 acres, a 32 percent increase (table 67), and alternatives B, C and A follow with 52, 61, and 82 percent increases in closed canopy acres, respectively. By the end of the 50 year modeling period all alternatives have augmented closed canopy acres by as much as 70, 116, 145, and 191 percent for alternatives D, B, C, and A, respectively, from current conditions. It would appear that under all alternatives, insufficient acres would be treated within this PNVT to achieve the desired conditions over time. At the proposed treatment rates it would take roughly 377, 79, 74, and 53 years for alternative A, B, C, and D, respectively, to treat the entire PNVT; natural regeneration and growth maybe occurring at a greater rate than treatment removal. See appendix G tables 3 and 4 for more information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for piñon-juniper.

As a result of canopy cover increases within this PNVT there should be a decrease in understory plant cover, richness, diversity, and heterogeneity. With expected decreases in herbaceous plant vigor through increased competition for sunlight and moisture, and slower nutrient cycling by fire there should be less herbage growth. Current average herbaceous cover ranging from 17-37 percent and average estimated production ranging from 100-225 pounds per acre have the potential to increase by as much as 60 and 73 percent for cover and production, respectively (table 48). Overstory canopy increase will not facilitate movement of the existing understory situation where low and moderately-low ecological conditions occur on more than 192,000 acres, to higher ecological levels and closer to desired conditions.

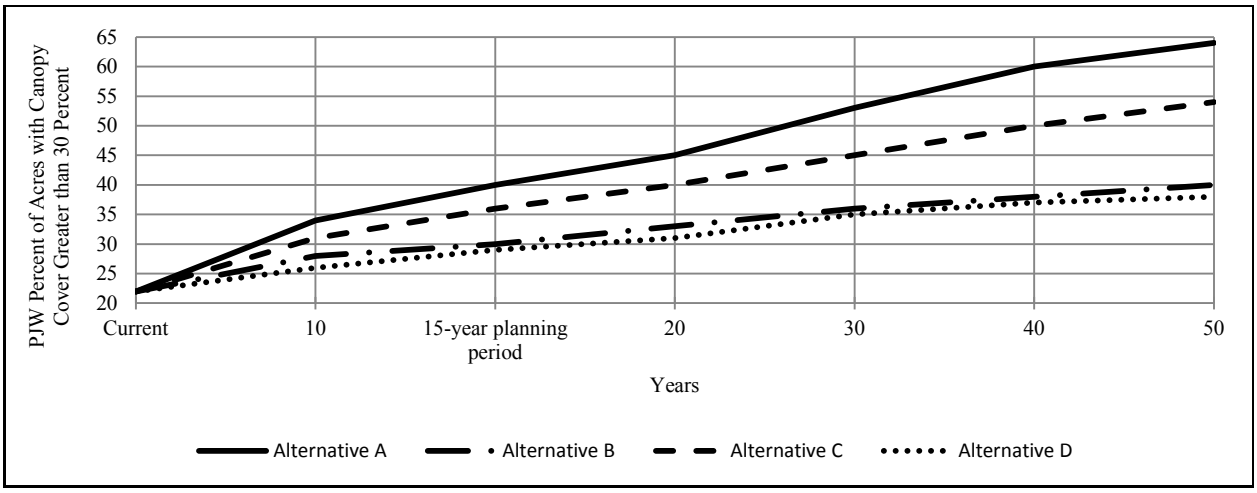



**Figure 28. Percent of piñon-juniper woodland PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

When combining Madrean pine-oak and piñon-juniper canopy changes, alternative D results in the greatest overall reduction (17%) by the end of the15-year planning period, and the 50-year modeling period (27%). Alternative B also results in a woody canopy cover reduction by 6% and 12% by the end of the15-year planning period, and the 50-year modeling period, respectively. Alternative A would result in the greatest overall increases in woody canopy cover by the end of the15-year planning period, and the 50-year modeling period; 9% and 21%, respectively. Alternative C also results in woody canopy cover

increase (1%) by the end of the 15-year planning period, and a decrease (1%) by the end of the 50-year modeling period.

## Grassland PNVTs

Grasslands by definition are those areas on which the vegetation is dominated by grasses, grass-like plants and/or forbs (Anderson 2008) and are maintained in this condition by natural successional processes, primarily driven by drought and fire. Grasslands should not have a woody species component that contributes greater than 10 percent of the overall canopy cover. Herbaceous vegetation provides critical soil cover as well as hiding cover and shelter for small wildlife. In addition, open grasslands have the potential to produce from 6 to 110 times the herbaceous biomass per acre as adjacent forested areas (Laing et al. 1989).

***Great Basin grassland:*** Great Basin grassland is naturally an open herbaceous vegetation dominated PNVT and desired conditions are to have less than 22 percent (40,815 acres) of this PNVT with closed woody canopy cover. Within the planning period all alternative proposed average acre treatment objectives produce reductions in woody canopy acres (figure 28); however, alternative B reduces the woody canopy cover on the greatest number of acres, from 165,190 to 61,223 acres, a 63 percent reduction (table 67); alternative D follows with a 57 percent reduction in closed canopy cover. During the same period, under alternatives A and C closed woody canopy acres are reduced by five and seven percent, respectively. By the end of the 50-year modeling period all alternative proposed average acre treatment objectives produce reductions in woody canopy acres (figure 29); however, alternative D reduces the woody canopy cover on the greatest number of acres, from 165,190 to 69,571 acres, a 58 percent reduction (table 67); alternative B follows with a 56 percent reduction in closed canopy cover. During the same period, under alternatives A and C closed woody canopy acres are reduced by two and eight percent, respectively. It appears that under alternatives A and C insufficient acres would be treated within this PNVT to achieve the desired conditions over time. It also appear that around 40 years management actions under alternatives B and D would need to change in order to continue to reduce closed woody canopy acres. See appendix G tables 3 and 4 for more information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for Great Basin.

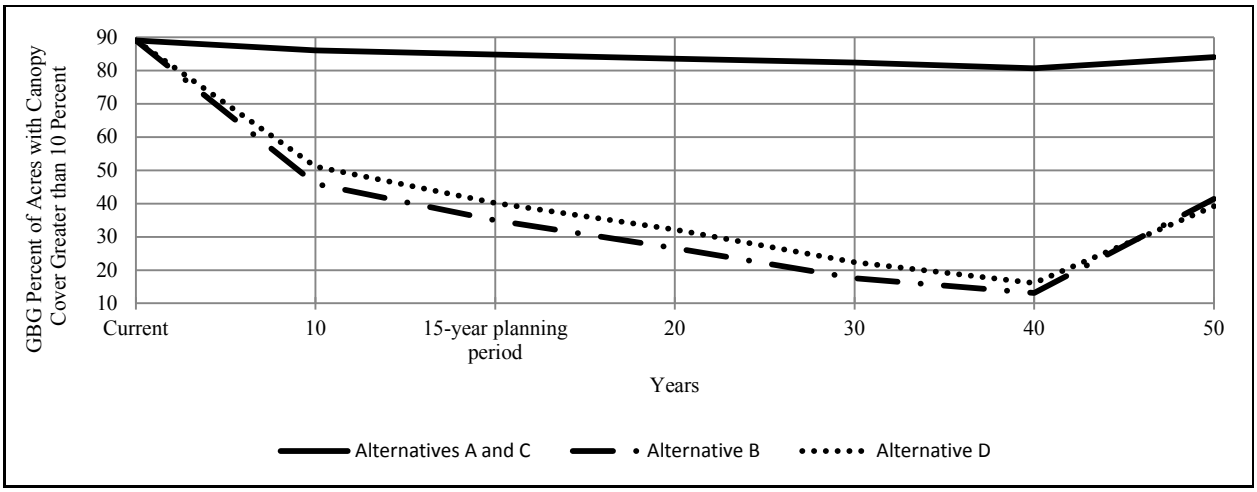



**Figure 29. Percent of Great Basin grassland PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

As a result of woody canopy cover elimination through mechanical thinning and introduction of periodic fire on a regular basis, within this PNVT there should be an increase in understory plant cover, richness, diversity, and heterogeneity. With expected increases in herbaceous plant vigor through decreased competition for sunlight and moisture, and more rapid nutrient cycling by fire there could be greater herbage growth. Current average herbaceous cover ranging from 23-45 percent and average estimated production ranging from 260-440 pounds per acre have the potential to increase by as much as 46 and 66 percent for cover and production, respectively (table 48). Overall, woody overstory canopy elimination should facilitate movement of the existing understory situation where low and moderately-low ecological conditions occur on more than 160,000 acres, to higher ecological levels and closer to desired conditions.

***Semi-desert grassland:*** Semi-desert grassland is naturally an open herbaceous vegetation dominated PNVT and desired conditions are to have less than 10 percent (10,695 acres) of this PNVT with closed woody canopy cover. By the end of the 15-year planning period both alternatives B and D proposed average acre treatment objectives produce reductions in closed woody canopy acres (figure 30) from 84,492 to 70,588 acres, a 16 percent reduction (table 67), however, during the same period, under both alternatives A and C closed woody canopy acres increase by six and four percent, respectively. By the end of 50-year modeling period both alternatives B and D have reduced closed woody canopy acres by 30 percent, while during the same period, under alternative A and C closed woody canopy acres increased by an additional 19 and 16 percent, respectively, from current conditions. It appears that under all alternatives insufficient acres would be treated within this PNVT to achieve the desired conditions over time. See appendix G tables 3 and 4 for more information regarding changes in canopy cover for the proposed high and low acre treatment objectives by the end of the 15-year planning period and the 50-year modeling period for semi-desert.

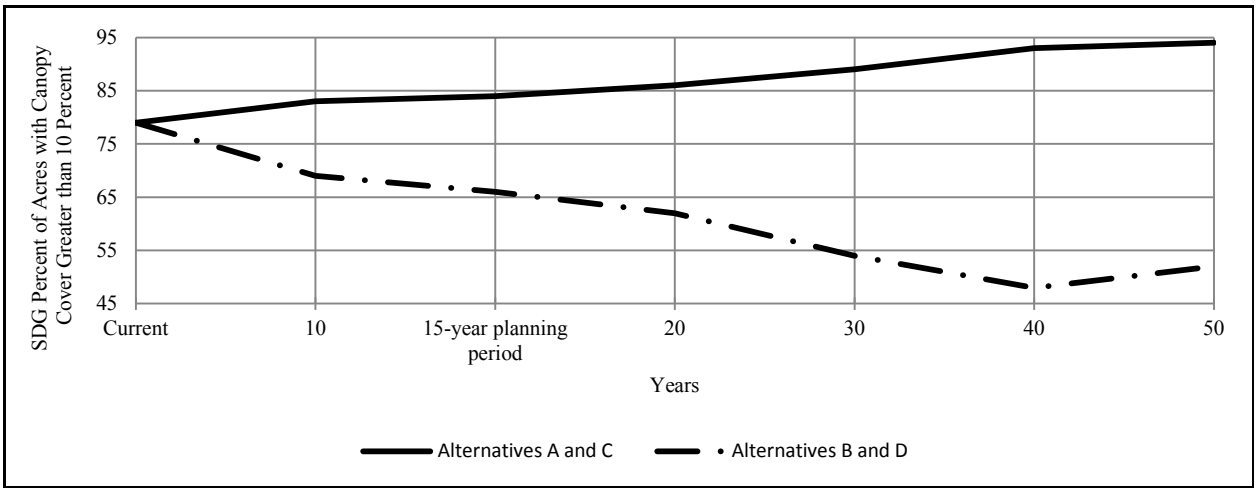



**Figure 30. Percent of semi-desert grassland PNVT acres with woody canopy cover greater than 30 percent over a 50-year timeframe, based on the proposed average acre treatment objectives for alternatives B, C and D, and alternative A**

As a result of woody canopy cover elimination through the introduction of periodic fire on a regular basis within this PNVT, under alternatives B and D there should be an increase in understory plant cover, richness, diversity, and heterogeneity. With expected increases in herbaceous plant vigor through decreased competition for sunlight and moisture, and more rapid nutrient cycling by fire there could be greater herbage growth. Current average herbaceous cover ranging from 7-16 percent and average estimated production ranging from 50-105 pounds per acre have the potential to increase by as much as 56 and 89 percent for cover and production, respectively (table 48). Overall, woody overstory canopy elimination should facilitate movement of the existing understory situation where low and moderately-

low ecological conditions occur on more than 44,800 acres, to higher ecological levels and closer to desired conditions.

When combining Great Basin and semi-desert closed woody canopy acre changes (table 67), alternative B results in the greatest overall reduction (47%) by the end of the 15-year planning period, however, by the end of the 50-year modeling period alternative D results in the greatest overall reduction (48%). Both alternatives A and C result in a slight (1% and 3%, respectively) decrease in closed woody canopy cover acres by the end of the 15-year planning period, however by the end of the 50-year modeling period the number of acres of closed woody canopy cover have increased for alternative A by five percent, while under alternative C they are the same as current conditions.

In summary (for a complete display of the tabular summations of the 15-year planning period and the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high, average, and low acre treatment objectives for alternatives B, C, and D, and alternative A see appendix E tables 1 through 6) for the alternative with the greatest overall contribution to the movement toward desired conditions (DC) and historical range of variability (HRV) and all other indicator variables by the end of the 15-year planning period and the 50-year modeling period under the proposed high acre treatment objectives is alternative D, followed by alternative B, then alternative C, and lastly by alternative A.

For the proposed average acreage treatment objectives the alternative with the greatest overall contribution to the movement toward desired conditions (DC) and historical range of variability (HRV) and all other indicator variables by the end of the 15-year planning period under is alternative B, followed by alternative D, then alternative C, and lastly by alternative A. However, for the proposed average acreage treatment objectives the alternative with the greatest overall contribution to the movement toward desired conditions (DC) and historical range of variability (HRV) and all other indicator variables by the end of the 50-year modeling period under is alternative D, followed by alternative B, then alternative C, and lastly by Alternative A.

For the proposed low acreage treatment objectives the alternative with the greatest overall contribution to the movement toward desired conditions (DC) and historical range of variability (HRV) and all other indicator variables by the end of the 15-year planning period and the 50-year modeling period under the proposed low acre treatment objectives is alternative is alternative B, followed by alternative D, then alternative C, and lastly by Alternative A.

## Climate Change

Refer to appendix A in the Apache-Sitgreaves National Forests Proposed Land Management Plan for a more in-depth discussion of this topic.

According to USDA Forest Service (2010), restoring and maintaining PNVT resilience[21] will likely improve the potential for ecosystems to retain or return to desired conditions after being influenced by climate change related influences and variability. Managing for resistance (e.g., maintenance thinning to prevent uncharacteristic fire, forest insect or disease epidemics) or resilience[22] (e.g., invasive plant

[21] Resilience - The capaity of a system to absorb disturbance and reorganize while undergoing changes so as to still retain essentially he same function, structure, identity, and feedback.

[22] Resistance - The capacity of a system to withstand the effects of an environmental agent.

control), both traditional sustainability subjects, offer common ground and present opportunities for meaningful response to climate change. Of the themes of resistance or resilience identified by Millar et al. (2007), the following may be useful for planning:

- Manage for asynchrony[23], promoting diversity
- Promote connected landscapes
- Reset significantly disrupted animal and plant communities

Modifying or resetting forest structure, towards desired (DC) and reference conditions (HRV), and restoring historic fire regime, should make these communities more resistant, resilience, function more as they did historically, and provide the capability of and capacity for these systems to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure, identity, and feedbacks (Walker et al. 2004). This is very important in the uncertainty of climate prediction. The alternative that makes the most progress towards these two desired conditions will provide the best resiliency and adaptation for all 14 of the PNVTs in the face of climate change. According to the CEICC (2008), a resilient ecosystem is one that can withstand a stress like pollution or rebuild after a major disturbance like a serious storm or fire. A resilient ecosystem can also cope with a drought or an unusually hot summer in ways that alter some aspects of ecosystem function but do not lead to a major shift in the type of ecosystem or the services it provides.

Climate change and ecosystems are intricately connected and impacts on one will often feedback to affect the other. According to Spriggs et al. (2000), natural ecosystems are regulated by climate. Long-term or short-term climate variability may cause shifts in the structure, composition, functioning and process of ecosystems, particularly in the fragile boundaries of the semiarid regions. These areas already contain plants, insects, and animals highly specialized and adapted to the landscape. A changing climate of wetter, warmer winters and overall temperature increases would alter their range, type, and number throughout the Southwest and on the ASNFs. Responding differently to shifts in climate, the somewhat tenuous balance among ecosystem components will also change because ecosystems are complex and their constituent species do not necessarily react to climate change at the same pace or in the same ways. As the health of the ecosystem is a function of water availability, temperature, carbon dioxide ($CO_2$), and many other factors, it is difficult to determine accurately the extent, type, and magnitude of ecosystem change under future climate scenarios. Yet, should vegetation cover and moisture exchanging properties of the land change, important local and regional climate characteristics such as light reflectivity, humidity, wind, and temperature will also change.

Climate scientists agree that human activities have led to elevated atmospheric concentrations of $CO_2$ and other greenhouse gases that cause global warming, and observed concentrations are projected to increase. Climate change can intensify the risk of ecosystem change for terrestrial and aquatic systems, affecting ecosystem composition, structure, function, and productivity (Collins and Larry 2007). Climate change is not the only stress affecting ecosystems, and other stresses, like habitat loss, and pollution, complicate species' and ecosystems' ability to adapt to climate change. If effective adaptations to the adverse effects of climate change are to be accomplished on the ASNFs, large-scale reductions or cessation of ecosystem stressors are crucial (Beschta et al. 2012).

[23] Asynchrony - In the general meaning, is the state of not being synchronized. In this usage, asynchrony refers to the promotion of diversity by managing for a range of conditions, occurring at different times, within a given ecosystem.

Currently there appears to be broad agreement among most climate modelers that the southwestern United States is experiencing a warming and drying trend that will continue well into the later part of the 21st century (Sprigg et al. 2000). Climate models depict temperatures rising approximately 4° to 5° F by 2030 and between 7° to 12° F by 2090 (Seager et al. 2007). Many researchers have identified the types of ecological change that could be attributed as an effect of climate change. These include species population declines (e.g. drought induced mortality), changes in phenology, shifts in distribution in either elevation or latitude, and increases in invasive species (native and non-native) (Parmesan and Yohe 2003; Root et al. 2003; Allen 2009).

The potential ecological implications of climate change trends in the Southwest and on the ASNFs also include:

- More extreme disturbance events, including wildfires, intense rain and floods, wind events, drought, epidemic insect and disease outbreaks, etc. (Swetnam et al. 1999; Lenart 2007; Williams et al. 2010)
- Long-term shifts in vegetation patterns (Westerling et al. 2006; Millar et al. 2007)
- Changes in the timing and synchronization of seasonal plant and animal life history events (Brown et al. 1999; Root et al. 2005; Parmesan 2006, 2007; Svoma 2011); declines in species populations (Pounds et al. 2006; Martin 2007); shifts in species distributions (Root et al. 2003; Jetz et al. 2007; La Sorte and Thompson 2007; McCain 2007)
- Reduced precipitation will act as a limiting factor to overall forest health (USDA Forest Service 2005)
- Declines in forest productivity and tree survival as a result of amplified water limitations due to drought (Williams et al. 2012) and heat induced mortality (Allen et al. 2010)
- Shifts in the timing of snowmelt, along with increases in summer temperatures, have serious implications for the survival of fish species and may challenge efforts to reintroduce species into their historic range (Joyce et al. 2005; Millar et al. 2007)
- Increasing temperatures, water shortages, and changing ecological conditions will likely affect biological diversity, and put pressure on wildlife populations, distribution, viability, and migration patterns. There may also be more vulnerability from invasive plant and animal species
- The importance of snow, uncertain climate change impacts on snow, and mediation of snow by interacting with environment dependent factors in complex mountain terrain may pose substantial difficulties for understanding how these diverse vegetation communities may respond to future climate conditions (Zald et al. 2012)
- Shorter winters, and less snowpack, also affect the timing of natural cycles such as plant dormancy and blooming, and peak river-flows (Svoma 2011)

There is no perfect way to examine these complex ecological implications with the limited resources currently available. The risks are especially profound when coupled with the synergistic effects of land use change (Sala et al. 2000; Hansen et al. 2001; Root et al. 2003). Climate change is likely to exacerbate the effects of natural and altered disturbance regimes, including wildfire, insect outbreaks, flooding and erosion, across all ASNFs' PNVTs and may prompt abrupt ecological changes. Resilience has limits. When a change exceeds those limits, or is coupled with other simultaneous changes that cause stress, the ecosystem undergoes a major change, often shifting to a fundamentally different ecosystem type occur (Gunderson and Pritchard 2002). This is particularly true in ecosystems such as grasslands, riparian areas, and forests where the effects of past management and land use change are substantial.

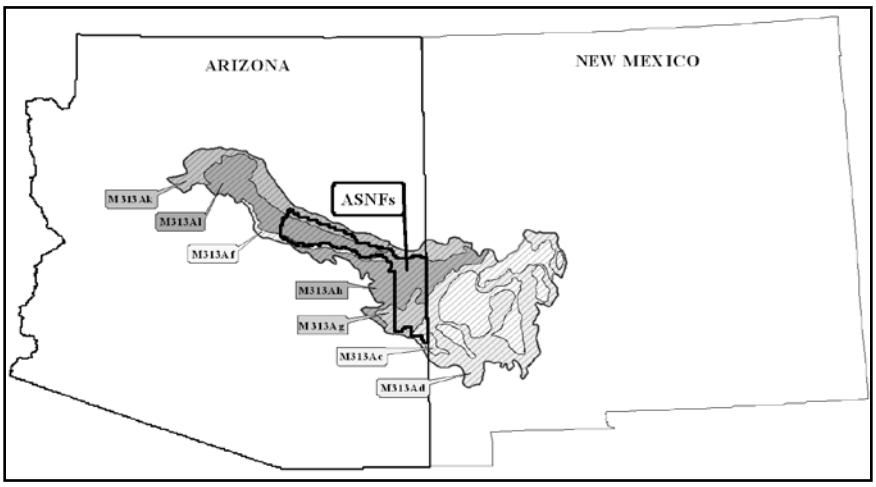
Resilient and redundant resource conditions provide reasonable assurances of the ability of these PNVTs to adapt to the uncertainties of potentially changing climate. Modifying current forest, woodland, and grassland vegetation composition and structure towards their DC and/or HRV and restoring historic

ecological process regimes should make these PNVTs more functional, enabling them to be more resistant and resilient in the face of uncertain future climate shifts and disturbance events. The closer ecological composition, structure, and process are to their historic conditions, the more properly each vegetation type is functioning and the more secure dependent species (plants and animals) are within the associated habitats. This is especially important with potential changes in the climate. The alternative that best provides for the greatest moment towards DC and HRV and therefore, the greatest reduction in risk, within the planning period is Alternative B.

Re-establishing the ecological processes and patterns necessary to make these terrestrial ecosystems sustainable, resilient, and healthy under proposed restoration alterations and future climatic conditions is of primary importance to their continued existence or evolutionary ability to adapt. Based on this analysis, when assessing each alternatives combined contribution toward achieving desired conditions (i.e., modeled movement toward DC/reference conditions, acres old/large trees, snags/acre, coarse woody debris, aspen retention, overstory/understory) the alternative that best provides for the greatest moment towards DC and HRV is Alternative B. Alternative B results in the greatest reduction in risk, and the greatest increases in resistance and resilience, and adaptive capacity of these PNVTs to absorb disturbances and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedback, within the planning period. The other alternatives rank in order of most contribution after Alternative B as follows: Alternatives D, C and A, respectively.

## Cumulative Environmental Consequences

Numerous national forests within Arizona and New Mexico are revising, or preparing to revise their forest plans. These plans may emphasis vegetation treatments that change the PNVTs vegetation composition and structure. Neighboring national forests, tribal, state, and BLM lands are also conducting vegetation treatments within vegetative communities very similar to those found on the ASNFs (map 17). These efforts would contribute to landscape restoration, overall change in movement toward HRV and DC, and a reduction in uncharacteristic wildfire across the broader landscape and contributing to the resiliency of these PNVTs.




**Map 17. ASNFs in context to the land areas of the White Mountains-San Francisco Peaks-Mogollon Rim ecoregion section in context within Arizona and New Mexico**

Some of the reasonably foreseeable projects occurring within the White Mountains-San Francisco Peaks-Mogollon Rim M313A ecoregion section (map 16) include the following:

1. Mechanical Vegetation Treatments (restoration/biomass/wildland urban interface (WUI) treatments)
    - Reasonably foreseeable mechanical treatments that may impact the composition, structure, and function of vegetation. Various activities including commercial harvesting, pre-commercial thinning, site preparation, wood cutting, and natural and artificial regeneration occurring on the State lands, Fort Apache and San Carlos Indian Reservations, Bureau of Land Management, Coconino, Gila, and Tonto NFs. The amounts and timing of these treatments are unknown
    - The Four-Forest Restoration Initiative (4FRI) is a planning effort designed to restore forest resiliency and function across four National Forests in Arizona including the Coconino, Kaibab, ASNFs, and Tonto NFs. Due to the size of the landscape involved, at least two environmental analyses will be conducted. The first environmental analysis focuses on the Coconino NF and Kaibab NF with a project area totaling approximately 988,764 acres. Within the 988,764 acre project area, the Forest Service is preparing an environmental impact statement (EIS) that proposes to conduct restoration activities on approximately 600,000 acres on the Coconino NF and Kaibab NF. Of this total, approximately 361,379 acres would be treated on the Coconino NF and 233,991 acres would be treated on the Kaibab NF. The objective of the project is to re-establish forest structure, pattern, and composition, which will lead to increased forest resiliency and function. Resiliency increases the ability of the ponderosa pine forest to survive natural disturbances such as insect and disease, fire, and climate change. Treatments include a range of both mechanical and fire treatments. There are also road (opening of temporary and closed roads, reconstruction, decommissioning) and aquatic restoration treatments. (Source: final refined Proposed Action for Four-Forest Restoration Initiative, August 2011). If successful, this effort could decrease susceptibility to large and uncharacteristic disturbances, increase water yields from winter snowfall through the creation of interspaces, and provide long-term carbon sequestration in large old trees at a scale meaningful to improving the resiliency and ability to adapt to climate change in the ponderosa pine type of the Southwest. The Gila NF is also managing for improved ecosystem health, movement toward reference conditions, and the reduction of fire risk.
    - The White Mountain and San Carlos Apache Tribes also continue to manage their lands for multiple resource purposes. Management within these lands has been directed at reducing fire risks.
2. Planned and Unplanned Ignitions
    - Both planned (prescribed) and unplanned (wildfire) ignitions are expected to continue as management strategies on adjacent lands including Fort Apache Indian Reservation, Bureau of Land Management, Coconino, Gila, and Tonto NFs. The amounts and timing of these fires are unknown.
3. Fire Suppression Activities
    - Fire suppression actions are expected to continue on adjoining lands: local municipalities, Fort Apache Indian Reservation, Bureau of Land Management, Coconino, Gila, and Tonto NFs. The amounts and timing of these activities are variable and based on occurrence and behavior of wildfire.
4. Treatments of Invasive Species
    - Arizona Game and Fish Department's plan emphasizes programs to eliminate or limit the spread of invasive plants and animals.
    - Coconino NF management strategy is to prevent any new noxious weeds from being established. Tonto NF identifies noxious weed treatment on their SOPA.

- Agreement in place with ADOT to minimize spread of noxious weeds. NEPA in place for ADOT treatment of invasive and hazardous vegetation along highways within Arizona national forests.

In summary, the sum of past management actions over time has resulted in the departure of most PNVTs from their characteristic vegetation states on and around the ASNFs. These departures are largely due to fire suppression, in conjunction with past, unsustainable timber and livestock grazing practices, and other anthropogenic disturbances of natural processes. It has resulted in a dramatic increase in stand-replacing fires, particularly since the mid-1990s, decreases in water yields, degradation of aspen stands, and woody species encroachment of grasslands with resultant loss of species diversity, and resulted in the priority needs for change identified for forest plan revision. Departures from reference conditions exist in all vegetation types on the forest, and most continue to trend further from reference conditions.

The cumulative environmental consequences of proposed management under all alternatives in the context of the larger ecoregion would contribute to the movement of vegetation towards desired conditions. These efforts would contribute to landscape restoration, control of invasive species, a reduction in uncharacteristic wildfire across the broader landscape, and the resiliency of these PNVTs to adapt to climate change.

## Unavoidable Adverse Impacts

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Before any ground-disturbing actions take place, they must be authorized in a subsequent environmental analysis. Therefore none of the alternatives cause unavoidable adverse impacts. Mechanisms are in place to monitor and use adaptive management principles in order to help alleviate any unanticipated impacts that need to be addressed singularly or cumulatively.

## Irreversible and Irretrievable Commitment of Resources

As mentioned above, the land management plan provides a programmatic framework and does not authorize, fund, or carryout any project or activity. Because of this the land management plan does not authorize or mandate any ground-disturbing actions, none of the alternatives cause an irreversible or irretrievable commitment of resources.

## Adaptive Management

All alternatives assume the use of adaptive management principles. Forest Service decisions are made as part of an on-going process. The land management plan identifies a monitoring program. Monitoring the results of actions will provide a flow of information that may indicate the need to change a course of action or the land management plan. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information

The changes in departure from DC and HRV resulting from ASNFs' proposed plan restoration efforts that primarily affect forest structure (distribution of size classes, canopy cover, and storiedness) will be observed. With monitoring and future updates to plan direction, the actual treatments applied over the course of the planning period (15 years) may be adjusted to reflect the consequences of prior treatments.

Any changes in management should be made to adjust the trajectory of trend towards PNVT DC and/or HRV. The ASNFs has provided the adaptive framework to deal with impacts from climate change – "resilient and redundant resource conditions provide reasonable assurance of the ability to adapt to a changing climate."

### Consistency with Law, Regulation, and Policy

All alternatives are designed to guide ASNFs' management activities in meeting federal law, regulations, and policy.

### Other Planning Efforts

There are no are potential conflicts between the proposed action and the objectives of Federal, regional, State, local, or Tribal land use plans, policies, and controls for the area concerned?

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# Appendix A

## State and Transition Modeling and Vegetation Models

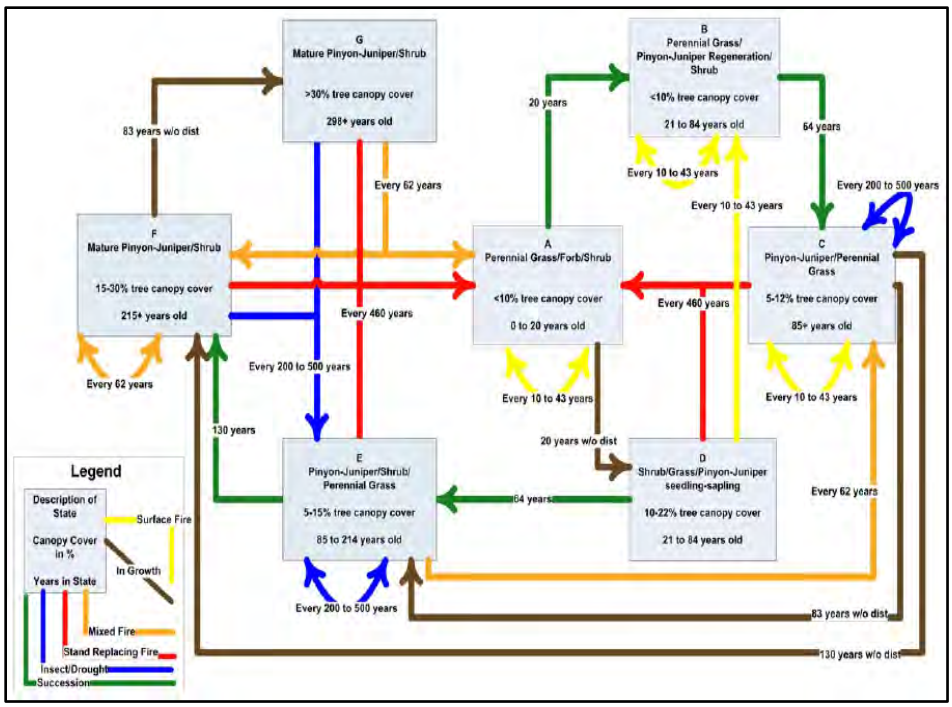
## Vegetation State and Transition Models

In response to the USDA Forest Service Southwest Region's need for landscape scale planning tools, the Nature Conservancy (TNC) (Smith and Schussman 2007) developed broad-scale state and transition models for several Potential Natural Vegetation Types (PNVTs) in the Southwest based on a comprehensive literature review. TNC utilized this information to describe vegetation model states, identify parameter values for these models and to run quantitative scenario analysis, using Vegetation Dynamics Development Tool (VDDT) software (ESSA Technologies Ltd. 2006), to determine the relative proportion of model states on the landscape. Vegetation Dynamics Development Tool software is a non-spatial model that allows the user to model vegetation change over time as a series of vegetation states that differ in structure, composition, and cover and to specify the amount of time it takes to move from one vegetation state to another in the absence of disturbance (ESSA Technologies Ltd. 2006). Various disturbance agents affecting the movement of vegetation between states (or transitions) are incorporated (e.g., surface fires, stand-replacing fires, grazing, insect outbreaks, and drought events). By varying the types and rates of disturbance across the landscape, the effects of different disturbance regimes, such as historic and current fire regimes, or different management treatments, such as wildland fire use, fire suppression, prescribed burning, grazing practices, and mechanical fuel treatments, on vegetation can be investigated. These models will summarize and synthesize the current state of scientific knowledge of vegetation dynamics. Additionally, they will provide forest planners and managers with powerful tools for understanding, investigating, and demonstrating the effects of alternative scenarios for the management of vegetation on national forests at scales ranging from the Ranger District to the Southwest Region.

According to Smith and Schussman (2007), the region-wide scale at which TNC constructed the models, as well as the sole reliance on published scientific information to build and parameterize the models, necessarily limits the level of detail in a model as well as the applicability of the model to a given site. Given these constraint, it is important to utilize information from these models to understand general trends in vegetation change and dynamics at large scales while utilizing finer scale models (such as those found in Ecological Site Descriptions[24] developed by the Natural Resources Conservation Service) and/or expert information to model and evaluate land management at site specific levels.

Historic (pre-1880) and current (1880 to present) state and transition models for piñon-juniper savanna are shown in appendix A figures 1 and 2. Additionally, TNC used information in the historic range of variability (Schussman and Smith 2006a; Gori and Bate 2007) to estimate parameter values for transitions between model states (succession) and disturbance frequencies, allowing them to develop quantitative VDDT models. TNC's model parameters, output, and analysis for pinyon-juniper savanna are presented below (appendix A figures 1 and 2, and appendix A tables 1 and 2).

[24] Ecological sites are the basic component of a land-type classification system that describes ecological potential and ecosystem dynamics of land areas. All land/land use types are identified within the ecological site system, including rangeland, pasture, and forest land. An ecological site is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances. Lands are classified considering discrete physical and biotic factors. Physical factors include soils, climate, hydrology, geology, and physiographic features. Biotic factors include plant species occurrence, plant community compositions, annual biomass production, wildlife-vegetation interactions, and other factors. Ecological dynamics, primarily disturbance regimes, such as grazing; fire; drought; management actions; and all resulting interactions are also a primary factor of ecological sites. Information and data pertaining to a particular ecological site is organized into a reference document known as an Ecological Site Description (ESD). ESDs function as a primary repository of ecological knowledge regarding an ecological site. ESDs are maintained on the NRCS Ecological Site Information System (ESIS), which is the repository for information associated with ESDs and the collection of all site data. (USDA NRCS, last modified: 08/23/2011 http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=STELPRDB1043235)




**Appendix A figure 2. Conceptual historic state (box) and transition (arrow) model for piñon-juniper savanna vegetation type. Frequency of transitions are noted when this information is supported by published sources, where no or conflicting information exists on the frequency of transitions, unknown is the notation (adapted from Schussman and Smith 2006; Gori and Bate 2007)**

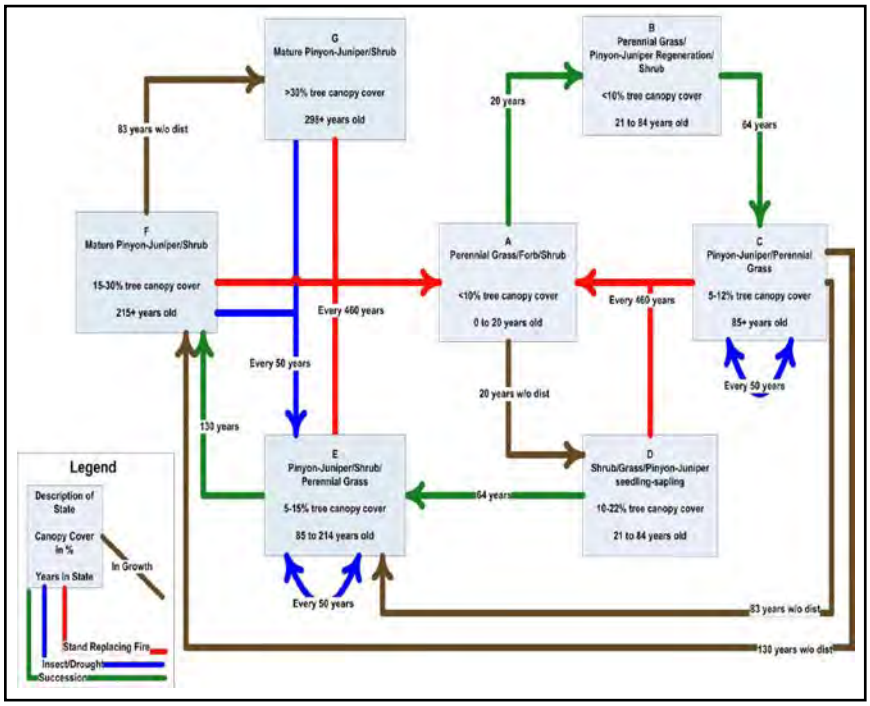
**Appendix A table 1. Identification of the historic transition types, transition frequency or length, sources of information and assumptions made in developing the piñon-juniper savanna VDDT model, (adapted from Gori and Bate 2007) displayed in appendix A figure 1, above**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Plant growth (20 years, 64 years) | After 20 years, 64 years without a stand replacing fire (or disturbance event) | Allen 1990; Arnold et al. 1964; Baisan and Swetnam 1997; Barnes and Cunningham 1987; Barney and Frishknecht 1974; Blackburn and Tueller 1970; Brown et al. 2001; Erdman 1970; Floyd et al. 2000; Gottfried and Severson 1993; Huffman et al. 2006a; Koniak 1985; Muldavin et al. 2003; Boykin 2000; Schott 1984; Wilkinson 1997; Young and Evans 1978. | Plant growth refers to the growth and ageing process of a stand in the absence of a stand-replacing fire. There are no fire history reconstructions that document historic stand-replacing fire (SRF) or succession after SRF in pinyon-juniper savanna. We assume that i) SRF's (or some other stand-replacing disturbance) occurred but were rare events as they were not recorded in savanna woodland fire histories that date back as early as 1400; and ii) succession in savannas is similar to that described for shrub woodlands, but that with surface fire the savanna understory stays primarily grassy. We base the latter assumption on the fact that i) piñon-juniper savannas and shrub woodlands share many of the same perennial grass and shrub species, the latter increasing at the expense of the former in the absence of surface fire (USDA 1997); ii) historic savannas have increased in tree and shrub densities post-settlement due in large part to human alteration of the fire regime (Allen 2001; Brockway et al. 2002; Humphrey 1953, 1958; Jacobs and Gatewood 1999; Jacobs et al. 2002; Leopold 1924; Miller 1999; McPherson 1997); and iii) present day tree densities in historical savannas and shrub woodlands are similar (table 12-7†). Studies of post-fire vegetation succession in shrub- or persistent woodland indicate that annual grasses and forbs dominate for the first 3 years. Perennial grasses become dominant on sites 5 to 6 years post fire while shrubs become dominant (in terms of cover) 12 to 30 years post-fire; shrub dominance persists until trees become dominant 70-100 years after SRF (see sources). We took the mean value of the latter two time ranges to estimate the amount of time vegetation was in the perennial grass/forb/shrub and shrub/grass/tree seedling-sapling states, 20 years and 64 years, respectively. We have not included an annual stage in the savanna model because perennial grasses will re-sprout after fire and preclude annuals from becoming an important component of the herbaceous community. With a regime of frequent surface fires, shrubs will be continually knocked back and young trees will be thinned, resulting in a perennial grass/tree seedling/sapling state following the perennial grass/forb/shrub state along the main successional pathway (Arnold et al. 1964; Leopold 1924; McPherson 1995). |
| In-growth | 83 years | Arnold et al. 1964; Howell 1941; Pieper and Wittie 1990. | In growth refers to the infill of trees that would not have survived with recurrent surface or mixed severity fire and occurs after an estimated period of 83 years without fire. We arrived at this time value based on the following information. Howell (1941) estimated that it takes up to 75 years for a juniper trees to grow > 1.2 m tall, a size where post-fire survivorship is high (Pieper and Wittie 1990). Similarly, Miller and Tausch (2001) found that it takes piñons and junipers up to 90 years to reach > 3 m tall, a height at which they found post-fire survivorship to be high; 83 years is the mean of these two estimates. If there is no surface fire during this period, tree recruitment and growth will likely increase tree density and canopy cover to levels characteristic of historic piñon-juniper shrub woodland [see table 12.7 for tree density increases in the absence of fire; tree density vs. canopy cover regression (cover = 0.031(tree density) + 10.3) derived from the following studies: Grier et al. 1992; Landis and Bailey 2005; Lymbery and Pieper 1983; Rowlands and Brian 2001; Mason et al. 1967†]. At this point, we assume a mixed-severity fire is needed to reduce tree density and canopy cover, restoring a savanna structure. |
| Shrub accumulation + in-growth (130 years) | After 83 years, then 47 years without fire | Tress and Klopatek 1987. | Tress and Klopatek (1987) estimated that it took approximately 215 years for a shrub-woodland to fully recover in tree density, canopy cover and species composition following a SRF. This indicates an additional 47-year time period to move from an open canopy piñon-juniper/shrub/perennial grass state to a mature, open canopy piñon-juniper/shrub state after 83 years without fire. |

**Appendix A table 1. Continued**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Surface fire | Every 10 to 43 years | Allen 1990; Baisan and Swetnam 1997; Brown et al. 2001; Huffman et al. 2006a; Leopold 1924; Wilkinson 1997; Muldavin et al. 2003; Boykin 2000. | Mean fire return intervals (MFRI) for piñon-juniper savanna based on analyses of fire-scarred trees range from 10 to 43 years; most estimates are point mean fire intervals (PMFI) based on analyses of individual trees which likely underestimate the stand-level MFRI. Restricted composite estimates all fall within the above range (Allen 1990; Huffman et al. 2006a); however, Baisan and Swetnam (1997) report composite estimates of the MFRI of between 6 and 11.2 years for a northern New Mexico site. We did not consider these latter estimates because they likely overestimate the stand-level fire occurrence (Baker and Ehle 2001; Baker and Shinneman 2004). In general, surface fires kill or top kill shrubs and remove young trees < 1.2 m but mortality of young trees is not always 100% (Arnold et al. 1964; Dwyer and Pieper 1967; Johnson et al. 1962). For example, if fire occurs in the shrub/perennial grass/tree seedling-sapling state, shrub mortality will create an opportunity for grass to rebound in the understory after fire, shifting the stand into the perennial grass/tree seedling/sapling/shrub state (Arnold et al. 1964). |
| Mixed severity fire | Every 62 years | Huffman et al. 2006a. | Historic PMFIs for mixed severity fire in shrub-woodland at the upper ecotone ranged from 42 to 81 years (mean value = 62 years). The effect of mixed severity fire in low and open cover shrub woodland stands will be a reduction in cover and mortality in younger trees, more similar to a surface fire than to a replacement fire, and in stands with shrub and grass understory, a fire will result in a shift to grass-dominated understory. In mature stands with greater than 30% canopy cover, we assume that a mixed severity fire will have both a stand replacing component (50%) and surface fire component (50%), in the latter case thinning trees and reducing canopy cover and in the former, sending the vegetation back to the perennial grass/forb/shrub state. In support of this, several studies found trees surviving successive fires that were > 100 years apart (Despain and Mosley 1990; Huffman et al. 2006a; Tausch et al. 1981, Tausch and West 1988) while other authors report stand-replacing fires in pre-settlement closed woodlands (table 12-3, HRV†). We chose the 50-50 split because in the absence of better information, this break minimizes estimation error (Sokal and Rohlf 1994). |
| Surface fire, mixed severity fire | Every 460 years | Allen 1990; Baisan and Swetnam 1997; Brown et al. 2001; Huffman et al 2006a; Leopold 1924; Wilkinson 1997; Muldavin et al. 2003; Boykin 2000. | Fire history reconstructions using fire-scarred trees provide a continuous record dating from 1400 to 1684, a period of roughly 320 to 600 years before present (mean = 460 years). Assuming that these stands initiated after a stand-replacing fire, this gives a conservative estimate of its frequency of (0.002). |
| Drought/insect-caused tree die-off. | Every 200 to 500 years | Allen and Breshears 1998; Betancourt et al. 1993; Breshears et al. 2005. | Betancourt et al. (1993) estimated that the 1950's drought was a 200- to 500-year return interval event; the 1996-2003 droughts were wetter but warmer than the 1950's drought (Breshears et al. 2005). The relationship between drought, insect outbreaks, and tree die-off in piñon-juniper woodlands is well established (Allen and Breshears 1998; Gottfried et al. 1995; Breshears et al. 2005; Wilson and Tkacz 1992), however, there is only one estimate of the amount (hectares) of piñon-juniper woodland affected regionally and this is for the recent 1996-2003 drought (Breshears et al. 2005). Since not all stands were affected during this drought (Mueller et al. 2005a; Negrón and Wilson 2003), we adjusted the drought frequency by the estimated proportion of woodland in Arizona and New Mexico with discernible tree die-off (0.07) based on aerial surveys (Breshears et al. 2005) to derive a patch level probability of tree die-off during drought. Piñon mortality was greater than juniper mortality, older individuals had higher mortality than younger ones, and denser stands were more susceptible to insect infestation and tree die-off was more severe than in less dense stands (Breshears et al. 2005; Mueller et al. 2005a; Negrón and Wilson 2003). Based on this information, drought/insect effects in tree-dominated states were modeled to move stands from higher canopy cover states to lower cover ones and to reset stand-age to the youngest age value for that state. |

†See Gori and Bate 2007

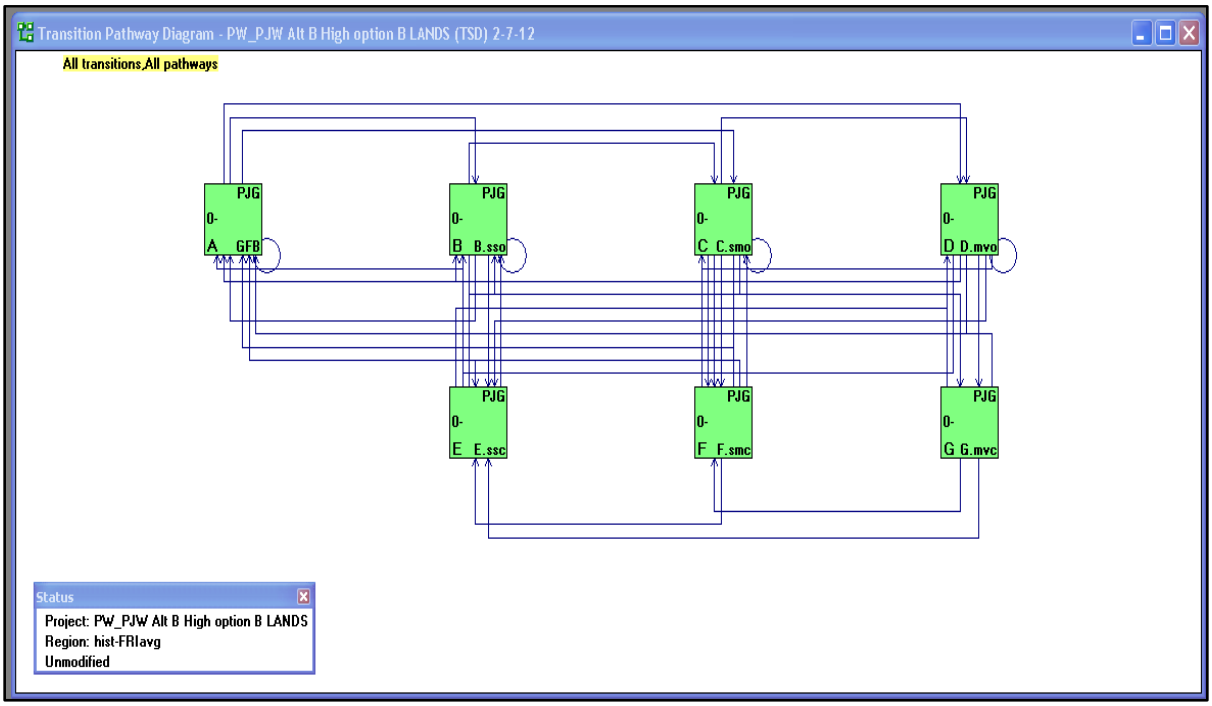



**Appendix A figure 2. Conceptual current state (box) and transition (arrow) model for piñon-juniper savanna vegetation type. Frequency of transitions are noted when this information is supported by published sources, where no or conflicting information exists on the frequency of transitions, unknown is the notation (adapted from Schussman and Smith 2006; Gori and Bate 2007)**

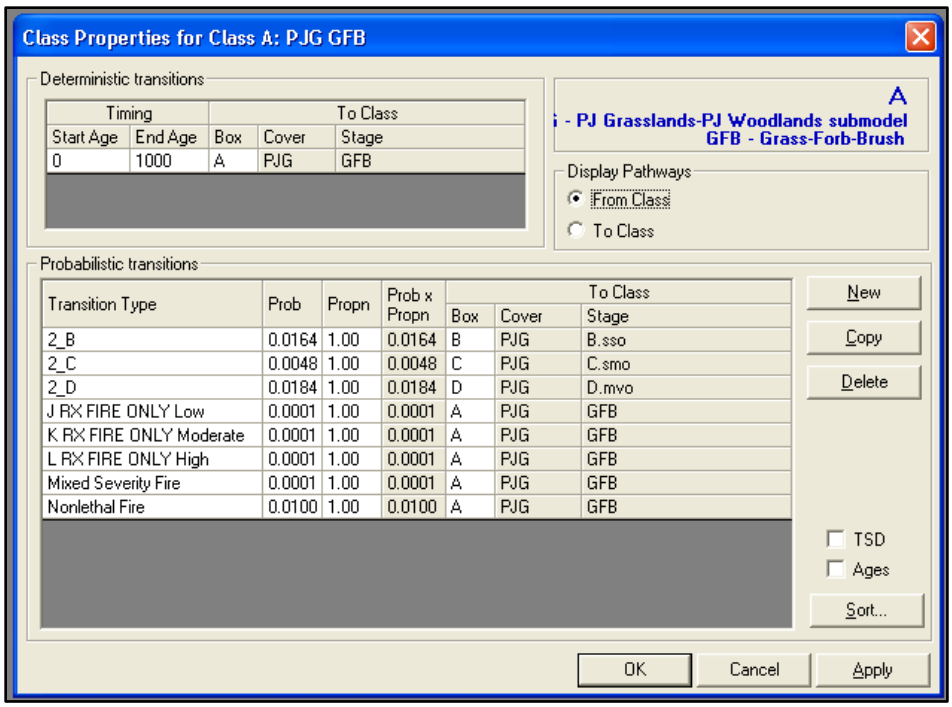
**Appendix A table 2. Identification of the current transition types, transition frequency or length, sources of information and assumptions made in developing the piñon-juniper savanna VDDT model, (adapted from Gori and Bate 2007) displayed in appendix A figure 2, above**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Surface fire, mixed severity fire | Not used in current model | Allen 1990, 2001; Baisan and Swetnam 1997; Brown et al. 2001; Huffman et al. 2006a; Leopold 1924; Wilkinson 1971; Muldavin et al. 2003; Boykin 2000 | Based on fire-history reconstructions and direct observation, we assume that surface fire and mixed severity fire have essentially ceased at the scale of piñon-juniper occurrence in Arizona and New Mexico (7.5 million ha). Occasional surface fires and mixed severity fires do occur, but not at the same scale, either because fine fuels are too sparse for fire spread or enough fuels have accumulated in many areas to quickly shift surface fires to stand replacing ones (Allen 2001; Butler et al. 1998). Prescribed fires and fire use are occurring in some areas at some times, but there is no published information on the amount of piñon-juniper savanna (and former savanna) affected and it is likely that this treatment level is not within the historic range of variability for this system. |
| Stand replacing fire | Every 460 years | Brown et al. 2001; Huffman et al. 2006a; Leopold 1924; Wilkinson 1971; Muldavin et al. 2003; Boykin 2000. | Cessation of surface fires and accumulation of fuels and development of fuel ladders has led to an increase in the frequency of stand replacing fires, especially during the last decade or two (Crimmins and Comrie 2004; Floyd et al. 2004; Floyd et al 2006; Romme et al. 2003). There is only a single study that provides information that would permit calculation of this increased SRF frequency for historic savanna or open-canopy persistent woodland at the upper ecotone (Crimmins and Comrie 2004), but there are technical problems with VDDT using this increased SRF frequency for the last 10-20 years in a relatively short (120-year) run. The increased SRF frequency is better applied to prospective scenario analyses (looking into the future) where the modeling time frame is 50 to 100 years. For this reason, we used the historic frequency for SRF. The effects of stand replacing fire on vegetation have been documented by Savage and Mast (2005). |
| Drought/insect outbreak | Once every 50 years | Allen and Breshears 1998; Breshears et al. 2005. | Two major droughts and regional outbreaks of piñon Ips have occurred over the last century (e.g., 50-year return interval) and their combined mortality effects on piñons and junipers have been quite variable on a population basis (Breshears et al. 2005; Mueller et al. 2005a; Negrón and Wilson 2003). See above historical drought/insect outbreak section for further detail. |
| Silvicultural activities, mechanical treatments | Highly variable through time and across space, thus not included in the model | Bahre 1991; Bahre and Hutchinson 1985; Gottfried et al. 1995. | Fuelwood cutting from piñon-juniper systems was a major source of fuel for mining until the end of the 19th century and for domestic heating and cooking as late as the 1940s; piñon-juniper fuelwood continues to be an important source for domestic heating and income generation in rural communities. However, there are no regional estimates of amount (hectares) of fuelwood cutting that has occurred over the last 120 years, nor are there equivalent estimates for areas treated mechanically or chemically to reduce tree density in piñon-juniper systems. |

The actual state and transition model developed and used for the piñon-juniper woodland on the ASNFs is presented in appendix A figures 3 through 10. Current and reference condition (historic range of variability) vegetation state descriptions and existing vegetation crosswalk for piñon-juniper woodland PNVT on the ASNFs (USFS 2010) is displayed in appendix A table 3.




**Appendix A figure 3. VDDT state (box) and transition (arrow) model for piñon-juniper woodland PNVT used for analysis on the ASNFs**



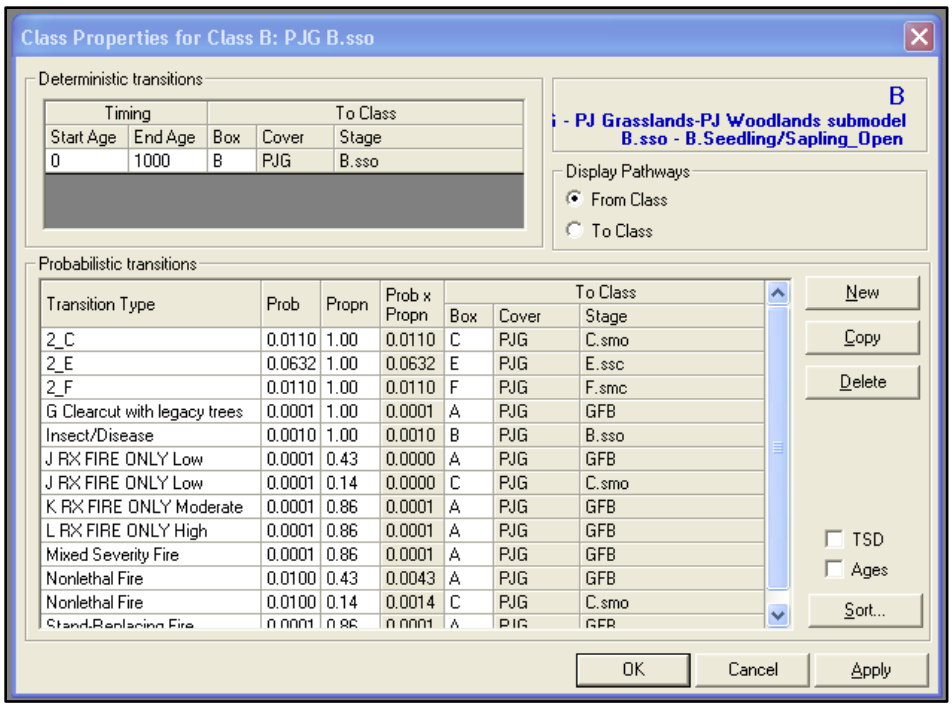

**Appendix A figure 4. Piñon-juniper woodland PNVT naturally driven (5) and potentially management driven (3) transitional pathways for STATE A (*PJ Grassland-PJ Woodland submodel GFB/SHR*): Recently burned, grass, forb and shrub types with less than 10 percent woody canopy cover; early successional development state used in VDDT modeling on the ASNFs**

**Naturally driven transition types:**

- **natural succession:**
  1. From state A to state B
  2. From state A to state C
  3. From state A to state D
- **wild fire:**
  4. Mixed severity fire, moderate intensity, from state A to state A (circular transition)
  5. Nonlethal fire, low intensity, from state A to state A (circular transition)

**Management driven transition types:**

- **prescribed burning:**
  1. J. Rx fire, low intensity, from state A to state A (circular transition)
  2. K. Rx fire, moderate intensity, from state A to state A (circular transition)
  3. L. Rx fire, high intensity, from state A to state A (circular transition)



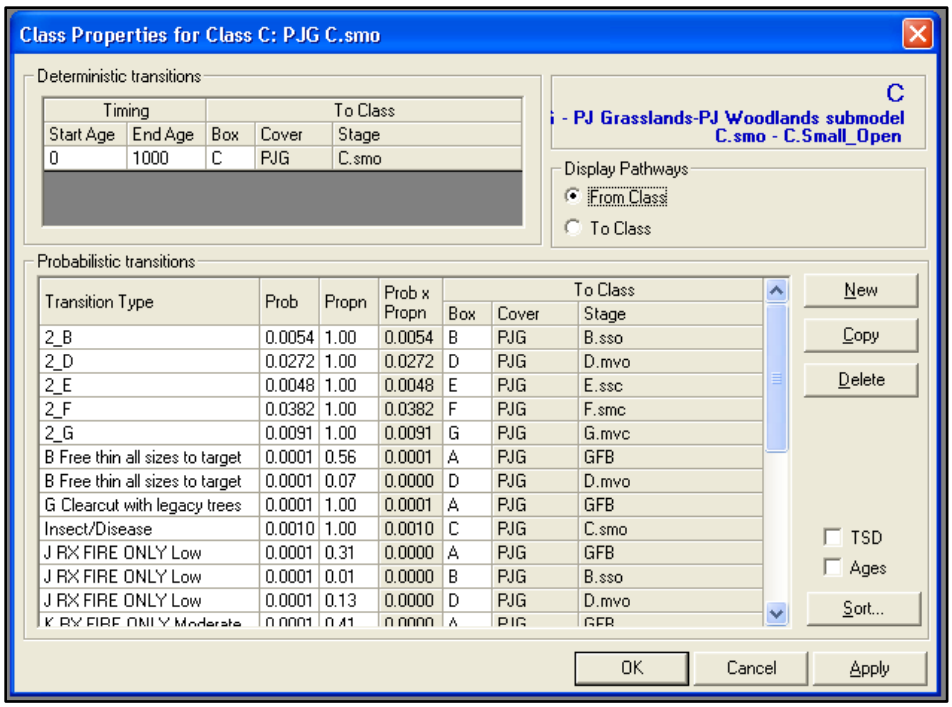

**Appendix A figure 5. Piñon-juniper woodland PNVT naturally driven (8) and potentially management driven (4) transitional pathways for STATE B (*PJ Grassland-PJ Woodland submodel SSO*): Seedling and sapling size, less than 5 inch diameter, trees with open, less than 30 percent canopy cover; all tree types; early successional development state used in VDDT modeling on the ASNFs**

**Naturally driven transition types:**

- **natural succession:**
  1. From state B to state C
  2. From state B to state E
  3. From state B to state F
- **insect/disease:**
  4. From state B to state B (circular transition)
- **wild fire:**
  5. Mixed severity fire, moderate intensity, from state B to state A
  6. Nonlethal fire, low intensity, from state B to state A
  7. Nonlethal fire, low intensity, from state B to state C
  8. Stand replacing fire, high intensity, from state B to state A

**Management driven transition types:**

- **prescribed burning:**
  1. J. Rx fire, low intensity, from state B to state A
  2. J. Rx fire, low intensity, from state B to state C
  3. K. Rx fire, moderate intensity, from state B to state A
  4. L. Rx fire, high intensity, from state B to state A



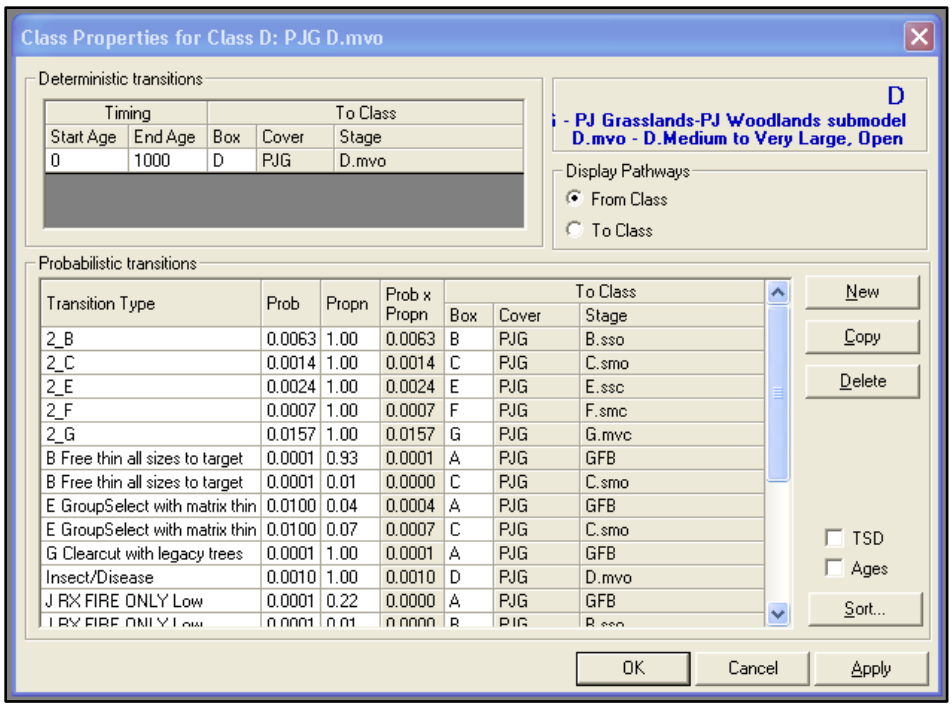

**Appendix A figure 6. Piñon-juniper woodland PNVT naturally driven (14) and potentially management driven (11) transitions for STATE C (*PJ Grassland-PJ Woodland submodel SMO*): Small size, 5 inch to 9.9 inch diameter, trees, with open, less than 30 percent canopy cover; all tree types; mid successional development state used in VDDT modeling on the ASNFs**

**Naturally driven transition types:**

- **natural succession:**
  1. From state C to state B
  2. From state C to state D
  3. From state C to state E
  4. From state C to state F
  5. From state C to state G
- **insect/disease:**
  6. From state C to state C (circular transition)
- **wild fire:**
  7. Mixed severity fire, moderate intensity, from state C to state A
  8. Mixed severity fire, moderate intensity, from state C to state B
  9. Mixed severity fire, moderate intensity, from state C to state D
  10. Nonlethal fire, low intensity, from state C to state A
  11. Nonlethal fire, low intensity, from state C to state B
  12. Nonlethal fire, low intensity, from state C to state D
  13. Stand replacing fire, high intensity, from state C to state A
  14. Stand replacing fire, high intensity, from state C to state A

**Management driven transition types:**

- **harvest treatments:**
  1. B. Free thin all sizes to target BA, from state C to state A
  2. B. Free thin all sizes to target BA, from state C to state D
  3. G. Clearcut with legacy trees, from state C to state A
- **prescribed burning:**
  4. J. Rx fire, low intensity, from state C to state A
  5. J. Rx fire, low intensity, from state C to state B
  6. J. Rx fire, low intensity, from state C to state D
  7. K. Rx fire, moderate intensity, from state C to state A
  8. K. Rx fire, moderate intensity, from state C to state B
  9. K. Rx fire, moderate intensity, from state C to state D
  10. L. Rx fire, high intensity, from state C to state A
  11. L. Rx fire, high intensity, from state C to state D



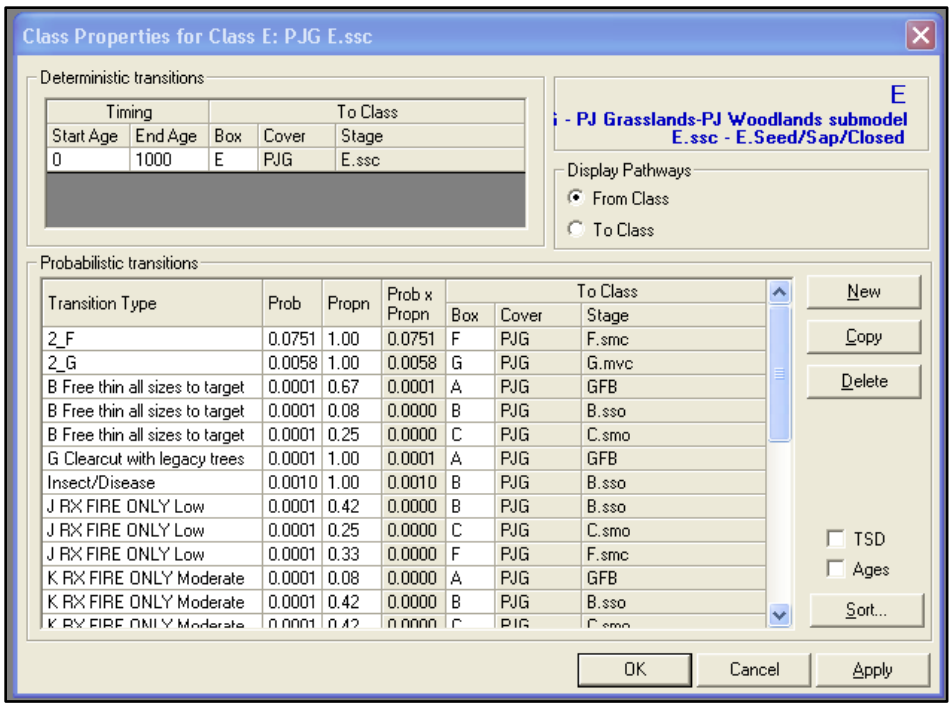

**Appendix A figure 7. Piñon-juniper woodland PNVT naturally driven (11) and potentially management driven (10) transitions for STATE D (*PJ Grassland-PJ Woodland submodel MVO*): Medium and large to very large size, greater than or equal to 10 inch diameter, trees, with open, less than 30 percent canopy cover; all tree types; late successional development, open piñon-juniper stand with "savannah-like" appearance; mixed shrub/herbaceous community state used in VDDT modeling on the ASNFs**

**Naturally driven transition types:**

- **natural succession:**
  1. From state D to state B
  2. From state D to state C
  3. From state D to state E
  4. From state D to state F
  5. From state D to state G
- **insect/disease:**
  6. From state D to state D (circular transition)
- **wild fire:**
  7. Mixed severity fire, moderate intensity, from state D to state A
  8. Mixed severity fire, moderate intensity, from state D to state C
  9. Nonlethal fire, low intensity, from state D to state A
  10. Nonlethal fire, low intensity, from state D to state B
  11. Stand replacing fire, high intensity, from state D to state A

**Management driven transition types:**

- **harvest treatments:**
  1. B. Free thin all sizes to target BA, from state D to state A
  2. B. Free thin all sizes to target BA, from state D to state C
  3. E. Groupselect with matrix thin, from state D to state A
  4. E. Groupselect with matrix thin, from state D to state C
  5. G. Clearcut with legacy trees, from state D to state A
- **prescribed burning:**
  6. J. Rx fire, low intensity, from state D to state A
  7. J. Rx fire, low intensity, from state D to state B
  8. K. Rx fire, moderate intensity, from state D to state A
  9. K. Rx fire, moderate intensity, from state D to state C
  10. L. Rx fire, high intensity, from state D to state A




**Appendix A figure 8. Piñon-juniper woodland PNVT naturally driven (13) and potentially management driven (14) transitions for State E (*PJ Grassland-PJ Woodland submodel SSC*): Seedling and sapling size, less than 5 inch diameter, trees with closed, greater than or equal to 30 percent canopy cover; all tree types; early successional development state used in VDDT modeling on the ASNFs**

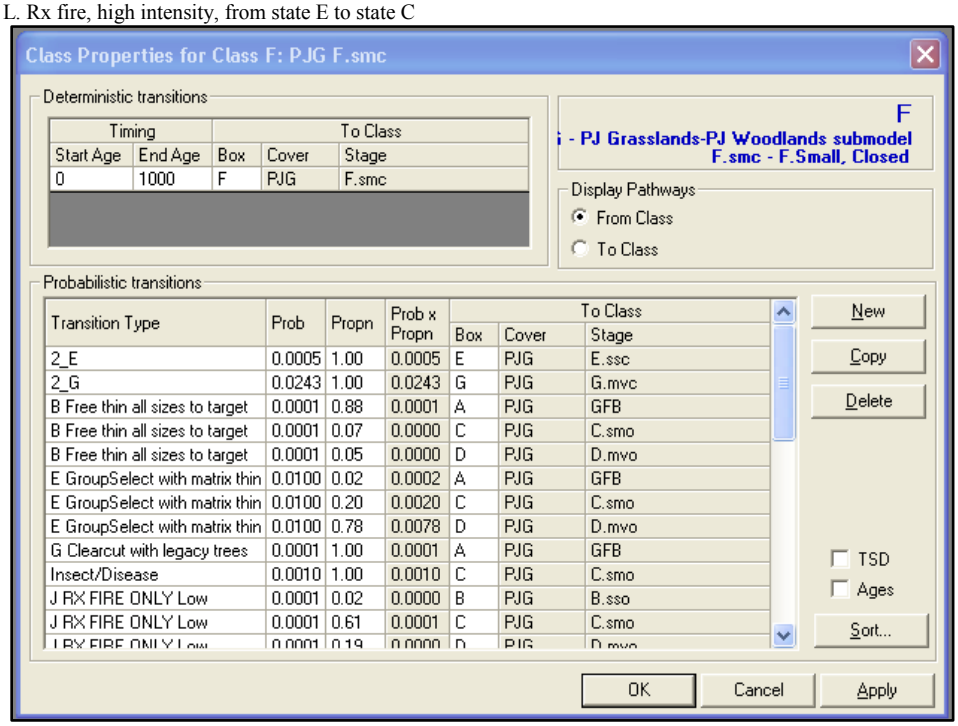
**Naturally driven transition types:**

- **natural succession:**
  1. From state E to state F
  2. From state E to state G
- **insect/disease:**
  3. From state E to state B
- **wild fire:**
  4. Mixed severity fire, moderate intensity, from state E to state A
  5. Mixed severity fire, moderate intensity, from state E to state B
  6. Mixed severity fire, moderate intensity, from state E to state C
  7. Mixed severity fire, moderate intensity, from state E to state F
  8. Nonlethal fire, low intensity, from state E to state B
  9. Nonlethal fire, low intensity, from state E to state C
  10. Nonlethal fire, low intensity, from state E to state F
  11. Stand replacing fire, high intensity, from state E to state A
  12. Stand replacing fire, high intensity, from state E to state B
  13. Stand replacing fire, high intensity, from state E to state F

**Management driven transition types:**

- **harvest treatments:**
  1. B. Free thin all sizes to target BA, from state E to state A
  2. B. Free thin all sizes to target BA, from state E to state B
  3. B. Free thin all sizes to target BA, from state E to state C
  4. G. Clearcut with legacy trees, from state E to state A
- **prescribed burning:**
  5. J. Rx fire, low intensity, from state E to state B
  6. J. Rx fire, low intensity, from state E to state C
  7. J. Rx fire, low intensity, from state E to state F
  8. K. Rx fire, moderate intensity, from state E to state A
  9. K. Rx fire, moderate intensity, from state E to state B
  10. K. Rx fire, moderate intensity, from state E to state C
  11. K. Rx fire, moderate intensity, from state E to state F
  12. L. Rx fire, high intensity, from state E to state A
  13. L. Rx fire, high intensity, from state E to state B

14. L. Rx fire, high intensity, from state E to state C




**Appendix A figure 9. Piñon-juniper woodland PNVT naturally driven (14) and potentially management driven (18) transitions for STATE F (*PJ Grassland-PJ Woodland submodel SMC*): Small size, 5 inch to 9.9 inch diameter, trees with closed, greater than or equal to 30 percent canopy cover; all tree types; understory beginning to disappear; mid successional development state used in VDDT modeling on the ASNFs**

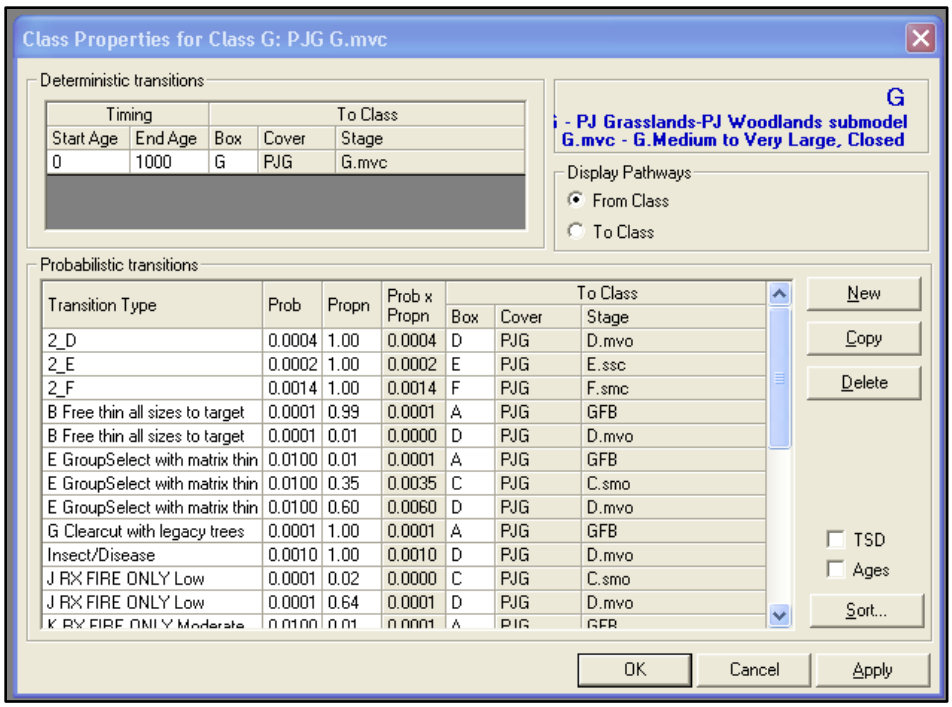
**Naturally driven transition types:**

- **natural succession:**
  1. From state F to state E
  2. From state F to state G
- **insect/disease:**
  3. From state F to state C
- **wild fire:**
  4. Mixed severity fire, moderate intensity, from state F to state B
  5. Mixed severity fire, moderate intensity, from state F to state C
  6. Mixed severity fire, moderate intensity, from state F to state D
  7. Mixed severity fire, moderate intensity, from state F to state G
  8. Nonlethal fire, low intensity, from state F to state B
  9. Nonlethal fire, low intensity, from state F to state C
  10. Nonlethal fire, low intensity, from state F to state D
  11. Nonlethal fire, low intensity, from state F to state G
  12. Stand replacing fire, high intensity, from state F to state A
  13. Stand replacing fire, high intensity, from state F to state C
  14. Stand replacing fire, high intensity, from state F to state D

**Management driven transition types:**

- **harvest treatments:**
  1. B. Free thin all sizes to target BA, from state F to state A
  2. B. Free thin all sizes to target BA, from state F to state C
  3. B. Free thin all sizes to target BA, from state F to state D
  4. E. Groupselect with matrix thin, from state F to state A
  5. E. Groupselect with matrix thin, from state F to state C
  6. E. Groupselect with matrix thin, from state F to state D
  7. G. Clearcut with legacy trees, from state F to state A
- **prescribed burning:**
  8. J. Rx fire, low intensity, from state F to state B
  9. J. Rx fire, low intensity, from state F to state C
  10. J. Rx fire, low intensity, from state F to state D

11. J. Rx fire, low intensity, from state F to state G
12. K. Rx fire, moderate intensity, from state F to state B
13. K. Rx fire, moderate intensity, from state F to state C
14. K. Rx fire, moderate intensity, from state F to state D
15. K. Rx fire, moderate intensity, from state F to state G
16. L. Rx fire, high intensity, from state F to state A
17. L. Rx fire, high intensity, from state F to state C
18. L. Rx fire, high intensity, from state F to state D




**Appendix A figure 10. Piñon-juniper woodland PNVT naturally driven (13) and potentially management driven (14) transitions for STATE G (*PJ Grassland-PJ Woodland submodel MVC*): Medium and large to very large size, greater than or equal to 10 inch diameter trees, with closed, greater than or equal to 30 percent canopy cover; all tree types; closed piñon-juniper forest with depauperate understory, may be multi-storied; substantial mortality within stands; late successional development state used in VDDT modeling on the ASNFs**

**Naturally driven transition types:**

- **natural succession:**
  1. From state G to state D
  2. From state G to state E
  3. From state G to state F
- **insect/disease:**
  4. From state G to state D
- **wild fire:**
  5. Mixed severity fire, moderate intensity, from state G to state A
  6. Mixed severity fire, moderate intensity, from state G to state C
  7. Mixed severity fire, moderate intensity, from state G to state D
  8. Nonlethal fire, low intensity, from state G to state B
  9. Nonlethal fire, low intensity, from state G to state C
  10. Nonlethal fire, low intensity, from state G to state D
  11. Stand replacing fire, high intensity, from state G to state A
  12. Stand replacing fire, high intensity, from state G to state C
  13. Stand replacing fire, high intensity, from state G to state D

**Management driven transition types:**

- **harvest treatments:**
  1. B. Free thin all sizes to target BA, from state G to state A
  2. B. Free thin all sizes to target BA, from state G to state D
  3. E. Groupselect with matrix thin, from state G to state A
  4. E. Groupselect with matrix thin, from state G to state C
  5. E. Groupselect with matrix thin, from state G to state D
  6. G. Clearcut with legacy trees, from state G to state A
- **prescribed burning:**
  7. J. Rx fire, low intensity, from state G to state C
  8. J. Rx fire, low intensity, from state G to state D
  9. K. Rx fire, moderate intensity, from state G to state A
  10. K. Rx fire, moderate intensity, from state G to state C
  11. K. Rx fire, moderate intensity, from state G to state D

12. L. Rx fire, high intensity, from state G to state A
13. L. Rx fire, high intensity, from state G to state C
14. L. Rx fire, high intensity, from state G to state D

**Appendix A table 3. Current and reference condition (historic range of variability) vegetation state descriptions and existing vegetation crosswalks developed by Region 3 for piñon-juniper woodland PNVT on the ASNFs (USFS 2010)**

| Current Trend Model† | | | | | Reference Condition‡ | | | | | Baseline Desired Condition | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | State | Description* | State (%) | | Source | State | Historic Mean (%) | Description | | State (%) | Description |
| USFS R3 model PJG | A | GFB/SHR | 5 | = | LANDFIRE RA JUPI1 | A | 5 | Post-fire community of forbs and perennial grasses | = | 5 | Based on reference condition |
| | B | SSO | 8 | = | | C | 25 | Early-development, open (< 40% cover) juniper-piñon stand with mixed shrub/herbaceous community in understory | = | 25 | Based on reference condition |
| | E | SSC | 8 | = | | | | | | | |
| | C | SMO | 8 | = | | | | | | | |
| | D | MVO | 50 | = | | D | 50 | Late-development, open juniper-piñon stand with "savannah-like" appearance; mixed shrub/herbaceous community | = | 50 | Based on reference condition |
| | F | SMC | 10 | = | | B | 10 | Mid-development, dense (> 40% cover) juniper-piñon woodland; understory presence diminishing | = | 10 | Based on reference condition |
| | G | MVC | 10 | = | | E | 10 | Late-development, closed juniper-piñon forest. May be multi-storied. Substantial mortality within stand; depauperate understory | = | 10 | Based on reference condition |

†Current trend model provided by the Regional Office

‡Potential Natural Vegetation Group: Juniper-Pinyon (Frequent Fire Type), PNVT Code: JUPI1, April 6, 2005. Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions (LANDFIRE 2005)

*GFB/SHR = grass, forb, shrub; with less than 10 percent woody canopy cover

SSO = Seedling, sapling size trees; with open woody canopy cover (< 5 inch diameter; and ≥ 10 percent and ≤ 30 percent)

SSC = Seedling, sapling size trees; with closed woody canopy cover (< 5 inch diameter; and > 30 percent)

SMO = Small size trees; with open woody canopy cover (5 to 9.9 inch diameter; and ≥ 10 percent and ≤ 30 percent)

MVO = Medium to very large size trees; with open woody canopy cover (> 10 inch diameter; and ≥ 10 percent and ≤ 30 percent)

SMC = Small size trees; with closed woody canopy cover (5 to 9.9 inch diameter; and > 30 percent)

MVC = Medium to very large size trees; with closed woody canopy cover (> 10 inch diameter; and > 30 percent)

**Appendix A table 4. Vegetative states, structure and respective compositions, cover and departure index to desired conditions (DC) and historic range of variability (HRV) for the piñon-juniper woodland PNVT (developed from LANDFIRE Rapid Assessment model description JUPI1)**

| Historic State | Successional Structure, Composition, and Cover Classes† | Percent Composition | | Lesser Values | Departure |
|---|---|---|---|---|---|
| | | Current ($A_i$) | DC/HRV ($B_i$) | (C) | Index‡ (%) |
| A | Early-development, post-fire community of forbs and perennial grasses | 7 | 5 | 5 | |
| B | Mid-development, dense (> 40% cover) juniper-piñon woodland; understory presence diminishing | 6 | 10 | 6 | |
| C | Early-development, open (< 40% cover) juniper-piñon stand with mixed shrub/herbaceous community in understory | 4 | 25 | 3 | 26 |
| D | Late-development, open juniper-piñon stand with "savannah-like" appearance; mixed shrub/herbaceous community | 69 | 50 | 50 | |
| E | Late-development, closed juniper-piñon forest. May be multi-storied. Substantial mortality within stand; depauperate understory | 15 | 10 | 10 | |
| | | 100 | 100 | 74 | |

†See appendix A table 3 for the vegetation state descriptions and appendix A table 3 for the vegetation map crosswalk for Piñon-Juniper Woodland PNVT on the ASNFs. See appendix A figures 1 and 2 for the conceptual historic and current piñon-juniper savanna vegetation type state and transition models (Gori and Bate 2007)

‡Percent departure index based on Czekanowski Coefficient (Czekanowski 1913; as cited in Kent and Coker 1992)

In the example above, the piñon-juniper woodland PNVT has a departure index (DI) of 26 percent and as a result is 26 percent departed from desired conditions and HRV. The following is Czekanowski's Coefficient:

$$DI_i = \frac{2 \sum_{i=1}^{m} \min (A_i, B_i)}{\sum_{i=1}^{m} A_i + \sum_{i=1}^{m} B_i}$$

where: $A_i$ and $B_i$ = abundance of percent composition *i* (*column A and column B*)

$\sum_{i=1}^{m} \min (A_i, B_i)$ = is sum of lesser values of percent composition *i* where it occurs in both $A_i$ and $B_i$

m = total number of states

→ Double the sum of the lesser values between states for Current ($A_i$) and DC/HRV ($B_i$) composition, this equals Column C [in this case (2 x 74) = 148]
→ Divide that value by the sum of the Current ($A_i$) composition plus the sum of the DC/HRV ($B_i$) composition [in this case (148 / (100 + 100)) = 0.74]
→ Subtract that value from 1 [in this case (1 - 0.74) = 0.26]
→ Multiply that value by 100 [in this case (0.26 x 100) = 26]
→ Departure Index = 26 percent

## Additional PNVT Models and Modeling Information

The following tables, appendix A tables 5 through 15 display, where available, the following information: the Region 3 crosswalks between the current trend model, R3 mid-scale existing vegetation mapping, reference conditions, and baseline desired conditions.

## Forested PNVTs

## Ponderosa Pine Forest

**Appendix A table 5. Ponderosa pine forest PNVT crosswalks developed by Region 3 (19 March 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Smith 2006a)**

| INPUT PROPORTION OF PPO/PPG HERE | |
|---|---|
| 68 | Area or proportion of ASNFs landscape in PPO |
| 32 | Area or proportion of ASNFs landscape in PPG |

| Current Trends Model | | | | R3 Mid-scale Existing Veg Mapping |
|---|---|---|---|---|
| Source | State | Description | | Dominance Unit - Size/Cover |
| USFS R3 model PPF | A, N | GFB/SHR | = | Non-treed: Recently burned, grass, forb, and shrub types - N/A |
| | B | SSO | = | All tree types - Seedling/sapling - open |
| | F | SSC | = | All tree types - Seedling/sapling - closed |
| | C | SMO | = | All tree types - Small - open |
| | D, J | MOS, MOM | = | All tree types - Medium - open |
| | E, K | VOS, VOM | = | All tree types - Very large - open |
| | *Contemporary landscapes only…* | | | |
| | G | SMC | = | All tree types - Small - closed |
| | H, L | MCS, MCM | = | All tree types - Medium - closed |
| | I, M | VCS, VCM | = | All tree types - Very large - closed |

| Reference Condition | | | |
|---|---|---|---|
| Source | TNC State | Historic Mean† (%) | Description |
| TNC Ponderosa Pine - Bunchgrass | A, J | 0 | Grass seedling/sapling < 10% tree cover and uncharacteristic grassland |
| | F | 0 | Seedling/sapling > 10% tree cover |
| | B | 0 | Ponderosa pine young forest, < 30% cover |
| | C | 0 | Ponderosa pine mid-age forest, < 30% cover |
| | D, E | 100 | Ponderosa pine mature/old forest with regeneration, < 30% cover |

†Based on 15.6-yr fire interval

| Baseline Desired Conditions for Ponderosa Pine/Gambel Oak (PPG) | |
|---|---|
| Structural Stage (%) | Description |
| 0 | Reference condition |
| 2 | Conditions indicative of occasional even-aged stand dynamics and the development of Mexican spotted owl (MSO) habitat† |
| 2 | Conditions indicative of occasional even-aged stand dynamics and the development of MSO habitat† |
| 79 (primarily in J & K) | Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as state J, versus high-productivity sites where state K is more likely‡ |
| 2 | Conditions indicative of occasional even-aged stand dynamics and the development of MSO habitat† |
| 15 | Conditions indicative of MSO habitat, and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2009), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as state H/L, versus high-productivity sites where state I/M is more likely |

†Reflects percentage of seral forests necessary to sustain at least 15% MSO habitat in mature closed forest

‡Based on residual proportion of the landscape not including mature closed forest (states H, L, I, M) and early-mid even-aged states (B, F, C, G)

| Baseline Desired Conditions for Ponderosa Pine/Bunchgrass (PPO) | |
|---|---|
| Structural Stage (%) | Description |
| 0 | Reference condition |
| 1 | Conditions indicative of occasional even-aged stand dynamics and the development of northern goshawk nesting habitat† |
| 1 | Conditions indicative of occasional even-aged stand dynamics and the development of northern goshawk nesting habitat† |
| 94 (primarily in J & K) | Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as state J, versus high-productivity sites where state K is more likely |
| 1 | Conditions indicative of occasional even-aged stand dynamics and the development of northern goshawk nesting habitat† |
| 3 | Conditions indicative of northern goshawk nesting habitat, and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2009), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as state H/L, versus high-productivity sites where state I/M is more likely |

†Reflects percentage of early-mid seral forest necessary to sustain at least 3% mature closed forest condition as northern goshawk nesting habitat

| Baseline Desired Conditions for Ponderosa Pine Forest - All (PPO/PPG) | |
|---|---|
| Structural Stage (%) | Description |
| 0.0 | Reference condition† |
| 1.3 | Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat† |
| 1.3 | Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat† |
| 89.2 (primarily in J & K) | Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as state J, versus high-productivity sites where state K is more likely |
| 1.3 | Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat† |
| 6.8 | Conditions indicative of mature closed forest habitat and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2009), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as state H/L, versus high-productivity sites where state I/M is more likely |

†Percentage may also be based on area weighting of PPO and PPG subclasses.

***Ponderosa Pine Forest PNVT State and Transition Models***

The following is Smith's (2006b) discussion concerning the current modeling results for ponderosa pine forest.

In response to the USDA Forest Service Southwest Region's need for landscape scale planning tools, Schussman and Smith (2006ab) developed broad-scale state and transition models for eight PNVTs in the Southwest based on a comprehensive literature review. They utilized this information to describe vegetation model states, identify parameter values for these models and to run quantitative scenario analysis, using VDDT software, to determine the relative proportion of model states on the landscape. VDDT software is a non-spatial model that allows the user to model vegetation change over time as a series of vegetation states that differ in structure, composition, and cover and to specify the amount of time it takes to move from one vegetation state to another in the absence of disturbance. Various disturbance agents affecting the movement of vegetation between states (or transitions) are incorporated (e.g., surface fires, stand-replacing fires, grazing, insect outbreaks, and drought events). By varying the types and rates of disturbance across the landscape, the effects of different disturbance regimes, such as historic and current fire regimes, or different management treatments, such as wildland fire use, fire suppression, prescribed burning, grazing practices, and mechanical fuel treatments, on vegetation can be investigated. These models will summarize and synthesize the current state of scientific knowledge of vegetation dynamics. Additionally, they will provide forest planners and managers with powerful tools for understanding, investigating, and demonstrating the effects of alternative scenarios for the management of vegetation on national forests at scales ranging from the RD to the Southwest Region.

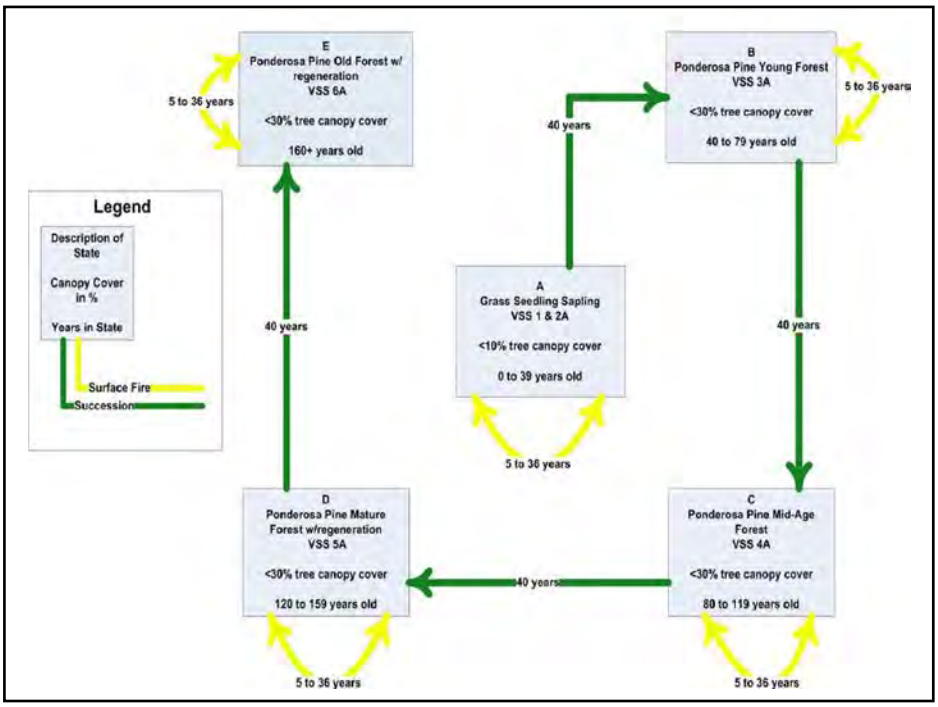
The region-wide scale at which the models were constructed, as well as the sole reliance on published scientific information to build and parameterize the models, necessarily limits the level of detail in a model as well as the applicability of the model to a given site. Given these constraint, it is important to utilize information from these models to understand general trends in vegetation change and dynamics at large scales while utilizing finer scale models (such as those found in ecological site descriptions developed by the Natural Resources Conservation Service) and/or expert information to model and evaluate land management at the site level.

Schussman and Smith (2006ab) defined all model states, transitions between states, and transition probabilities using information from published, peer-reviewed journal articles, as well as published conference proceedings, reports, theses and dissertations, and book chapters. They limited their search to relevant literature that came from studies of Southwest ecosystems, with a geographical emphasis on Arizona, New Mexico, and northern Mexico to ensure compatibility and relevance to Southwest ecosystems. This information is synthesized in narrative form for each PNVT in a companion document entitled *Historic range of variation for potential natural vegetation types of the Southwest* (Schussman and Smith 2006a).

Schussman and Smith (2006ab) described each model state by 1) its dominant vegetation and/or life form, 2) percent canopy cover or density of one vegetation component (i.e. grass, shrubs or trees), and 3) the number of years that can be spent in that state (without a disturbance) before it transitions to another state. Dominant vegetation and life form definitions followed the Forest Service's guidelines which break down or identify dominance types in terms of a single dominant species or genera when either accounts for greater than or equal to 60 percent canopy cover, or in terms of co-dominant species or genera when two or more species or genera account for greater than or equal to 80 percent canopy cover together with each individually having greater than or equal to 20 percent canopy cover. Life forms are classified as tree if tree canopy cover is greater than or equal to ten percent, shrub if shrub canopy cover is greater than or equal to ten percent, and herbaceous if herbaceous canopy cover

is greater than or equal to ten percent herbaceous canopy cover (Brohman and Bryant 2005). The Nature Conservancy utilized Forest Service guidelines in the model building process in order to make the models directly comparable to Region 3's mid-scale mapping of current vegetation. Parity of this nature will allow modeled estimates of historic vegetation to be compared with current vegetation in order to determine departure from historic and too help identify desired future conditions.

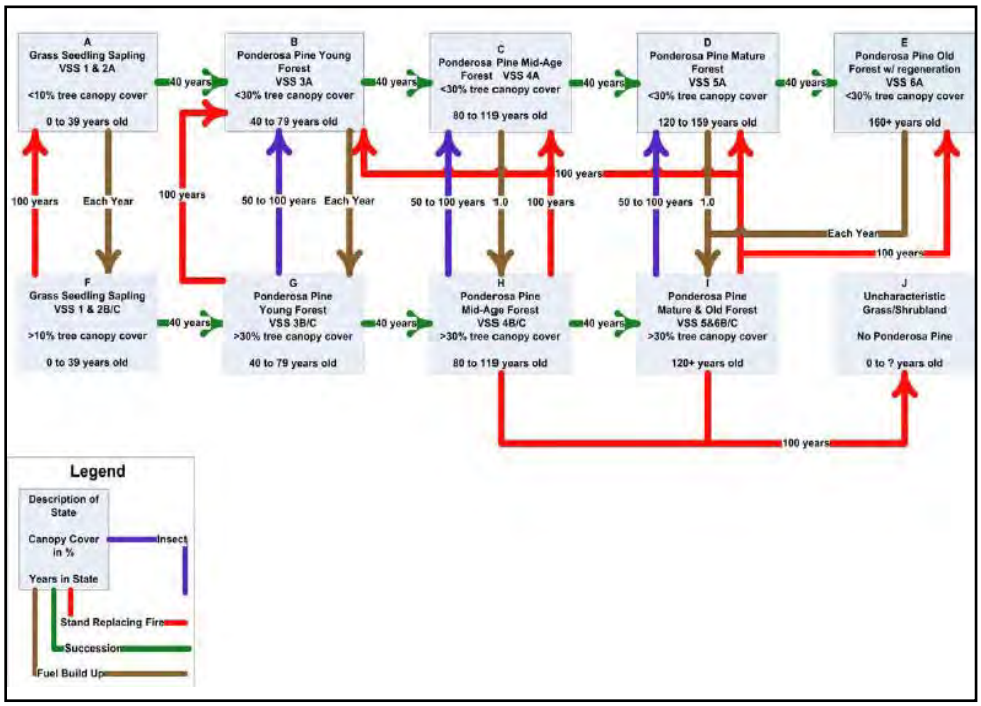
Smith (2006a) identified 19 types of transitions that are likely under historical (pre-1880) (figure 4) and/or current (post-1880) (figure 5) conditions: stand replacing fire, mixed severity fire, surface fire, in-growth, drought event, wet event, large droughts followed immediately by erosion events such as large wet events or wind events (drought/wet/wind), windthrow, avalanche, insect outbreak, disease outbreak, herbivory (native and non-native), use by native people, plant growth, prescribed fire or wildland fire use, spread of non-native species, and mechanical or chemical treatments. This is not an exhaustive list of possible transitions but rather represents a list for which there was information available to determine the effect and/or frequency of the transition.




**Appendix A figure 11. Conceptual historic state and transition model for the ponderosa pine-bunchgrass vegetation type. Frequency of transitions are noted when this information is supported by published sources; where no or conflicting information exists on the frequency of transitions, unknown is the notation**

The level of model complexity (number of model states and transitions) varies by PNVT based on the amount of available information. For example, there is a great deal of disturbance, cover, and post-disturbance regeneration information available for the ponderosa pine forest PNVT; hence a ten state model with five transitions was created. In contrast, there is little to nothing known about these same factors for the Madrean encinal woodland PNVT (as an example), hence no model was created. Figure 5 displays a conceptual current state and transition model for the Ponderosa Pine forest-bunchgrass vegetation type (Smith 2006a) used in VDDT modeling. In table 6, Smith (2006a) describes the parameters included or not included within the current VDDT models (Schussman and Smith 2006ab), as well as the sources of information and any assumptions used to create the model parameters. Figures 6 through 16 display the actual state and transition model used in the VDDT

program to determine future departure conditions and assessment of trends for the ponderosa pine and dry mixed conifer forest PNVT ("AKA - mixed conifer with frequent fire forest") on the ASNFs. According to Smith (2006ab), results of the historic ponderosa pine-bunchgrass model indicate a small amount of variability in the 900-year average for each state based on the fire interval range. Historic models simulate the average (15.6 years), maximum (36.3 years), and minimum (5.4 years) of the estimated fire return interval range. All three fire return intervals predicted that a majority of the landscape (99 percent) would be in the open old forest (State E), with a very small proportion of the landscape in the mature open forests, (State D) (< 1 percent). The states represent uneven-aged stands or patches with the range of ages given representing the maximum age of the stand rather than the absolute range of ages within the patch.




**Appendix A figure 12. Conceptual current state and transition model for ponderosa pine-bunchgrass native vegetation type. Frequency of transitions are noted when this information is supported by published sources, where no or conflicting information exists on the frequency of transitions, unknown is the notation. Dashed outlines represent states which may have been uncharacteristic for the Nature Conservancy's descriptions of the VDDT model transitions (Smith 2006a, Schussman and Smith 2006ab)**

The current ponderosa pine-bunchgrass model, which was run for 120 years, had very different results from the historic model. Old forest open (State E) has been reduced 70-90 percent, while mature/old forest closed (State I) increased from 0 percent in the historic model to a range of 53 to 57 percent in the current model. The percentage of open states is very low (0 to 1 percent) in the current model, while there is low abundance of the closed states other than state I (1 to 6 percent). Uncharacteristic grasslands (State J) accumulated up to 16 percent of the landscape under the current scenario, compared to 0 percent under the historic scenario. The minimum and average fire return intervals produced identical values for landscape proportion for all classes, indicating that the model is not sensitive to this variability in fire regime.

According to Smith (2006ab), these modeled scenarios implicate the importance of frequent surface fire in maintaining open ponderosa pine-bunchgrass ecosystems. When comparing the historic versus

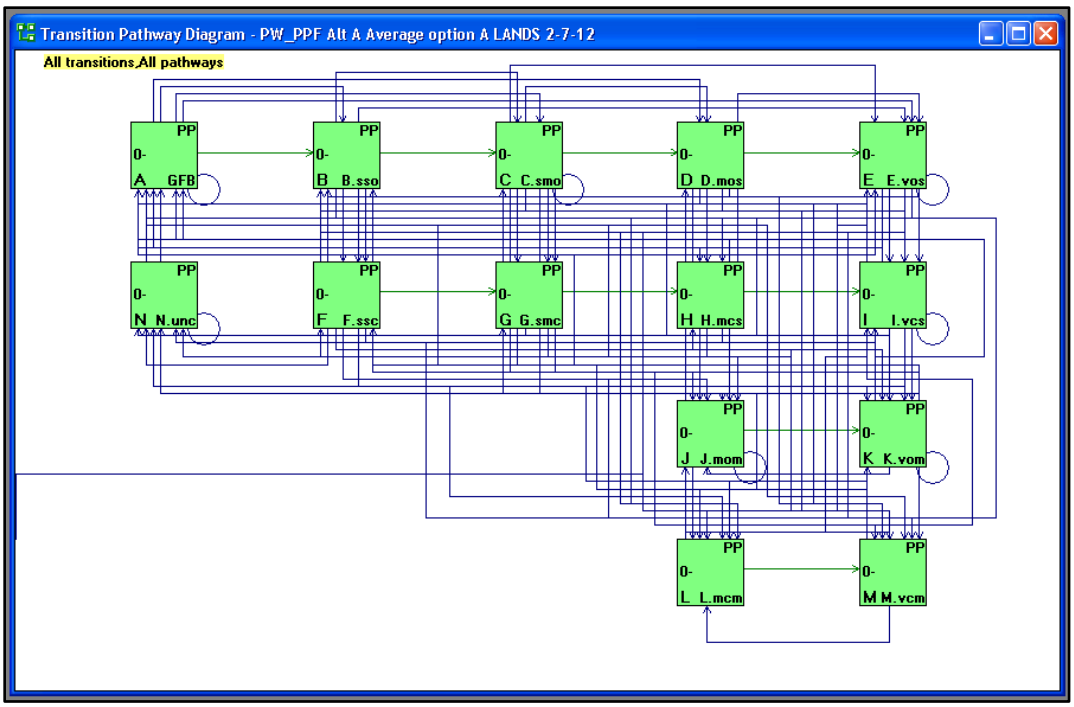
the current models, the increase in proportion of the landscape that is closed and susceptible to stand replacing fires that result in uncharacteristic grasslands that are not forested, and may have a low probability of becoming reforested without costly intervention, is readily apparent. When comparing the model outputs to existing conditions, it is likely that the model overestimates all classes of mature and old forest, which in reality have been reduced as a result of timber harvest (Bahre 1985), and underestimate the seedling and sapling class abundance due to the lack of a regeneration transition that would increase these class abundances (States A and F). The abundance of these model states could be refined through a careful assessment of forthcoming datasets that will quantify their current abundance in the mid-scale vegetation analysis.

These modeled scenarios implicate the importance of frequent surface fire in maintaining open ponderosa pine-bunchgrass ecosystems. When comparing the Historic versus the current models, the increase in proportion of the landscape that is closed and susceptible to stand replacing fires that result in uncharacteristic grasslands that are not forested, and may have a low probability of becoming reforested without costly intervention, is readily apparent. When comparing the model outputs to existing conditions, it is likely that the model overestimates all classes of mature and old forest, which in reality have been reduced as a result of timber harvest (Bahre 1985), and underestimate the seedling and sapling class abundance due to the lack of a regeneration transition that would increase these class abundances (States A and F). The abundance of these model states could be refined through a careful assessment of forthcoming datasets that will quantify their current abundance in the mid-scale vegetation analysis.

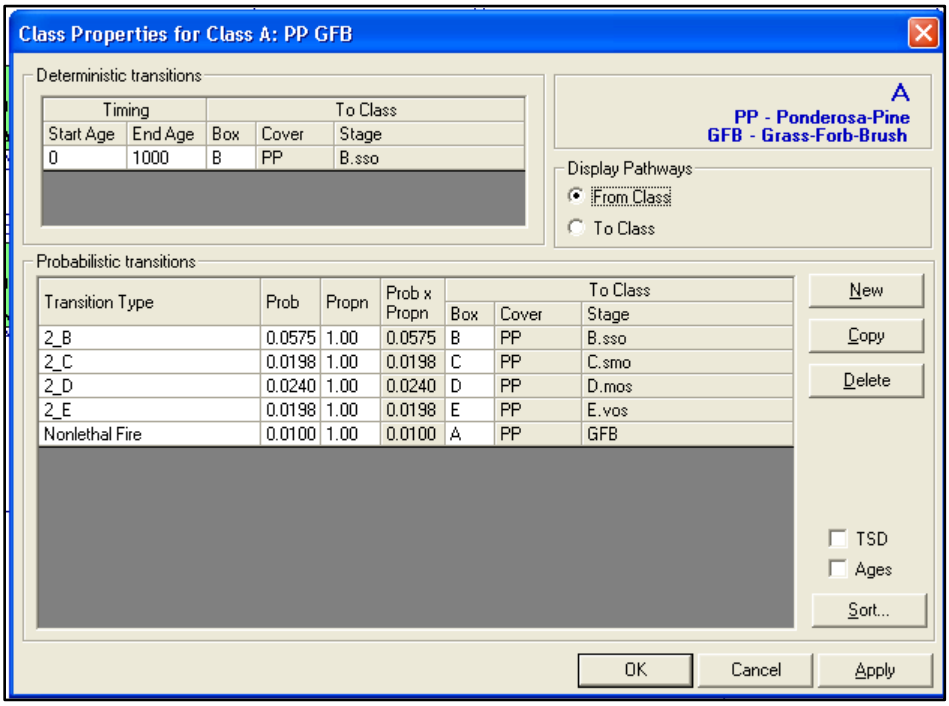
Appendix A figures 13- 27 through display the actual VDDT model for ponderosa pine forest, developed by the USFS Southwest Region 3, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends.

**Appendix A table 6. Identification of current transitions, frequency of transitions, sources of information used, and assumptions used to develop the frequency of transitions and its effect on vegetation for the ponderosa pine forest included in the VDDT models (adapted from Smith 2006b)**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Fuel build-up | Once every year after 25 years of growth | Several authors have documented the cessation of surface fires around 1880, which has led to the accumulation of fuels (Covington and Moore 1994; Swetnam and Baisan 1996; Allen et al. 2002; Fule et al. 2003) | Smith assumed that it would take approximately 25 years of growth since the last surface fire to move from an open canopy state (< 30% canopy cover) to a higher canopy state (> 30%). |
| Surface fire | Not used in current model | Covington and Moore 1994; Swetnam and Baisan 1996; Sneed et al. 2003; Allen et al. 2002; Fule et al. 2003. | Based on direct observation, we assume that surface fire has ceased at the scale of this model (9 million acres). Occasional surface fires do occur, but not at the same scale, and typically enough fuels have accumulated in most areas to quickly transition surface fires to stand replacing fires. Prescribed fire and fire use fires are occurring in some areas at some times, but not within the range of variability for this system. |
| Stand replacing fire | Once every 100 years | Cessation of surface fires and accumulation of fuels and development of fuel ladders has led to an increase in the frequency of stand replacing fires (Covington and Moore 1994; Swetnam and Baisan 1996; Covington et al. 1997; Allen et al. 2002). The effects of stand replacing fire on vegetation have been documented by Savage and Mast (2005). | Smith based his estimate of fire on fire scar data. Specifically, regional fire scar data shows drastic declines in fires from 1900 to present. Given these data, we estimated a fire occurrence of 1 in the last 100 years. Fires studied by Savage and Mast (2005) give proportions of ponderosa pine forests resulting from stand replacing fires of the 1940s to 1970s. These values were used in modeling the relative proportion of states resulting from stand replacing fire in ponderosa pine forests of the southwest. |
| Insect outbreak | Once every 50 to 100 years | Bark beetle insect outbreaks have occurred 1 to 2 times over the last century (Dahms and Geils 1997; Negrón et al. 2000). | Insect-mediated mortality of ponderosa pines is highly variable spatially and temporally, but stands seldom experience 100% mortality, and it is assumed that beetle outbreaks take patches from a closed to an open state of the same age. |
| Plant growth | 40 years | Transitions among model states were taken from silvicultural data summarized by Reynolds et al. (1992). | Smith assumed that transition from seedling/sapling to young forest takes approximately 40 years, and transitions from young to mid-age forest, mid-age to mature forest, and mature forest to old forest also take 40 years . |
| Silvicultural activities | Highly variable through time and across space, thus not included in the model | Ponderosa pine forests have been logged and thinned since the 1850s to 1880s, with silvicultural prescriptions ranging from clear-cutting to thinning of pole and smaller trees (Bahre 1985). | Smith assumed that the model overestimates the proportion of the current landscape in the mature to old forest open and closed classes due to the loss of many of the larger trees to timber harvest. |




**Appendix A figure 13. Actual VDDT state and transition model used for assessing trends in the ponderosa pine forest PNVT on the ASNFs**



Class Properties for Class A: PP GFB

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | B | PP | B.sso |

A
PP - Ponderosa-Pine
GFB - Grass-Forb-Brush

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0575 | 1.00 | 0.0575 | B | PP | B.sso |
| 2_C | 0.0198 | 1.00 | 0.0198 | C | PP | C.smo |
| 2_D | 0.0240 | 1.00 | 0.0240 | D | PP | D.mos |
| 2_E | 0.0198 | 1.00 | 0.0198 | E | PP | E.vos |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | A | PP | GFB |

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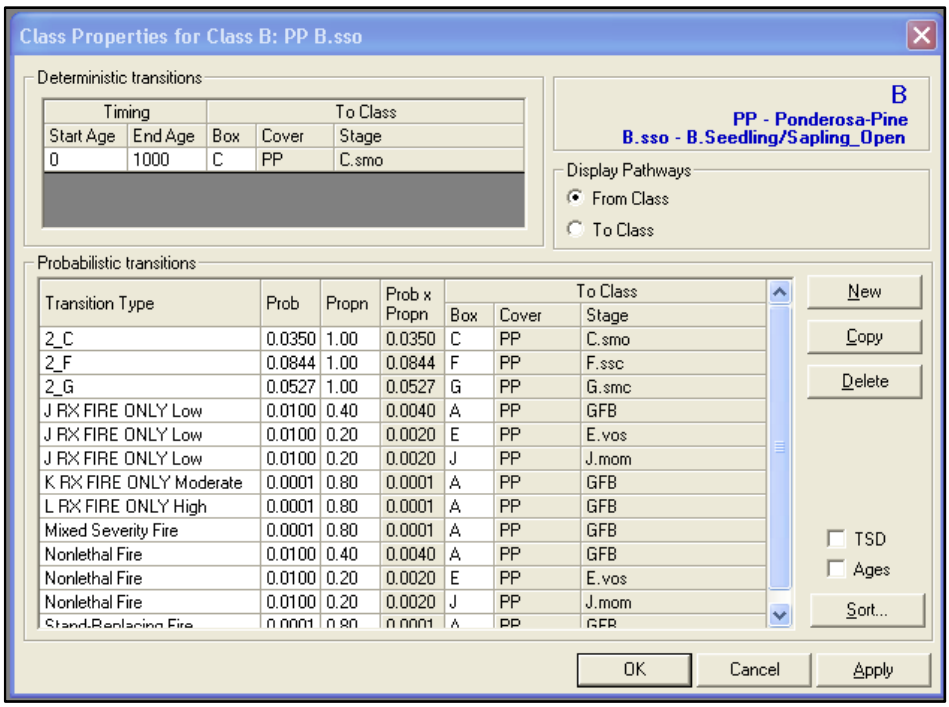
**Appendix A figure 14. Ponderosa pine forest PNVTs' potentially management driven (0) and naturally driven (5) transitions for State A**



Class Properties for Class B: PP B.sso

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | C | PP | C.smo |

B
PP - Ponderosa-Pine
B.sso - B.Seedling/Sapling_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0350 | 1.00 | 0.0350 | C | PP | C.smo |
| 2_F | 0.0844 | 1.00 | 0.0844 | F | PP | F.ssc |
| 2_G | 0.0527 | 1.00 | 0.0527 | G | PP | G.smc |
| J RX FIRE ONLY Low | 0.0100 | 0.40 | 0.0040 | A | PP | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.20 | 0.0020 | E | PP | E.vos |
| J RX FIRE ONLY Low | 0.0100 | 0.20 | 0.0020 | J | PP | J.mom |
| K RX FIRE ONLY Moderate | 0.0001 | 0.80 | 0.0001 | A | PP | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.80 | 0.0001 | A | PP | GFB |
| Mixed Severity Fire | 0.0001 | 0.80 | 0.0001 | A | PP | GFB |
| Nonlethal Fire | 0.0100 | 0.40 | 0.0040 | A | PP | GFB |
| Nonlethal Fire | 0.0100 | 0.20 | 0.0020 | E | PP | E.vos |
| Nonlethal Fire | 0.0100 | 0.20 | 0.0020 | J | PP | J.mom |
| Stand-Replacing Fire | 0.0001 | 0.80 | 0.0001 | A | PP | GFB |

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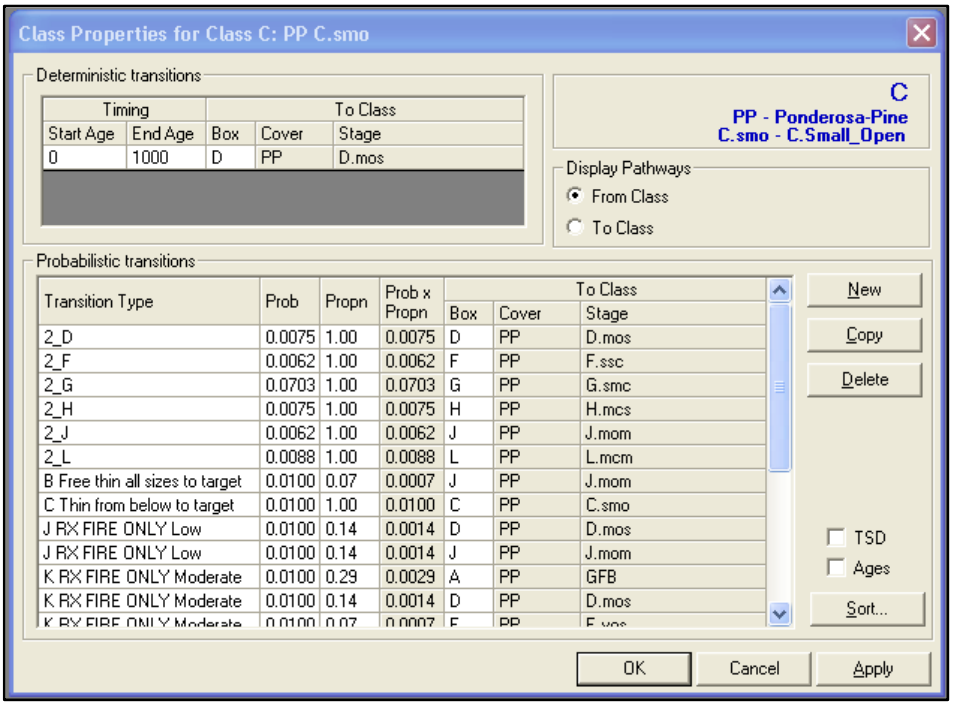
**Appendix A figure 15. Ponderosa pine forest PNVTs' potentially management driven (5) and naturally driven (9) transitions for State B**



Class Properties for Class C: PP C.smo

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | D | PP | D.mos |

C
PP - Ponderosa-Pine
C.smo - C.Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_D | 0.0075 | 1.00 | 0.0075 | D | PP | D.mos |
| 2_F | 0.0062 | 1.00 | 0.0062 | F | PP | F.ssc |
| 2_G | 0.0703 | 1.00 | 0.0703 | G | PP | G.smc |
| 2_H | 0.0075 | 1.00 | 0.0075 | H | PP | H.mcs |
| 2_J | 0.0062 | 1.00 | 0.0062 | J | PP | J.mom |
| 2_L | 0.0088 | 1.00 | 0.0088 | L | PP | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.07 | 0.0007 | J | PP | J.mom |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | C | PP | C.smo |
| J RX FIRE ONLY Low | 0.0100 | 0.14 | 0.0014 | D | PP | D.mos |
| J RX FIRE ONLY Low | 0.0100 | 0.14 | 0.0014 | J | PP | J.mom |
| K RX FIRE ONLY Moderate | 0.0100 | 0.29 | 0.0029 | A | PP | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.14 | 0.0014 | D | PP | D.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.07 | 0.0007 | E | PP | E.vos |

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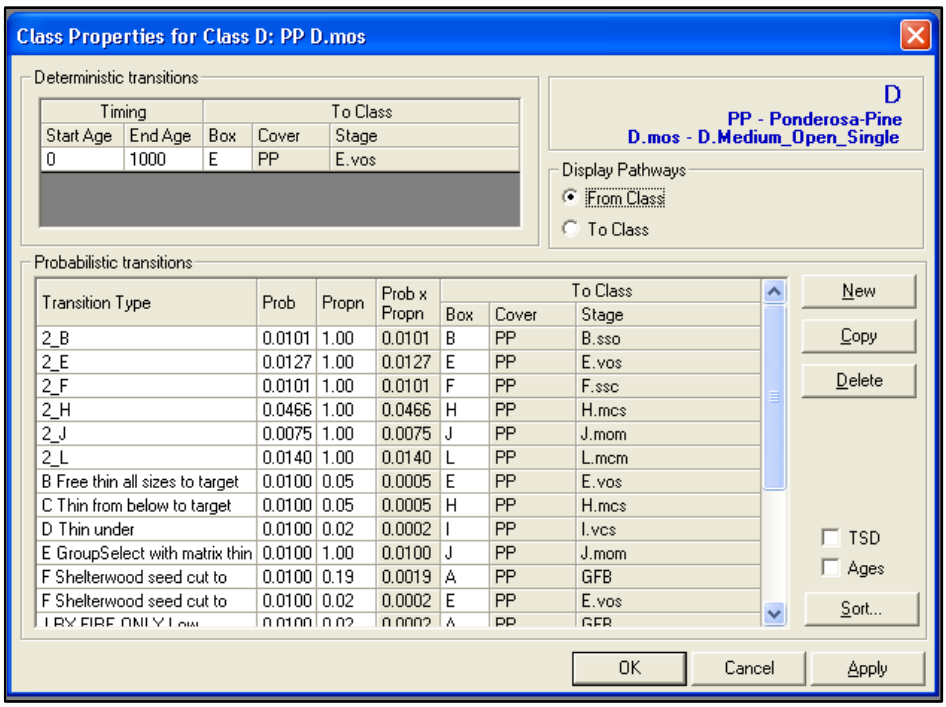
**Appendix A figure 16. Ponderosa pine forest PNVTs' potentially management driven (9) and naturally driven (13) transitions for State C**



Class Properties for Class D: PP D.mos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | PP | E.vos |

D
PP - Ponderosa-Pine
D.mos - D.Medium_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0101 | 1.00 | 0.0101 | B | PP | B.sso |
| 2_E | 0.0127 | 1.00 | 0.0127 | E | PP | E.vos |
| 2_F | 0.0101 | 1.00 | 0.0101 | F | PP | F.ssc |
| 2_H | 0.0466 | 1.00 | 0.0466 | H | PP | H.mcs |
| 2_J | 0.0075 | 1.00 | 0.0075 | J | PP | J.mom |
| 2_L | 0.0140 | 1.00 | 0.0140 | L | PP | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | H | PP | H.mcs |
| D Thin under | 0.0100 | 0.02 | 0.0002 | I | PP | I.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | PP | J.mom |
| F Shelterwood seed cut to | 0.0100 | 0.19 | 0.0019 | A | PP | GFB |
| F Shelterwood seed cut to | 0.0100 | 0.02 | 0.0002 | E | PP | E.vos |
| L RX FIRE ONLY Low | 0.0100 | 0.02 | 0.0002 | A | PP | GFB |

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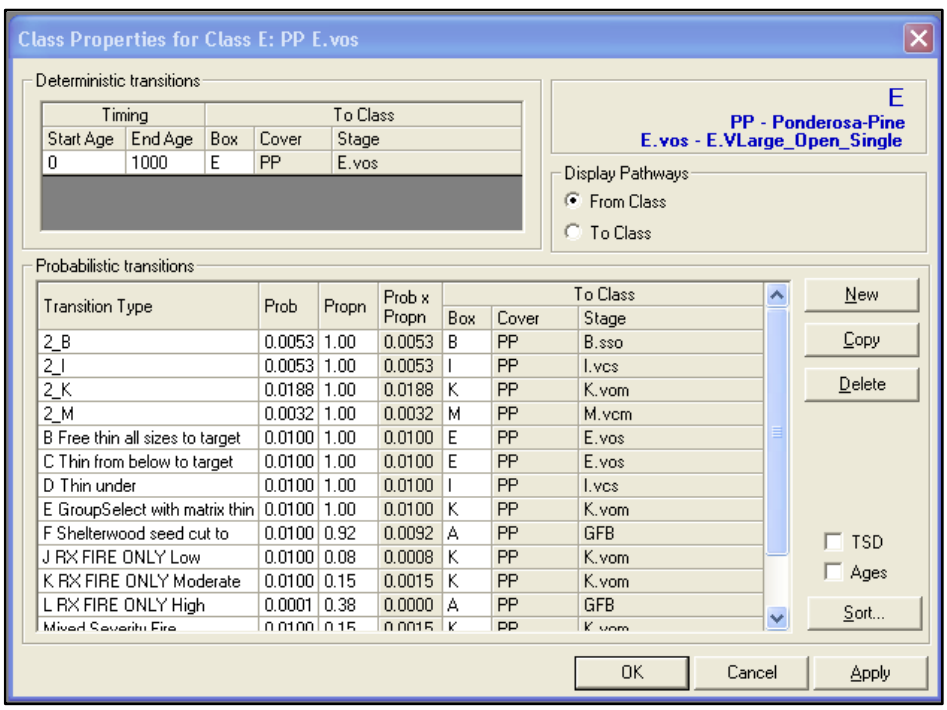
**Appendix A figure 17. Ponderosa pine forest PNVTs' potentially management driven (10) and naturally driven (10) transitions for State D**



Class Properties for Class E: PP E.vos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | PP | E.vos |

E
PP - Ponderosa-Pine
E.vos - E.VLarge_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0053 | 1.00 | 0.0053 | B | PP | B.sso |
| 2_I | 0.0053 | 1.00 | 0.0053 | I | PP | I.vcs |
| 2_K | 0.0188 | 1.00 | 0.0188 | K | PP | K.vom |
| 2_M | 0.0032 | 1.00 | 0.0032 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | E | PP | E.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | PP | I.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | PP | K.vom |
| F Shelterwood seed cut to | 0.0100 | 0.92 | 0.0092 | A | PP | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.08 | 0.0008 | K | PP | K.vom |
| K RX FIRE ONLY Moderate | 0.0100 | 0.15 | 0.0015 | K | PP | K.vom |
| L RX FIRE ONLY High | 0.0001 | 0.38 | 0.0000 | A | PP | GFB |
| Mixed Severity Fire | 0.0100 | 0.15 | 0.0015 | K | PP | K.vom |

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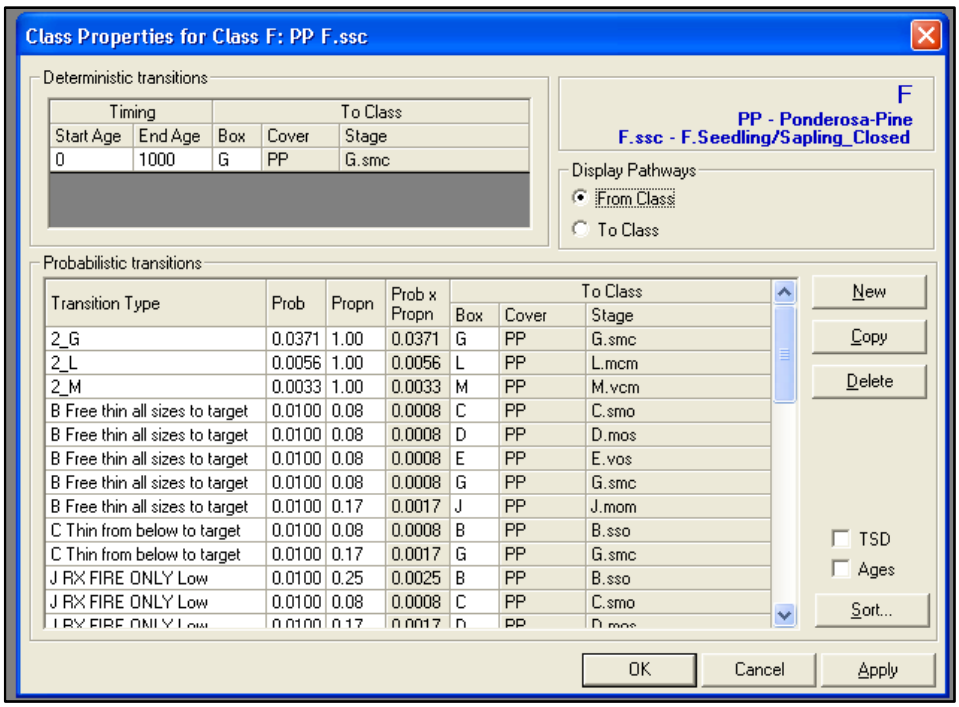
**Appendix A figure 18. Ponderosa pine forest PNVTs' potentially management driven (8) and naturally driven (7) transitions for State E**



Class Properties for Class F: PP F.ssc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | G | PP | G.smc |

F
PP - Ponderosa-Pine
F.ssc - F.Seedling/Sapling_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_G | 0.0371 | 1.00 | 0.0371 | G | PP | G.smc |
| 2_L | 0.0056 | 1.00 | 0.0056 | L | PP | L.mcm |
| 2_M | 0.0033 | 1.00 | 0.0033 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.08 | 0.0008 | C | PP | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.08 | 0.0008 | D | PP | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.08 | 0.0008 | E | PP | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.08 | 0.0008 | G | PP | G.smc |
| B Free thin all sizes to target | 0.0100 | 0.17 | 0.0017 | J | PP | J.mom |
| C Thin from below to target | 0.0100 | 0.08 | 0.0008 | B | PP | B.sso |
| C Thin from below to target | 0.0100 | 0.17 | 0.0017 | G | PP | G.smc |
| J RX FIRE ONLY Low | 0.0100 | 0.25 | 0.0025 | B | PP | B.sso |
| J RX FIRE ONLY Low | 0.0100 | 0.08 | 0.0008 | C | PP | C.smo |
| J RX FIRE ONLY Low | 0.0100 | 0.17 | 0.0017 | D | PP | D.mos |

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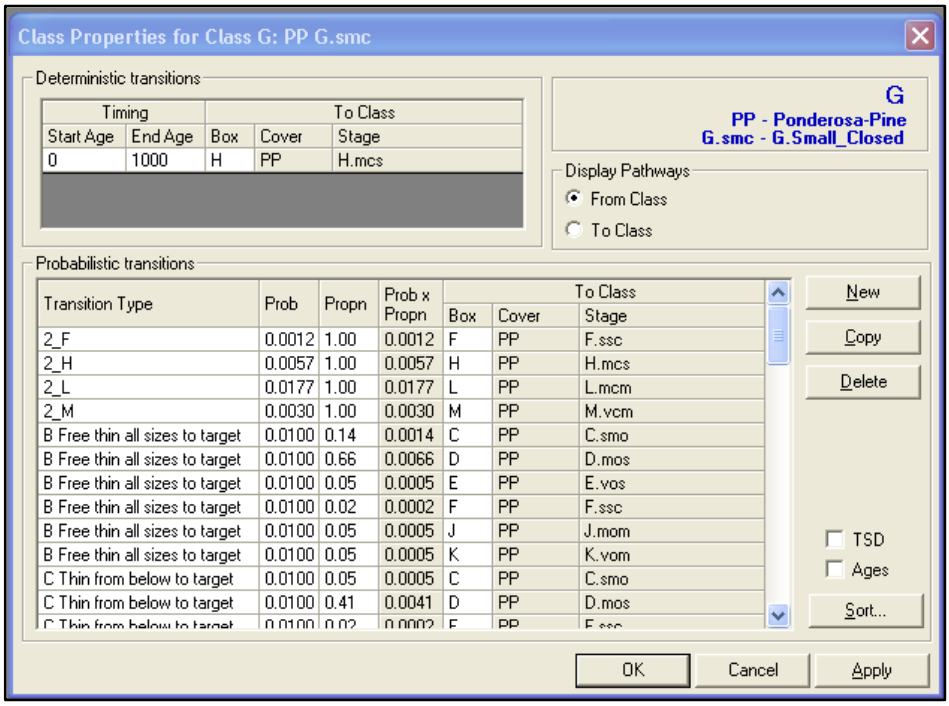
**Appendix A figure 19. Ponderosa pine forest PNVTs' potentially management driven (21) and naturally driven (17) transitions for State F**



Class Properties for Class G: PP G.smc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | H | PP | H.mcs |

G
PP - Ponderosa-Pine
G.smc - G.Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0012 | 1.00 | 0.0012 | F | PP | F.ssc |
| 2_H | 0.0057 | 1.00 | 0.0057 | H | PP | H.mcs |
| 2_L | 0.0177 | 1.00 | 0.0177 | L | PP | L.mcm |
| 2_M | 0.0030 | 1.00 | 0.0030 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.14 | 0.0014 | C | PP | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.66 | 0.0066 | D | PP | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | E | PP | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | F | PP | F.ssc |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | J | PP | J.mom |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | K | PP | K.vom |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | C | PP | C.smo |
| C Thin from below to target | 0.0100 | 0.41 | 0.0041 | D | PP | D.mos |
| C Thin from below to target | 0.0100 | 0.02 | 0.0002 | F | PP | F.ssc |

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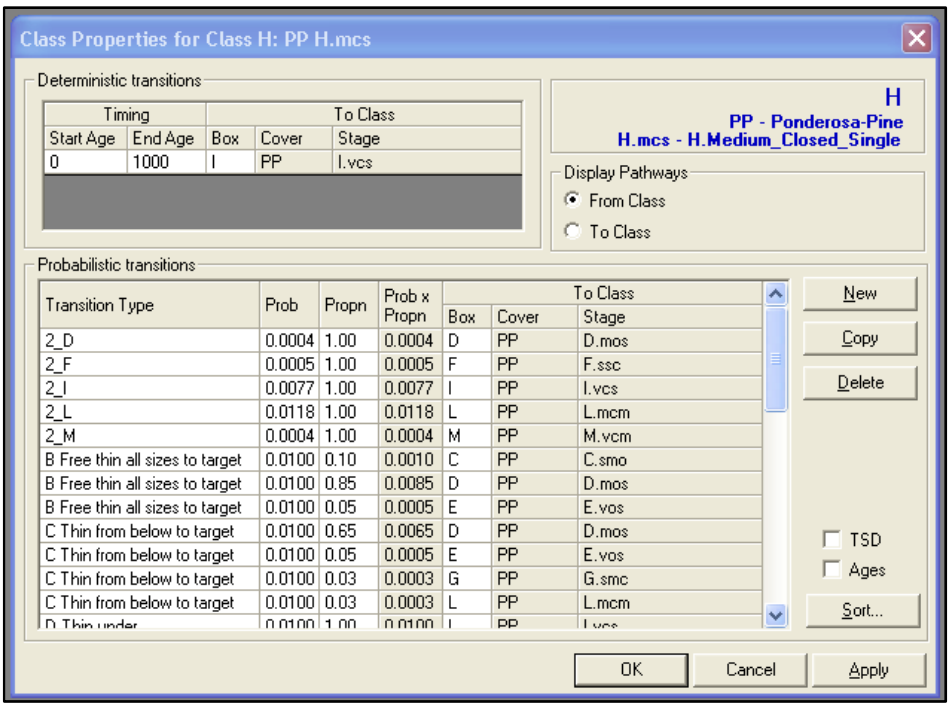
**Appendix A figure 20. Ponderosa pine forest PNVTs' potentially management driven (35) and naturally driven (27) transitions for State G**



Class Properties for Class H: PP H.mcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | I | PP | I.vcs |

H
PP - Ponderosa-Pine
H.mcs - H.Medium_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_D | 0.0004 | 1.00 | 0.0004 | D | PP | D.mos |
| 2_F | 0.0005 | 1.00 | 0.0005 | F | PP | F.ssc |
| 2_I | 0.0077 | 1.00 | 0.0077 | I | PP | I.vcs |
| 2_L | 0.0118 | 1.00 | 0.0118 | L | PP | L.mcm |
| 2_M | 0.0004 | 1.00 | 0.0004 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.10 | 0.0010 | C | PP | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.85 | 0.0085 | D | PP | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 0.65 | 0.0065 | D | PP | D.mos |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 0.03 | 0.0003 | G | PP | G.smc |
| C Thin from below to target | 0.0100 | 0.03 | 0.0003 | L | PP | L.mcm |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | PP | I.vcs |

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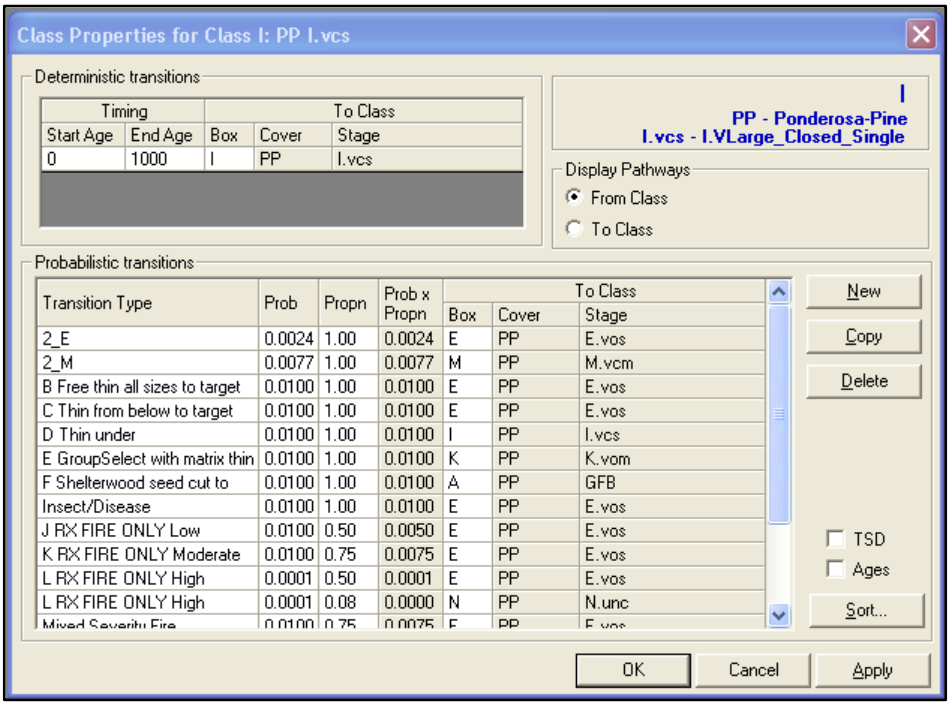
**Appendix A figure 21. Ponderosa pine forest PNVTs' potentially management driven (22) and naturally driven (15) transitions for State H**



Class Properties for Class I: PP I.vcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | I | PP | I.vcs |

I
PP - Ponderosa-Pine
I.vcs - I.VLarge_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_E | 0.0024 | 1.00 | 0.0024 | E | PP | E.vos |
| 2_M | 0.0077 | 1.00 | 0.0077 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | E | PP | E.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | PP | I.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | PP | K.vom |
| F Shelterwood seed cut to | 0.0100 | 1.00 | 0.0100 | A | PP | GFB |
| Insect/Disease | 0.0100 | 1.00 | 0.0100 | E | PP | E.vos |
| J RX FIRE ONLY Low | 0.0100 | 0.50 | 0.0050 | E | PP | E.vos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.75 | 0.0075 | E | PP | E.vos |
| L RX FIRE ONLY High | 0.0001 | 0.50 | 0.0001 | E | PP | E.vos |
| L RX FIRE ONLY High | 0.0001 | 0.08 | 0.0000 | N | PP | N.unc |
| Mixed Severity Fire | 0.0100 | 0.75 | 0.0075 | E | PP | E.vos |

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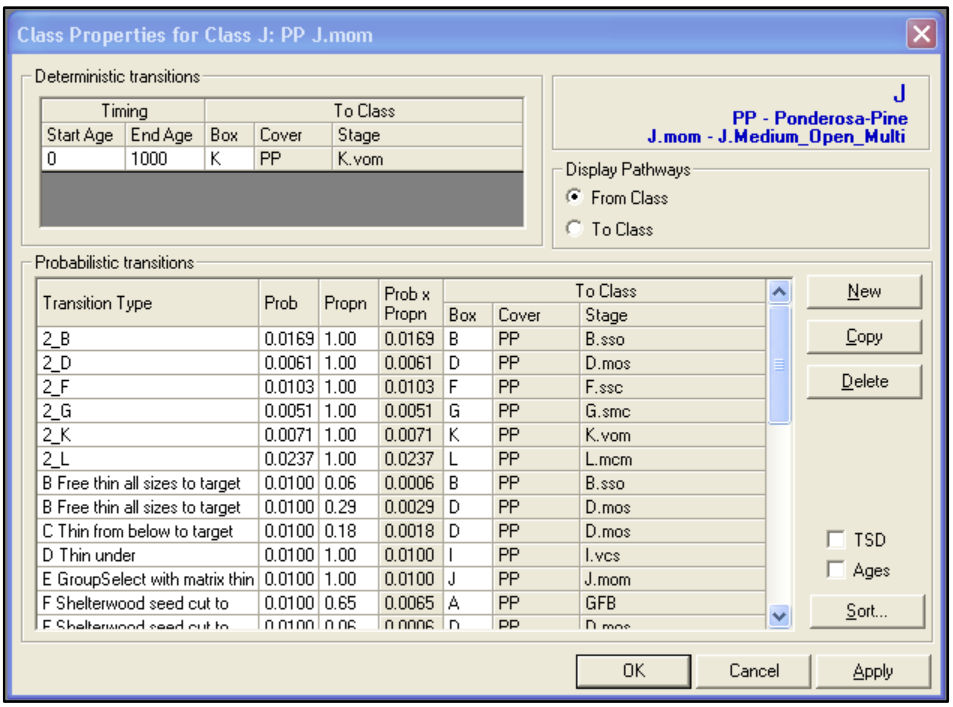
**Appendix A figure 22. Ponderosa pine forest PNVTs' potentially management driven (10) and naturally driven (8) transitions for State I**



Class Properties for Class J: PP J.mom

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | K | PP | K.vom |

J
PP - Ponderosa-Pine
J.mom - J.Medium_Open_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0169 | 1.00 | 0.0169 | B | PP | B.sso |
| 2_D | 0.0061 | 1.00 | 0.0061 | D | PP | D.mos |
| 2_F | 0.0103 | 1.00 | 0.0103 | F | PP | F.ssc |
| 2_G | 0.0051 | 1.00 | 0.0051 | G | PP | G.smc |
| 2_K | 0.0071 | 1.00 | 0.0071 | K | PP | K.vom |
| 2_L | 0.0237 | 1.00 | 0.0237 | L | PP | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | B | PP | B.sso |
| B Free thin all sizes to target | 0.0100 | 0.29 | 0.0029 | D | PP | D.mos |
| C Thin from below to target | 0.0100 | 0.18 | 0.0018 | D | PP | D.mos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | PP | I.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | PP | J.mom |
| F Shelterwood seed cut to | 0.0100 | 0.65 | 0.0065 | A | PP | GFB |
| F Shelterwood seed cut to | 0.0100 | 0.06 | 0.0006 | D | PP | D.mos |

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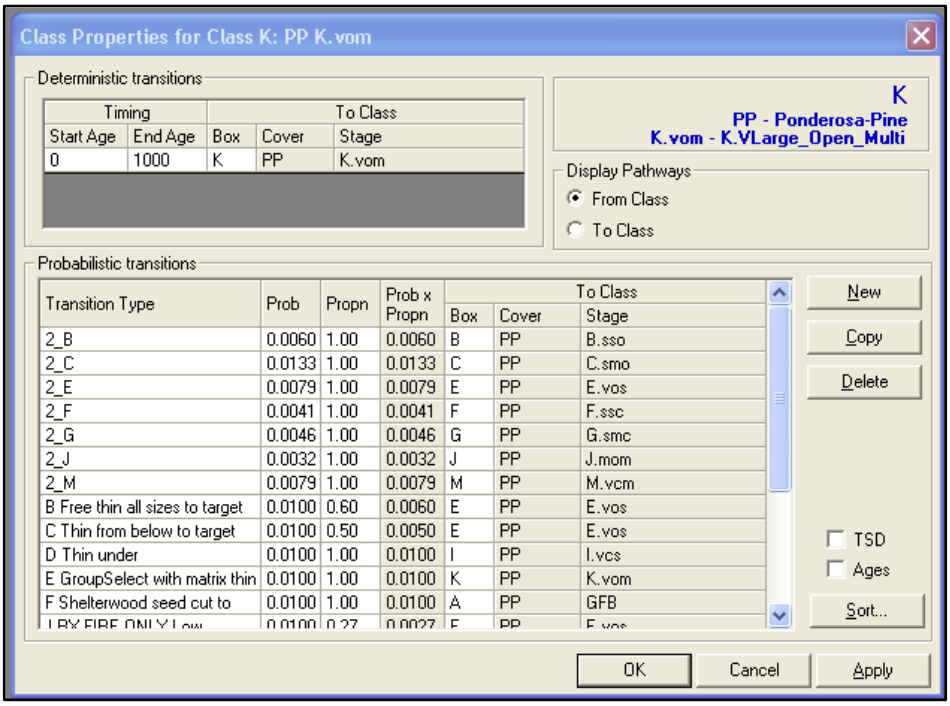
**Appendix A figure 23. Ponderosa pine forest PNVTs' potentially management driven (17) and naturally driven (14) transitions for State J**



Class Properties for Class K: PP K.vom

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | K | PP | K.vom |

K
PP - Ponderosa-Pine
K.vom - K.VLarge_Open_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0060 | 1.00 | 0.0060 | B | PP | B.sso |
| 2_C | 0.0133 | 1.00 | 0.0133 | C | PP | C.smo |
| 2_E | 0.0079 | 1.00 | 0.0079 | E | PP | E.vos |
| 2_F | 0.0041 | 1.00 | 0.0041 | F | PP | F.ssc |
| 2_G | 0.0046 | 1.00 | 0.0046 | G | PP | G.smc |
| 2_J | 0.0032 | 1.00 | 0.0032 | J | PP | J.mom |
| 2_M | 0.0079 | 1.00 | 0.0079 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.60 | 0.0060 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 0.50 | 0.0050 | E | PP | E.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | PP | I.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | PP | K.vom |
| F Shelterwood seed cut to | 0.0100 | 1.00 | 0.0100 | A | PP | GFB |
| LBX FIRE ONLY Low | 0.0100 | 0.27 | 0.0027 | E | PP | E.vos |

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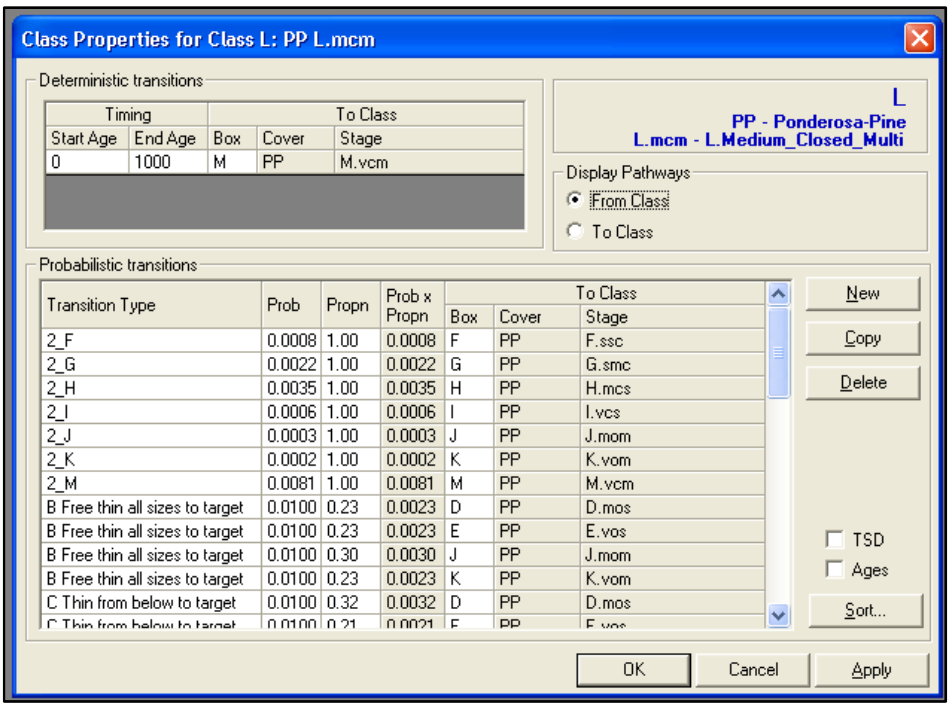
**Appendix A figure 24. Ponderosa pine forest PNVTs' potentially management driven (9) and naturally driven (11) transitions for State K**



Class Properties for Class L: PP L.mcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | M | PP | M.vcm |

L
PP - Ponderosa-Pine
L.mcm - L.Medium_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0008 | 1.00 | 0.0008 | F | PP | F.ssc |
| 2_G | 0.0022 | 1.00 | 0.0022 | G | PP | G.smc |
| 2_H | 0.0035 | 1.00 | 0.0035 | H | PP | H.mcs |
| 2_I | 0.0006 | 1.00 | 0.0006 | I | PP | I.vcs |
| 2_J | 0.0003 | 1.00 | 0.0003 | J | PP | J.mom |
| 2_K | 0.0002 | 1.00 | 0.0002 | K | PP | K.vom |
| 2_M | 0.0081 | 1.00 | 0.0081 | M | PP | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.23 | 0.0023 | D | PP | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.23 | 0.0023 | E | PP | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.30 | 0.0030 | J | PP | J.mom |
| B Free thin all sizes to target | 0.0100 | 0.23 | 0.0023 | K | PP | K.vom |
| C Thin from below to target | 0.0100 | 0.32 | 0.0032 | D | PP | D.mos |
| C Thin from below to target | 0.0100 | 0.21 | 0.0021 | E | PP | E.vos |

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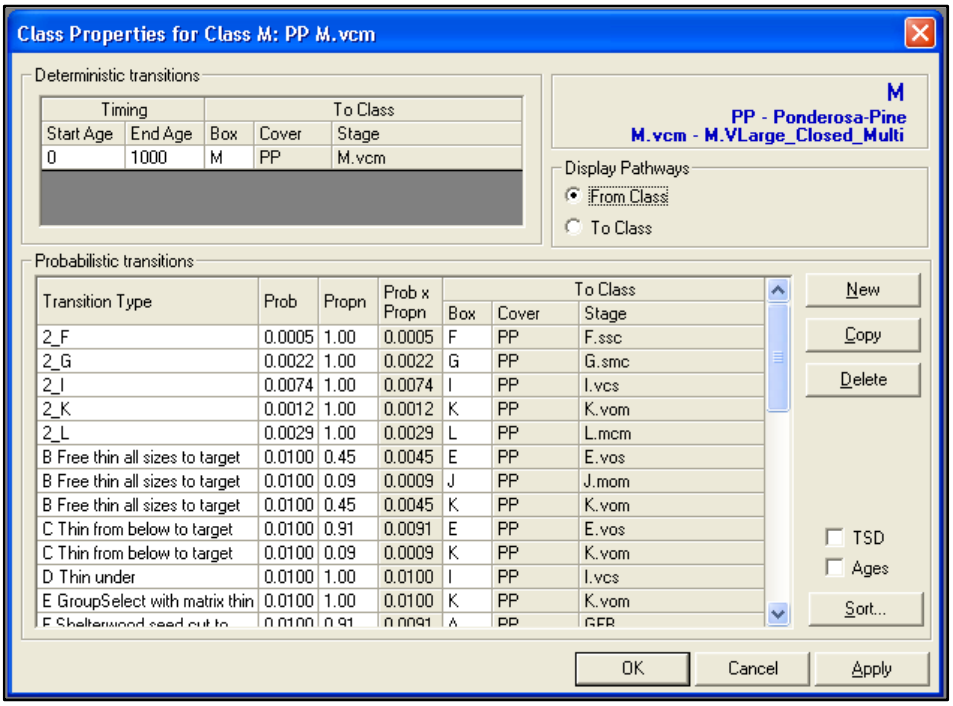
**Appendix A figure 25. Ponderosa pine forest PNVTs' potentially management driven (26) and naturally driven (20) transitions for State L**



Class Properties for Class M: PP M.vcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | M | PP | M.vcm |

M
PP - Ponderosa-Pine
M.vcm - M.VLarge_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0005 | 1.00 | 0.0005 | F | PP | F.ssc |
| 2_G | 0.0022 | 1.00 | 0.0022 | G | PP | G.smc |
| 2_I | 0.0074 | 1.00 | 0.0074 | I | PP | I.vcs |
| 2_K | 0.0012 | 1.00 | 0.0012 | K | PP | K.vom |
| 2_L | 0.0029 | 1.00 | 0.0029 | L | PP | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.45 | 0.0045 | E | PP | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.09 | 0.0009 | J | PP | J.mom |
| B Free thin all sizes to target | 0.0100 | 0.45 | 0.0045 | K | PP | K.vom |
| C Thin from below to target | 0.0100 | 0.91 | 0.0091 | E | PP | E.vos |
| C Thin from below to target | 0.0100 | 0.09 | 0.0009 | K | PP | K.vom |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | PP | I.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | PP | K.vom |
| E Shelterwood seed cut to | 0.0100 | 0.91 | 0.0091 | A | PP | GFR |

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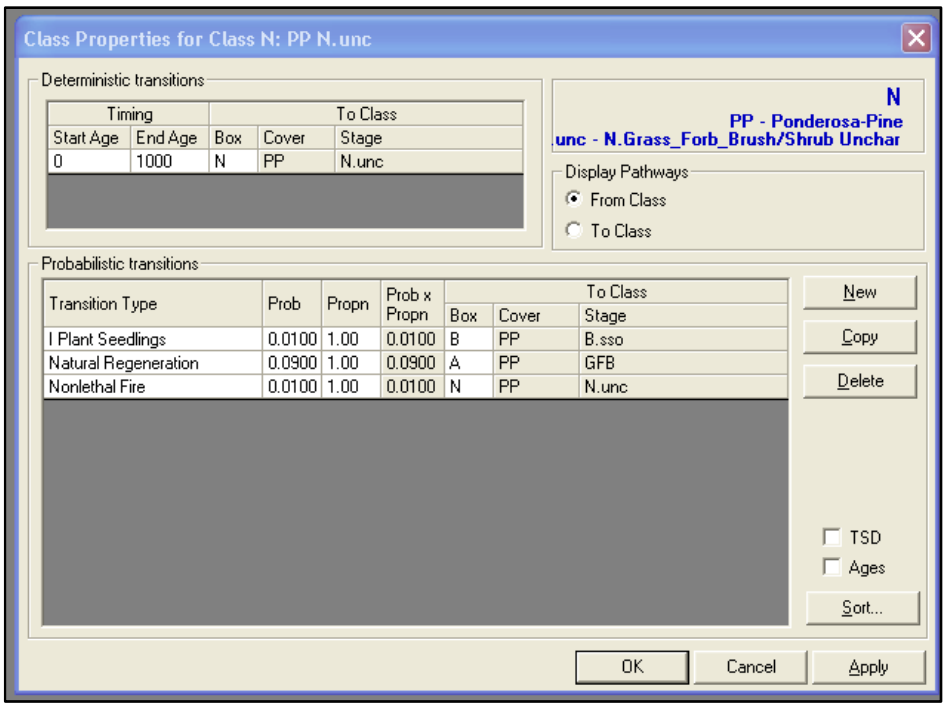
**Appendix A figure 26. Ponderosa pine forest PNVTs' potentially management driven (15) and naturally driven (6) transitions for State M**




**Appendix A figure 27. Ponderosa pine forest PNVTs' potentially management driven (1) and naturally driven (2) transitions for State N**

## Wet Mixed Conifer Forest

**Appendix A table 7. Wet mixed conifer forest (AKA "*Mixed conifer with aspen PNVT (MCW) - with and without aspen succession*") PNVT crosswalks developed by Region 3 (9 December 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Smith 2006b)**

| Current Trend Model | | | | R3 Mid-scale Existing Veg Mapping |
|---|---|---|---|---|
| Source | State†♪ | Description | | Dominance Unit - Size/Cover |
| USFS R3 model MCW | A, ***K*** | GFB/SHR (all) | = | Non-treed: Recently burned, grass, forb, and shrub types - N/A |
| | B | Aspen/mixed deciduous (all size and cover classes) | = | All quaking aspen, deciduous tree mix, and evergreen-deciduous mix tree types (e.g., quaking aspen_Douglas-fir) - Seedling/sapling, small, medium, and very-large all cover classes |
| | C℄ | SSC, SMC tolerant conifer (SSO, SMO tolerant also included here)‡ | = | Shade tolerant/mixed tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Seedling/sapling, small, all cover classes |
| | G, ***P*** | SSO, SMO intolerant conifer | = | Shade intolerant tree types - Seedling/sapling - open, small-open |
| | ***L*** | SSC, SMC intolerant conifer | = | Shade intolerant tree types - Seedling/sapling - closed, small-closed |
| | D, ***M*** | MC tolerant conifer (MO tolerant also included here)‡ | = | Shade tolerant and mixed tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Medium, all cover classes |
| | H, ***Q*** | MO intolerant conifer (MC intolerant also included here‡) | = | All shade intolerant tree types - Medium, all cover classes |
| | E, ***N*** | VCS tolerant conifer (VCS intolerant also included here)‡ | = | Shade tolerant and shade intolerant tree types - Very large - closed |
| | F, ***O*** | VCM tolerant conifer (VCM intolerant also included here)‡ | | |
| | I, ***R*** | VOS tolerant conifer (include VOS intolerant conifers here)‡ | = | All shade tolerant and shade intolerant tree types - Very large - open |
| | J, ***S*** | VOM tolerant conifer (include VOM intolerant conifers here)‡ | | |

† States with elk and no quaking aspen regeneration are indicated in **bold** and *italic*, and are found on contemporary landscapes only and were not part of the historic conditions

♪Initial conditions are proportioned for A-K, D-M, E-N, F-O, G-P, H-Q, I-R, and J-S according to the proportion of the landscape outside and inside elk summer range, respectively

℄R3 model state C has only partial overlap in theme with TNC states C and F, but provides a better cross-reference than other options

‡Atypical type without a model state, included with the next most similar state

| Reference Condition | | | |
|---|---|---|---|
| Source | TNC State | Historic Mean† (%) | Description |
| TNC SW Mixed Conifer with Aspen | A | 1 | Grass/forb with quaking aspen or oak ramets, 10 - 40% tree cover |
| | B | 21 | Quaking aspen/mixed-quaking aspen forest, > 40% tree cover, dominated by quaking aspen or oak, conifer understory. |
| | C, F | 29 | Mixed conifer forest with regeneration, 20 - 60%+ tree cover |
| | D, G | 49 | Mixed conifer old forest with regeneration, 20 - 60%+ tree cover |

†Based on 15-yr non-lethal fire interval

| Baseline Desired Conditions | |
|---|---|
| Historic Mean (%) | Description |
| 7 | Reference condition including systems with no quaking aspen succession† |
| 21 | Reference condition |
| 18 | Reference condition including systems with no quaking aspen succession† |
| 14 | Reference condition including systems with no quaking aspen succession† |
| 40 | Reference condition including systems with no quaking aspen succession.† Higher proportions can be expected for associations with longer stand replacement intervals‡ |

†Weibull age-class distribution model used to estimate values for systems with no quaking aspen succession, model parameters below (300 years - stand cycle age, quaking aspen succession system; 200 years - stand cycle age, no quaking aspen succession system; 63% - proportion of landscape occurring with quaking aspen succession; 0.8 – severity coefficient, Weibull model; 263 – resulting average stand cycle age)

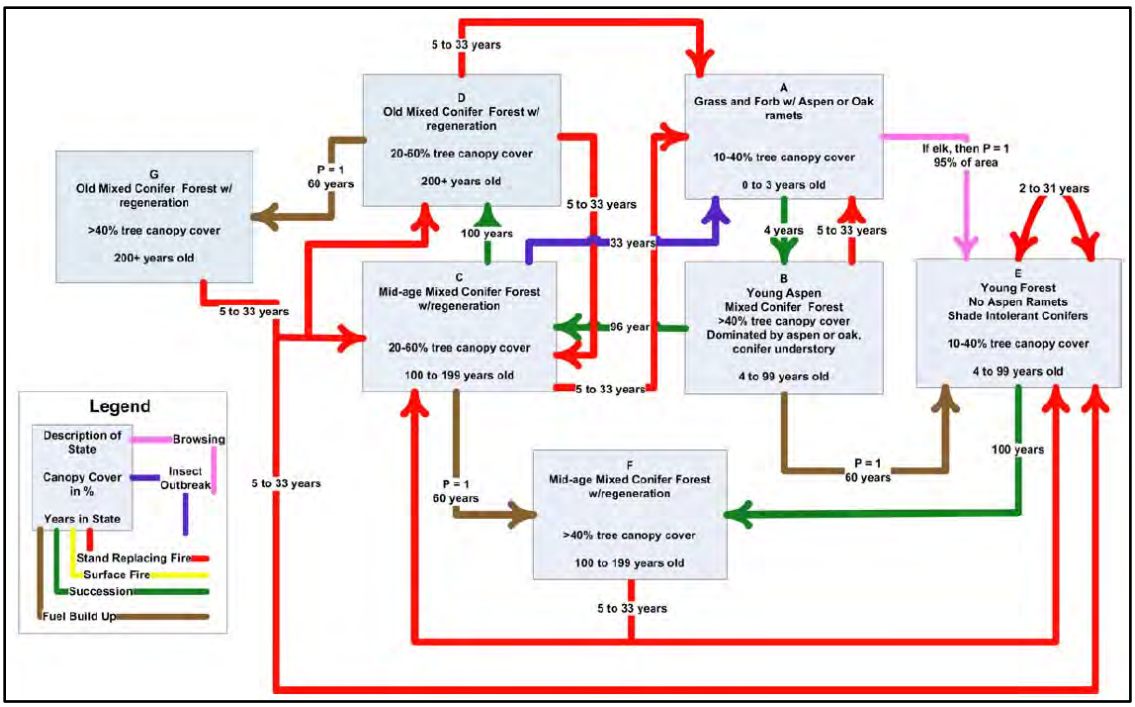
‡Adaptation strategies to thin stands (to states C, F) are limited where white fir and spruce dominate.

### *Wet Mixed Conifer Forest ("AKA - Mixed Conifer with Aspen") State and Transition Models*

The following is Smith's (2006c) discussion concerning the current modeling results for wet mixed conifer forest.

Based on this understanding of vegetation dynamics, we created state and transition models depicting historic (pre-1880) and current (1880 to present) vegetation dynamics within this forest. Additionally, we used information from the state and transition models to develop quantitative VDDT models. The VDDT 17-3 software allows the user to model succession as a series of vegetation states that differ in structure, composition, and cover and to specify the amount of time it takes to move from one vegetation state to another in the absence of disturbance. Various disturbance agents affecting the movement of vegetation between states can then be incorporated (e.g., surface fires, stand-replacing fires, grazing and browsing, insect outbreaks). By varying the types and rates of disturbance across the landscape, the effects of different management treatments, such as wildland fire use, fire suppression, prescribed burning, grazing practices, and mechanical fuel treatments, on future vegetation can be investigated. While VDDT models can be used to "game play" with different management scenarios, the models we ran in this analysis only include states and transitions for which there is published information to support their inclusion within the model. Smith discusses model parameters, output, and analysis below.

Figure 28 displays a conceptual current state and transition model for the wet mixed conifer forest vegetation type (Smith 2006d) used in VDDT modeling. In table 23, Smith (2006d) describes the parameters included or not included within the current VDDT models (Schussman and Smith 2006ab), as well as the sources of information and any assumptions used to create the model parameters.




**Appendix A figure 28. Conceptual current state and transition model for the wet mixed conifer forest vegetation type. Frequency of transitions are noted when this information is supported by published sources, where no or conflicting information exists on the frequency of transitions, unknown is the notation. Dashed outlines represent states which may have been uncharacteristic for the historic period (Smith 2006c)**

The current mixed conifer with aspen model, which was run for 120 years following the development of historic conditions, had very different results from the historic model (table 17-4[25]). Old forest open (state D) has been reduced by about half for all three fire interval models, and aspen regeneration (State A) has been reduced by about 75% for the two least frequently burned landscapes, and by about 90% for the most frequently burned landscape. With a fire return interval (FRI) of 33 years, slightly less than a third of the landscape is in the old forest closed state (state G), slightly more than a third is in the old forest open (state D), and around 10% is in states C, E, and F. Also, with an FRI = 33 years, the two youngest historic classes are not well represented (state A <1%, state B <3%), and over 50% of the landscape is in states that are not characteristic based on the historic model (states E, F, and G). With the average FRI (15 years), 56% of the landscape is uncharacteristic, and for the minimum FRI (5 years), almost 70% of the landscape is uncharacteristic.

These modeled scenarios implicate the importance of frequent surface fire in maintaining both ends of the age spectrum for mixed conifer with aspen forests. The reduction by half of the open, mature/old forest (state D) may have a large impact on wildlife species that depend on old trees and forests. Replacement of these older, more open-canopied forests with denser, closed-canopied forests may also affect the abundance and diversity of shrubs, understory grasses and forbs. Also, the loss of early aspen regeneration and subsequent young and mid-aged forest with a strong aspen component is important due to the potential decline of species of wildlife that utilize aspen. Typically, we think of aspen decline being caused by overtopping and succession

[25] See Smith 2006c.

by conifers (Shaw 2005). In the absence of disturbance such as fire, few young aspen ramets are produced, and aspen regenerates in very small patches. However, under the scenario presented in the current model, lack of surface fire is compounded by the addition of heavy browsing by an introduced ungulate, Rocky Mountain elk, which hastens the decline of aspen by reducing young ramets across the landscape, and changes its trajectory along a hypothetically irreversible pathway.

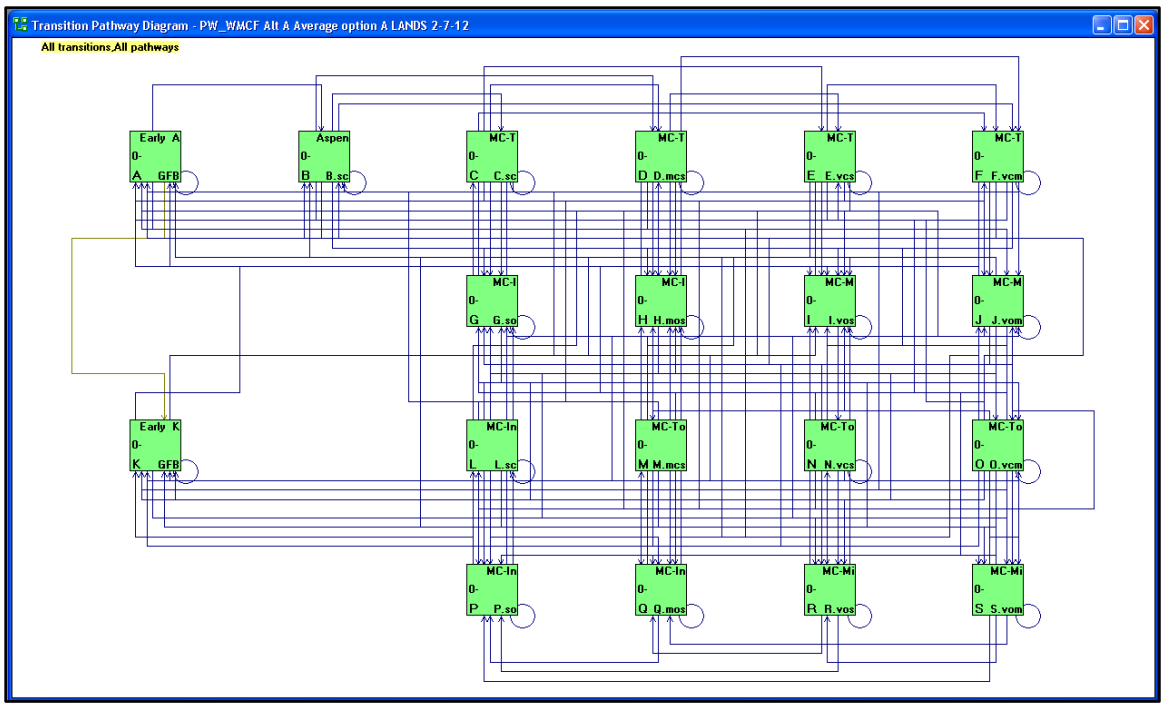
Under the current scenario, there is a large increase in the proportion of closed, mid- age to old age forests. In a forest system that has evolved with occasional, small scale stand replacing fire, the elimination of surface fire may lead to increased frequency, and probably more importantly, more widespread spatially stand replacing fire, of higher intensity, covering more area per decade than was experienced in the historic, or prehistoric periods.

Appendix A figures 29 through 48 display the actual VDDT model for wet mixed conifer forest, developed by the USFS Southwest Region 3, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends.

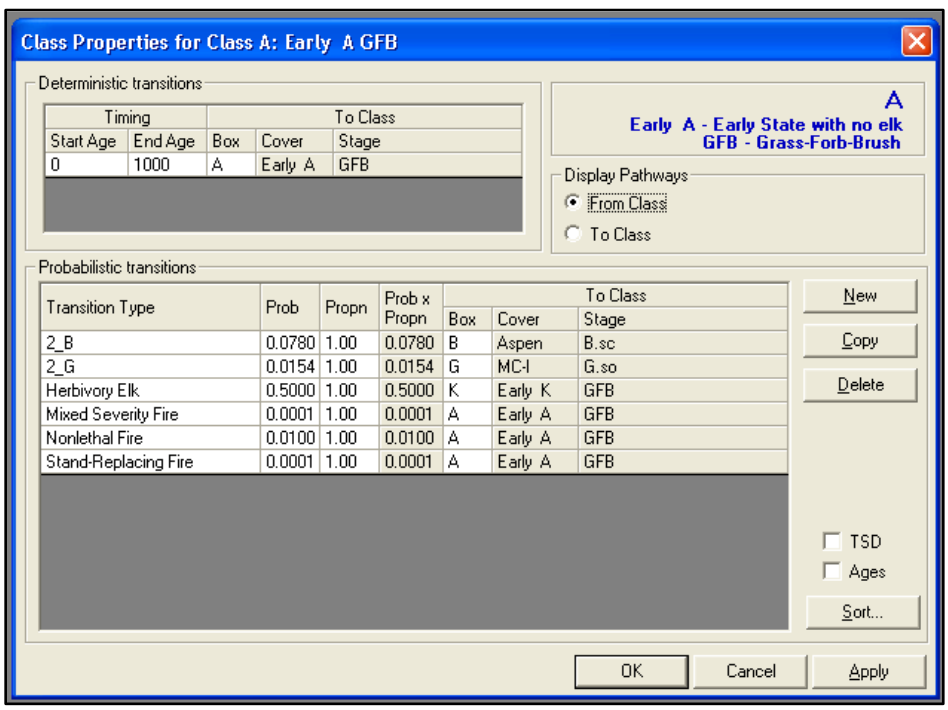
**Appendix A table 8. Identification of current transitions, frequency of transitions, sources of information used, and assumptions used to develop the frequency of transitions and its effect on vegetation included in the VDDT models (adapted from Smith 2006c)**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Fuel build up | Once every year. | Several authors have documented the cessation of surface fires around 1880, which has led to the accumulation of fuels (Covington and Moore 1994; Swetnam and Baisan 1996; Allen et al. 2002; Fulé et al. 2003) | Smith assumed that it would take approximately 60 years of growth since the last surface fire to move from an open canopy state (< 30% canopy cover) to a higher canopy state (> 30%). |
| Surface fire | Not used in current model | Covington and Moore 1994; Swetnam and Baisan 1996; Sneed et al. 2003; Allen et al. 2002; Fule et al. 2003. | Based on direct observation, we assume that surface fire has ceased at the scale of this model (~2 million acres). Occasional surface fires do occur, but not at the same scale, and typically enough fuels have accumulated in most areas to quickly transition surface fires to stand replacing fires. Prescribed fire and fire use fires are occurring in some areas at some times, but not within the range of variability for this system. |
| Stand replacing fire | Once every 5 to 33 years | Cessation of surface fires and accumulation of fuels and development of fuel ladders has not yet led to an increase in the frequency of stand replacing fires, but the size of patches affected by these fire events may be increasing (Swetnam et al. 2005). | Smith assumed that stand replacing fires have not changed in frequency, but that they have changed in how much area they affect, and which states they move forests to. We assumed that stand replacing fires currently move 10-20% of the landscape area (double historic values) to equal proportions of less dense or younger forest classes (e.g. state G goes to states E, C and D; state F goes to states C and E, but state E does not go to state B because aspen has been removed by browsing, so state E stays at state E.). |
| Insect outbreak | 33 years between outbreaks | Swetnam 1987, Lynch and Swetnam 1992. | Western spruce budworm outbreaks occurred once every 33 years on average, preferentially during wet periods, and primarily on mid-age forests. We assumed that the area affected by defoliations was small (< 5% of landscape) but openings would be moved back to the regeneration state (A). |
| Browsing | Once every year in presence of elk over 95% of landscape | If elk are present, they browse aspen until it does not produce ramets within 2-5 years (Bailey and Whitham 2002; Rolf unpublished report†). | Smith assumed that elk have moved aspen recruitment dynamics into a new trajectory, where regeneration by conifers occurs not under the shade of aspens, but in full sun, preferentially selecting for shade intolerant species such as ponderosa pine. Since aspen are short-lived trees, this process may not be reversible unless mature aspen is still extant. |
| Plant growth State E to State F | 95 years from young to mid-age forest | Jones and DeByle 1985. | Smith assumed that the transition from young forest to mid-age forest takes approximately 95 years, as conifer trees in the understory grow into the canopy. Tree composition may be different from historic based on above effects of browse pressure and lack of surface fires. |
| Plant growth State F to State G | 100 years from mid-age forest to old/mature forest | Old growth characteristics begin developing around 200 years (Mehl 1992). | Smith assumed that transition from mid-age to mature/old forest takes approximately 100 years, with multiple conifer regeneration events occurring, aspen decline is nearly complete, and stand structure has closed due to infill by regeneration and growth of mid-age trees. |
| Silvicultural activities | Highly variable through time and across space, thus not included in the model. | Mixed conifer forests have been logged and thinned since the 1850s to 1880s, with silvicultural prescriptions ranging from clear-cutting to thinning of pole and smaller trees (Bahre 1985). | Smith assumed that the model overestimates the proportion of the current landscape in the old forest open and closed classes (states D and G) due to the loss of many of the larger trees to timber harvest that is not accounted for in the model. |

†Rolf, James 2005. Unpublished report. USDA-USFS, Coconino National Forest, Flagstaff, Arizona




**Appendix A figure 29. Actual VDDT state and transition model used for assessing trends in the wet mixed conifer forest PNVT on the ASNFs**



Class Properties for Class A: Early A GFB

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | A | Early A | GFB |

A
Early A - Early State with no elk
GFB - Grass-Forb-Brush

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0780 | 1.00 | 0.0780 | B | Aspen | B.sc |
| 2_G | 0.0154 | 1.00 | 0.0154 | G | MC-I | G.so |
| Herbivory Elk | 0.5000 | 1.00 | 0.5000 | K | Early K | GFB |
| Mixed Severity Fire | 0.0001 | 1.00 | 0.0001 | A | Early A | GFB |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| Stand-Replacing Fire | 0.0001 | 1.00 | 0.0001 | A | Early A | GFB |

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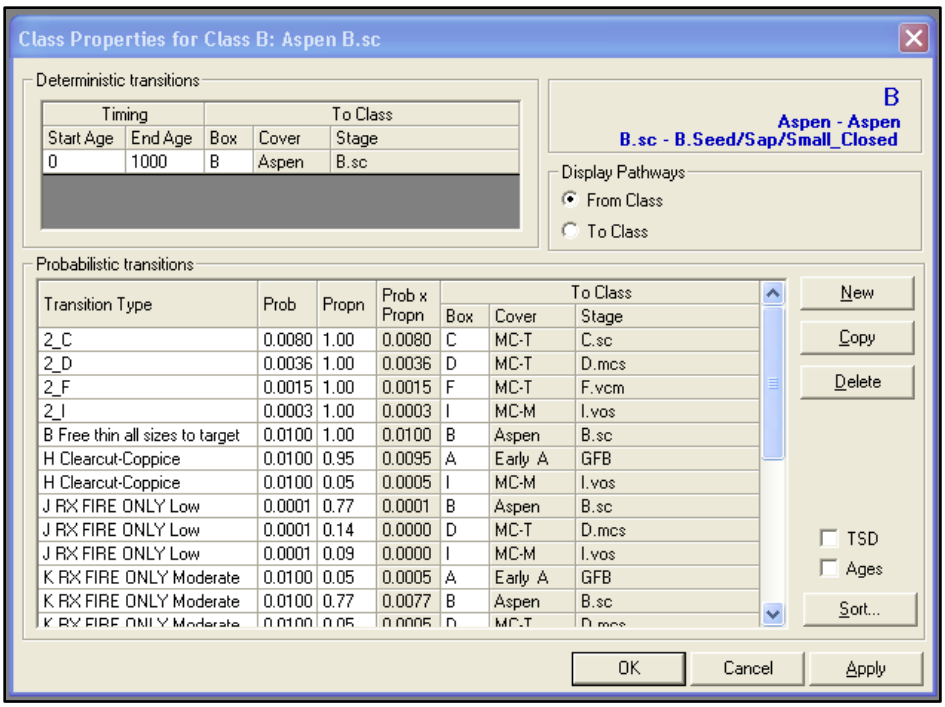
**Appendix A figure 30. Wet mixed conifer forest PNVTs' potentially management driven (0) and naturally driven (6) transitions for State A**



Class Properties for Class B: Aspen B.sc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | B | Aspen | B.sc |

B
Aspen - Aspen
B.sc - B.Seed/Sap/Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0080 | 1.00 | 0.0080 | C | MC-T | C.sc |
| 2_D | 0.0036 | 1.00 | 0.0036 | D | MC-T | D.mcs |
| 2_F | 0.0015 | 1.00 | 0.0015 | F | MC-T | F.vcm |
| 2_I | 0.0003 | 1.00 | 0.0003 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | B | Aspen | B.sc |
| H Clearcut-Coppice | 0.0100 | 0.95 | 0.0095 | A | Early A | GFB |
| H Clearcut-Coppice | 0.0100 | 0.05 | 0.0005 | I | MC-M | I.vos |
| J RX FIRE ONLY Low | 0.0001 | 0.77 | 0.0001 | B | Aspen | B.sc |
| J RX FIRE ONLY Low | 0.0001 | 0.14 | 0.0000 | D | MC-T | D.mcs |
| J RX FIRE ONLY Low | 0.0001 | 0.09 | 0.0000 | I | MC-M | I.vos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.05 | 0.0005 | A | Early A | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.77 | 0.0077 | B | Aspen | B.sc |
| K RX FIRE ONLY Moderate | 0.0100 | 0.05 | 0.0005 | D | MC-T | D.mcs |

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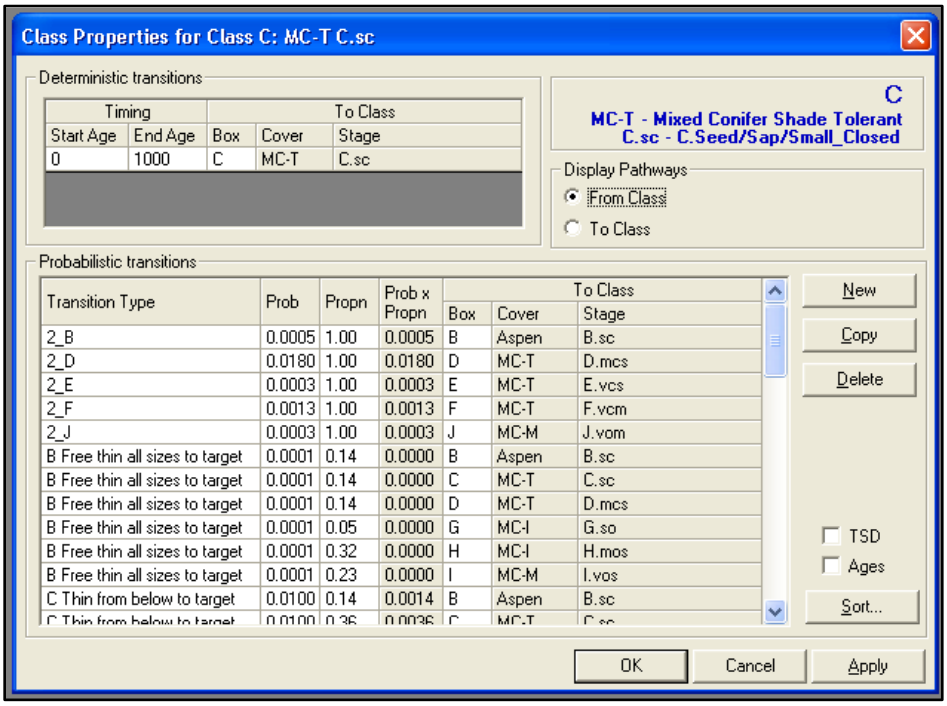
**Appendix A figure 31. Wet mixed conifer forest PNVTs' potentially management driven (10) and naturally driven (11) transitions for State B**



Class Properties for Class C: MC-T C.sc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | C | MC-T | C.sc |

C
MC-T - Mixed Conifer Shade Tolerant
C.sc - C.Seed/Sap/Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0005 | 1.00 | 0.0005 | B | Aspen | B.sc |
| 2_D | 0.0180 | 1.00 | 0.0180 | D | MC-T | D.mcs |
| 2_E | 0.0003 | 1.00 | 0.0003 | E | MC-T | E.vcs |
| 2_F | 0.0013 | 1.00 | 0.0013 | F | MC-T | F.vcm |
| 2_J | 0.0003 | 1.00 | 0.0003 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0001 | 0.14 | 0.0000 | B | Aspen | B.sc |
| B Free thin all sizes to target | 0.0001 | 0.14 | 0.0000 | C | MC-T | C.sc |
| B Free thin all sizes to target | 0.0001 | 0.14 | 0.0000 | D | MC-T | D.mcs |
| B Free thin all sizes to target | 0.0001 | 0.05 | 0.0000 | G | MC-I | G.so |
| B Free thin all sizes to target | 0.0001 | 0.32 | 0.0000 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0001 | 0.23 | 0.0000 | I | MC-M | I.vos |
| C Thin from below to target | 0.0100 | 0.14 | 0.0014 | B | Aspen | B.sc |
| C Thin from below to target | 0.0100 | 0.36 | 0.0036 | C | MC-T | C.sc |

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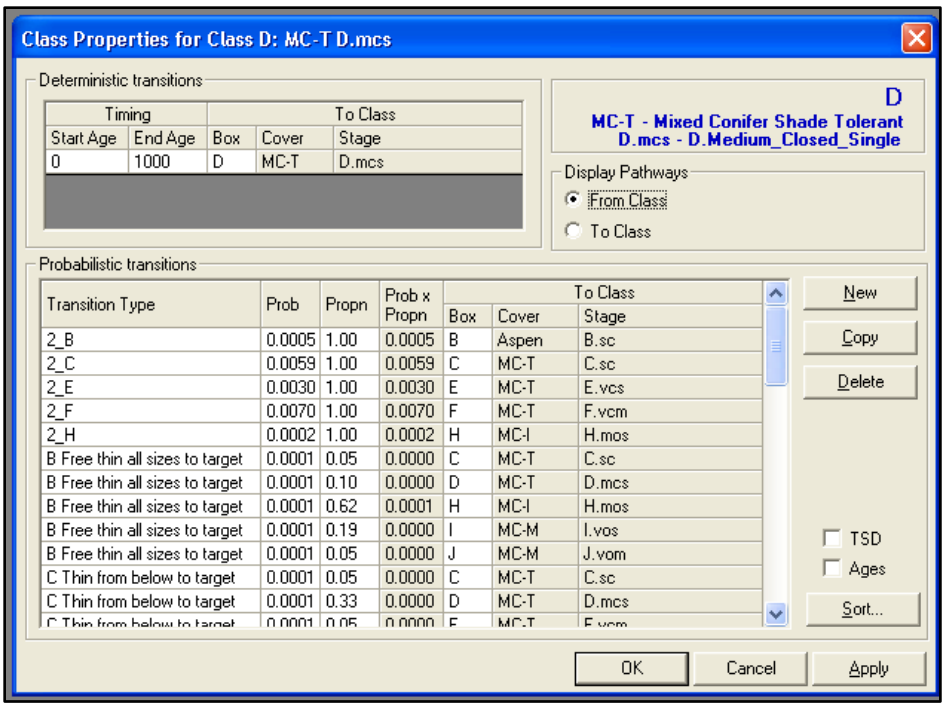
**Appendix A figure 32. Wet mixed conifer forest PNVTs' potentially management driven (26) and naturally driven (21) transitions for State C**



Class Properties for Class D: MC-T D.mcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | D | MC-T | D.mcs |

D
MC-T - Mixed Conifer Shade Tolerant
D.mcs - D.Medium_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0005 | 1.00 | 0.0005 | B | Aspen | B.sc |
| 2_C | 0.0059 | 1.00 | 0.0059 | C | MC-T | C.sc |
| 2_E | 0.0030 | 1.00 | 0.0030 | E | MC-T | E.vcs |
| 2_F | 0.0070 | 1.00 | 0.0070 | F | MC-T | F.vcm |
| 2_H | 0.0002 | 1.00 | 0.0002 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0001 | 0.05 | 0.0000 | C | MC-T | C.sc |
| B Free thin all sizes to target | 0.0001 | 0.10 | 0.0000 | D | MC-T | D.mcs |
| B Free thin all sizes to target | 0.0001 | 0.62 | 0.0001 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0001 | 0.19 | 0.0000 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0001 | 0.05 | 0.0000 | J | MC-M | J.vom |
| C Thin from below to target | 0.0001 | 0.05 | 0.0000 | C | MC-T | C.sc |
| C Thin from below to target | 0.0001 | 0.33 | 0.0000 | D | MC-T | D.mcs |
| C Thin from below to target | 0.0001 | 0.05 | 0.0000 | E | MC-T | E.vcm |

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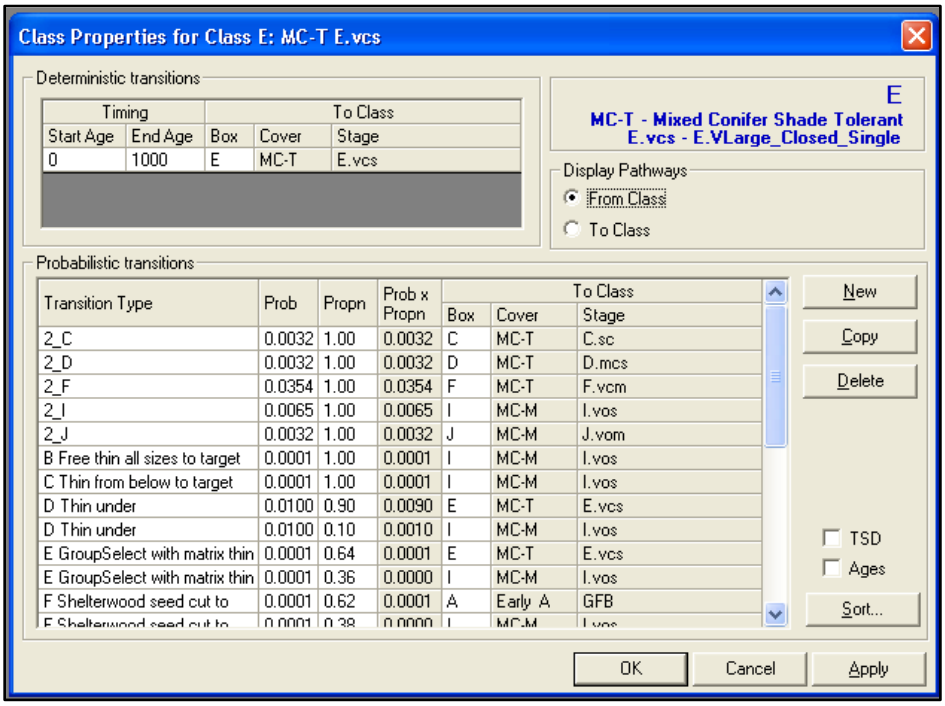
**Appendix A figure 33. Wet mixed conifer forest PNVTs' potentially management driven (27) and naturally driven (13) transitions for State D**



Class Properties for Class E: MC-T E.vcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | MC-T | E.vcs |

E
MC-T - Mixed Conifer Shade Tolerant
E.vcs - E.VLarge_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0032 | 1.00 | 0.0032 | C | MC-T | C.sc |
| 2_D | 0.0032 | 1.00 | 0.0032 | D | MC-T | D.mcs |
| 2_F | 0.0354 | 1.00 | 0.0354 | F | MC-T | F.vcm |
| 2_I | 0.0065 | 1.00 | 0.0065 | I | MC-M | I.vos |
| 2_J | 0.0032 | 1.00 | 0.0032 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0001 | 1.00 | 0.0001 | I | MC-M | I.vos |
| C Thin from below to target | 0.0001 | 1.00 | 0.0001 | I | MC-M | I.vos |
| D Thin under | 0.0100 | 0.90 | 0.0090 | E | MC-T | E.vcs |
| D Thin under | 0.0100 | 0.10 | 0.0010 | I | MC-M | I.vos |
| E GroupSelect with matrix thin | 0.0001 | 0.64 | 0.0001 | E | MC-T | E.vcs |
| E GroupSelect with matrix thin | 0.0001 | 0.36 | 0.0000 | I | MC-M | I.vos |
| F Shelterwood seed cut to | 0.0001 | 0.62 | 0.0001 | A | Early A | GFB |
| F Shelterwood seed cut to | 0.0001 | 0.38 | 0.0000 | I | MC-M | I.vos |

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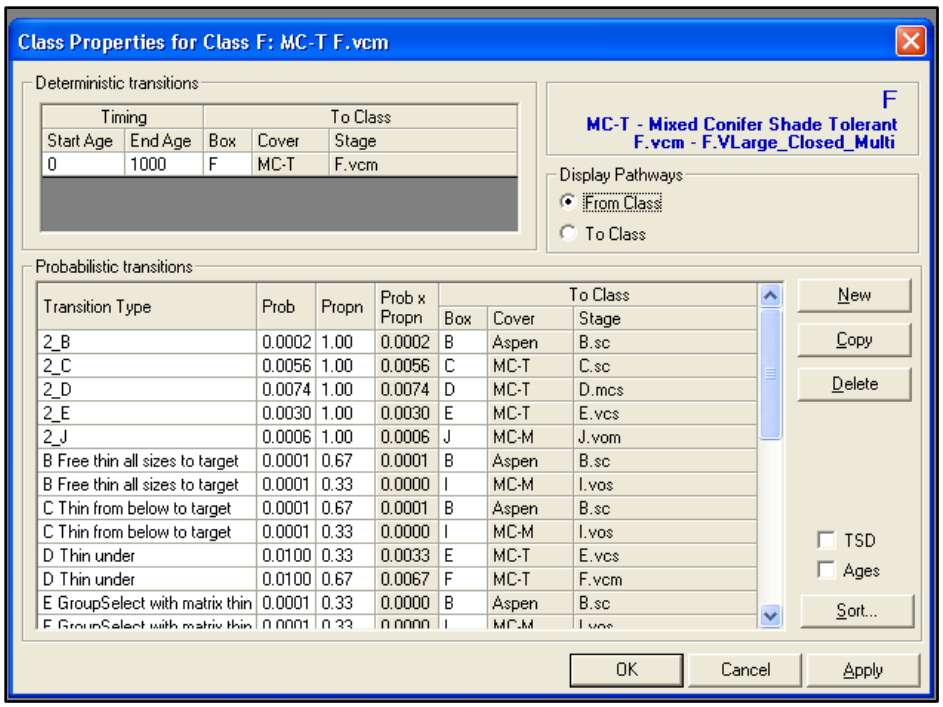
**Appendix A figure 34. Wet mixed conifer forest PNVTs' potentially management driven (13) and naturally driven (11) transitions for State E**



Class Properties for Class F: MC-T F.vcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | F | MC-T | F.vcm |

F
MC-T - Mixed Conifer Shade Tolerant
F.vcm - F.VLarge_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0002 | 1.00 | 0.0002 | B | Aspen | B.sc |
| 2_C | 0.0056 | 1.00 | 0.0056 | C | MC-T | C.sc |
| 2_D | 0.0074 | 1.00 | 0.0074 | D | MC-T | D.mcs |
| 2_E | 0.0030 | 1.00 | 0.0030 | E | MC-T | E.vcs |
| 2_J | 0.0006 | 1.00 | 0.0006 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0001 | 0.67 | 0.0001 | B | Aspen | B.sc |
| B Free thin all sizes to target | 0.0001 | 0.33 | 0.0000 | I | MC-M | I.vos |
| C Thin from below to target | 0.0001 | 0.67 | 0.0001 | B | Aspen | B.sc |
| C Thin from below to target | 0.0001 | 0.33 | 0.0000 | I | MC-M | I.vos |
| D Thin under | 0.0100 | 0.33 | 0.0033 | E | MC-T | E.vcs |
| D Thin under | 0.0100 | 0.67 | 0.0067 | F | MC-T | F.vcm |
| E GroupSelect with matrix thin | 0.0001 | 0.33 | 0.0000 | B | Aspen | B.sc |

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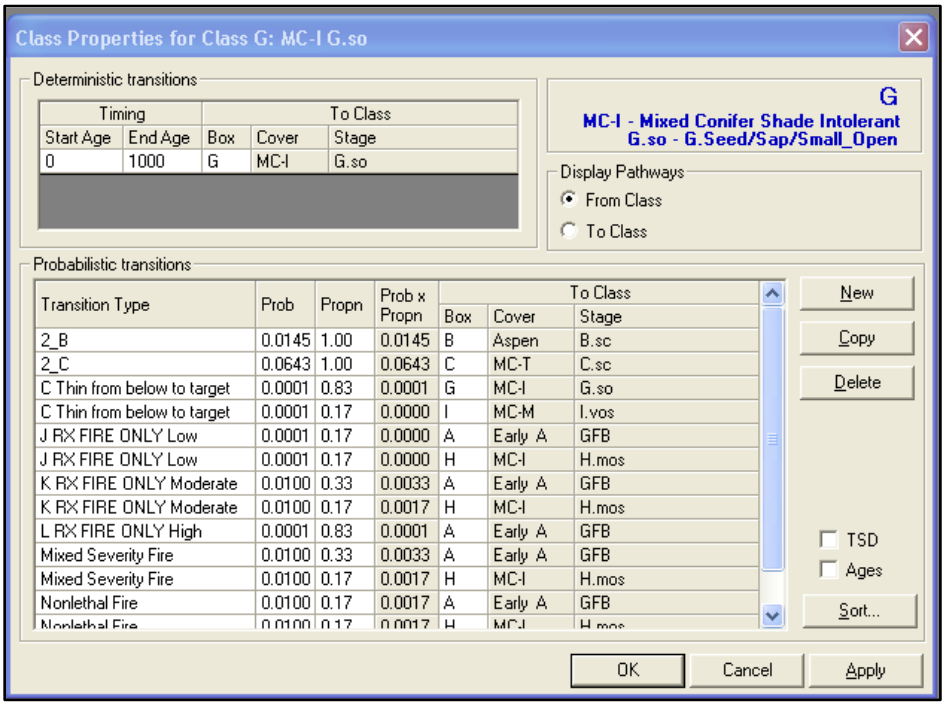
**Appendix A figure 35. Wet mixed conifer forest PNVTs' potentially management driven (14) and naturally driven (10) transitions for State F**



Class Properties for Class G: MC-I G.so

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | G | MC-I | G.so |

G
MC-I - Mixed Conifer Shade Intolerant
G.so - G.Seed/Sap/Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0145 | 1.00 | 0.0145 | B | Aspen | B.sc |
| 2_C | 0.0643 | 1.00 | 0.0643 | C | MC-T | C.sc |
| C Thin from below to target | 0.0001 | 0.83 | 0.0001 | G | MC-I | G.so |
| C Thin from below to target | 0.0001 | 0.17 | 0.0000 | I | MC-M | I.vos |
| J RX FIRE ONLY Low | 0.0001 | 0.17 | 0.0000 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0001 | 0.17 | 0.0000 | H | MC-I | H.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.33 | 0.0033 | A | Early A | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.17 | 0.0017 | H | MC-I | H.mos |
| L RX FIRE ONLY High | 0.0001 | 0.83 | 0.0001 | A | Early A | GFB |
| Mixed Severity Fire | 0.0100 | 0.33 | 0.0033 | A | Early A | GFB |
| Mixed Severity Fire | 0.0100 | 0.17 | 0.0017 | H | MC-I | H.mos |
| Nonlethal Fire | 0.0100 | 0.17 | 0.0017 | A | Early A | GFB |

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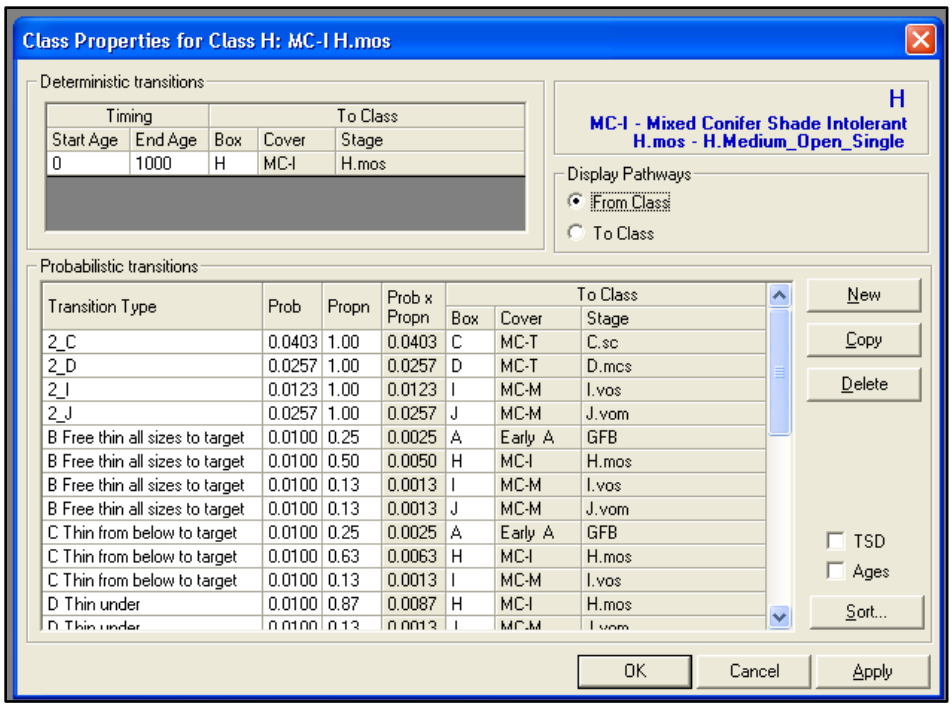
**Appendix A figure 36. Wet mixed conifer forest PNVTs' potentially management driven (6) and naturally driven (7) transitions for State G**



Class Properties for Class H: MC-I H.mos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | H | MC-I | H.mos |

H
MC-I - Mixed Conifer Shade Intolerant
H.mos - H.Medium_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0403 | 1.00 | 0.0403 | C | MC-T | C.sc |
| 2_D | 0.0257 | 1.00 | 0.0257 | D | MC-T | D.mcs |
| 2_I | 0.0123 | 1.00 | 0.0123 | I | MC-M | I.vos |
| 2_J | 0.0257 | 1.00 | 0.0257 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0100 | 0.25 | 0.0025 | A | Early A | GFB |
| B Free thin all sizes to target | 0.0100 | 0.50 | 0.0050 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0100 | 0.13 | 0.0013 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0100 | 0.13 | 0.0013 | J | MC-M | J.vom |
| C Thin from below to target | 0.0100 | 0.25 | 0.0025 | A | Early A | GFB |
| C Thin from below to target | 0.0100 | 0.63 | 0.0063 | H | MC-I | H.mos |
| C Thin from below to target | 0.0100 | 0.13 | 0.0013 | I | MC-M | I.vos |
| D Thin under | 0.0100 | 0.87 | 0.0087 | H | MC-I | H.mos |
| D Thin under | 0.0100 | 0.13 | 0.0013 | I | MC-M | I.vom |

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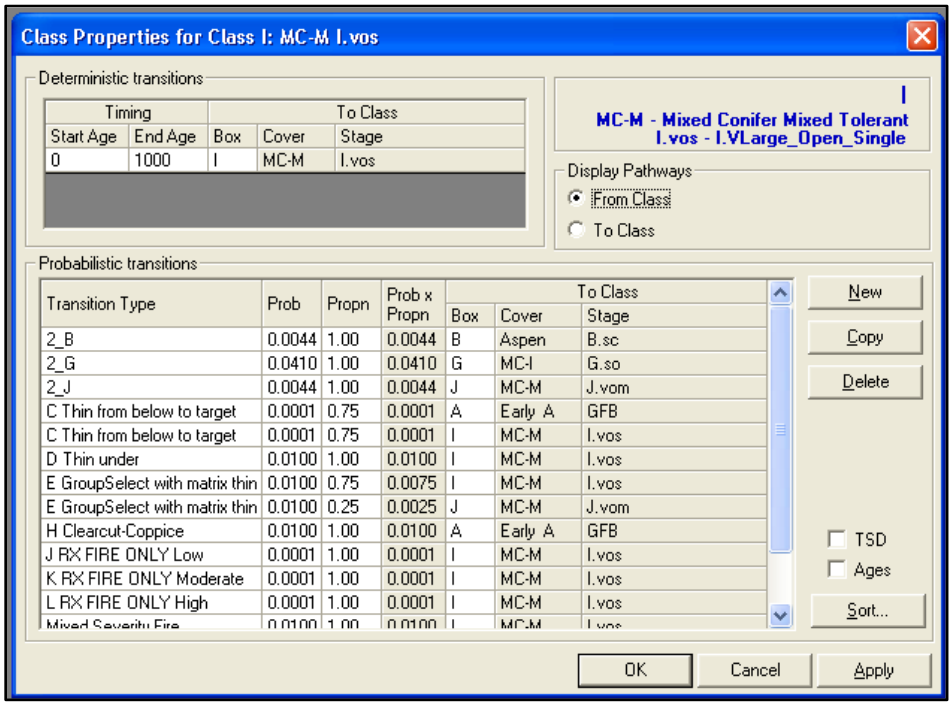
**Appendix A figure 37. Wet mixed conifer forest PNVTs' potentially management driven (15) and naturally driven (8) transitions for State H**



Class Properties for Class I: MC-M I.vos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | I | MC-M | I.vos |

I
MC-M - Mixed Conifer Mixed Tolerant
I.vos - I.VLarge_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0044 | 1.00 | 0.0044 | B | Aspen | B.sc |
| 2_G | 0.0410 | 1.00 | 0.0410 | G | MC-I | G.so |
| 2_J | 0.0044 | 1.00 | 0.0044 | J | MC-M | J.vom |
| C Thin from below to target | 0.0001 | 0.75 | 0.0001 | A | Early A | GFB |
| C Thin from below to target | 0.0001 | 0.75 | 0.0001 | I | MC-M | I.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | MC-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.75 | 0.0075 | I | MC-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.25 | 0.0025 | J | MC-M | J.vom |
| H Clearcut-Coppice | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0001 | 1.00 | 0.0001 | I | MC-M | I.vos |
| K RX FIRE ONLY Moderate | 0.0001 | 1.00 | 0.0001 | I | MC-M | I.vos |
| L RX FIRE ONLY High | 0.0001 | 1.00 | 0.0001 | I | MC-M | I.vos |
| Mixed Severity Fire | 0.0100 | 1.00 | 0.0100 | I | MC-M | I.vos |

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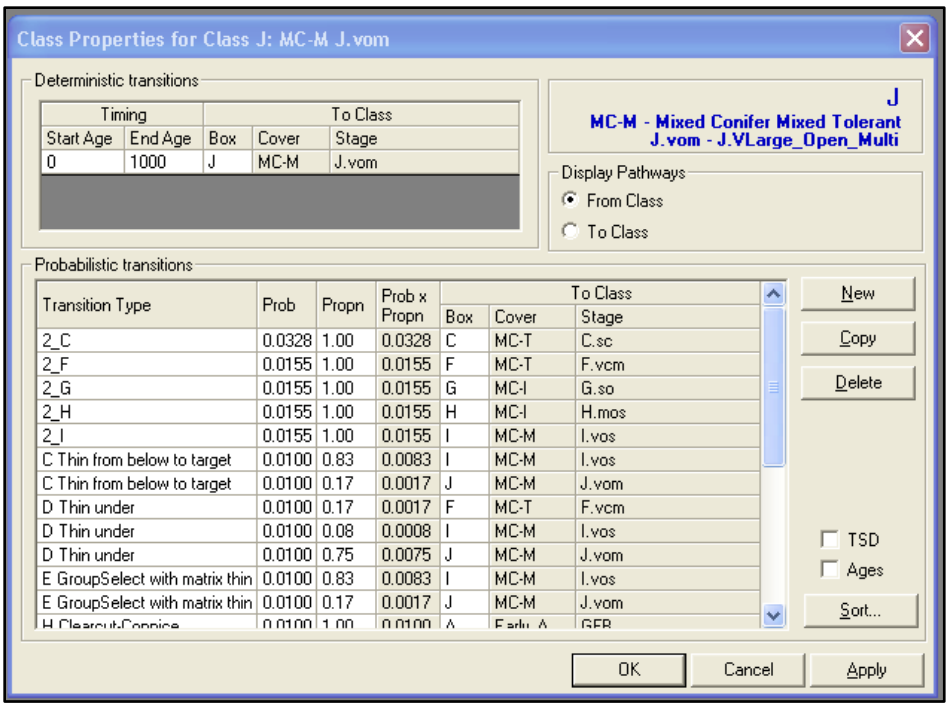
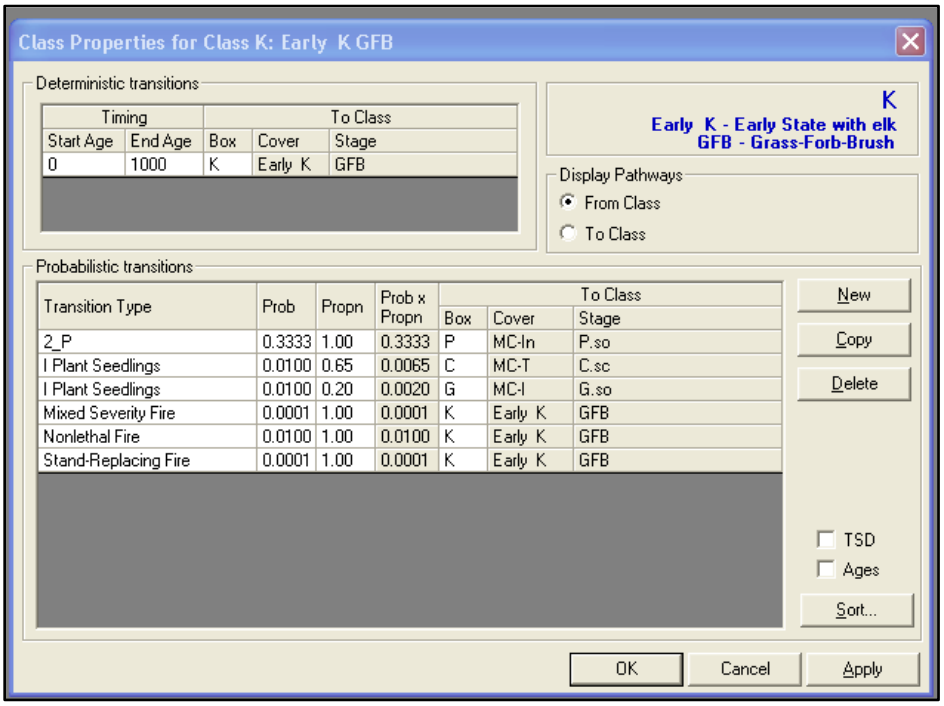
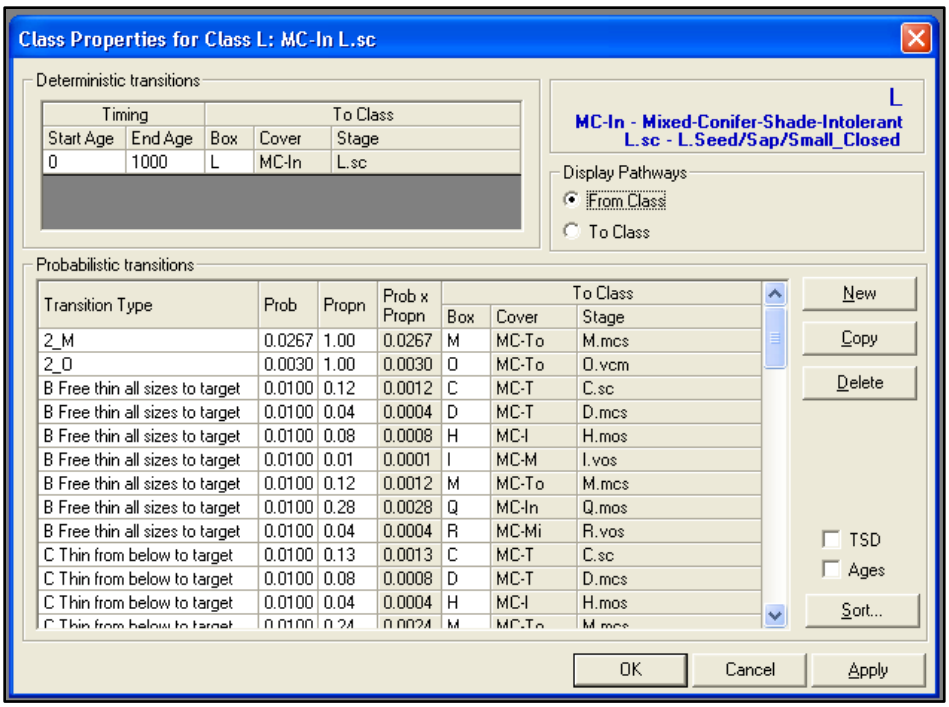
**Appendix A figure 38. Wet mixed conifer forest PNVTs' potentially management driven (7) and naturally driven (6) transitions for State I**




**Appendix A figure 39. Wet mixed conifer forest PNVTs' potentially management driven (10) and naturally driven (9) transitions for State J**




**Appendix A figure 40. Wet mixed conifer forest PNVTs' potentially management driven (2) and naturally driven (4) transitions for State K**



Class Properties for Class L: MC-In L.sc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | L | MC-In | L.sc |

L
MC-In - Mixed-Conifer-Shade-Intolerant
L.sc - L.Seed/Sap/Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_M | 0.0267 | 1.00 | 0.0267 | M | MC-To | M.mcs |
| 2_O | 0.0030 | 1.00 | 0.0030 | O | MC-To | O.vcm |
| B Free thin all sizes to target | 0.0100 | 0.12 | 0.0012 | C | MC-T | C.sc |
| B Free thin all sizes to target | 0.0100 | 0.04 | 0.0004 | D | MC-T | D.mcs |
| B Free thin all sizes to target | 0.0100 | 0.08 | 0.0008 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0100 | 0.01 | 0.0001 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0100 | 0.12 | 0.0012 | M | MC-To | M.mcs |
| B Free thin all sizes to target | 0.0100 | 0.28 | 0.0028 | Q | MC-In | Q.mos |
| B Free thin all sizes to target | 0.0100 | 0.04 | 0.0004 | R | MC-Mi | R.vos |
| C Thin from below to target | 0.0100 | 0.13 | 0.0013 | C | MC-T | C.sc |
| C Thin from below to target | 0.0100 | 0.08 | 0.0008 | D | MC-T | D.mcs |
| C Thin from below to target | 0.0100 | 0.04 | 0.0004 | H | MC-I | H.mos |
| C Thin from below to target | 0.0100 | 0.24 | 0.0024 | M | MC-To | M.mcs |

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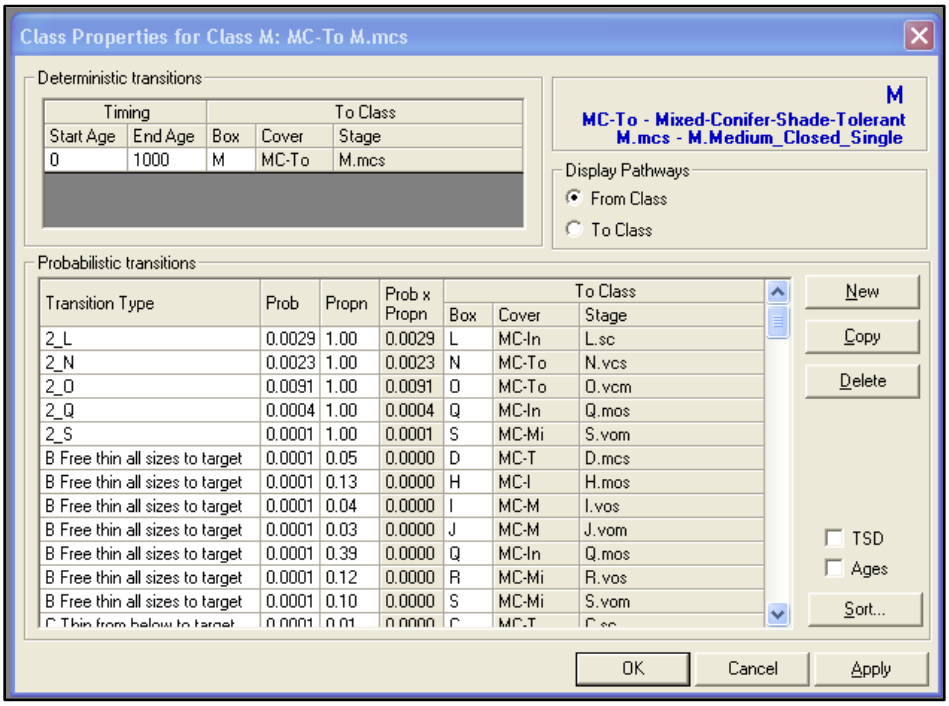
**Appendix A figure 41. Wet mixed conifer forest PNVTs' potentially management driven (35) and naturally driven (24) transitions for State L**



Class Properties for Class M: MC-To M.mcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | M | MC-To | M.mcs |

M
MC-To - Mixed-Conifer-Shade-Tolerant
M.mcs - M.Medium_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0029 | 1.00 | 0.0029 | L | MC-In | L.sc |
| 2_N | 0.0023 | 1.00 | 0.0023 | N | MC-To | N.vcs |
| 2_O | 0.0091 | 1.00 | 0.0091 | O | MC-To | O.vcm |
| 2_Q | 0.0004 | 1.00 | 0.0004 | Q | MC-In | Q.mos |
| 2_S | 0.0001 | 1.00 | 0.0001 | S | MC-Mi | S.vom |
| B Free thin all sizes to target | 0.0001 | 0.05 | 0.0000 | D | MC-T | D.mcs |
| B Free thin all sizes to target | 0.0001 | 0.13 | 0.0000 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0001 | 0.04 | 0.0000 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0001 | 0.03 | 0.0000 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0001 | 0.39 | 0.0000 | Q | MC-In | Q.mos |
| B Free thin all sizes to target | 0.0001 | 0.12 | 0.0000 | R | MC-Mi | R.vos |
| B Free thin all sizes to target | 0.0001 | 0.10 | 0.0000 | S | MC-Mi | S.vom |
| C Thin from below to target | 0.0001 | 0.01 | 0.0000 | C | MC-T | C.sc |

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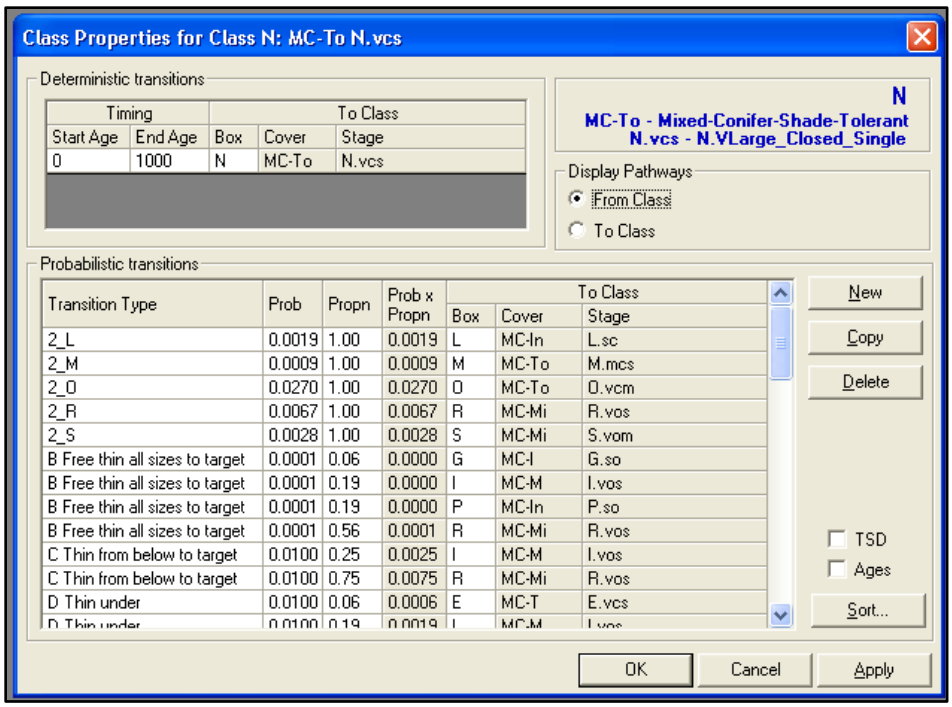
**Appendix A figure 42. Wet mixed conifer forest PNVTs' potentially management driven (76) and naturally driven (31) transitions for State M**



Class Properties for Class N: MC-To N.vcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | N | MC-To | N.vcs |

N
MC-To - Mixed-Conifer-Shade-Tolerant
N.vcs - N.VLarge_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0019 | 1.00 | 0.0019 | L | MC-In | L.sc |
| 2_M | 0.0009 | 1.00 | 0.0009 | M | MC-To | M.mcs |
| 2_O | 0.0270 | 1.00 | 0.0270 | O | MC-To | O.vcm |
| 2_R | 0.0067 | 1.00 | 0.0067 | R | MC-Mi | R.vos |
| 2_S | 0.0028 | 1.00 | 0.0028 | S | MC-Mi | S.vom |
| B Free thin all sizes to target | 0.0001 | 0.06 | 0.0000 | G | MC-I | G.so |
| B Free thin all sizes to target | 0.0001 | 0.19 | 0.0000 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0001 | 0.19 | 0.0000 | P | MC-In | P.so |
| B Free thin all sizes to target | 0.0001 | 0.56 | 0.0001 | R | MC-Mi | R.vos |
| C Thin from below to target | 0.0100 | 0.25 | 0.0025 | I | MC-M | I.vos |
| C Thin from below to target | 0.0100 | 0.75 | 0.0075 | R | MC-Mi | R.vos |
| D Thin under | 0.0100 | 0.06 | 0.0006 | E | MC-T | E.vcs |
| D Thin under | 0.0100 | 0.19 | 0.0019 | I | MC-M | I.vos |

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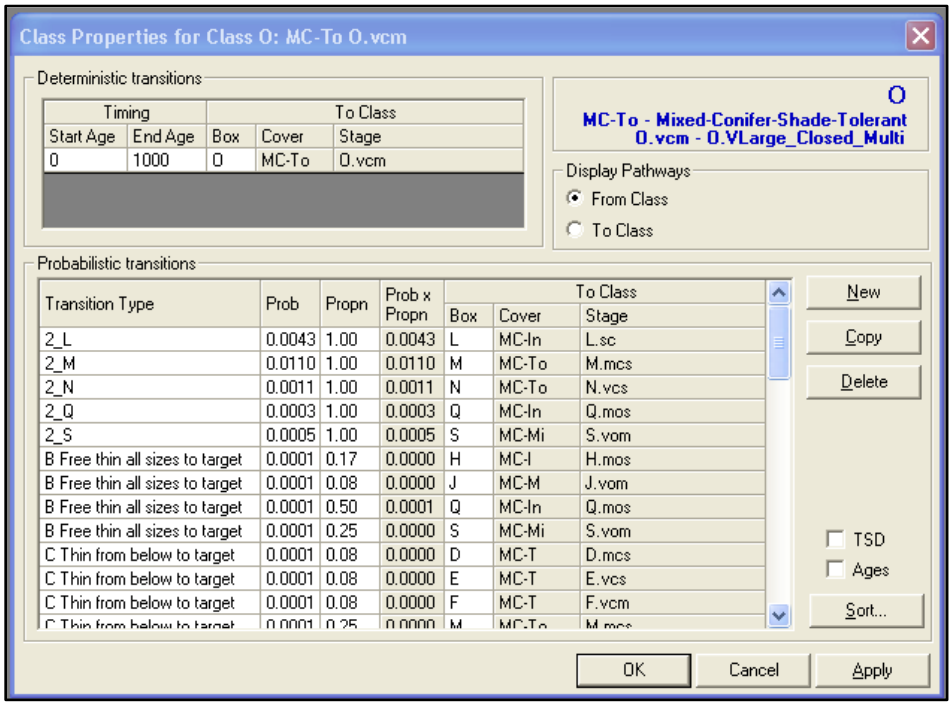
**Appendix A figure 43. Wet mixed conifer forest PNVTs' potentially management driven (34) and naturally driven (16) transitions for State N**



Class Properties for Class O: MC-To O.vcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | O | MC-To | O.vcm |

O
MC-To - Mixed-Conifer-Shade-Tolerant
O.vcm - O.VLarge_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0043 | 1.00 | 0.0043 | L | MC-In | L.sc |
| 2_M | 0.0110 | 1.00 | 0.0110 | M | MC-To | M.mcs |
| 2_N | 0.0011 | 1.00 | 0.0011 | N | MC-To | N.vcs |
| 2_Q | 0.0003 | 1.00 | 0.0003 | Q | MC-In | Q.mos |
| 2_S | 0.0005 | 1.00 | 0.0005 | S | MC-Mi | S.vom |
| B Free thin all sizes to target | 0.0001 | 0.17 | 0.0000 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0001 | 0.08 | 0.0000 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0001 | 0.50 | 0.0001 | Q | MC-In | Q.mos |
| B Free thin all sizes to target | 0.0001 | 0.25 | 0.0000 | S | MC-Mi | S.vom |
| C Thin from below to target | 0.0001 | 0.08 | 0.0000 | D | MC-T | D.mcs |
| C Thin from below to target | 0.0001 | 0.08 | 0.0000 | E | MC-T | E.vcs |
| C Thin from below to target | 0.0001 | 0.08 | 0.0000 | F | MC-T | F.vcm |
| C Thin from below to target | 0.0001 | 0.25 | 0.0000 | M | MC-To | M.mcs |

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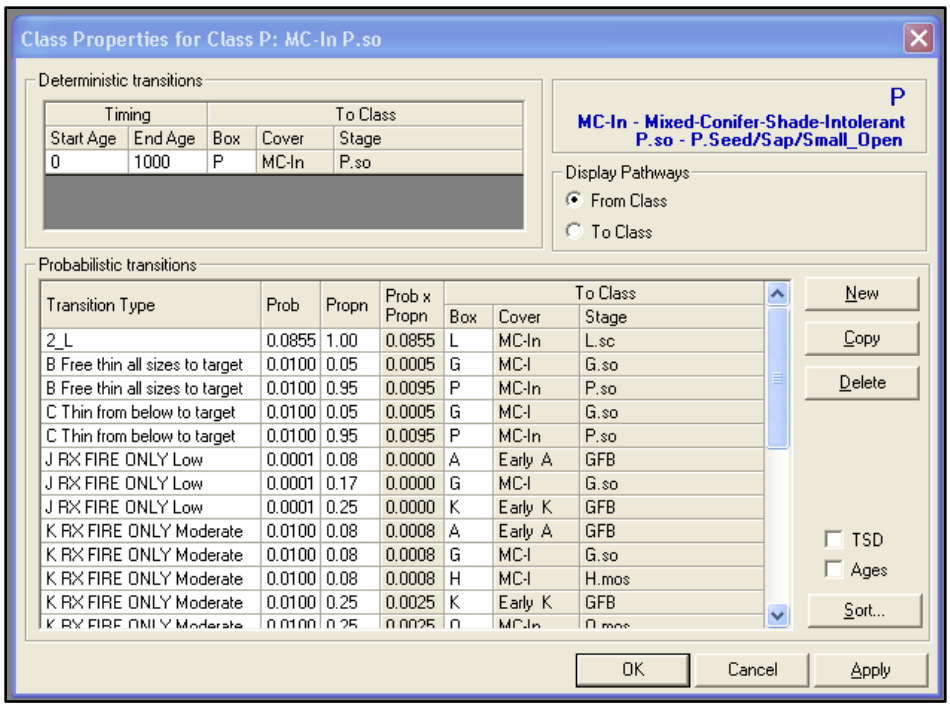
**Appendix A figure 44. Wet mixed conifer forest PNVTs' potentially management driven (33) and naturally driven (15) transitions for State O**



Class Properties for Class P: MC-In P.so

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | P | MC-In | P.so |

P
MC-In - Mixed-Conifer-Shade-Intolerant
P.so - P.Seed/Sap/Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0855 | 1.00 | 0.0855 | L | MC-In | L.sc |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | G | MC-I | G.so |
| B Free thin all sizes to target | 0.0100 | 0.95 | 0.0095 | P | MC-In | P.so |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | G | MC-I | G.so |
| C Thin from below to target | 0.0100 | 0.95 | 0.0095 | P | MC-In | P.so |
| J RX FIRE ONLY Low | 0.0001 | 0.08 | 0.0000 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0001 | 0.17 | 0.0000 | G | MC-I | G.so |
| J RX FIRE ONLY Low | 0.0001 | 0.25 | 0.0000 | K | Early K | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.08 | 0.0008 | A | Early A | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.08 | 0.0008 | G | MC-I | G.so |
| K RX FIRE ONLY Moderate | 0.0100 | 0.08 | 0.0008 | H | MC-I | H.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.25 | 0.0025 | K | Early K | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.25 | 0.0025 | O | MC-In | O.mos |

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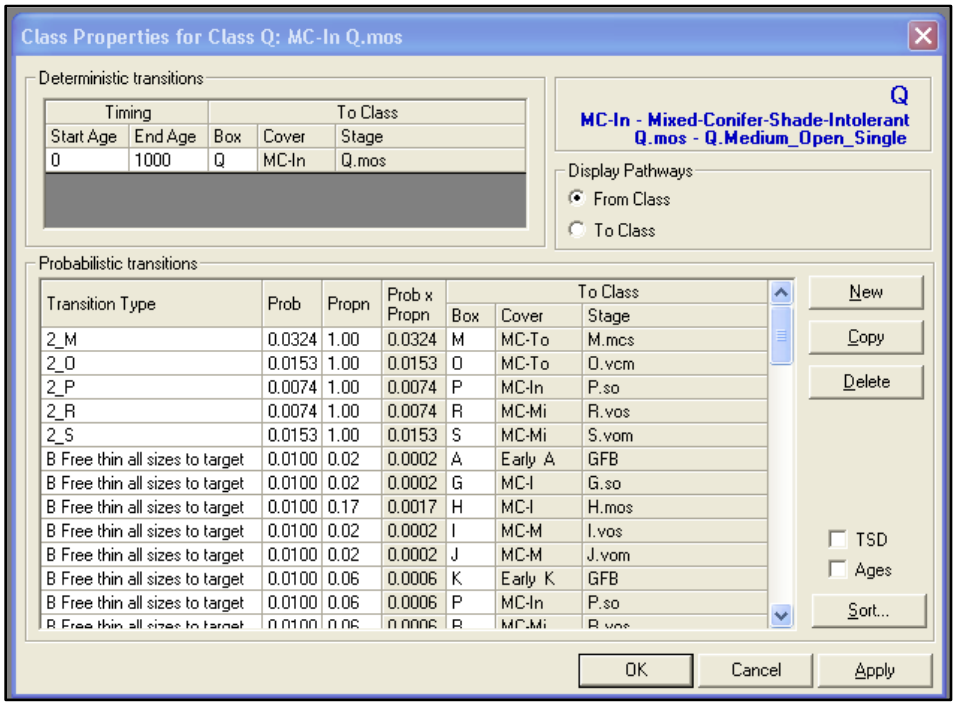
**Appendix A figure 45. Wet mixed conifer forest PNVTs' potentially management driven (13) and naturally driven (11) transitions for State P**



Class Properties for Class Q: MC-In Q.mos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | Q | MC-In | Q.mos |

Q
MC-In - Mixed-Conifer-Shade-Intolerant
Q.mos - Q.Medium_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_M | 0.0324 | 1.00 | 0.0324 | M | MC-To | M.mcs |
| 2_O | 0.0153 | 1.00 | 0.0153 | O | MC-To | O.vcm |
| 2_P | 0.0074 | 1.00 | 0.0074 | P | MC-In | P.so |
| 2_R | 0.0074 | 1.00 | 0.0074 | R | MC-Mi | R.vos |
| 2_S | 0.0153 | 1.00 | 0.0153 | S | MC-Mi | S.vom |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | A | Early A | GFB |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | G | MC-I | G.so |
| B Free thin all sizes to target | 0.0100 | 0.17 | 0.0017 | H | MC-I | H.mos |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | I | MC-M | I.vos |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | J | MC-M | J.vom |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | K | Early K | GFB |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | P | MC-In | P.so |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | R | MC-Mi | R.vos |

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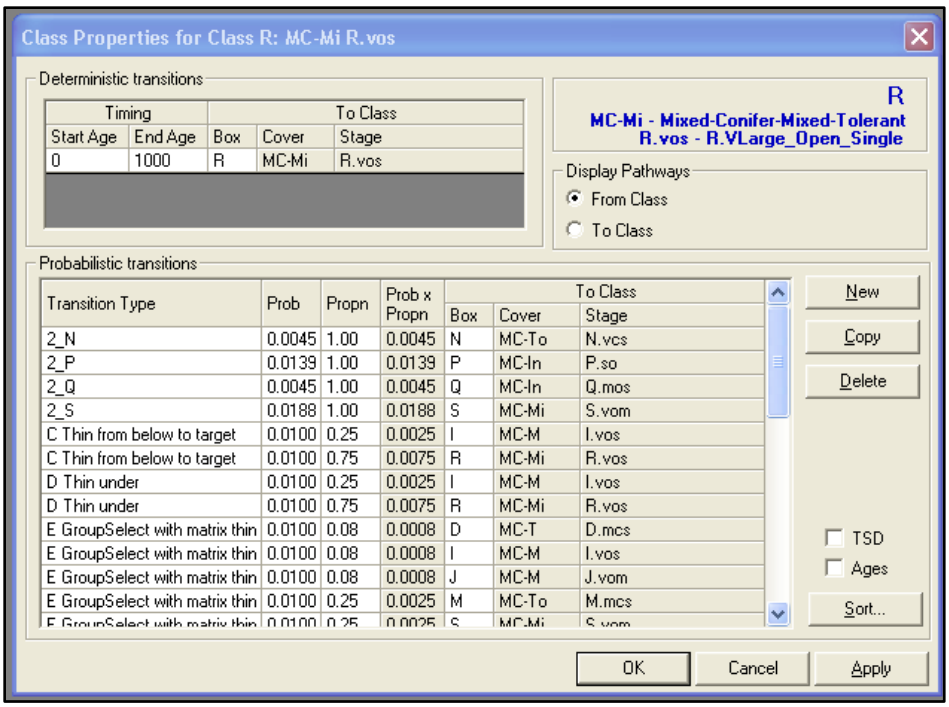
**Appendix A figure 46. Wet mixed conifer forest PNVTs' potentially management driven (50) and naturally driven (12) transitions for State Q**



Class Properties for Class R: MC-Mi R.vos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | R | MC-Mi | R.vos |

R
MC-Mi - Mixed-Conifer-Mixed-Tolerant
R.vos - R.VLarge_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_N | 0.0045 | 1.00 | 0.0045 | N | MC-To | N.vcs |
| 2_P | 0.0139 | 1.00 | 0.0139 | P | MC-In | P.so |
| 2_Q | 0.0045 | 1.00 | 0.0045 | Q | MC-In | Q.mos |
| 2_S | 0.0188 | 1.00 | 0.0188 | S | MC-Mi | S.vom |
| C Thin from below to target | 0.0100 | 0.25 | 0.0025 | I | MC-M | I.vos |
| C Thin from below to target | 0.0100 | 0.75 | 0.0075 | R | MC-Mi | R.vos |
| D Thin under | 0.0100 | 0.25 | 0.0025 | I | MC-M | I.vos |
| D Thin under | 0.0100 | 0.75 | 0.0075 | R | MC-Mi | R.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | D | MC-T | D.mcs |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | I | MC-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | J | MC-M | J.vom |
| E GroupSelect with matrix thin | 0.0100 | 0.25 | 0.0025 | M | MC-To | M.mcs |
| E GroupSelect with matrix thin | 0.0100 | 0.25 | 0.0025 | S | MC-Mi | S.vom |

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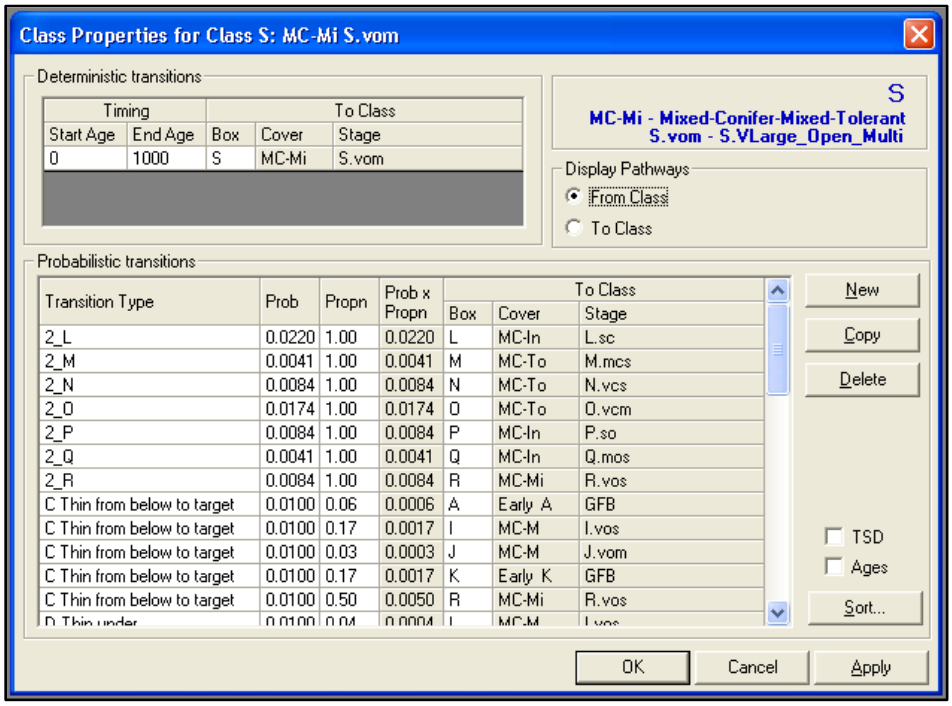
**Appendix A figure 47. Wet mixed conifer forest PNVTs' potentially management driven (22) and naturally driven (11) transitions for State R**



Class Properties for Class S: MC-Mi S.vom

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | S | MC-Mi | S.vom |

S
MC-Mi - Mixed-Conifer-Mixed-Tolerant
S.vom - S.VLarge_Open_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0220 | 1.00 | 0.0220 | L | MC-In | L.sc |
| 2_M | 0.0041 | 1.00 | 0.0041 | M | MC-To | M.mcs |
| 2_N | 0.0084 | 1.00 | 0.0084 | N | MC-To | N.vcs |
| 2_O | 0.0174 | 1.00 | 0.0174 | O | MC-To | O.vcm |
| 2_P | 0.0084 | 1.00 | 0.0084 | P | MC-In | P.so |
| 2_Q | 0.0041 | 1.00 | 0.0041 | Q | MC-In | Q.mos |
| 2_R | 0.0084 | 1.00 | 0.0084 | R | MC-Mi | R.vos |
| C Thin from below to target | 0.0100 | 0.06 | 0.0006 | A | Early A | GFB |
| C Thin from below to target | 0.0100 | 0.17 | 0.0017 | I | MC-M | I.vos |
| C Thin from below to target | 0.0100 | 0.03 | 0.0003 | J | MC-M | J.vom |
| C Thin from below to target | 0.0100 | 0.17 | 0.0017 | K | Early K | GFB |
| C Thin from below to target | 0.0100 | 0.50 | 0.0050 | R | MC-Mi | R.vos |
| D Thin under | 0.0100 | 0.04 | 0.0004 | I | MC-M | I.vos |

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**Appendix A figure 48. Wet mixed conifer forest PNVTs' potentially management driven (23) and naturally driven (14) transitions for State S**

## Dry Mixed Conifer Forest

**Appendix A table 9. Dry mixed conifer forest (AKA "*Mixed conifer with frequent fire PNVT (MCD)*") PNVT crosswalks developed by Region 3 (19 March 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2007a)**

| Current Trends Model | | | | R3 Mid-scale Existing Veg Mapping |
|---|---|---|---|---|
| Source | State | Description | | Dominance Unit - Size/Cover |
| USFS R3 model MCD | A, N | GFB/SHR | = | NON-TREE: Recently burned, grass, forb, and shrub types - N/A |
| | B, F | SSC, SSO | = | All tree types - Seedling/sapling - open, seedling/sapling-closed |
| | C | SMO - intolerant | = | All shade intolerant tree types - Small-open |
| | D, J | MOS, MOM -intolerant | = | All shade intolerant tree types - Medium-open |
| | E, K | VOS, VOM - Intolerant | = | All shade intolerant tree types - Very large-open |
| | G | SMC - mixed tolerant | = | All shade tolerant tree types and mixed-tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Small-closed |
| | H, L | MCS, MCM - mixed tolerant | = | All shade tolerant tree types and mixed-tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Medium closed |
| | I, M | VCS, VCM - mixed tolerant | = | All shade tolerant tree types and mixed-tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Very large-closed |

| Reference Condition | | | |
|---|---|---|---|
| Source | State | Historic Mean† (%) | Description |
| LANDFIRE National 1510510 - Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer | A | 20 | Early development, all structures |
| | C | 10 | Mid development, open |
| | D | 60 | Late development, open |
| | B | 5 | Mid development, closed |
| | E | 5 | Late development, closed |

†Based on 15.6-yr fire interval

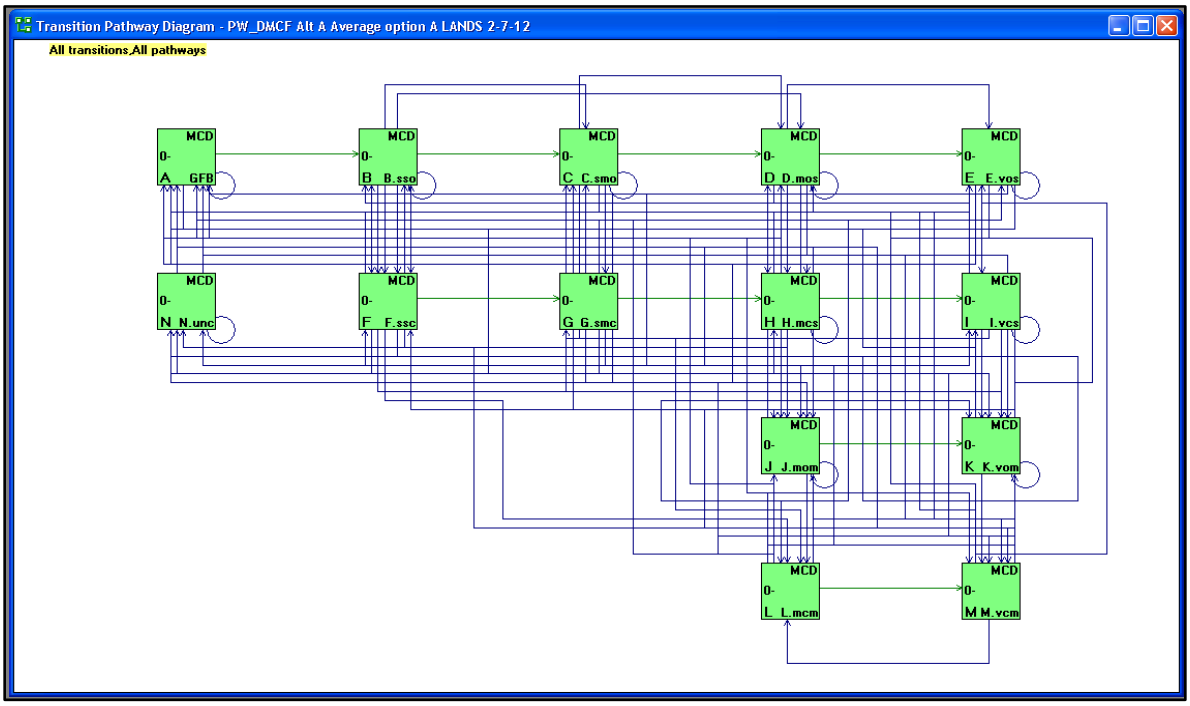
| Baseline Desired Conditions | |
|---|---|
| Structural Stage (%) | Description |
| 9 | Reference condition, and conditions indicative of even-aged stand dynamics and the development of Mexican spotted owl (MSO) habitat† |
| 3 | Reference condition, and conditions indicative of even-aged stand dynamics and the development of MSO habitat‡ |
| 60 | Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as state J, versus high-productivity sites where state K is more likely‡ |
| 3 | Reference condition, and conditions indicative of even-aged stand dynamics and the development of MSO habitat‡ |
| 25 | Conditions indicative of MSO habitat, and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2010), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as state H/L, versus high-productivity sites where state I/M is more likely |

†Based on necessary level of even-aged management (4% per decade) to maintain 25% mature closed forest condition (10"+ dbh), tempered by reference condition (20%). The remaining available percentage, after accounting for sustenance of MSO habitat and 60% late-open, was included here

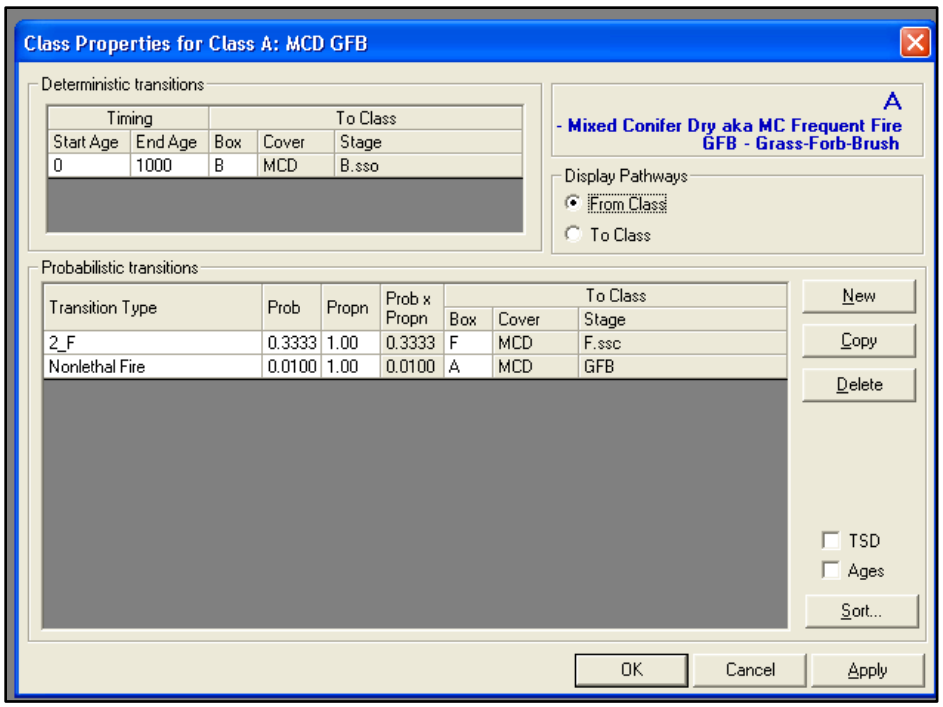
‡Reflects percentage of seral forests necessary to sustain at least 25% MSO habitat in mature closed forest

***Dry Mixed Conifer Forest (AKA –"Mixed Conifer with Frequent Fire") PNVT State and Transition Models:***

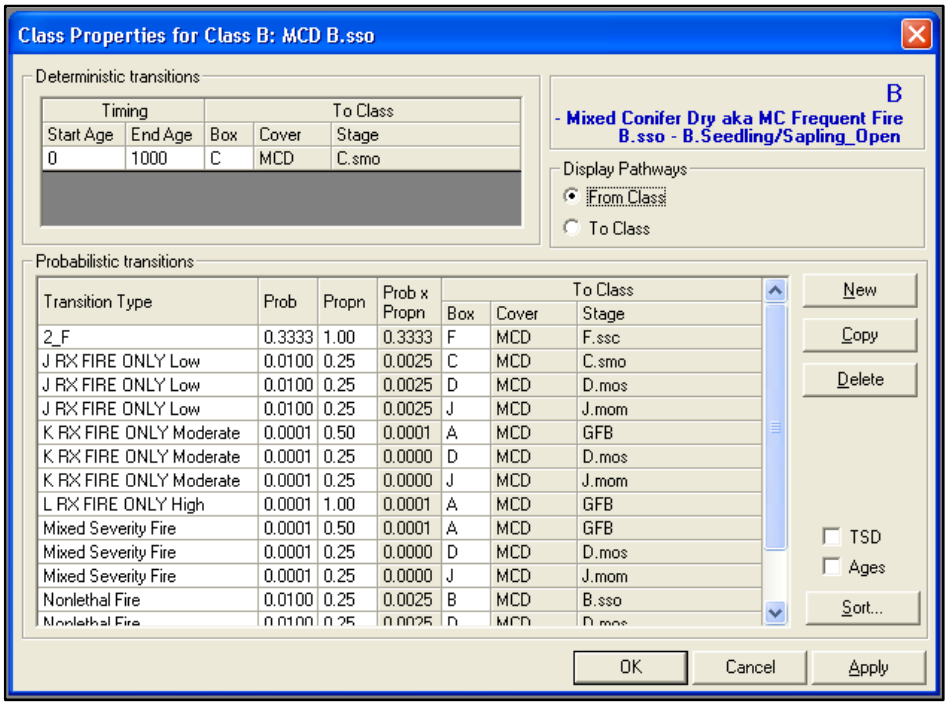
See discussion and VDDT modeling under ponderosa pine forest PNVT. Appendix A figures 49 - 63 through display the actual VDDT model for dry mixed conifer forest, developed by the USFS Southwest Region 3, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends.



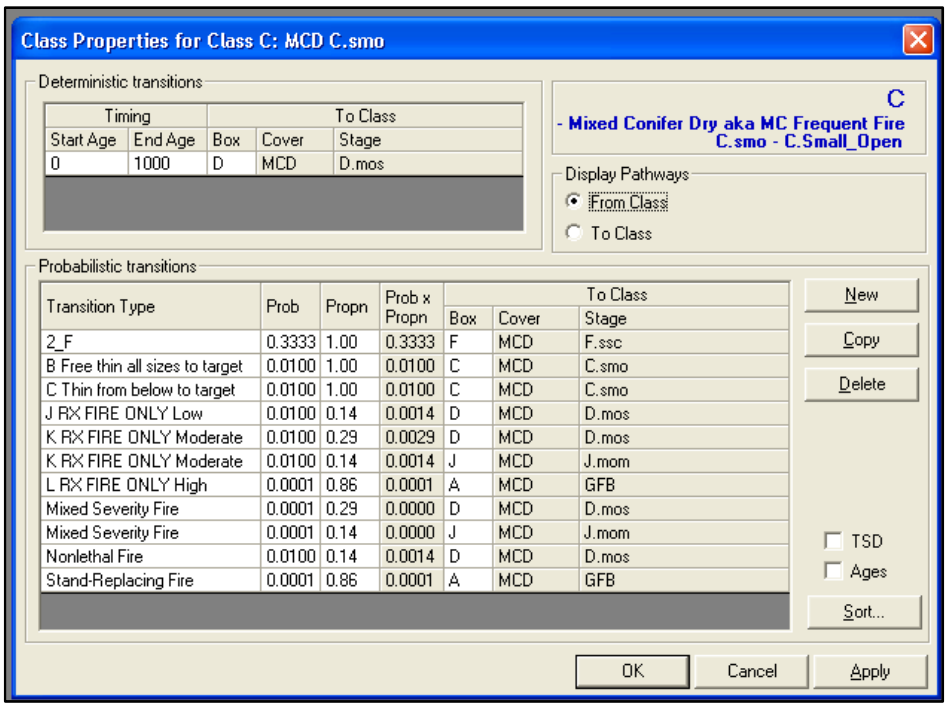

**Appendix A figure 49. Actual VDDT state and transition model used for assessing trends in the dry mixed conifer forest PNVT on the ASNFs**




**Appendix A figure 50. Dry mixed conifer forest PNVTs' potentially management driven (0) and naturally driven (2) transitions for State A**




**Appendix A figure 51. Dry mixed conifer forest PNVTs' potentially management driven (7) and naturally driven (8) transitions for State B**



Class Properties for Class C: MCD C.smo

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | D | MCD | D.mos |

C
- Mixed Conifer Dry aka MC Frequent Fire
C.smo - C.Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.3333 | 1.00 | 0.3333 | F | MCD | F.ssc |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | C | MCD | C.smo |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | C | MCD | C.smo |
| J RX FIRE ONLY Low | 0.0100 | 0.14 | 0.0014 | D | MCD | D.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.29 | 0.0029 | D | MCD | D.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.14 | 0.0014 | J | MCD | J.mom |
| L RX FIRE ONLY High | 0.0001 | 0.86 | 0.0001 | A | MCD | GFB |
| Mixed Severity Fire | 0.0001 | 0.29 | 0.0000 | D | MCD | D.mos |
| Mixed Severity Fire | 0.0001 | 0.14 | 0.0000 | J | MCD | J.mom |
| Nonlethal Fire | 0.0100 | 0.14 | 0.0014 | D | MCD | D.mos |
| Stand-Replacing Fire | 0.0001 | 0.86 | 0.0001 | A | MCD | GFB |

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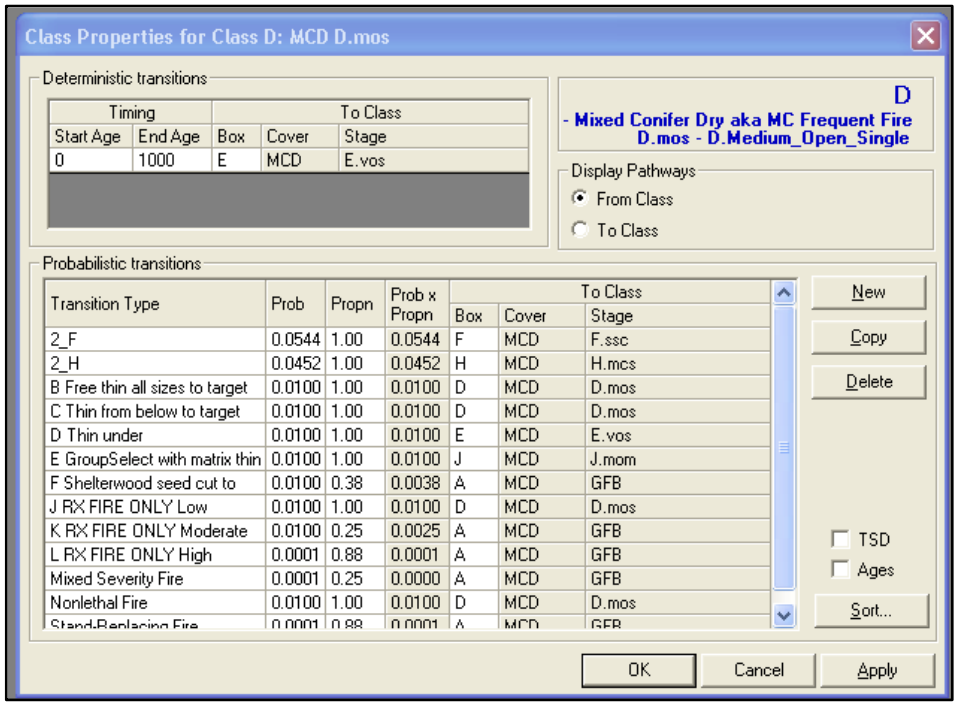
**Appendix A figure 52. Dry mixed conifer forest PNVTs' potentially management driven (6) and naturally driven (5) transitions for State C**



Class Properties for Class D: MCD D.mos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | MCD | E.vos |

D
- Mixed Conifer Dry aka MC Frequent Fire
D.mos - D.Medium_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0544 | 1.00 | 0.0544 | F | MCD | F.ssc |
| 2_H | 0.0452 | 1.00 | 0.0452 | H | MCD | H.mcs |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | D | MCD | D.mos |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | D | MCD | D.mos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | MCD | J.mom |
| F Shelterwood seed cut to | 0.0100 | 0.38 | 0.0038 | A | MCD | GFB |
| J RX FIRE ONLY Low | 0.0100 | 1.00 | 0.0100 | D | MCD | D.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.25 | 0.0025 | A | MCD | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.88 | 0.0001 | A | MCD | GFB |
| Mixed Severity Fire | 0.0001 | 0.25 | 0.0000 | A | MCD | GFB |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | D | MCD | D.mos |
| Stand-Replacing Fire | 0.0001 | 0.88 | 0.0001 | A | MCD | GFB |

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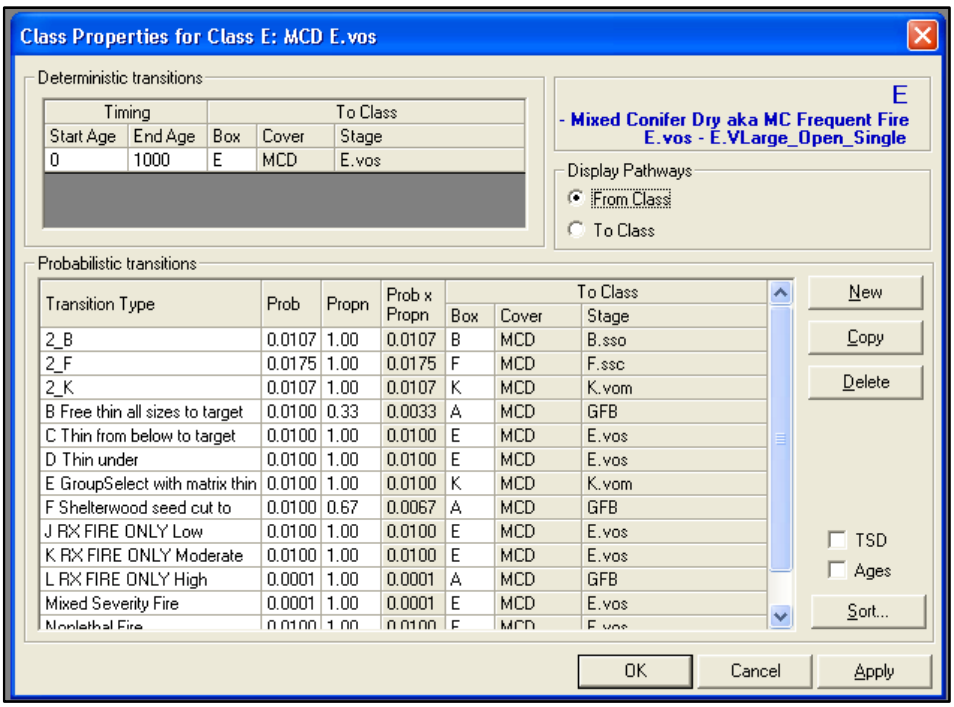
**Appendix A figure 53. Dry mixed conifer forest PNVTs' potentially management driven (8) and naturally driven (5) transitions for State D**



Class Properties for Class E: MCD E.vos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | MCD | E.vos |

E
- Mixed Conifer Dry aka MC Frequent Fire
E.vos - E.VLarge_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0107 | 1.00 | 0.0107 | B | MCD | B.sso |
| 2_F | 0.0175 | 1.00 | 0.0175 | F | MCD | F.ssc |
| 2_K | 0.0107 | 1.00 | 0.0107 | K | MCD | K.vom |
| B Free thin all sizes to target | 0.0100 | 0.33 | 0.0033 | A | MCD | GFB |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | MCD | K.vom |
| F Shelterwood seed cut to | 0.0100 | 0.67 | 0.0067 | A | MCD | GFB |
| J RX FIRE ONLY Low | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| K RX FIRE ONLY Moderate | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| L RX FIRE ONLY High | 0.0001 | 1.00 | 0.0001 | A | MCD | GFB |
| Mixed Severity Fire | 0.0001 | 1.00 | 0.0001 | E | MCD | E.vos |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |

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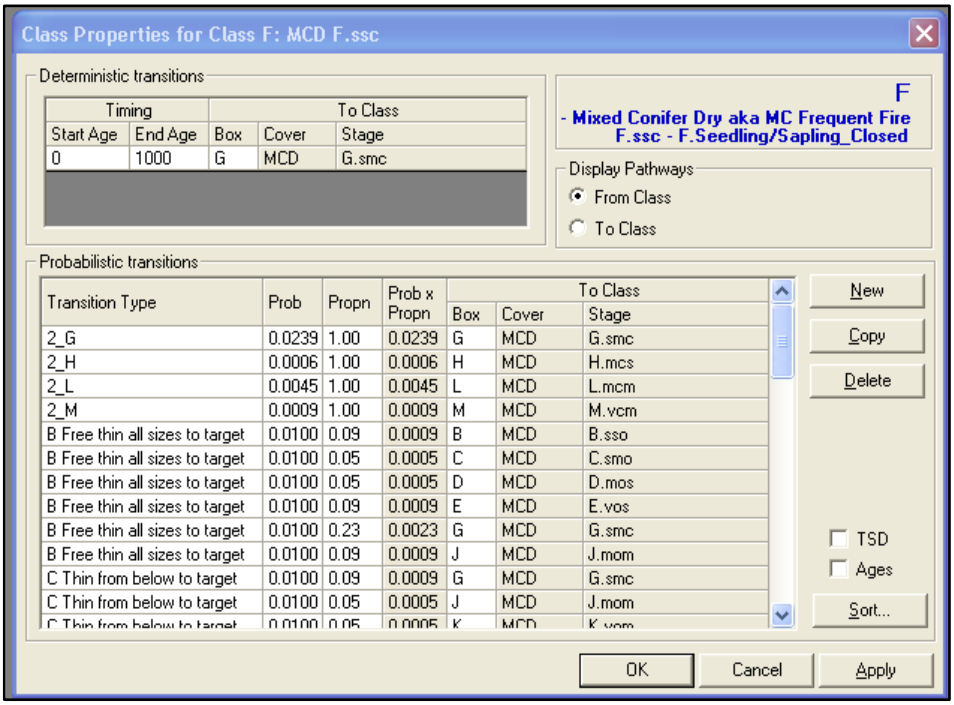
**Appendix A figure 54. Dry mixed conifer forest PNVTs' potentially management driven (8) and naturally driven (6) transitions for State E**



Class Properties for Class F: MCD F.ssc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | G | MCD | G.smc |

F
- Mixed Conifer Dry aka MC Frequent Fire
F.ssc - F.Seedling/Sapling_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_G | 0.0239 | 1.00 | 0.0239 | G | MCD | G.smc |
| 2_H | 0.0006 | 1.00 | 0.0006 | H | MCD | H.mcs |
| 2_L | 0.0045 | 1.00 | 0.0045 | L | MCD | L.mcm |
| 2_M | 0.0009 | 1.00 | 0.0009 | M | MCD | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.09 | 0.0009 | B | MCD | B.sso |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | C | MCD | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | D | MCD | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.09 | 0.0009 | E | MCD | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.23 | 0.0023 | G | MCD | G.smc |
| B Free thin all sizes to target | 0.0100 | 0.09 | 0.0009 | J | MCD | J.mom |
| C Thin from below to target | 0.0100 | 0.09 | 0.0009 | G | MCD | G.smc |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | J | MCD | J.mom |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | K | MCD | K.vom |

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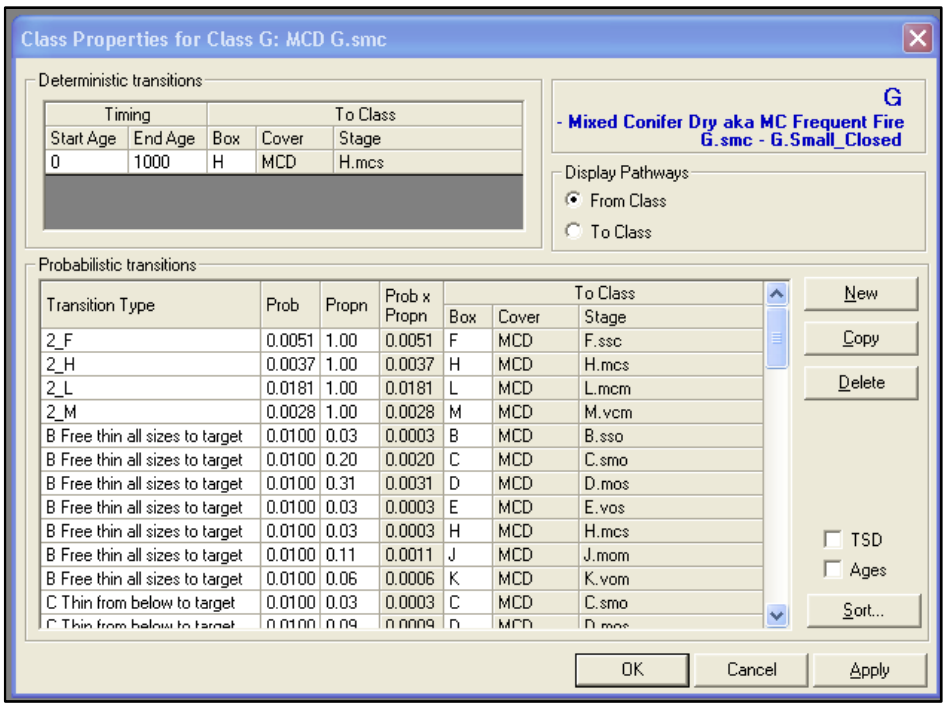
**Appendix A figure 55. Dry mixed conifer forest PNVTs' potentially management driven (29) and naturally driven (21) transitions for State F**



Class Properties for Class G: MCD G.smc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | H | MCD | H.mcs |

G
- Mixed Conifer Dry aka MC Frequent Fire
G.smc - G.Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0051 | 1.00 | 0.0051 | F | MCD | F.ssc |
| 2_H | 0.0037 | 1.00 | 0.0037 | H | MCD | H.mcs |
| 2_L | 0.0181 | 1.00 | 0.0181 | L | MCD | L.mcm |
| 2_M | 0.0028 | 1.00 | 0.0028 | M | MCD | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.03 | 0.0003 | B | MCD | B.sso |
| B Free thin all sizes to target | 0.0100 | 0.20 | 0.0020 | C | MCD | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.31 | 0.0031 | D | MCD | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.03 | 0.0003 | E | MCD | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.03 | 0.0003 | H | MCD | H.mcs |
| B Free thin all sizes to target | 0.0100 | 0.11 | 0.0011 | J | MCD | J.mom |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | K | MCD | K.vom |
| C Thin from below to target | 0.0100 | 0.03 | 0.0003 | C | MCD | C.smo |
| C Thin from below to target | 0.0100 | 0.09 | 0.0009 | D | MCD | D.mos |

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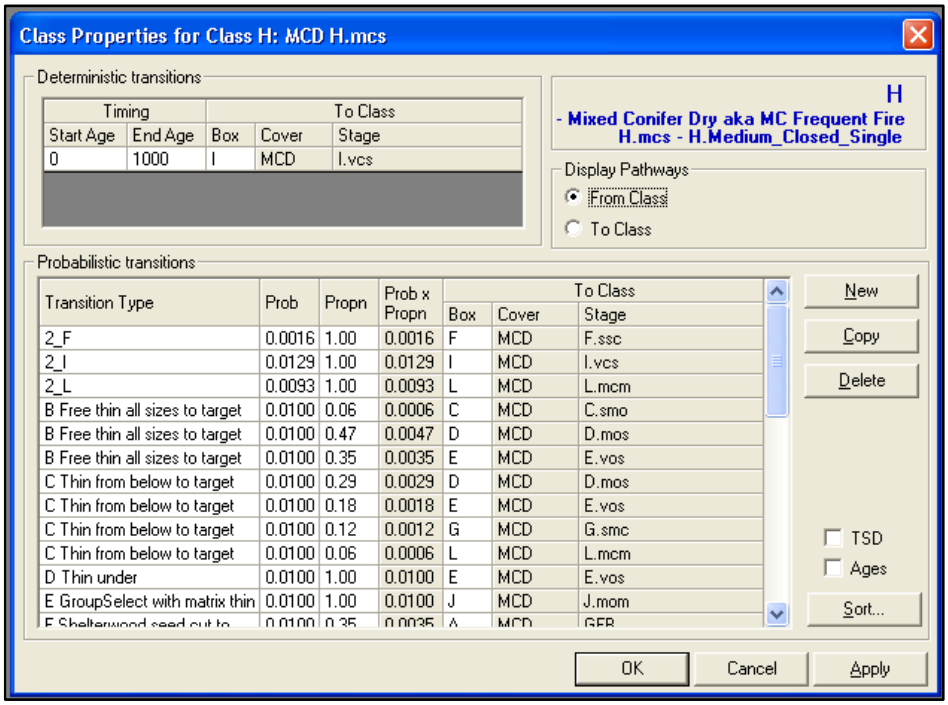
**Appendix A figure 56. Dry mixed conifer forest PNVTs' potentially management driven (36) and naturally driven (24) transitions for State G**



Class Properties for Class H: MCD H.mcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | I | MCD | I.vcs |

H
- Mixed Conifer Dry aka MC Frequent Fire
H.mcs - H.Medium_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0016 | 1.00 | 0.0016 | F | MCD | F.ssc |
| 2_I | 0.0129 | 1.00 | 0.0129 | I | MCD | I.vcs |
| 2_L | 0.0093 | 1.00 | 0.0093 | L | MCD | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | C | MCD | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.47 | 0.0047 | D | MCD | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.35 | 0.0035 | E | MCD | E.vos |
| C Thin from below to target | 0.0100 | 0.29 | 0.0029 | D | MCD | D.mos |
| C Thin from below to target | 0.0100 | 0.18 | 0.0018 | E | MCD | E.vos |
| C Thin from below to target | 0.0100 | 0.12 | 0.0012 | G | MCD | G.smc |
| C Thin from below to target | 0.0100 | 0.06 | 0.0006 | L | MCD | L.mcm |
| D Thin under | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | MCD | J.mom |
| E Shelterwood seed cut to | 0.0100 | 0.35 | 0.0035 | A | MCD | GFR |

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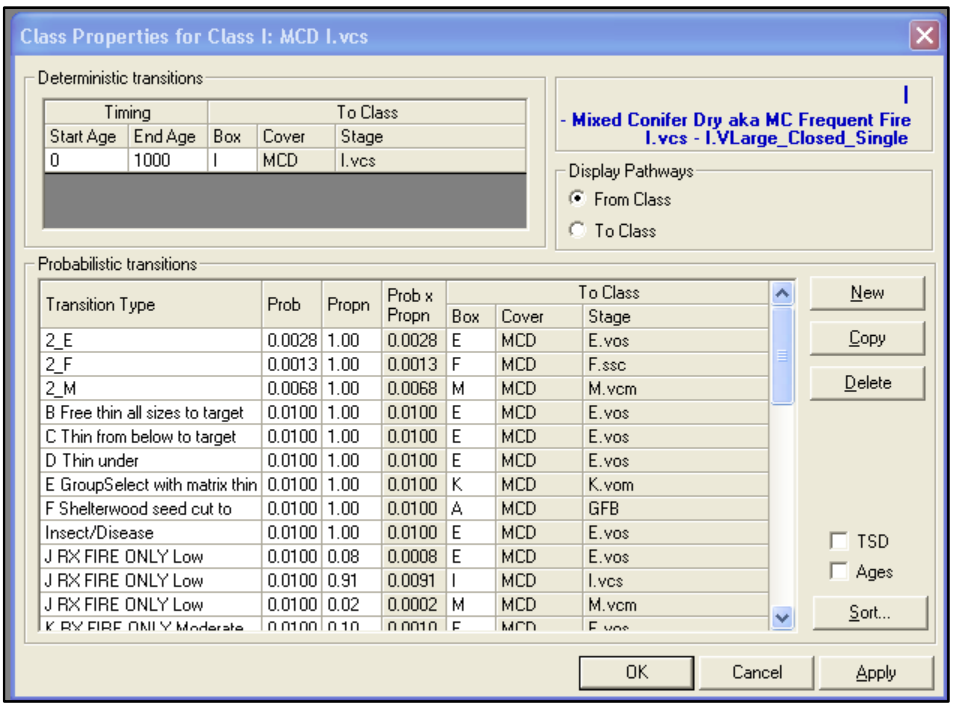
**Appendix A figure 57. Dry mixed conifer forest PNVTs' potentially management driven (21) and naturally driven (12) transitions for State H**



Class Properties for Class I: MCD I.vcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | I | MCD | I.vcs |

I
- Mixed Conifer Dry aka MC Frequent Fire
I.vcs - I.VLarge_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_E | 0.0028 | 1.00 | 0.0028 | E | MCD | E.vos |
| 2_F | 0.0013 | 1.00 | 0.0013 | F | MCD | F.ssc |
| 2_M | 0.0068 | 1.00 | 0.0068 | M | MCD | M.vcm |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | MCD | K.vom |
| F Shelterwood seed cut to | 0.0100 | 1.00 | 0.0100 | A | MCD | GFB |
| Insect/Disease | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| J RX FIRE ONLY Low | 0.0100 | 0.08 | 0.0008 | E | MCD | E.vos |
| J RX FIRE ONLY Low | 0.0100 | 0.91 | 0.0091 | I | MCD | I.vcs |
| J RX FIRE ONLY Low | 0.0100 | 0.02 | 0.0002 | M | MCD | M.vcm |
| K RX FIRE ONLY Moderate | 0.0100 | 0.10 | 0.0010 | E | MCD | E.vos |

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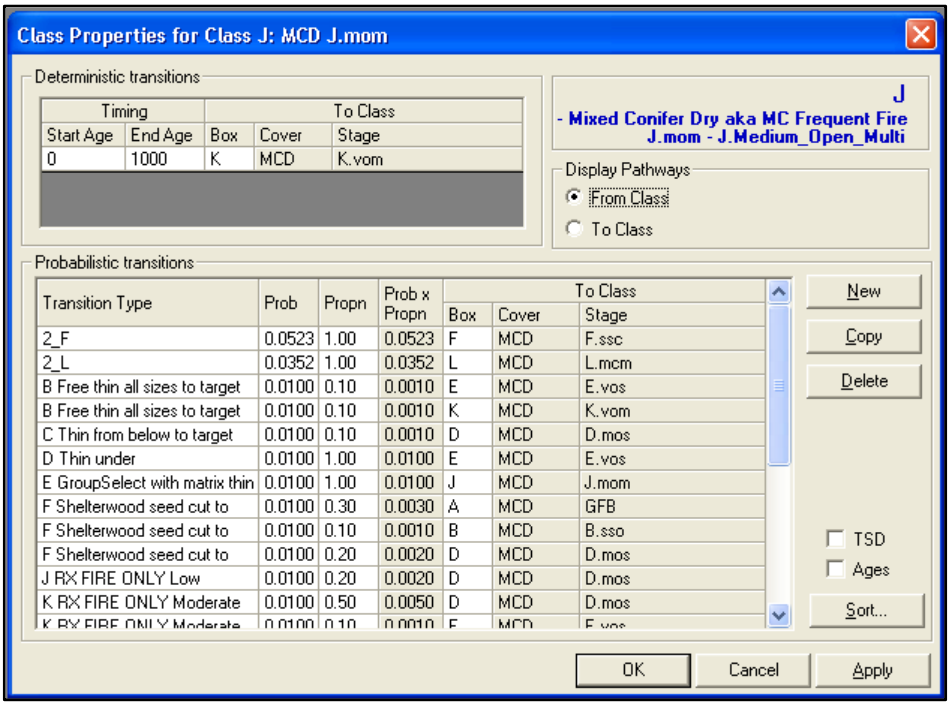
**Appendix A figure 58. Dry mixed conifer forest PNVTs' potentially management driven (20) and naturally driven (18) transitions for State I**



Class Properties for Class J: MCD J.mom

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | K | MCD | K.vom |

J
- Mixed Conifer Dry aka MC Frequent Fire
J.mom - J.Medium_Open_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0523 | 1.00 | 0.0523 | F | MCD | F.ssc |
| 2_L | 0.0352 | 1.00 | 0.0352 | L | MCD | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.10 | 0.0010 | E | MCD | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.10 | 0.0010 | K | MCD | K.vom |
| C Thin from below to target | 0.0100 | 0.10 | 0.0010 | D | MCD | D.mos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | MCD | J.mom |
| F Shelterwood seed cut to | 0.0100 | 0.30 | 0.0030 | A | MCD | GFB |
| F Shelterwood seed cut to | 0.0100 | 0.10 | 0.0010 | B | MCD | B.sso |
| F Shelterwood seed cut to | 0.0100 | 0.20 | 0.0020 | D | MCD | D.mos |
| J RX FIRE ONLY Low | 0.0100 | 0.20 | 0.0020 | D | MCD | D.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.50 | 0.0050 | D | MCD | D.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.10 | 0.0010 | E | MCD | E.vos |

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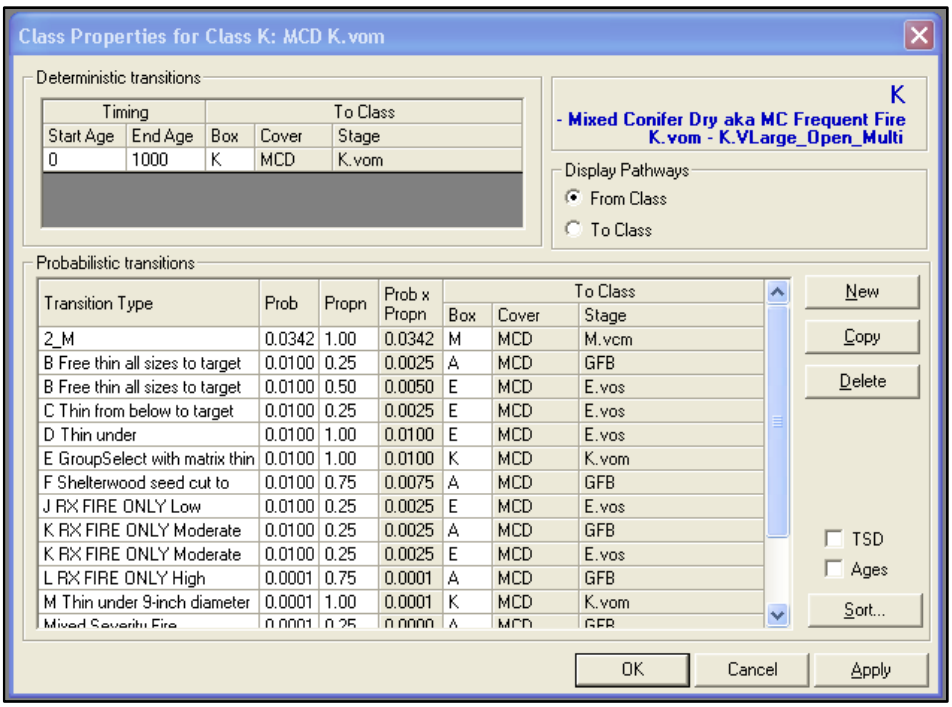
**Appendix A figure 59. Dry mixed conifer forest PNVTs' potentially management driven (15) and naturally driven (9) transitions for State J**



Class Properties for Class K: MCD K.vom

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | K | MCD | K.vom |

K
- Mixed Conifer Dry aka MC Frequent Fire
K.vom - K.VLarge_Open_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_M | 0.0342 | 1.00 | 0.0342 | M | MCD | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.25 | 0.0025 | A | MCD | GFB |
| B Free thin all sizes to target | 0.0100 | 0.50 | 0.0050 | E | MCD | E.vos |
| C Thin from below to target | 0.0100 | 0.25 | 0.0025 | E | MCD | E.vos |
| D Thin under | 0.0100 | 1.00 | 0.0100 | E | MCD | E.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | K | MCD | K.vom |
| F Shelterwood seed cut to | 0.0100 | 0.75 | 0.0075 | A | MCD | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.25 | 0.0025 | E | MCD | E.vos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.25 | 0.0025 | A | MCD | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.25 | 0.0025 | E | MCD | E.vos |
| L RX FIRE ONLY High | 0.0001 | 0.75 | 0.0001 | A | MCD | GFB |
| M Thin under 9-inch diameter | 0.0001 | 1.00 | 0.0001 | K | MCD | K.vom |
| Mixed Severity Fire | 0.0001 | 0.25 | 0.0000 | A | MCD | GFB |

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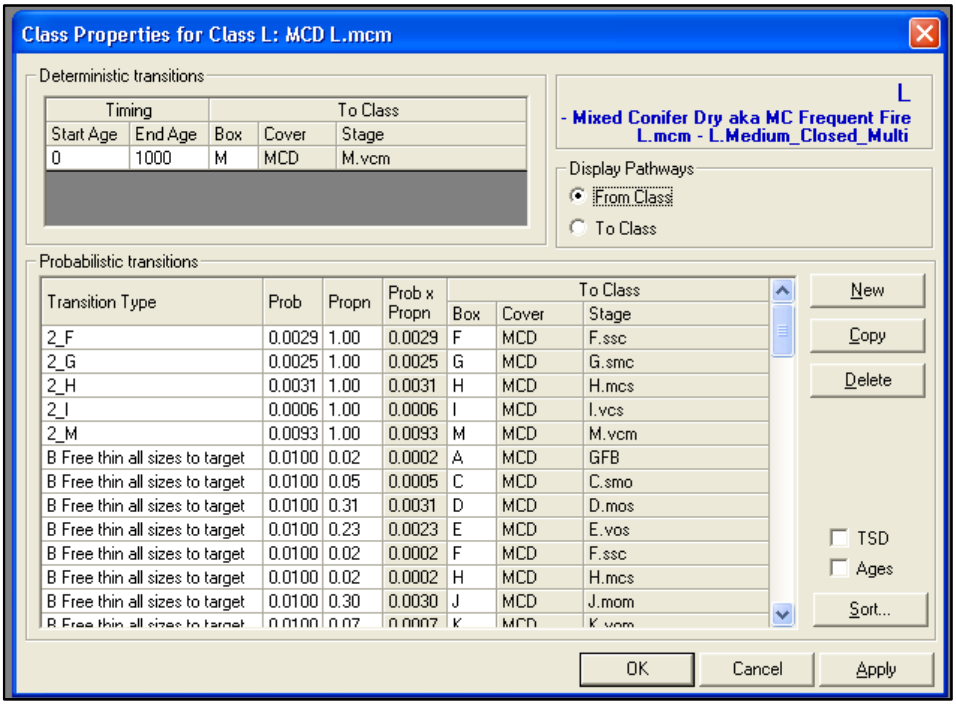
**Appendix A figure 60. Dry mixed conifer forest PNVTs' potentially management driven (11) and naturally driven (5) transitions for State K**



Class Properties for Class L: MCD L.mcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | M | MCD | M.vcm |

L
- Mixed Conifer Dry aka MC Frequent Fire
L.mcm - L.Medium_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0029 | 1.00 | 0.0029 | F | MCD | F.ssc |
| 2_G | 0.0025 | 1.00 | 0.0025 | G | MCD | G.smc |
| 2_H | 0.0031 | 1.00 | 0.0031 | H | MCD | H.mcs |
| 2_I | 0.0006 | 1.00 | 0.0006 | I | MCD | I.vcs |
| 2_M | 0.0093 | 1.00 | 0.0093 | M | MCD | M.vcm |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | A | MCD | GFB |
| B Free thin all sizes to target | 0.0100 | 0.05 | 0.0005 | C | MCD | C.smo |
| B Free thin all sizes to target | 0.0100 | 0.31 | 0.0031 | D | MCD | D.mos |
| B Free thin all sizes to target | 0.0100 | 0.23 | 0.0023 | E | MCD | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | F | MCD | F.ssc |
| B Free thin all sizes to target | 0.0100 | 0.02 | 0.0002 | H | MCD | H.mcs |
| B Free thin all sizes to target | 0.0100 | 0.30 | 0.0030 | J | MCD | J.mom |
| B Free thin all sizes to target | 0.0100 | 0.07 | 0.0007 | K | MCD | K.vom |

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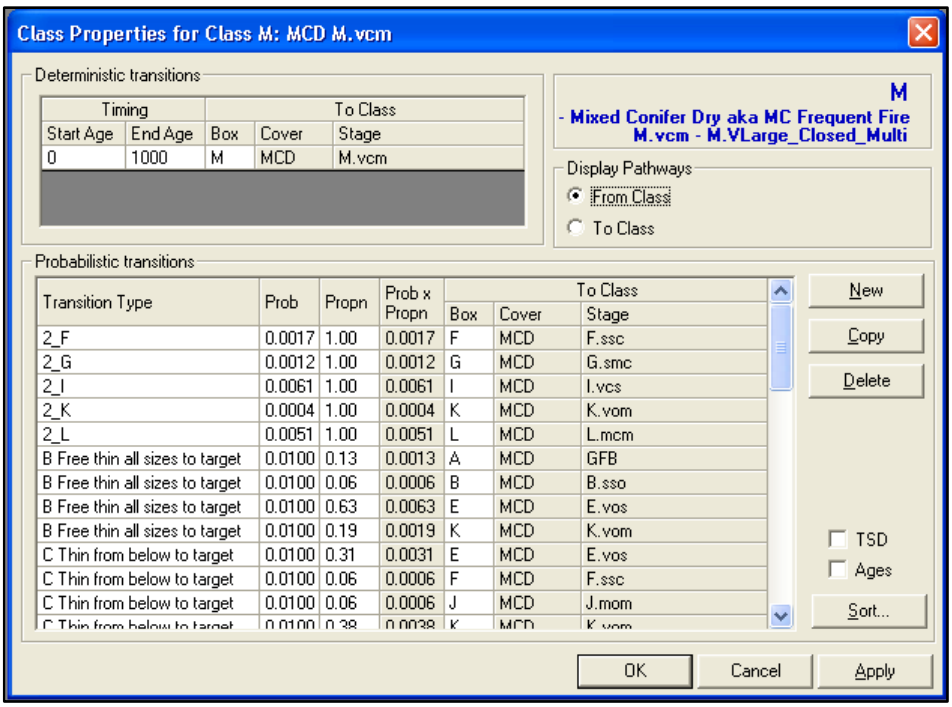
**Appendix A figure 61. Dry mixed conifer forest PNVTs' potentially management driven (45) and naturally driven (25) transitions for State L**



Class Properties for Class M: MCD M.vcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | M | MCD | M.vcm |

M
- Mixed Conifer Dry aka MC Frequent Fire
M.vcm - M.VLarge_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0017 | 1.00 | 0.0017 | F | MCD | F.ssc |
| 2_G | 0.0012 | 1.00 | 0.0012 | G | MCD | G.smc |
| 2_I | 0.0061 | 1.00 | 0.0061 | I | MCD | I.vcs |
| 2_K | 0.0004 | 1.00 | 0.0004 | K | MCD | K.vom |
| 2_L | 0.0051 | 1.00 | 0.0051 | L | MCD | L.mcm |
| B Free thin all sizes to target | 0.0100 | 0.13 | 0.0013 | A | MCD | GFB |
| B Free thin all sizes to target | 0.0100 | 0.06 | 0.0006 | B | MCD | B.sso |
| B Free thin all sizes to target | 0.0100 | 0.63 | 0.0063 | E | MCD | E.vos |
| B Free thin all sizes to target | 0.0100 | 0.19 | 0.0019 | K | MCD | K.vom |
| C Thin from below to target | 0.0100 | 0.31 | 0.0031 | E | MCD | E.vos |
| C Thin from below to target | 0.0100 | 0.06 | 0.0006 | F | MCD | F.ssc |
| C Thin from below to target | 0.0100 | 0.06 | 0.0006 | J | MCD | J.mom |
| C Thin from below to target | 0.0100 | 0.38 | 0.0038 | K | MCD | K.vom |

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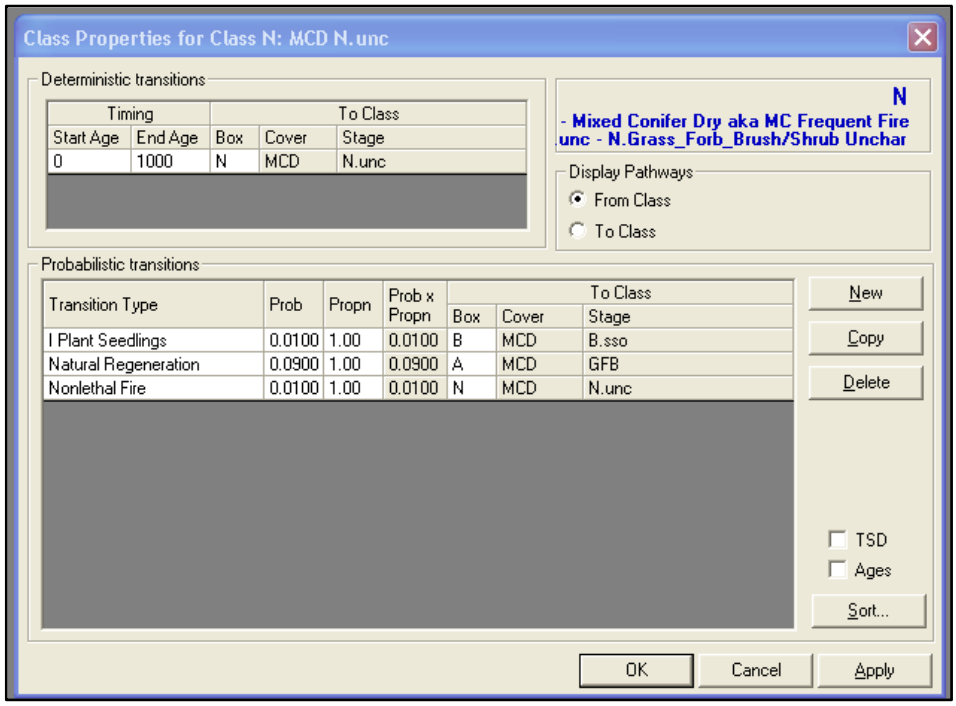
**Appendix A figure 62. Dry mixed conifer forest PNVTs' potentially management driven (26) and naturally driven (17) transitions for State M**



Class Properties for Class N: MCD N.unc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | N | MCD | N.unc |

N
- Mixed Conifer Dry aka MC Frequent Fire
unc - N.Grass_Forb_Brush/Shrub Unchar

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| I Plant Seedlings | 0.0100 | 1.00 | 0.0100 | B | MCD | B.sso |
| Natural Regeneration | 0.0900 | 1.00 | 0.0900 | A | MCD | GFB |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | N | MCD | N.unc |

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**Appendix A figure 63. Dry mixed conifer forest PNVTs' potentially management driven (1) and naturally driven (2) transitions for State N**

## Spruce-Fir Forest

**Appendix A table 10. Spruce-fir forest (with and without aspen) PNVT crosswalks developed by Region 3 (10 December 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Smith 2006c)**

| INPUT PROPORTION OF SFM/SFP HERE | |
|---|---|
| 100 | Area or proportion of landscape in SFM (Lower) |
| 0 | Area or proportion of landscape in SFP (Upper) |

| Current Trend Model | | | | R3 Mid-scale Existing Veg Mapping | Reference Condition | | | | Desired Conditions - Spruce-Fir Forest Mix - Lower | | Desired Conditions - Spruce-Fir Forest Pure - Upper | | DESIRED CONDITION - ALL (SFM/SFP) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | State†♪ | Description | | Dominance Unit - Size/Cover | Source | TNC State | Historic Mean† (%) | Description | Structural Stage (%) | Description | Structural Stage (%) | Description | Structural Stage (%) | Description |
| USFS R3 model SFF | A, ***K*** | GFB/SHR (all) | = | Non-treed: Recently burned, grass, forb, and shrub types - N/A | TNC "Spruce-Fir High and Low Elevation" (2005) | A | 21 | Grass/forb seedling/sapling with quaking aspen, Douglas-fir, spruce, fir | 9 | Reference condition including systems with no quaking aspen succession† | 9 | Reference condition including systems with no quaking aspen succession† | 9 | Grass/forb with quaking aspen or oak ramets, 10 - 40% tree cover: based on reference condition for 'mixed conifer with quaking aspen |
| | B | Aspen/mixed deciduous (all size and cover classes) | = | All quaking aspen, deciduous tree mix, and evergreen - deciduous mix tree types (e.g., quaking aspen_Douglas-fir) - Seedling/sapling, small, medium, and very large all cover classes | | | | | 13 | Quaking aspen/mixed - quaking aspen early forest, 10 - 20%: based on reference condition including systems with no quaking aspen succession†; corroborated by Forest Inventory Data | 5 | Quaking aspen/mixed - quaking aspen early forest, 0 - 10%: based on reference condition including systems with no quaking aspen succession†; corroborated by Forest Inventory Data | 13 | Quaking aspen/mixed - quaking aspen early forest, 0 - 10%: based on cover constancy of aspen in spruce-fir forest-upper associations; corroborated by Forest Inventory Data |
| | C¶ | SSC, SMC tolerant conifer (SSO, SMO tolerant also included here)‡ | = | Shade tolerant and mixed tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Seedling/sapling, small, all cover classes | | | | | 20 | Reference condition including systems with no aspen succession†; corroborated by Forest Inventory Data | 23 | Reference condition including systems with no aspen succession†; corroborated by Forest Inventory Data | 20 | Conifer early forest, 10 - 20%: based on remaining proportion of early forest not including quaking aspen/mixed - quaking aspen cover types |
| | G, ***P*** | SSO, SMO intolerant conifer | = | Shade intolerant tree types - Seedling/sapling - open, small - open | | | | | | | | | | |
| | ***L*** | SSC, SMC intolerant conifer | = | All shade intolerant tree types - Seedling/sapling - closed, small - closed | | | | | | | | | | |
| | D, ***M*** | MC tolerant conifer (MO tolerant also included here)‡ | = | Shade tolerant and mixed tolerant tree types (e.g., ponderosa pine_Douglas-fir) - Medium, all cover classes | | B | 33 | Young forest with regeneration | 14 | Reference condition including systems with no aspen succession† | 15 | Reference condition including systems with no quaking aspen succession† | 14 | Based on reference condition |
| | H, ***Q*** | MO intolerant conifer (MC intolerant also included here)‡ | = | All shade intolerant tree types - Medium, all cover classes | | | | | | | | | | |
| | E, ***N*** | VCS tolerant conifer (VCS intolerant also included here)‡ | = | Shade tolerant and shade intolerant tree types - Very large - closed | | C | 46 | Mature/old forest with regeneration | 44 | Reference condition including systems with no quaking aspen succession† | 48 | Reference condition including systems with no quaking aspen succession† | 44 | Based on reference condition |
| | F, ***O*** | VCM tolerant conifer (VCM intolerant also included here)‡ | | | | | | | | | | | | |
| | I, ***R*** | VOS Tolerant Conifer (include VOS intolerant conifers here) | = | All shade tolerant and shade intolerant tree types - Very large - open | | | | | | | | | | |
| | J, ***S*** | VOM Tolerant Conifer (include VOM intolerant conifers here) | | | | | | | | | | | | |

†States with elk and no quaking aspen regeneration are indicated in **bold** and *italic*, and are found on contemporary landscapes only and were not part of the historic conditions

♪Initial conditions are proportioned for A-K, D-M, E-N, F-O, G-P, H-Q, I-R, and J-S according to the proportion of the landscape outside and inside elk summer range, respectively

¶R3 model state C has only partial overlap in theme with TNC states C and F, but provides a better cross-reference than other options

‡Atypical type without a model state, included with the next most similar state

†Historic mean based on 300-yr stand replacement fire interval

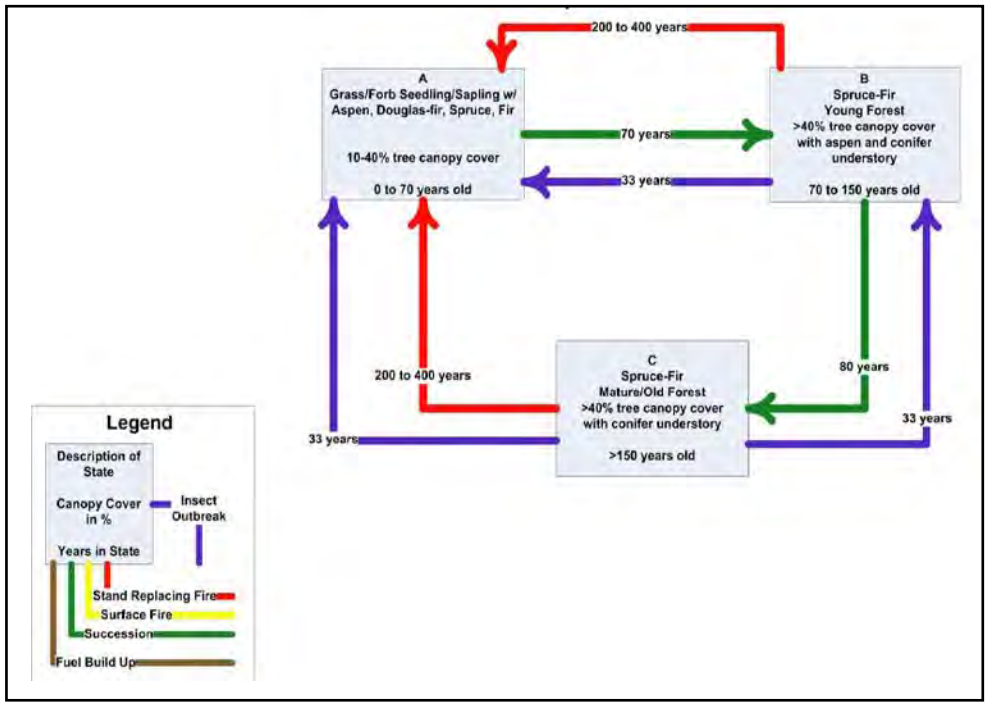
†Weibull age-class distribution model used to estimate values for systems with no quaking aspen succession, model parameters below (Spruce-fir Lower: 340 years - stand cycle age, quaking aspen succession system; 240 years - stand cycle age, no quaking aspen succession system; 40% - proportion of landscape occurring with quaking aspen succession; 0.7 - severity coefficient, Weibull model; 280 - resulting average stand cycle age)

†Weibull age-class distribution model used to estimate values for systems with no quaking aspen succession, model parameters below (Spruce-fir Upper: 360 years - stand cycle age, quaking aspen succession system; 270 years - stand cycle age, no quaking aspen succession system; 15% - proportion of landscape occurring with quaking aspen succession; 0.7 - severity coefficient, Weibull model; 284 - resulting average stand cycle age)

### *Spruce-Fir Forest State and Transition Models*

The following is Smith's (2006d) discussion concerning the current modeling results for spruce-fir forest.

Appendix A figure 64 displays a conceptual current state and transition model for the spruce-fir with wet mixed conifer forest- vegetation type (Smith 2006d) used in VDDT modeling. In table 11[26], Smith (2006d) describes the parameters included or not included within the current VDDT models (Schussman and Smith 2006ab), as well as the sources of information and any assumptions used to create the model parameters.




**Appendix A figure 64. Conceptual current state and transition model for both low and high elevation spruce-fir forest vegetation type. Frequency of transitions are noted when this information is supported by published sources, where no or conflicting information exists on the frequency of transitions, unknown is the notation (Schussman and Smith 2006ab, Smith 2006d)**

Based on Smith's understanding of vegetation dynamics, they created state and transition models depicting historic (pre-1880) and current (1880 to present) vegetation dynamics within this forest type. Additionally, they used information from the state and transition models to develop quantitative VDDT models. The VDDT software allows the user to model succession as a series of vegetation states that differ in structure, composition, and cover and to specify the amount of time it takes to move from one vegetation state to another in the absence of disturbance. Various disturbance agents affecting the movement of vegetation between states can then be incorporated (e.g., surface fires, stand-replacing fires, grazing, insect outbreaks). By varying the types and rates of disturbance across the landscape, the effects of different management treatments, such as

[26] See Smith 2006d

wildland fire use, fire suppression, prescribed burning, grazing practices, and mechanical fuel treatments, on future vegetation can be investigated. While VDDT models can be used to "game play" with different management scenarios, the models we ran in this analysis only include states and transitions for which there is published information to support their inclusion within the model. We discuss model parameters, output, and analysis below.

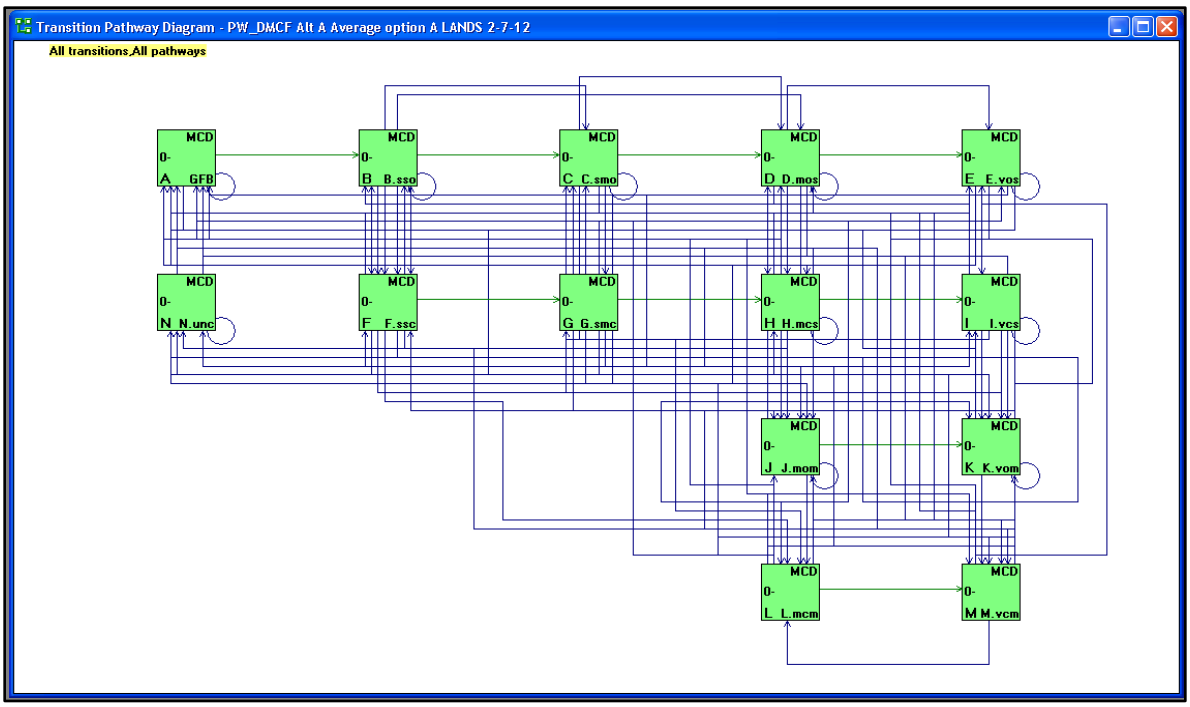
Results for the current spruce-fir low and high elevation models, which were run for 120 years following development of the Historic conditions, were very similar to results from the Historic models. For example, under a stand replacing fire return interval of 300 years, average landscape proportion of the historic low elevation spruce-fir was 39.8%, for high elevation spruce-fir it was 40.5%, and for the current model for both high and low elevation spruce-fir it was 45.4%.

These modeled scenarios indicate that although there may be large differences in canopy and understory composition due to differences in elevation and moisture regimes, the resulting difference in disturbance regime (surface plus canopy versus strictly canopy fire) has a minor effect on the relative proportion of the landscape in the three model states (regeneration, young, and old forest). Also, elimination of a relatively long-rotation surface fire regime (31 years) has had minimal effect on the relative proportion of model states over 120 years. This is in concurrence with other authors' contention that spruce-fir forest conditions in many areas of the Southwest may be within its historic range of variation, and that insufficient time has elapsed since the last crown fire for us to have experienced crown fire in contemporary time (Koprowski et al. 2005; Swetnam et al. 2005; Vankat 2006).

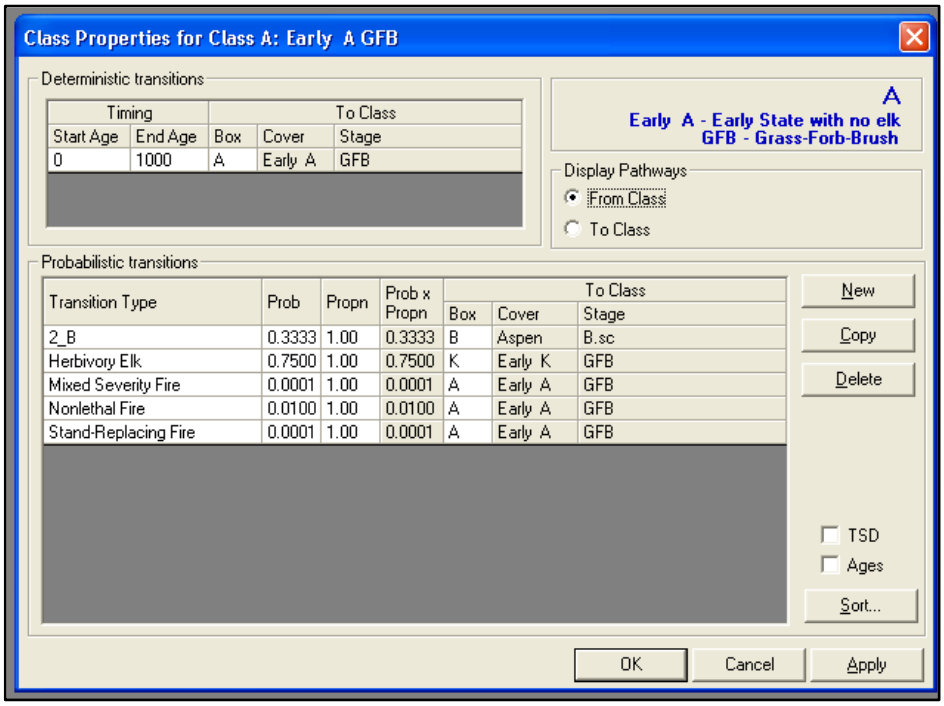
Appendix A figures 65 - 84 through display the actual VDDT model for spruce-fir forest, developed by the USFS Southwest Region 3, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends.

**Appendix A table 11. TNC's identification of current transitions, frequency of transitions, sources of information and assumptions used to develop the frequency of transitions and their effects on vegetation states included in the VDDT model for spruce-fir high elevation with stand replacing fire. A major assumption here is that historic and current conditions are sufficiently similar for the spruce-fir high elevation vegetation type that current forests are within their HRV, because the time elapsed since the last crown fire is within the range of their historic fire frequency. Current conditions for the spruce-fir wet forest vegetation type were assumed to reflect the current conditions of the dry spruce-fir forest type because the surface fire regime, which is the only difference between the two (from a disturbance standpoint), has been extinguished (adapted from Smith 2006d)**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Plant growth | 70 to 80 years between states | Transitions among model states were taken from data developed by Veblen et al. (1994) and Vankat (2006). | Smith assumed that transition from seedling/sapling to young forest takes approximately 70 years, and from young to old/mature forest takes approximately 80 years. |
| Regeneration from seed | Unknown, not used in model | Seed production and seedling recruitment is highly variable in both space and time, and there is insufficient information to assign a probability for this transition across the entire region. | Due to the lack of data on seedling recruitment, this transition is not included in the model, and hence the proportion of this seedling/sapling class of vegetation is presumed to be underestimated in the model. |
| Stand replacing fire | Once every 200 to 400 years | Stand replacing fire was reported to occur in small patches throughout spruce-fir's range, but relatively infrequent (Dieterich 1983; Moir 1993; Fulé et al. 2003; Vankat 2006). | Stand replacing fire occurred in small patches across all spruce-fir forests, returning the forest to the seedling/sapling stage. |
| Insect outbreak | Once every 33 years for young forests; once every 100 years for old/mature forests | Spruce beetle outbreaks have been documented for the northern portion of the range (northern New Mexico and Kaibab Plateau, Arizona) and for the Pinaleno Mountains in southern Arizona (Baker and Veblen 1990; Koprowski et al. 2005). | Smith assumed that insect outbreaks occurred at a lower frequency for young forest than for old/mature forest, returning young forest to regeneration state "A", and returning old/mature forest to equal proportions of regeneration and young forest. |
| Silvicultural activities | Not used in model | | Spruce-fir forests were too high in elevation, too inaccessible, or of too low value to have been significantly affected by timber harvest. |




**Appendix A figure 65. Actual VDDT state and transition model used for assessing trends in the spruce-fir forest PNVT on the ASNFs**



Class Properties for Class A: Early A GFB

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | A | Early A | GFB |

A
Early A - Early State with no elk
GFB - Grass-Forb-Brush

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.3333 | 1.00 | 0.3333 | B | Aspen | B.sc |
| Herbivory Elk | 0.7500 | 1.00 | 0.7500 | K | Early K | GFB |
| Mixed Severity Fire | 0.0001 | 1.00 | 0.0001 | A | Early A | GFB |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| Stand-Replacing Fire | 0.0001 | 1.00 | 0.0001 | A | Early A | GFB |

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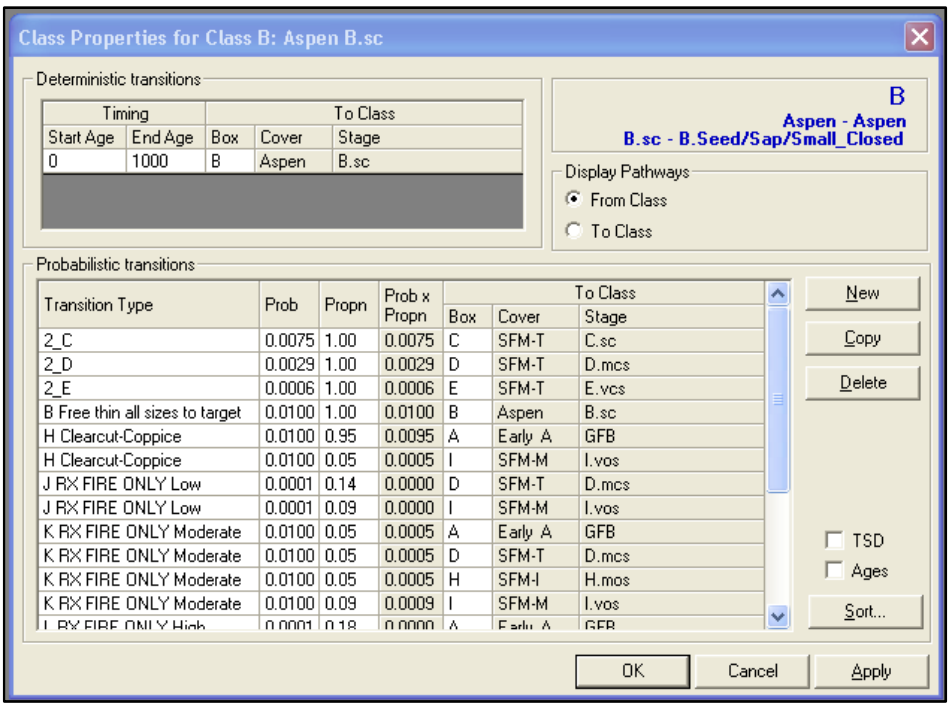
**Appendix A figure 66. Spruce-fir forest PNVTs' potentially management driven (0) and naturally driven (5) transitions for State A**



Class Properties for Class B: Aspen B.sc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | B | Aspen | B.sc |

B
Aspen - Aspen
B.sc - B.Seed/Sap/Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0075 | 1.00 | 0.0075 | C | SFM-T | C.sc |
| 2_D | 0.0029 | 1.00 | 0.0029 | D | SFM-T | D.mcs |
| 2_E | 0.0006 | 1.00 | 0.0006 | E | SFM-T | E.vcs |
| B Free thin all sizes to target | 0.0100 | 1.00 | 0.0100 | B | Aspen | B.sc |
| H Clearcut-Coppice | 0.0100 | 0.95 | 0.0095 | A | Early A | GFB |
| H Clearcut-Coppice | 0.0100 | 0.05 | 0.0005 | I | SFM-M | I.vos |
| J RX FIRE ONLY Low | 0.0001 | 0.14 | 0.0000 | D | SFM-T | D.mcs |
| J RX FIRE ONLY Low | 0.0001 | 0.09 | 0.0000 | I | SFM-M | I.vos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.05 | 0.0005 | A | Early A | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.05 | 0.0005 | D | SFM-T | D.mcs |
| K RX FIRE ONLY Moderate | 0.0100 | 0.05 | 0.0005 | H | SFM-I | H.mos |
| K RX FIRE ONLY Moderate | 0.0100 | 0.09 | 0.0009 | I | SFM-M | I.vos |
| L RX FIRE ONLY High | 0.0001 | 0.18 | 0.0000 | A | Early A | GFB |

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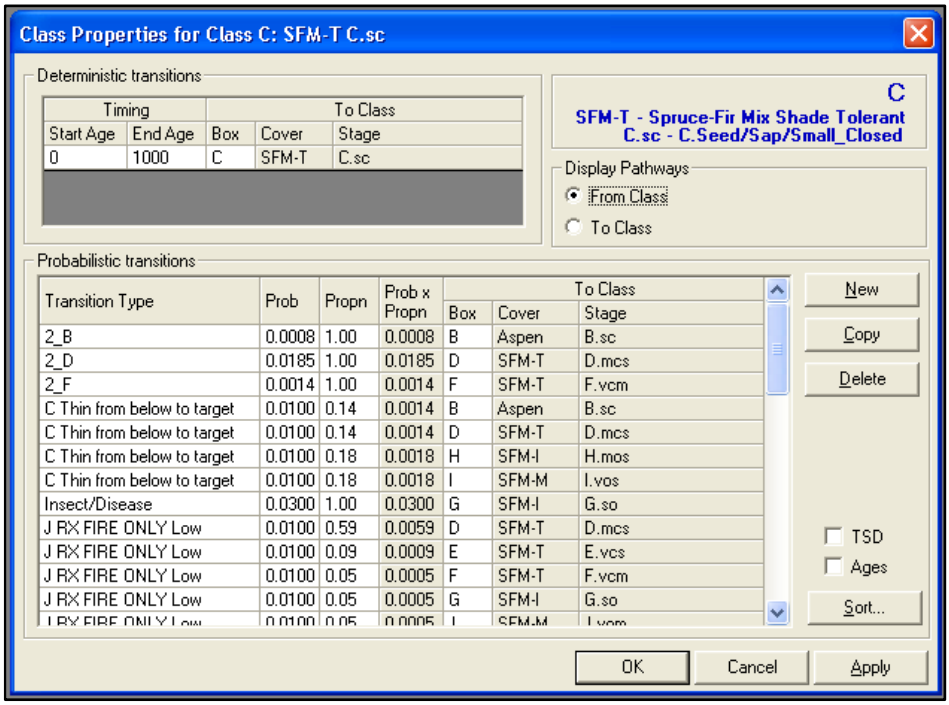
**Appendix A figure 67. Spruce-fir forest PNVTs' potentially management driven (10) and naturally driven (10) transitions for State B**



Class Properties for Class C: SFM-T C.sc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | C | SFM-T | C.sc |

C
SFM-T - Spruce-Fir Mix Shade Tolerant
C.sc - C.Seed/Sap/Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0008 | 1.00 | 0.0008 | B | Aspen | B.sc |
| 2_D | 0.0185 | 1.00 | 0.0185 | D | SFM-T | D.mcs |
| 2_F | 0.0014 | 1.00 | 0.0014 | F | SFM-T | F.vcm |
| C Thin from below to target | 0.0100 | 0.14 | 0.0014 | B | Aspen | B.sc |
| C Thin from below to target | 0.0100 | 0.14 | 0.0014 | D | SFM-T | D.mcs |
| C Thin from below to target | 0.0100 | 0.18 | 0.0018 | H | SFM-I | H.mos |
| C Thin from below to target | 0.0100 | 0.18 | 0.0018 | I | SFM-M | I.vos |
| Insect/Disease | 0.0300 | 1.00 | 0.0300 | G | SFM-I | G.so |
| J RX FIRE ONLY Low | 0.0100 | 0.59 | 0.0059 | D | SFM-T | D.mcs |
| J RX FIRE ONLY Low | 0.0100 | 0.09 | 0.0009 | E | SFM-T | E.vcs |
| J RX FIRE ONLY Low | 0.0100 | 0.05 | 0.0005 | F | SFM-T | F.vcm |
| J RX FIRE ONLY Low | 0.0100 | 0.05 | 0.0005 | G | SFM-I | G.so |
| L RX FIRE ONLY Low | 0.0100 | 0.05 | 0.0005 | I | SFM-M | I.vos |

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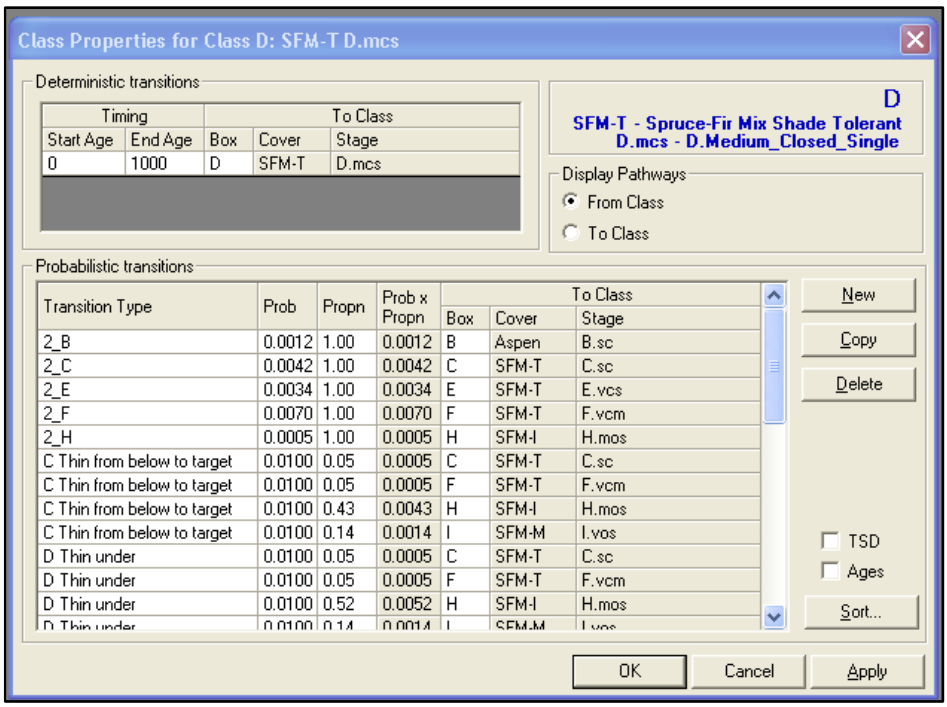
**Appendix A figure 68. Spruce-fir forest PNVTs' potentially management driven (28) and naturally driven (19) transitions for State C**



Class Properties for Class D: SFM-T D.mcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | D | SFM-T | D.mcs |

D
SFM-T - Spruce-Fir Mix Shade Tolerant
D.mcs - D.Medium_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0012 | 1.00 | 0.0012 | B | Aspen | B.sc |
| 2_C | 0.0042 | 1.00 | 0.0042 | C | SFM-T | C.sc |
| 2_E | 0.0034 | 1.00 | 0.0034 | E | SFM-T | E.vcs |
| 2_F | 0.0070 | 1.00 | 0.0070 | F | SFM-T | F.vcm |
| 2_H | 0.0005 | 1.00 | 0.0005 | H | SFM-I | H.mos |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | C | SFM-T | C.sc |
| C Thin from below to target | 0.0100 | 0.05 | 0.0005 | F | SFM-T | F.vcm |
| C Thin from below to target | 0.0100 | 0.43 | 0.0043 | H | SFM-I | H.mos |
| C Thin from below to target | 0.0100 | 0.14 | 0.0014 | I | SFM-M | I.vos |
| D Thin under | 0.0100 | 0.05 | 0.0005 | C | SFM-T | C.sc |
| D Thin under | 0.0100 | 0.05 | 0.0005 | F | SFM-T | F.vcm |
| D Thin under | 0.0100 | 0.52 | 0.0052 | H | SFM-I | H.mos |
| D Thin under | 0.0100 | 0.14 | 0.0014 | I | SFM-M | I.vos |

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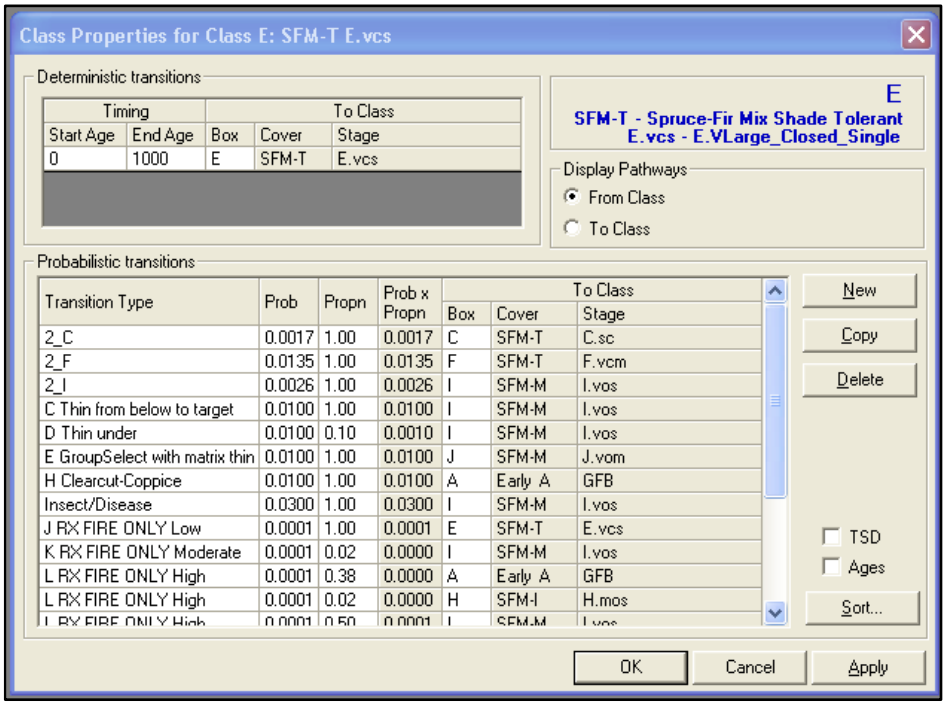
**Appendix A figure 69. Spruce-fir forest PNVTs' potentially management driven (19) and naturally driven (13) transitions for State D**



Class Properties for Class E: SFM-T E.vcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | SFM-T | E.vcs |

E
SFM-T - Spruce-Fir Mix Shade Tolerant
E.vcs - E.VLarge_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0017 | 1.00 | 0.0017 | C | SFM-T | C.sc |
| 2_F | 0.0135 | 1.00 | 0.0135 | F | SFM-T | F.vcm |
| 2_I | 0.0026 | 1.00 | 0.0026 | I | SFM-M | I.vos |
| C Thin from below to target | 0.0100 | 1.00 | 0.0100 | I | SFM-M | I.vos |
| D Thin under | 0.0100 | 0.10 | 0.0010 | I | SFM-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | SFM-M | J.vom |
| H Clearcut-Coppice | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| Insect/Disease | 0.0300 | 1.00 | 0.0300 | I | SFM-M | I.vos |
| J RX FIRE ONLY Low | 0.0001 | 1.00 | 0.0001 | E | SFM-T | E.vcs |
| K RX FIRE ONLY Moderate | 0.0001 | 0.02 | 0.0000 | I | SFM-M | I.vos |
| L RX FIRE ONLY High | 0.0001 | 0.38 | 0.0000 | A | Early A | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.02 | 0.0000 | H | SFM-I | H.mos |
| L RX FIRE ONLY High | 0.0001 | 0.50 | 0.0001 | I | SFM-M | I.vos |

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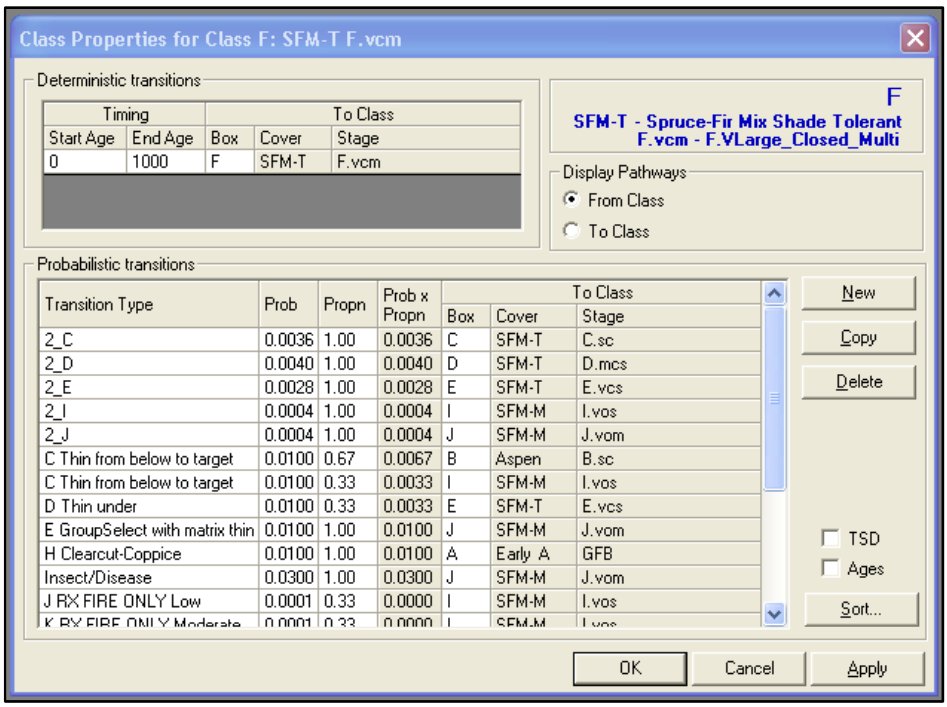
**Appendix A figure 70. Spruce-fir forest PNVTs' potentially management driven (10) and naturally driven (9) transitions for State E**



Class Properties for Class F: SFM-T F.vcm

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | F | SFM-T | F.vcm |

F
SFM-T - Spruce-Fir Mix Shade Tolerant
F.vcm - F.VLarge_Closed_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0036 | 1.00 | 0.0036 | C | SFM-T | C.sc |
| 2_D | 0.0040 | 1.00 | 0.0040 | D | SFM-T | D.mcs |
| 2_E | 0.0028 | 1.00 | 0.0028 | E | SFM-T | E.vcs |
| 2_I | 0.0004 | 1.00 | 0.0004 | I | SFM-M | I.vos |
| 2_J | 0.0004 | 1.00 | 0.0004 | J | SFM-M | J.vom |
| C Thin from below to target | 0.0100 | 0.67 | 0.0067 | B | Aspen | B.sc |
| C Thin from below to target | 0.0100 | 0.33 | 0.0033 | I | SFM-M | I.vos |
| D Thin under | 0.0100 | 0.33 | 0.0033 | E | SFM-T | E.vcs |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | SFM-M | J.vom |
| H Clearcut-Coppice | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| Insect/Disease | 0.0300 | 1.00 | 0.0300 | J | SFM-M | J.vom |
| J RX FIRE ONLY Low | 0.0001 | 0.33 | 0.0000 | I | SFM-M | I.vos |
| K RX FIRE ONLY Moderate | 0.0001 | 0.33 | 0.0000 | I | SFM-M | I.vos |

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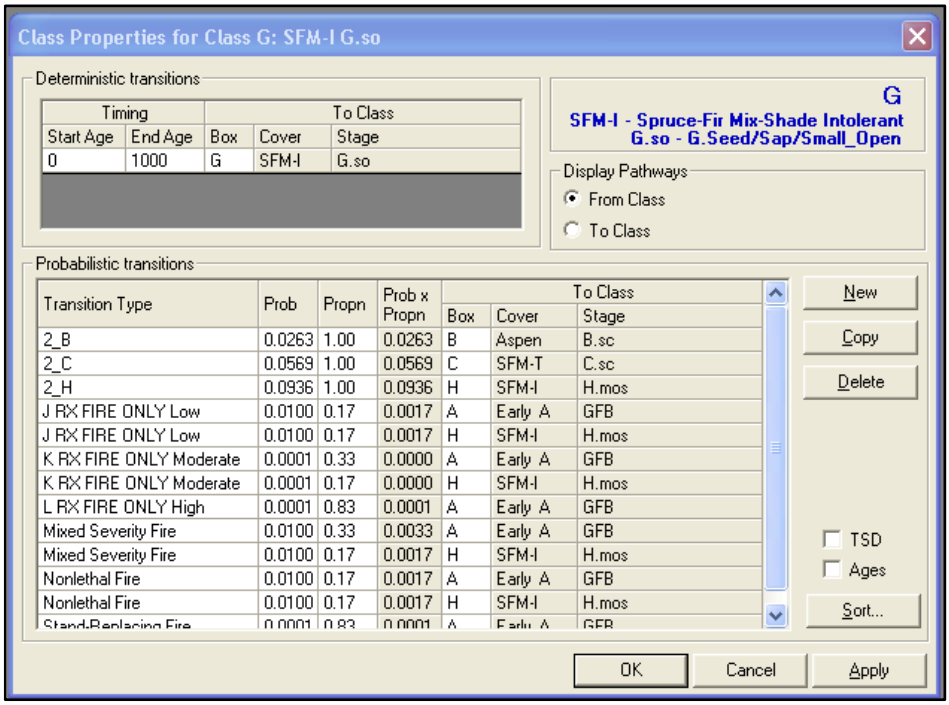
**Appendix A figure 71. Spruce-fir forest PNVTs' potentially management driven (10) and naturally driven (10) transitions for State F**



Class Properties for Class G: SFM-I G.so

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | G | SFM-I | G.so |

G
SFM-I - Spruce-Fir Mix-Shade Intolerant
G.so - G.Seed/Sap/Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0263 | 1.00 | 0.0263 | B | Aspen | B.sc |
| 2_C | 0.0569 | 1.00 | 0.0569 | C | SFM-T | C.sc |
| 2_H | 0.0936 | 1.00 | 0.0936 | H | SFM-I | H.mos |
| J RX FIRE ONLY Low | 0.0100 | 0.17 | 0.0017 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.17 | 0.0017 | H | SFM-I | H.mos |
| K RX FIRE ONLY Moderate | 0.0001 | 0.33 | 0.0000 | A | Early A | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.17 | 0.0000 | H | SFM-I | H.mos |
| L RX FIRE ONLY High | 0.0001 | 0.83 | 0.0001 | A | Early A | GFB |
| Mixed Severity Fire | 0.0100 | 0.33 | 0.0033 | A | Early A | GFB |
| Mixed Severity Fire | 0.0100 | 0.17 | 0.0017 | H | SFM-I | H.mos |
| Nonlethal Fire | 0.0100 | 0.17 | 0.0017 | A | Early A | GFB |
| Nonlethal Fire | 0.0100 | 0.17 | 0.0017 | H | SFM-I | H.mos |
| Stand-Replacing Fire | 0.0001 | 0.83 | 0.0001 | A | Early A | GFB |

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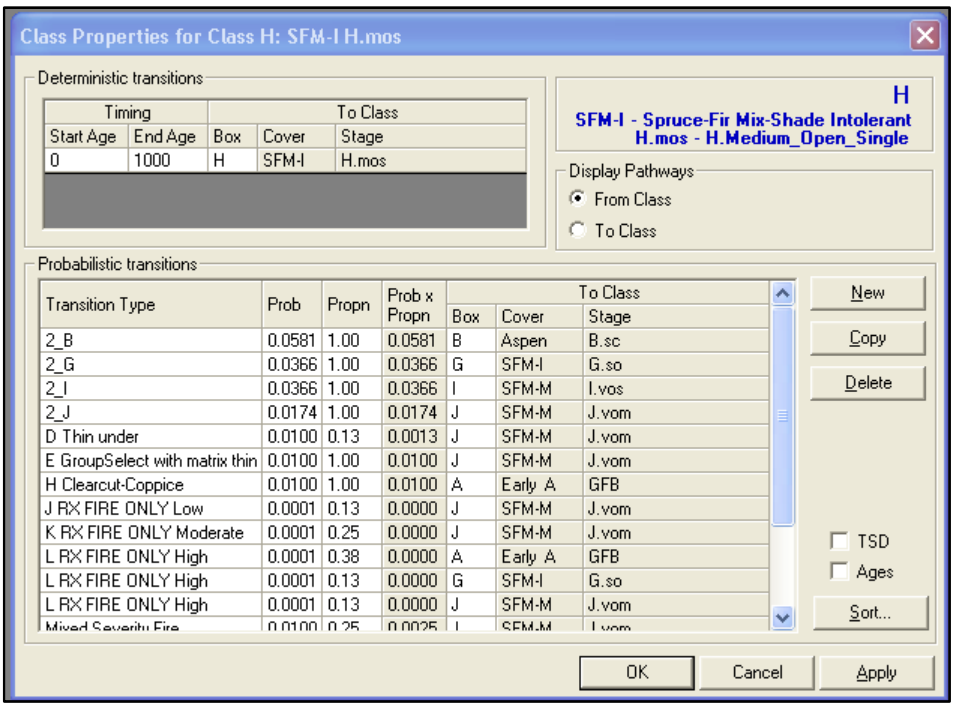
**Appendix A figure 72. Spruce-fir forest PNVTs' potentially management driven (5) and naturally driven (8) transitions for State G**



Class Properties for Class H: SFM-I H.mos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | H | SFM-I | H.mos |

H
SFM-I - Spruce-Fir Mix-Shade Intolerant
H.mos - H.Medium_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0581 | 1.00 | 0.0581 | B | Aspen | B.sc |
| 2_G | 0.0366 | 1.00 | 0.0366 | G | SFM-I | G.so |
| 2_I | 0.0366 | 1.00 | 0.0366 | I | SFM-M | I.vos |
| 2_J | 0.0174 | 1.00 | 0.0174 | J | SFM-M | J.vom |
| D Thin under | 0.0100 | 0.13 | 0.0013 | J | SFM-M | J.vom |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | SFM-M | J.vom |
| H Clearcut-Coppice | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0001 | 0.13 | 0.0000 | J | SFM-M | J.vom |
| K RX FIRE ONLY Moderate | 0.0001 | 0.25 | 0.0000 | J | SFM-M | J.vom |
| L RX FIRE ONLY High | 0.0001 | 0.38 | 0.0000 | A | Early A | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.13 | 0.0000 | G | SFM-I | G.so |
| L RX FIRE ONLY High | 0.0001 | 0.13 | 0.0000 | J | SFM-M | J.vom |
| Mixed Severity Fire | 0.0100 | 0.25 | 0.0025 | I | SFM-M | I.vom |

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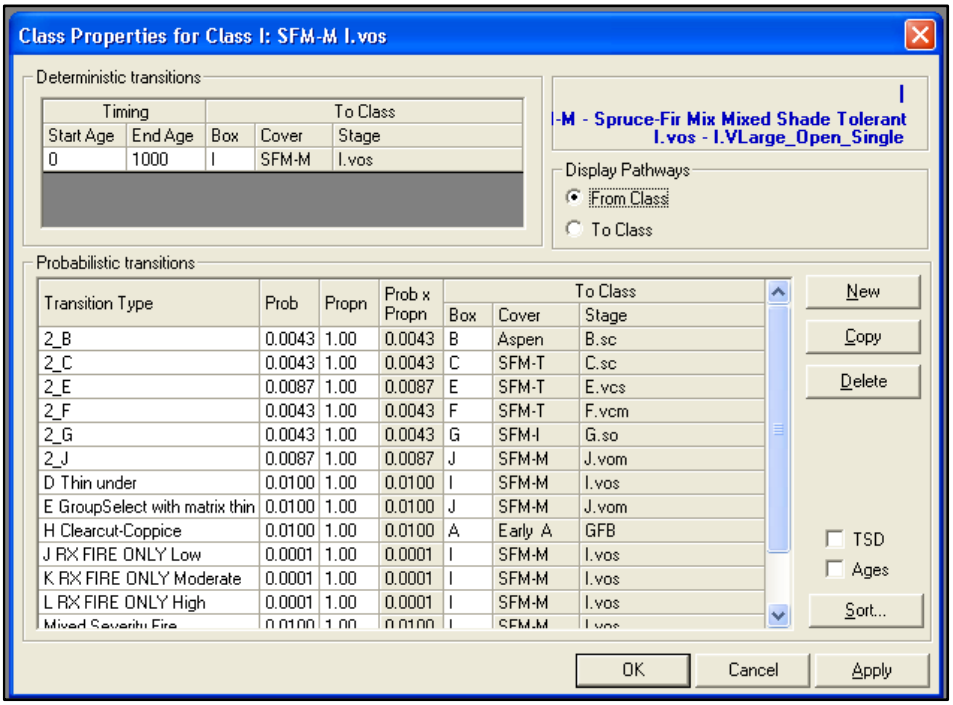
**Appendix A figure 73. Spruce-fir forest PNVTs' potentially management driven (8) and naturally driven (8) transitions for State H**



Class Properties for Class I: SFM-M I.vos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | I | SFM-M | I.vos |

I
I-M - Spruce-Fir Mix Mixed Shade Tolerant
I.vos - I.VLarge_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0043 | 1.00 | 0.0043 | B | Aspen | B.sc |
| 2_C | 0.0043 | 1.00 | 0.0043 | C | SFM-T | C.sc |
| 2_E | 0.0087 | 1.00 | 0.0087 | E | SFM-T | E.vcs |
| 2_F | 0.0043 | 1.00 | 0.0043 | F | SFM-T | F.vcm |
| 2_G | 0.0043 | 1.00 | 0.0043 | G | SFM-I | G.so |
| 2_J | 0.0087 | 1.00 | 0.0087 | J | SFM-M | J.vom |
| D Thin under | 0.0100 | 1.00 | 0.0100 | I | SFM-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 1.00 | 0.0100 | J | SFM-M | J.vom |
| H Clearcut-Coppice | 0.0100 | 1.00 | 0.0100 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0001 | 1.00 | 0.0001 | I | SFM-M | I.vos |
| K RX FIRE ONLY Moderate | 0.0001 | 1.00 | 0.0001 | I | SFM-M | I.vos |
| L RX FIRE ONLY High | 0.0001 | 1.00 | 0.0001 | I | SFM-M | I.vos |
| Mixed Severity Fire | 0.0100 | 1.00 | 0.0100 | I | SFM-M | I.vos |

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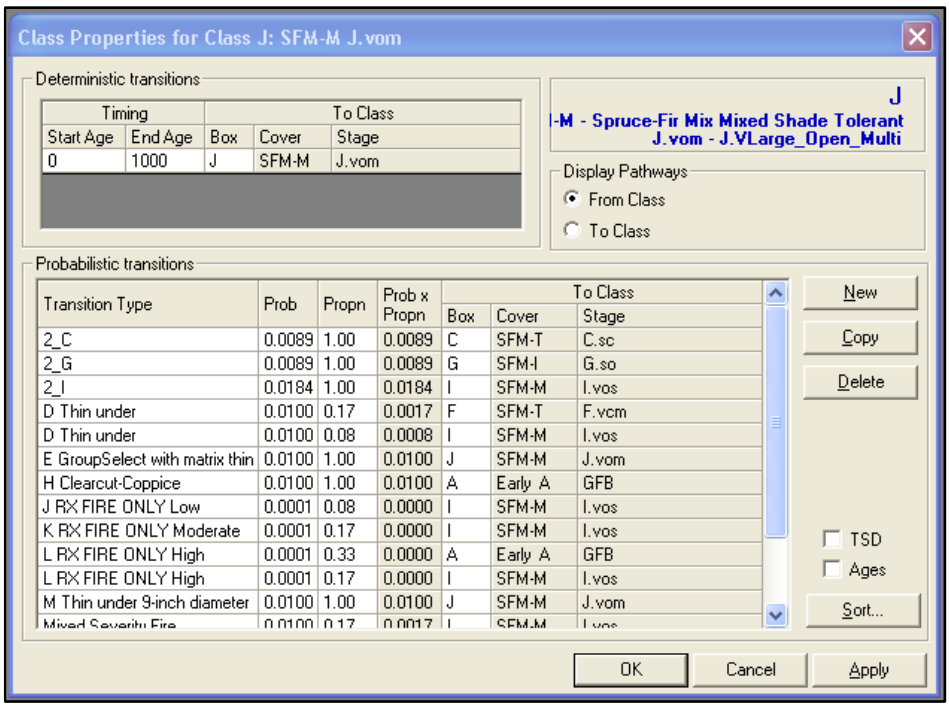
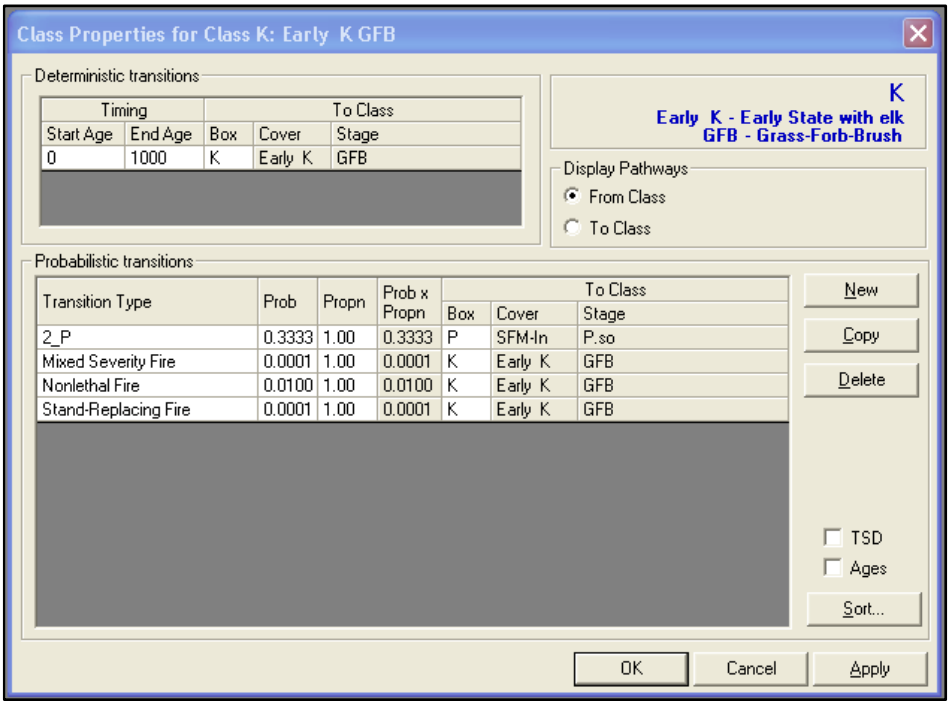
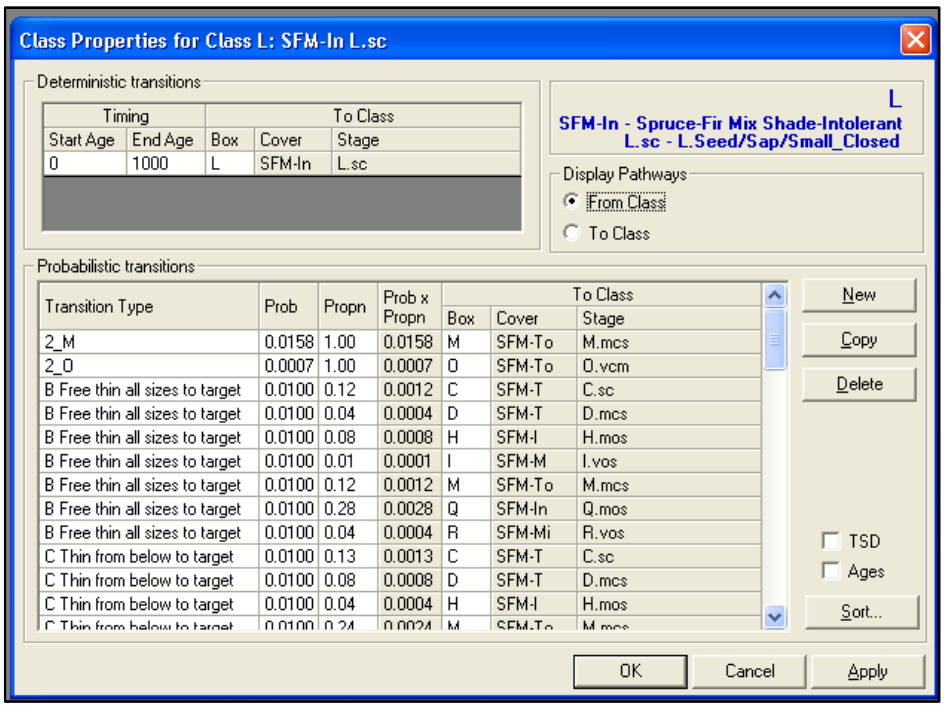
**Appendix A figure 74. Spruce-fir forest PNVTs' potentially management driven (7) and naturally driven (9) transitions for State I**




**Appendix A figure 75. Spruce-fir forest PNVTs' potentially management driven (9) and naturally driven (7) transitions for State J**




**Appendix A figure 76. Spruce-fir forest PNVTs' potentially management driven (2) and naturally driven (4) transitions for State K**



Class Properties for Class L: SFM-In L.sc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | L | SFM-In | L.sc |

L
SFM-In - Spruce-Fir Mix Shade-Intolerant
L.sc - L.Seed/Sap/Small_Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_M | 0.0158 | 1.00 | 0.0158 | M | SFM-To | M.mcs |
| 2_O | 0.0007 | 1.00 | 0.0007 | O | SFM-To | O.vcm |
| B Free thin all sizes to target | 0.0100 | 0.12 | 0.0012 | C | SFM-T | C.sc |
| B Free thin all sizes to target | 0.0100 | 0.04 | 0.0004 | D | SFM-T | D.mcs |
| B Free thin all sizes to target | 0.0100 | 0.08 | 0.0008 | H | SFM-I | H.mos |
| B Free thin all sizes to target | 0.0100 | 0.01 | 0.0001 | I | SFM-M | I.vos |
| B Free thin all sizes to target | 0.0100 | 0.12 | 0.0012 | M | SFM-To | M.mcs |
| B Free thin all sizes to target | 0.0100 | 0.28 | 0.0028 | Q | SFM-In | Q.mos |
| B Free thin all sizes to target | 0.0100 | 0.04 | 0.0004 | R | SFM-Mi | R.vos |
| C Thin from below to target | 0.0100 | 0.13 | 0.0013 | C | SFM-T | C.sc |
| C Thin from below to target | 0.0100 | 0.08 | 0.0008 | D | SFM-T | D.mcs |
| C Thin from below to target | 0.0100 | 0.04 | 0.0004 | H | SFM-I | H.mos |
| C Thin from below to target | 0.0100 | 0.24 | 0.0024 | M | SFM-To | M.mcs |

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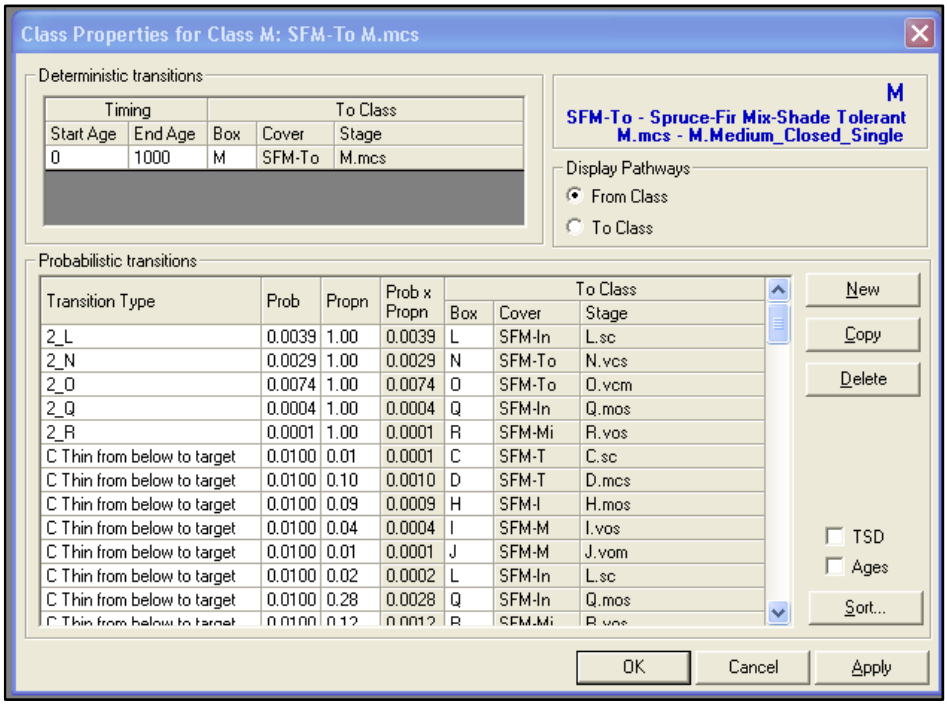
**Appendix A figure 77. Spruce-fir forest PNVTs' potentially management driven (35) and naturally driven (24) transitions for State L**



Class Properties for Class M: SFM-To M.mcs

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | M | SFM-To | M.mcs |

M
SFM-To - Spruce-Fir Mix-Shade Tolerant
M.mcs - M.Medium_Closed_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0039 | 1.00 | 0.0039 | L | SFM-In | L.sc |
| 2_N | 0.0029 | 1.00 | 0.0029 | N | SFM-To | N.vcs |
| 2_O | 0.0074 | 1.00 | 0.0074 | O | SFM-To | O.vcm |
| 2_Q | 0.0004 | 1.00 | 0.0004 | Q | SFM-In | Q.mos |
| 2_R | 0.0001 | 1.00 | 0.0001 | R | SFM-Mi | R.vos |
| C Thin from below to target | 0.0100 | 0.01 | 0.0001 | C | SFM-T | C.sc |
| C Thin from below to target | 0.0100 | 0.10 | 0.0010 | D | SFM-T | D.mcs |
| C Thin from below to target | 0.0100 | 0.09 | 0.0009 | H | SFM-I | H.mos |
| C Thin from below to target | 0.0100 | 0.04 | 0.0004 | I | SFM-M | I.vos |
| C Thin from below to target | 0.0100 | 0.01 | 0.0001 | J | SFM-M | J.vom |
| C Thin from below to target | 0.0100 | 0.02 | 0.0002 | L | SFM-In | L.sc |
| C Thin from below to target | 0.0100 | 0.28 | 0.0028 | Q | SFM-In | Q.mos |
| C Thin from below to target | 0.0100 | 0.12 | 0.0012 | R | SFM-Mi | R.vos |

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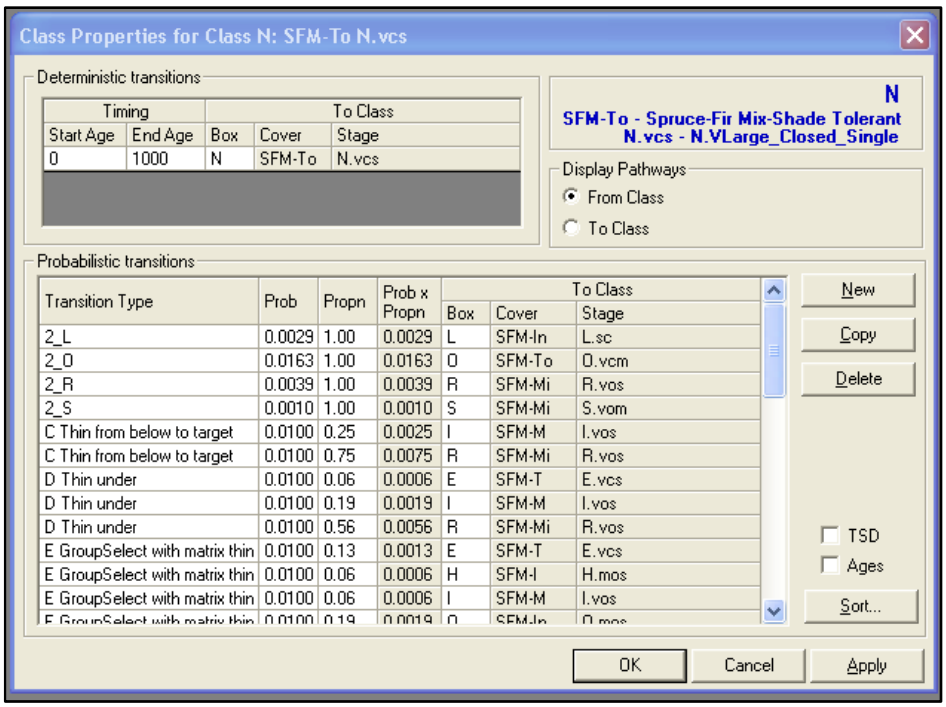
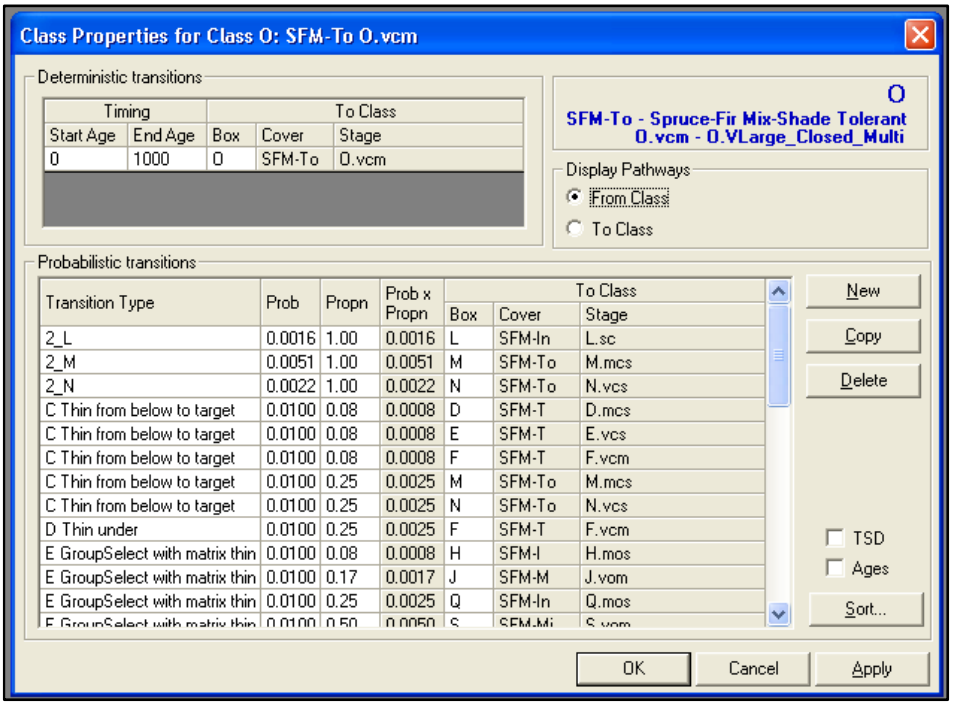
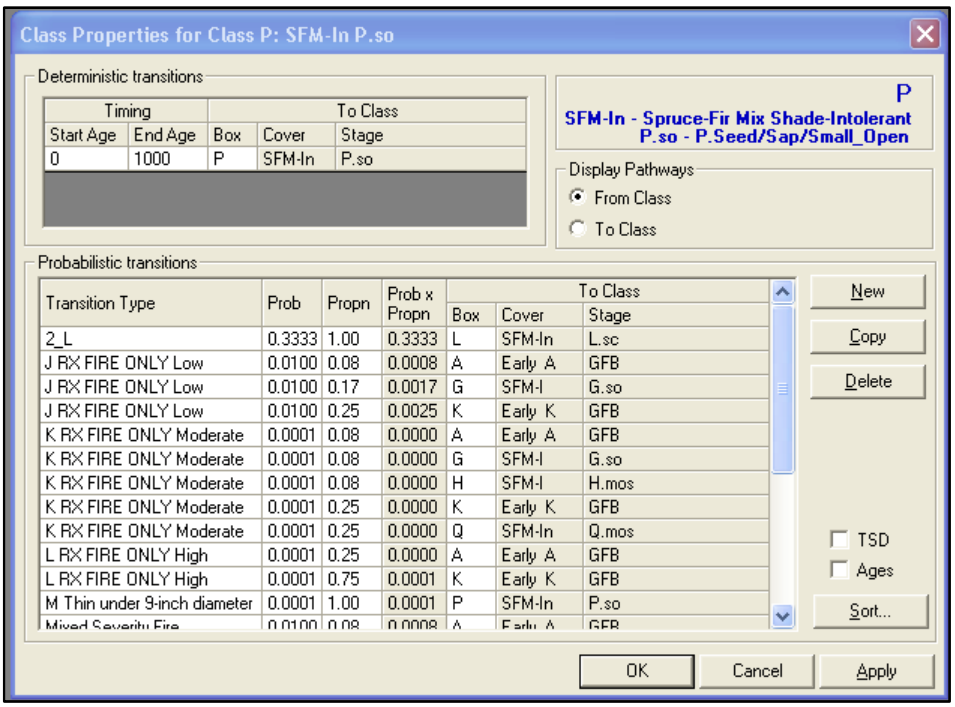
**Appendix A figure 78. Spruce-fir forest PNVTs' potentially management driven (59) and naturally driven (31) transitions for State M**




**Appendix A figure 79. Spruce-fir forest PNVTs' potentially management driven (24) and naturally driven (15) transitions for State N**




**Appendix A figure 80. Spruce-fir forest PNVTs' potentially management driven (23) and naturally driven (13) transitions for State O**



Class Properties for Class P: SFM-In P.so

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | P | SFM-In | P.so |

P
SFM-In - Spruce-Fir Mix Shade-Intolerant
P.so - P.Seed/Sap/Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.3333 | 1.00 | 0.3333 | L | SFM-In | L.sc |
| J RX FIRE ONLY Low | 0.0100 | 0.08 | 0.0008 | A | Early A | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.17 | 0.0017 | G | SFM-I | G.so |
| J RX FIRE ONLY Low | 0.0100 | 0.25 | 0.0025 | K | Early K | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.08 | 0.0000 | A | Early A | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.08 | 0.0000 | G | SFM-I | G.so |
| K RX FIRE ONLY Moderate | 0.0001 | 0.08 | 0.0000 | H | SFM-I | H.mos |
| K RX FIRE ONLY Moderate | 0.0001 | 0.25 | 0.0000 | K | Early K | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.25 | 0.0000 | Q | SFM-In | Q.mos |
| L RX FIRE ONLY High | 0.0001 | 0.25 | 0.0000 | A | Early A | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.75 | 0.0001 | K | Early K | GFB |
| M Thin under 9-inch diameter | 0.0001 | 1.00 | 0.0001 | P | SFM-In | P.so |
| Mixed Severity Fire | 0.0100 | 0.08 | 0.0008 | A | Early A | GFB |

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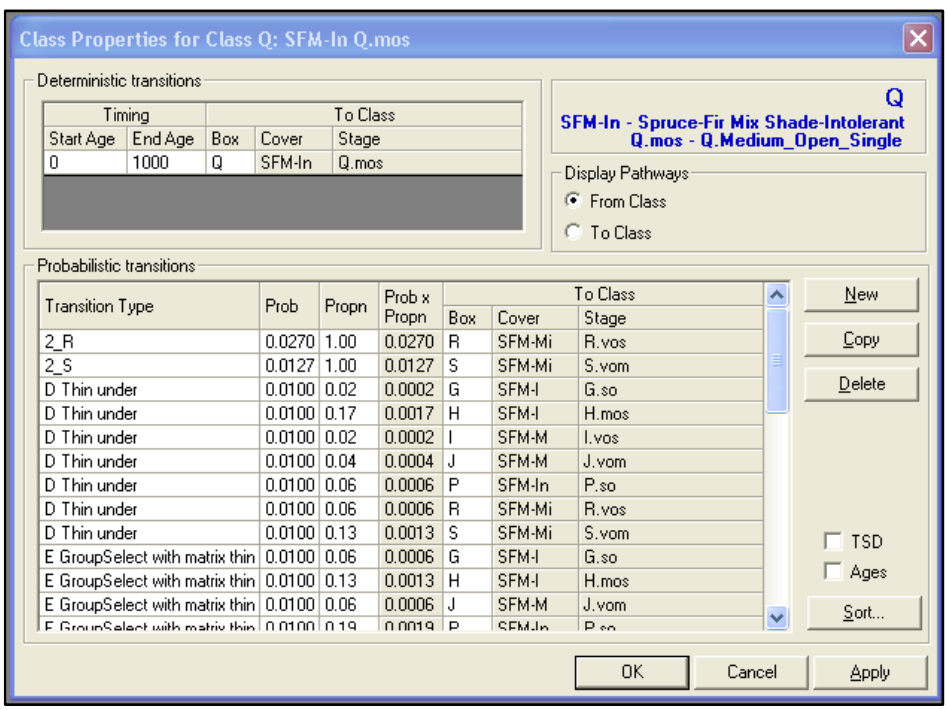
**Appendix A figure 81. Spruce-fir forest PNVTs' potentially management driven (13) and naturally driven (11) transitions for State P**



Class Properties for Class Q: SFM-In Q.mos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | Q | SFM-In | Q.mos |

Q
SFM-In - Spruce-Fir Mix Shade-Intolerant
Q.mos - Q.Medium_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_R | 0.0270 | 1.00 | 0.0270 | R | SFM-Mi | R.vos |
| 2_S | 0.0127 | 1.00 | 0.0127 | S | SFM-Mi | S.vom |
| D Thin under | 0.0100 | 0.02 | 0.0002 | G | SFM-I | G.so |
| D Thin under | 0.0100 | 0.17 | 0.0017 | H | SFM-I | H.mos |
| D Thin under | 0.0100 | 0.02 | 0.0002 | I | SFM-M | I.vos |
| D Thin under | 0.0100 | 0.04 | 0.0004 | J | SFM-M | J.vom |
| D Thin under | 0.0100 | 0.06 | 0.0006 | P | SFM-In | P.so |
| D Thin under | 0.0100 | 0.06 | 0.0006 | R | SFM-Mi | R.vos |
| D Thin under | 0.0100 | 0.13 | 0.0013 | S | SFM-Mi | S.vom |
| E GroupSelect with matrix thin | 0.0100 | 0.06 | 0.0006 | G | SFM-I | G.so |
| E GroupSelect with matrix thin | 0.0100 | 0.13 | 0.0013 | H | SFM-I | H.mos |
| E GroupSelect with matrix thin | 0.0100 | 0.06 | 0.0006 | J | SFM-M | J.vom |
| E GroupSelect with matrix thin | 0.0100 | 0.19 | 0.0019 | P | SFM-In | P.so |

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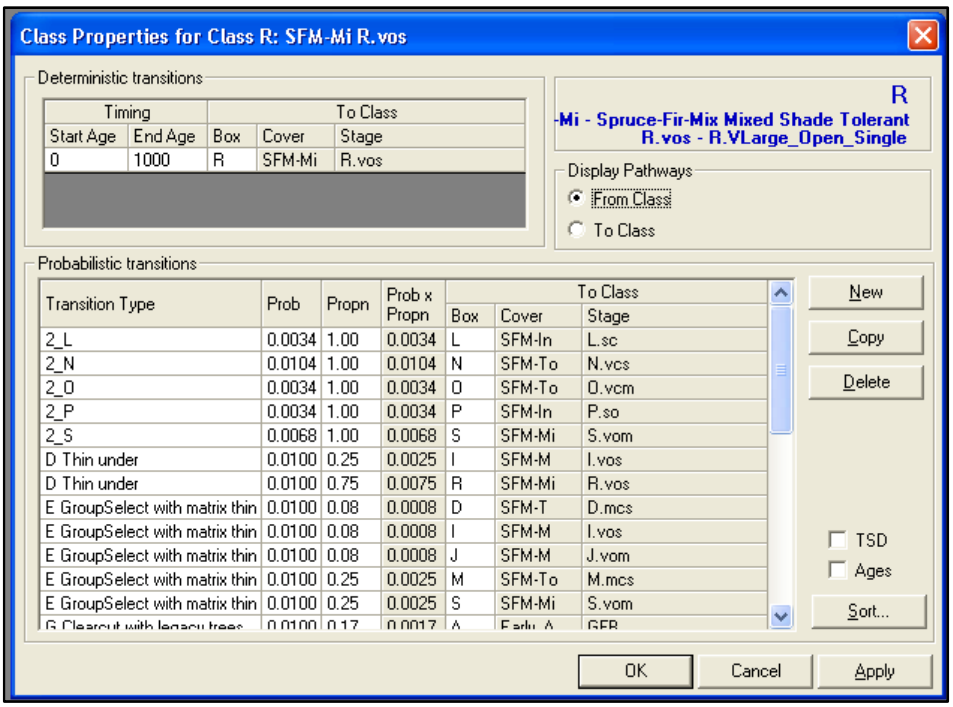
**Appendix A figure 82. Spruce-fir forest PNVTs' potentially management driven (43) and naturally driven (9) transitions for State Q**



Class Properties for Class R: SFM-Mi R.vos

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | R | SFM-Mi | R.vos |

R
-Mi - Spruce-Fir-Mix Mixed Shade Tolerant
R.vos - R.VLarge_Open_Single

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0034 | 1.00 | 0.0034 | L | SFM-In | L.sc |
| 2_N | 0.0104 | 1.00 | 0.0104 | N | SFM-To | N.vcs |
| 2_O | 0.0034 | 1.00 | 0.0034 | O | SFM-To | O.vcm |
| 2_P | 0.0034 | 1.00 | 0.0034 | P | SFM-In | P.so |
| 2_S | 0.0068 | 1.00 | 0.0068 | S | SFM-Mi | S.vom |
| D Thin under | 0.0100 | 0.25 | 0.0025 | I | SFM-M | I.vos |
| D Thin under | 0.0100 | 0.75 | 0.0075 | R | SFM-Mi | R.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | D | SFM-T | D.mcs |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | I | SFM-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | J | SFM-M | J.vom |
| E GroupSelect with matrix thin | 0.0100 | 0.25 | 0.0025 | M | SFM-To | M.mcs |
| E GroupSelect with matrix thin | 0.0100 | 0.25 | 0.0025 | S | SFM-Mi | S.vom |
| G Clearcut with legacy trees | 0.0100 | 0.17 | 0.0017 | A | Early A | GFB |

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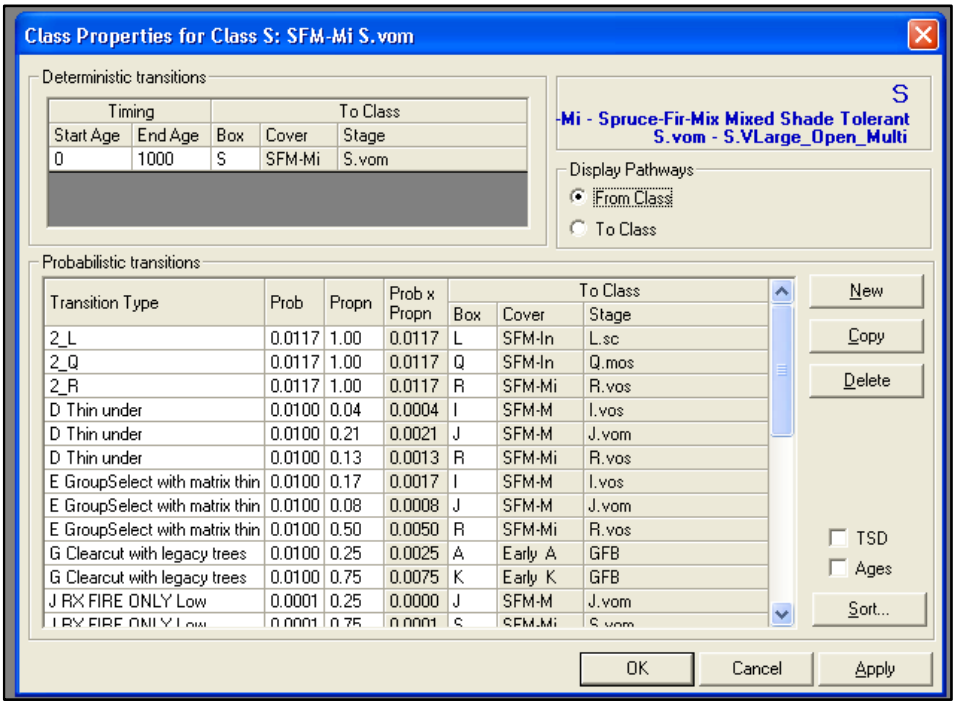
**Appendix A figure 83. Spruce-fir forest PNVTs' potentially management driven (19) and naturally driven (12) transitions for State R**



Class Properties for Class S: SFM-Mi S.vom

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | S | SFM-Mi | S.vom |

S
-Mi - Spruce-Fir-Mix Mixed Shade Tolerant
S.vom - S.VLarge_Open_Multi

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_L | 0.0117 | 1.00 | 0.0117 | L | SFM-In | L.sc |
| 2_Q | 0.0117 | 1.00 | 0.0117 | Q | SFM-In | Q.mos |
| 2_R | 0.0117 | 1.00 | 0.0117 | R | SFM-Mi | R.vos |
| D Thin under | 0.0100 | 0.04 | 0.0004 | I | SFM-M | I.vos |
| D Thin under | 0.0100 | 0.21 | 0.0021 | J | SFM-M | J.vom |
| D Thin under | 0.0100 | 0.13 | 0.0013 | R | SFM-Mi | R.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.17 | 0.0017 | I | SFM-M | I.vos |
| E GroupSelect with matrix thin | 0.0100 | 0.08 | 0.0008 | J | SFM-M | J.vom |
| E GroupSelect with matrix thin | 0.0100 | 0.50 | 0.0050 | R | SFM-Mi | R.vos |
| G Clearcut with legacy trees | 0.0100 | 0.25 | 0.0025 | A | Early A | GFB |
| G Clearcut with legacy trees | 0.0100 | 0.75 | 0.0075 | K | Early K | GFB |
| J RX FIRE ONLY Low | 0.0001 | 0.25 | 0.0000 | J | SFM-M | J.vom |
| J RX FIRE ONLY Low | 0.0001 | 0.75 | 0.0001 | S | SFM-Mi | S.vom |

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**Appendix A figure 84. Spruce-fir forest PNVTs' potentially management driven (23) and naturally driven (10) transitions for State S**

## Woodland PNVTs

## Madrean Pine-Oak Woodland

**Appendix A table 12. Madrean pine-oak woodland PNVT crosswalks developed by Region 3 (19 March 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Schussman and Gori 2006)**

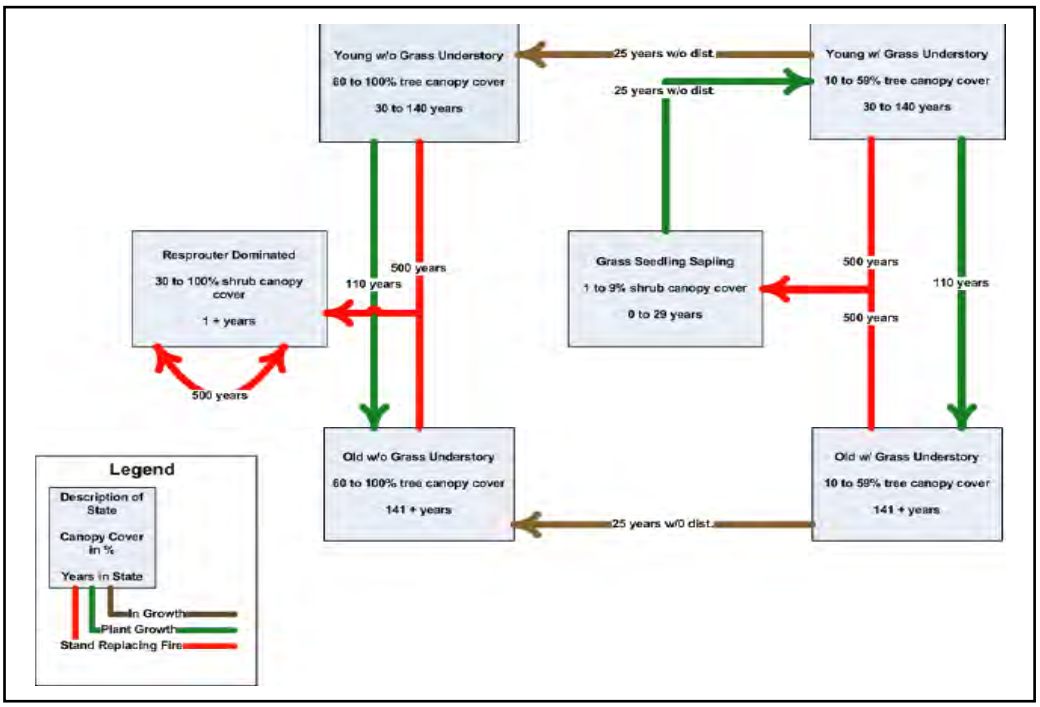
| Current Trends Model | | | | R3 Mid-scale Existing Veg Mapping | Reference Condition | | | | Baseline Desired Conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| Source | State | Description | | Dominance Unit - Size/Cover | Source | TNC State | Historic Mean (%) | Description | Structural Stage (%) | Description |
| USFS R3 model MPO | A | GFB/SHR | = | Non-treed: Recently burned, grass, forb, and shrub types - N/A | TNC Madrean Pine Oak Woodland | A | 4 | Grass, seedling/sapling | 4 | Reference condition |
| | B | SSO | = | All tree types - Seedling/sapling - open | | F | 5 | Resprouter dominated | 5 | Reference condition |
| | E | SSC | = | All tree types - Seedling/sapling - closed | | | | | | |
| | C | SMO | = | All tree types - Small - open | | C | 24 | Young with grass understory, moderate canopy cover | 13 | Reference condition, and conditions indicative of even-aged stand dynamics and the development of Mexican spotted owl (MSO) habitat† |
| | F | SMC | = | All tree types - Small - closed | | B | 3 | Young with grass understory, closed canopy | 3 | Reference condition |
| | D | MVO | = | All tree types - Medium - open, very large - open | | D | 60 | Old with grass understory, moderate canopy cover | 60 | Reference condition |
| | G | MVC | = | All tree types - Medium - closed, very large - closed | | E | 4 | Old with grass understory, closed canopy | 15 | Conditions indicative of MSO habitat and mature closed-forest conditions‡ |

†Reflects the reference condition of 24% minus the additional 9% allocated to state E for MSO habitat (mature-closed)
‡Reference condition for this state is 4%

### *Madrean Pine-Oak Woodland State and Transition Models*

The following is Schussman and Gori's (2006) discussion concerning the current modeling results for Madrean pine-oak woodlands.

Appendix A figure 85 displays a conceptual current state and transition model for the Madrean pine-oak woodland vegetation type (Schussman and Gori 2006) used in VDDT modeling. In table 13[27], Schussman and Gori (2006) describe the parameters included or not included within the current VDDT model (Schussman and Gori 2006), as well as the sources of information and any assumptions used to create the model parameters.




**Appendix A figure 85. Conceptual current state and transition model for the Madrean pine-oak woodland vegetation type, frequency of transitions are noted (Schussman and Gori 2006)**

[27] See Schussman and Gori 2006

**Appendix A table 13. Identification of historic transitions, frequency of transitions, sources of information and assumptions used to develop the frequency of transitions and their effects on vegetation states included in the VDDT model for Madrean pine-oak woodland (adapted from Schussman and Gori 2006)**

| Transition Type | Transition Frequency or Length | Source | Assumptions |
|---|---|---|---|
| In-growth | After 25 years without fire | Barton et al. 2001 | Based on Barton et al.(2001) study that showed that pines need 20 to 30 years of fire free periods in order to establish, we determined that in growth would occur in areas that had been free of fire for 25 years. |
| Plant growth (25 years) | After 25 years without fire | Barton et al. 2001 | Based on Barton et al. (2001) study that showed that pines need 20 to 30 years of fire free periods in order to establish, we determined that plant growth would occur in areas that had been free of fire for 25 years, resulting in a transition from a grass/seedling/sapling state to a young pine oak woodland. |
| Plant growth (110 years) | 110 years | Andrew Barton, personal communication† | Based on unpublished data on the age of various size classes of pine in the Chiricahua Mountains of southeastern Arizona, we determined that it takes 110 years for a pine to grow from a young pine (5 cm dbh) to an old pine (8 inches dbh). |
| Stand replacing fire | Every 500 years | Don Falk and Jose Iniquez, personal communication† and unpublished data | In a study of large homogenous stands of ponderosa pine, Don Falk could find no tree-ring evidence of a stand-replacing fire that was 1,000 acres or larger in size over a period of 500 years. His sampling design, however, could not discern a stand-replacing fire of 100 acres in size over the same time period. In general, Don Falk's theoretical and empirical work indicates that estimates of fire frequency are area sensitive. Based on a recently-completed study of Madrean pine-oak in the Catalina and Rincon Mountains, Arizona, Jose Iniquez estimates the probability of a SRF 1,000 acres in size in large homogenous pine-oak stands as once every 600 years (0.0017) and in small heterogeneous stands as once every 300 years (0.0033). Considering pine-oak woodland regionally (1,416,765 acres in Region 3) and using 1,000 pixels in the simulation, pixel size would be 1,416 acres which is close to the event size (1,000 acres) of the above SRF estimates. For this reason and because there was no a priori way to distinguish large homogeneous vs. small heterogeneous areas of Madrean pine-oak based on existing data, we used a SRF probability of every 500 years (0.002). It is important to note that there is little difference in final output using a SRF probability of 0.001 and 0.002 which bracket the values for a 1000-acre stand-replacing event discussed above. However, there is a significant change in the output if a SRF probability of 0.0033 is used. |
| Surface fire | Every 6 to 11.5 years | Fulé and Covington 1996, 1997, 1998, 1999; Fulé et al. 2005; Kaib et al. 1996; Swetnam and Baisan 1996; Swetnam et al. 1992; Swetnam et al. in press‡ | Mean fire return intervals (MFRI) for fires that scarred 25% or more trees at 17 sites located in Arizona and northern Mexico ranged between 6 and 14.5 years. This is more than a two-fold difference between sites at the low vs. high end of the MFRI range. All but 1 site (Bear Canyon, Catalina Mountains, Arizona) fell between 6 and 11.5 years with Bear Canyon appearing to be an outlier so we eliminated this site from the analysis. Running the model at an MFRI of 14.5 years (0.069) significantly changes the output. Surface fire potentially affects all vegetation states including the Resprouter Dominated state which can move back into pine-oak woodland following a period of 100 years that allows for pine recruitment and frequent surface fires to reduce resprouting species (Drew Barton, personal communication†). |
| Mixed severity fire | At the same frequency as surface fires but only affects states or stands that have not experienced a surface fire for > 50 years | Barton 1999, 2002; Fulé et al. 2000 | An increase in the density of pines, oaks and other resprouters as well as a compositional shift in favor of oaks following a fire-free period of more than 50 years leads to a mixed severity fire with some patches experiencing high-intensity, crown replacing fire that moves vegetation from a closed canopy stand (i.e., without a grass understory) to the resprouter dominated state with few to no pines. Other patches, however, experience lower intensity fire that thins vegetation and moves it from a closed canopy stand to an open canopy stand with a grass understory (after a post-burn recovery period). The probability of high vs. low intensity effects on patches for the mixed severity fire was assumed to be equal (= 0.5). The model was also run assuming the probability of high vs. low intensity effects was 0.67 vs. 0.33, respectively. The results were very similar to those in Table 6-3, except that more of the historic landscape ended up in the resprouter dominated state (1.3 to 5.2% more, on average, depending on the FRI); output for this second set of runs is available from D. Gori on request. |

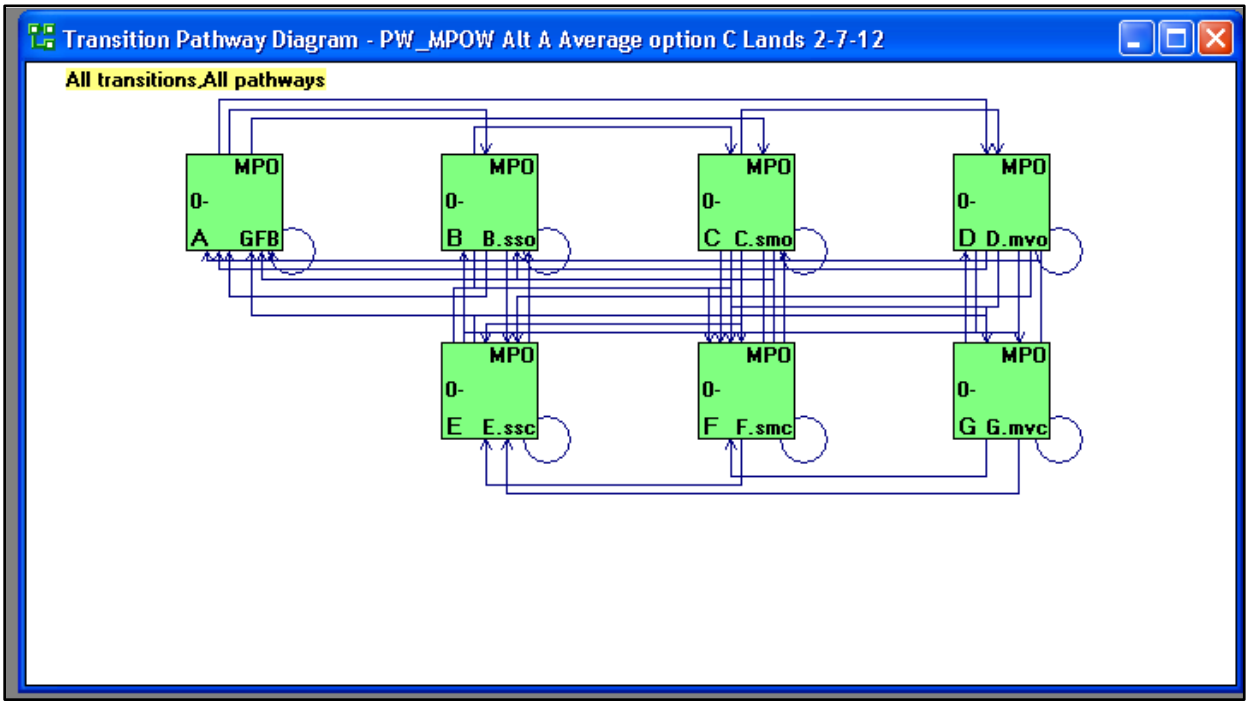
†Personal communications with Schussman and Gori

‡Swetnam, T.W.; Baisan, C.H.; and Kaib, M.J. In Press. Forest fire histories of La Frontera: Fire-scar reconstructions of fire regimes in the United States/Mexico borderlands. *In*: Webster, G.L.; and. Bahre, C.J (eds.), Vegetation and flora of La Frontera: historic vegetation change along the United States/Mexico boundary. University of New Mexico Press.

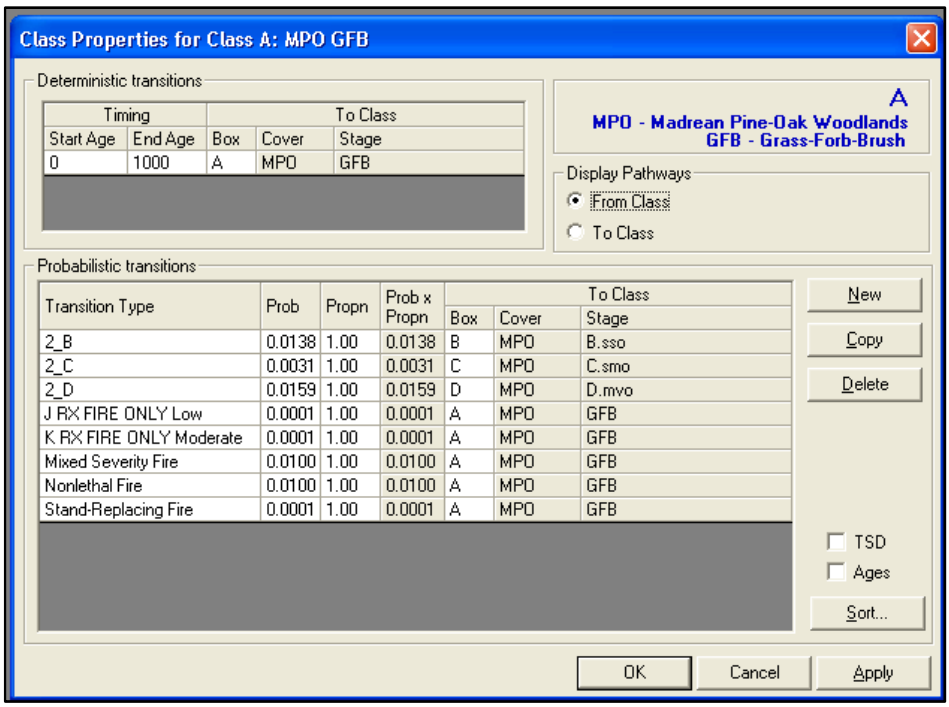
Results of the Madrean pine oak woodland historic VDDT model show some variability in the 900-year average percent of the modeled landscape in each state based on the fire return interval range. Even with this variability, all models showed a consistent pattern of the majority of the historic vegetation occurring in the old pine-oak with understory state (48.6%, 60.2% and 71.2% for fire return intervals of 11.5, 9, and 6 years respectively). A significant proportion of the vegetation also occurs in the young pine-oak with understory state. A comparison of simulated historic conditions and current conditions shows an increase in the amount of old pine-oak without understory (76.5%) from all historic model runs. Additionally, the current model has 14.8% of the landscape in the resprouter dominated state compared to less than 10% in the historic model.

These results highlight the importance of maintaining a frequent surface fire regime within the Madrean pine oak woodland vegetation type. Without frequent fires the modeled landscape shifted from open canopied young and old pine oak woodland to denser canopied old pine oak woodland. The increase in canopy cover and oak abundance resulted in a larger proportion of the stand replacing fires transitioning to a resprouter dominated community. These modeled results are similar to the changes that have been documented within the vegetation type (Barton 1999, 2002; Barton et al. 2001; Fulé and Covington 1997, 1998; Fulé et al. 2000).

Appendix A figures 86 through 93 through display the actual VDDT model for Madrean pine-oak woodland, developed by the USFS Southwest Region 3, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends.




**Appendix A figure 86. Actual VDDT state and transition model used for assessing trends in the Madrean pine-oak woodland PNVT on the ASNFs**



Class Properties for Class A: MPO GFB

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | A | MPO | GFB |

A
MPO - Madrean Pine-Oak Woodlands
GFB - Grass-Forb-Brush

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0138 | 1.00 | 0.0138 | B | MPO | B.sso |
| 2_C | 0.0031 | 1.00 | 0.0031 | C | MPO | C.smo |
| 2_D | 0.0159 | 1.00 | 0.0159 | D | MPO | D.mvo |
| J RX FIRE ONLY Low | 0.0001 | 1.00 | 0.0001 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 1.00 | 0.0001 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 1.00 | 0.0100 | A | MPO | GFB |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | A | MPO | GFB |
| Stand-Replacing Fire | 0.0001 | 1.00 | 0.0001 | A | MPO | GFB |

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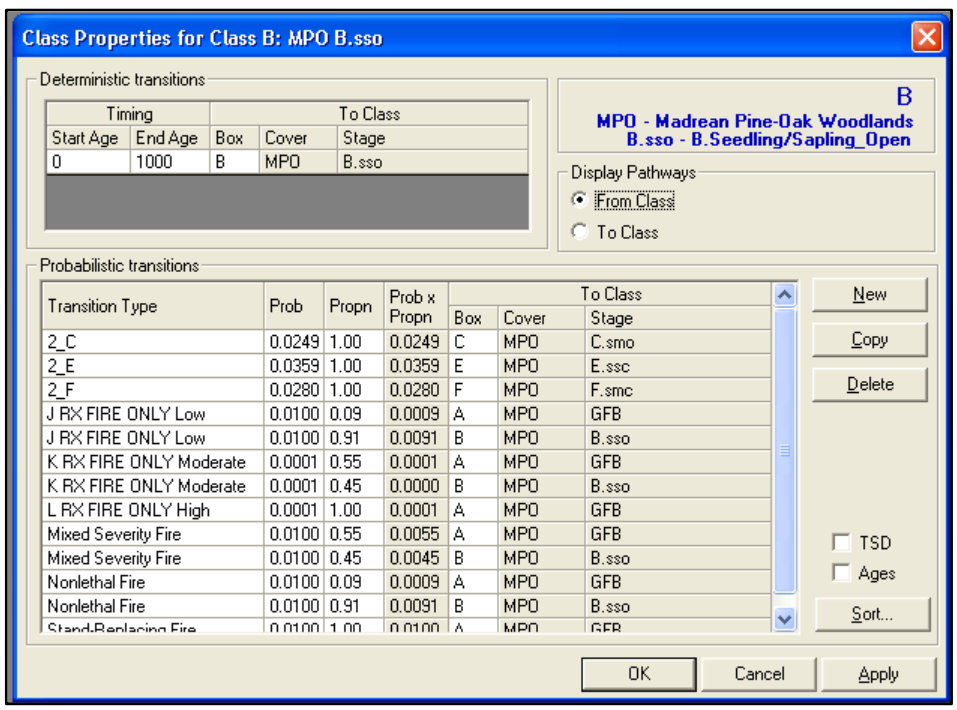
**Appendix A figure 87. Madrean pine-oak woodland PNVTs' potentially management driven (2) and naturally driven (6) transitions for State A**



Class Properties for Class B: MPO B.sso

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | B | MPO | B.sso |

B
MPO - Madrean Pine-Oak Woodlands
B.sso - B.Seedling/Sapling_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_C | 0.0249 | 1.00 | 0.0249 | C | MPO | C.smo |
| 2_E | 0.0359 | 1.00 | 0.0359 | E | MPO | E.ssc |
| 2_F | 0.0280 | 1.00 | 0.0280 | F | MPO | F.smc |
| J RX FIRE ONLY Low | 0.0100 | 0.09 | 0.0009 | A | MPO | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.91 | 0.0091 | B | MPO | B.sso |
| K RX FIRE ONLY Moderate | 0.0001 | 0.55 | 0.0001 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.45 | 0.0000 | B | MPO | B.sso |
| L RX FIRE ONLY High | 0.0001 | 1.00 | 0.0001 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.55 | 0.0055 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.45 | 0.0045 | B | MPO | B.sso |
| Nonlethal Fire | 0.0100 | 0.09 | 0.0009 | A | MPO | GFB |
| Nonlethal Fire | 0.0100 | 0.91 | 0.0091 | B | MPO | B.sso |
| Stand-Replacing Fire | 0.0100 | 1.00 | 0.0100 | A | MPO | GFB |

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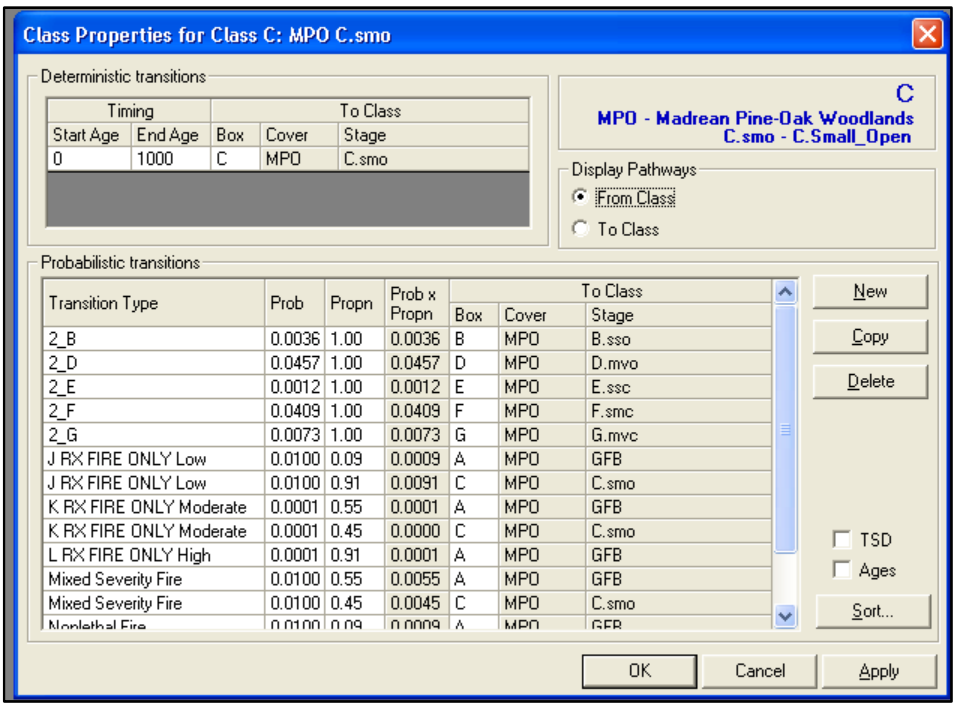
**Appendix A figure 88. Madrean pine-oak woodland PNVTs' potentially management driven (5) and naturally driven (8) transitions for State B**



Class Properties for Class C: MPO C.smo

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | C | MPO | C.smo |

C
MPO - Madrean Pine-Oak Woodlands
C.smo - C.Small_Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_B | 0.0036 | 1.00 | 0.0036 | B | MPO | B.sso |
| 2_D | 0.0457 | 1.00 | 0.0457 | D | MPO | D.mvo |
| 2_E | 0.0012 | 1.00 | 0.0012 | E | MPO | E.ssc |
| 2_F | 0.0409 | 1.00 | 0.0409 | F | MPO | F.smc |
| 2_G | 0.0073 | 1.00 | 0.0073 | G | MPO | G.mvc |
| J RX FIRE ONLY Low | 0.0100 | 0.09 | 0.0009 | A | MPO | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.91 | 0.0091 | C | MPO | C.smo |
| K RX FIRE ONLY Moderate | 0.0001 | 0.55 | 0.0001 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.45 | 0.0000 | C | MPO | C.smo |
| L RX FIRE ONLY High | 0.0001 | 0.91 | 0.0001 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.55 | 0.0055 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.45 | 0.0045 | C | MPO | C.smo |
| Nonlethal Fire | 0.0100 | 0.09 | 0.0009 | A | MPO | GFB |

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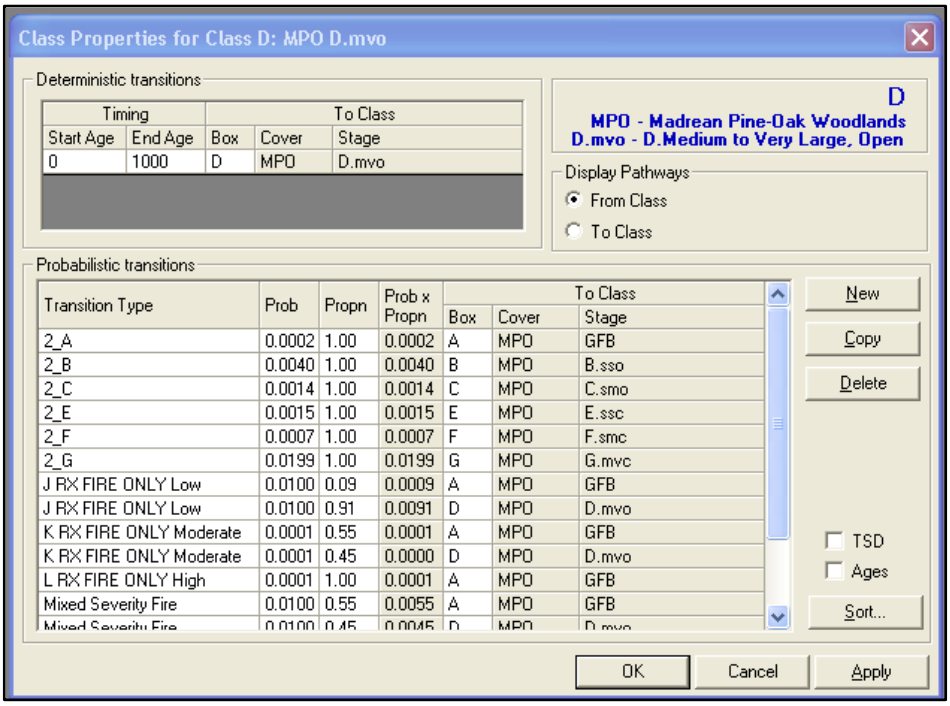
**Appendix A figure 89. Madrean pine-oak woodland PNVTs' potentially management driven (5) and naturally driven (10) transitions for State C**



Class Properties for Class D: MPO D.mvo

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | D | MPO | D.mvo |

D
MPO - Madrean Pine-Oak Woodlands
D.mvo - D.Medium to Very Large, Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_A | 0.0002 | 1.00 | 0.0002 | A | MPO | GFB |
| 2_B | 0.0040 | 1.00 | 0.0040 | B | MPO | B.sso |
| 2_C | 0.0014 | 1.00 | 0.0014 | C | MPO | C.smo |
| 2_E | 0.0015 | 1.00 | 0.0015 | E | MPO | E.ssc |
| 2_F | 0.0007 | 1.00 | 0.0007 | F | MPO | F.smc |
| 2_G | 0.0199 | 1.00 | 0.0199 | G | MPO | G.mvc |
| J RX FIRE ONLY Low | 0.0100 | 0.09 | 0.0009 | A | MPO | GFB |
| J RX FIRE ONLY Low | 0.0100 | 0.91 | 0.0091 | D | MPO | D.mvo |
| K RX FIRE ONLY Moderate | 0.0001 | 0.55 | 0.0001 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0001 | 0.45 | 0.0000 | D | MPO | D.mvo |
| L RX FIRE ONLY High | 0.0001 | 1.00 | 0.0001 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.55 | 0.0055 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.45 | 0.0045 | D | MPO | D.mvo |

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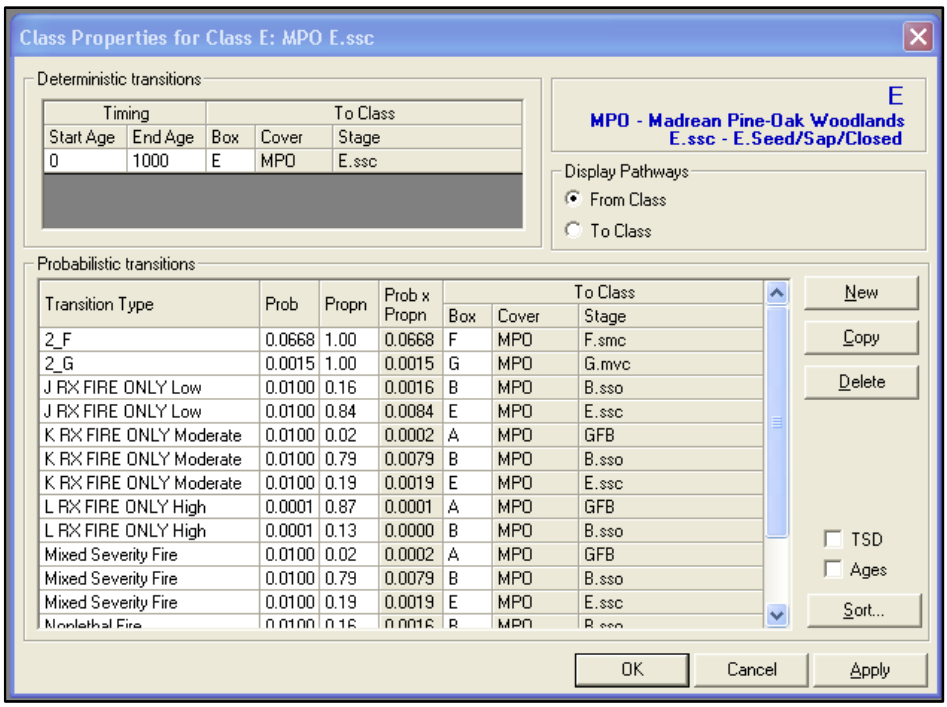
**Appendix A figure 90. Madrean pine-oak woodland PNVTs' potentially management driven (5) and naturally driven (11) transitions for State D**



Class Properties for Class E: MPO E.ssc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | E | MPO | E.ssc |

E
MPO - Madrean Pine-Oak Woodlands
E.ssc - E.Seed/Sap/Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_F | 0.0668 | 1.00 | 0.0668 | F | MPO | F.smc |
| 2_G | 0.0015 | 1.00 | 0.0015 | G | MPO | G.mvc |
| J RX FIRE ONLY Low | 0.0100 | 0.16 | 0.0016 | B | MPO | B.sso |
| J RX FIRE ONLY Low | 0.0100 | 0.84 | 0.0084 | E | MPO | E.ssc |
| K RX FIRE ONLY Moderate | 0.0100 | 0.02 | 0.0002 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.79 | 0.0079 | B | MPO | B.sso |
| K RX FIRE ONLY Moderate | 0.0100 | 0.19 | 0.0019 | E | MPO | E.ssc |
| L RX FIRE ONLY High | 0.0001 | 0.87 | 0.0001 | A | MPO | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.13 | 0.0000 | B | MPO | B.sso |
| Mixed Severity Fire | 0.0100 | 0.02 | 0.0002 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.79 | 0.0079 | B | MPO | B.sso |
| Mixed Severity Fire | 0.0100 | 0.19 | 0.0019 | E | MPO | E.ssc |
| Nonlethal Fire | 0.0100 | 0.16 | 0.0016 | B | MPO | B.sso |

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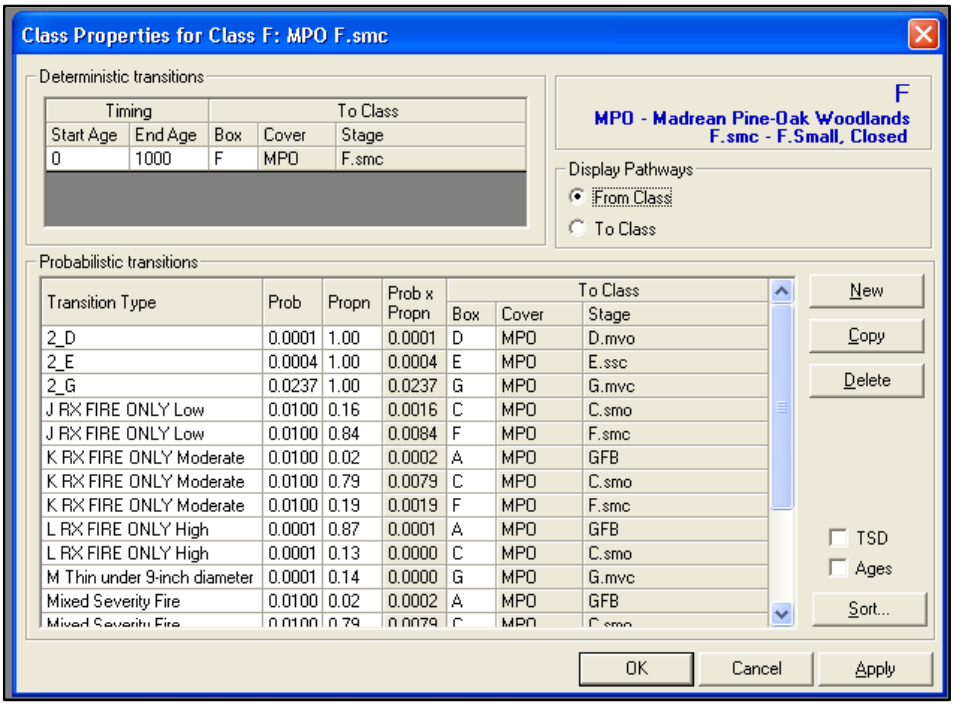
**Appendix A figure 91. Madrean pine-oak woodland PNVTs' potentially management driven (7) and naturally driven (9) transitions for State E**



Class Properties for Class F: MPO F.smc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | F | MPO | F.smc |

F
MPO - Madrean Pine-Oak Woodlands
F.smc - F.Small, Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_D | 0.0001 | 1.00 | 0.0001 | D | MPO | D.mvo |
| 2_E | 0.0004 | 1.00 | 0.0004 | E | MPO | E.ssc |
| 2_G | 0.0237 | 1.00 | 0.0237 | G | MPO | G.mvc |
| J RX FIRE ONLY Low | 0.0100 | 0.16 | 0.0016 | C | MPO | C.smo |
| J RX FIRE ONLY Low | 0.0100 | 0.84 | 0.0084 | F | MPO | F.smc |
| K RX FIRE ONLY Moderate | 0.0100 | 0.02 | 0.0002 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.79 | 0.0079 | C | MPO | C.smo |
| K RX FIRE ONLY Moderate | 0.0100 | 0.19 | 0.0019 | F | MPO | F.smc |
| L RX FIRE ONLY High | 0.0001 | 0.87 | 0.0001 | A | MPO | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.13 | 0.0000 | C | MPO | C.smo |
| M Thin under 9-inch diameter | 0.0001 | 0.14 | 0.0000 | G | MPO | G.mvc |
| Mixed Severity Fire | 0.0100 | 0.02 | 0.0002 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.79 | 0.0079 | C | MPO | C.smo |

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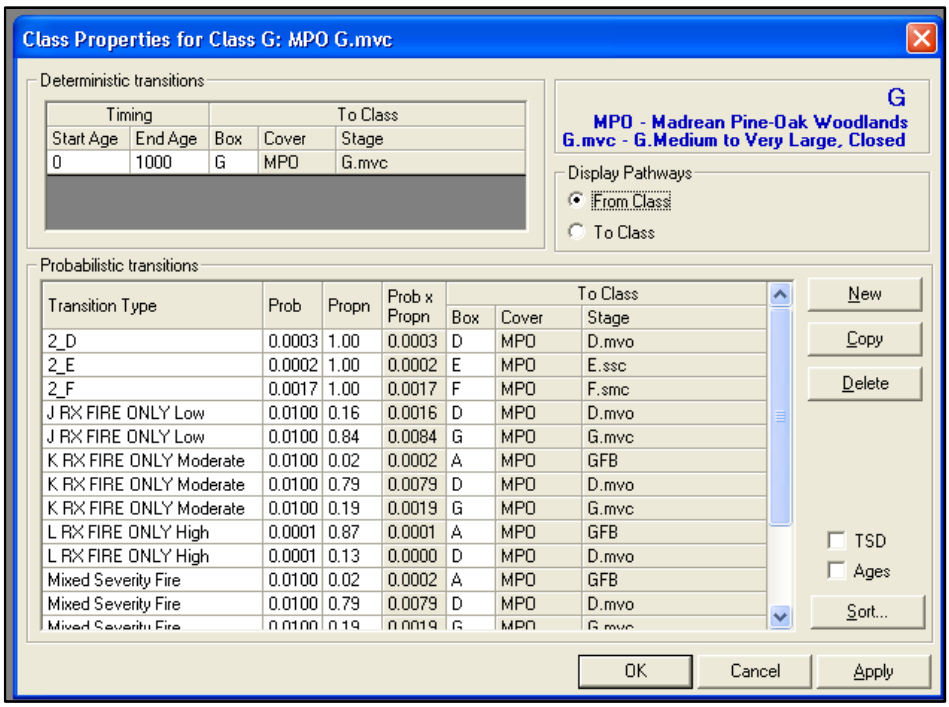
**Appendix A figure 92. Madrean pine-oak woodland PNVTs' potentially management driven (8) and naturally driven (10) transitions for State F**



Class Properties for Class G: MPO G.mvc

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 1000 | G | MPO | G.mvc |

G
MPO - Madrean Pine-Oak Woodlands
G.mvc - G.Medium to Very Large, Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| 2_D | 0.0003 | 1.00 | 0.0003 | D | MPO | D.mvo |
| 2_E | 0.0002 | 1.00 | 0.0002 | E | MPO | E.ssc |
| 2_F | 0.0017 | 1.00 | 0.0017 | F | MPO | F.smc |
| J RX FIRE ONLY Low | 0.0100 | 0.16 | 0.0016 | D | MPO | D.mvo |
| J RX FIRE ONLY Low | 0.0100 | 0.84 | 0.0084 | G | MPO | G.mvc |
| K RX FIRE ONLY Moderate | 0.0100 | 0.02 | 0.0002 | A | MPO | GFB |
| K RX FIRE ONLY Moderate | 0.0100 | 0.79 | 0.0079 | D | MPO | D.mvo |
| K RX FIRE ONLY Moderate | 0.0100 | 0.19 | 0.0019 | G | MPO | G.mvc |
| L RX FIRE ONLY High | 0.0001 | 0.87 | 0.0001 | A | MPO | GFB |
| L RX FIRE ONLY High | 0.0001 | 0.13 | 0.0000 | D | MPO | D.mvo |
| Mixed Severity Fire | 0.0100 | 0.02 | 0.0002 | A | MPO | GFB |
| Mixed Severity Fire | 0.0100 | 0.79 | 0.0079 | D | MPO | D.mvo |
| Mixed Severity Fire | 0.0100 | 0.19 | 0.0019 | G | MPO | G.mvc |

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**Appendix A figure 93. Madrean pine-oak woodland PNVTs' potentially management driven (7) and naturally driven (10) transitions for State G**

## Grassland PNVTs

## Great Basin Grassland

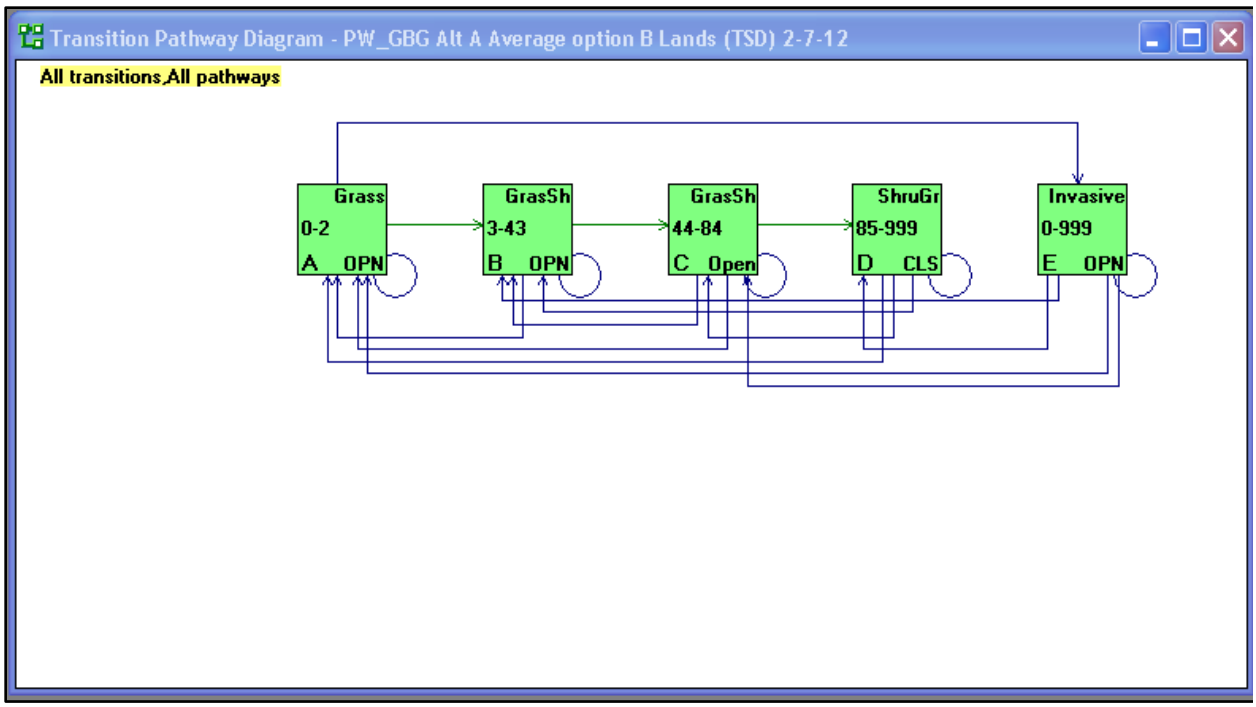
**Appendix A table 14. Great Basin grassland (Colorado Plateau/Great Basin Grassland) PNVT crosswalks developed by Region 3 (30 August 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2007b)**

| Model | State | Desired Condition/Reference Condition (%) | VDDT Model Vegetation States | | R3 Existing Veg Classes<br>Dominance Type Group - Structure Class |
|---|---|---|---|---|---|
| LANDFIRE National "Inter-Mountain Basins Semi-Desert Grassland" (1511350) | A | 5 | Early development 1 - open | = | Recently burned, sparsely vegetated - N/A |
| | B | 70 | Mid development 1 - open | = | All corresponding herbaceous types - N/A |
| | C | 20 | Late development 1 - open | = | Shrub types: All corresponding shrub types - Shrub - open |
| | | | | | Tree types: All corresponding tree types - Seedling/sapling, small/medium - open |
| | D | 5 | Mid development 2 - closed | = | Shrub types: All corresponding shrub types - Shrub - closed |
| | | | | | Tree types: All corresponding tree types - Very large - open |
| | *Contemporary Landscapes Only …* | | | | |
| | E† | 0 | Invasive plants | = | Invasive plants |

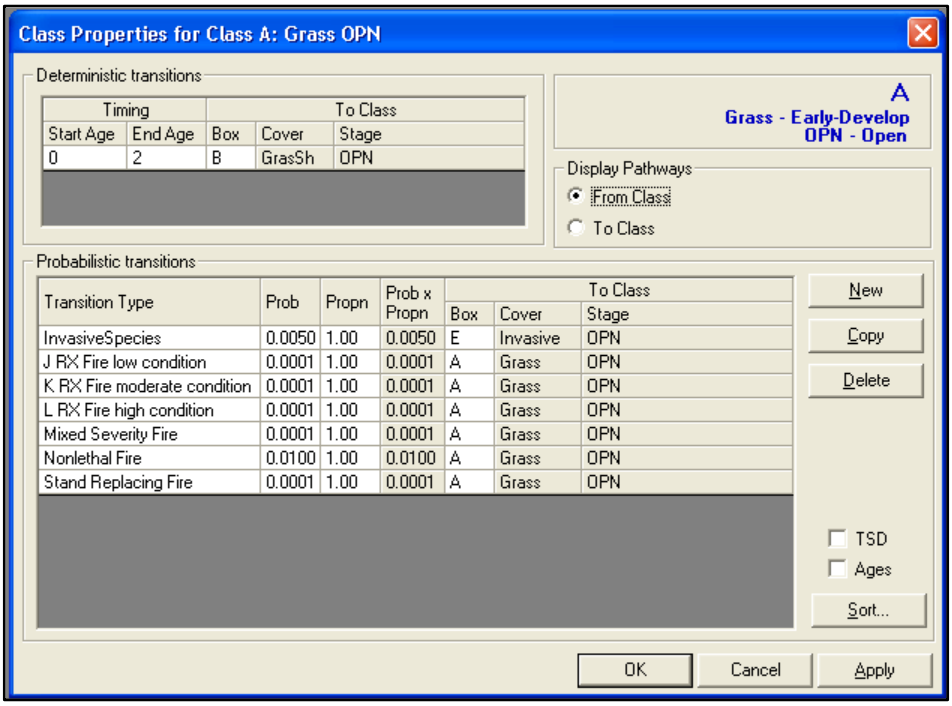
†This state was added to the model to reflect the presence of various noxious weeds and invasive plants that makeup a significant portion of the herbaceous vegetation composition; not part of the historic conditions or within historic range of variability and are occurring on contemporary landscapes only

*State and Transition Models for Great Basin Grassland*

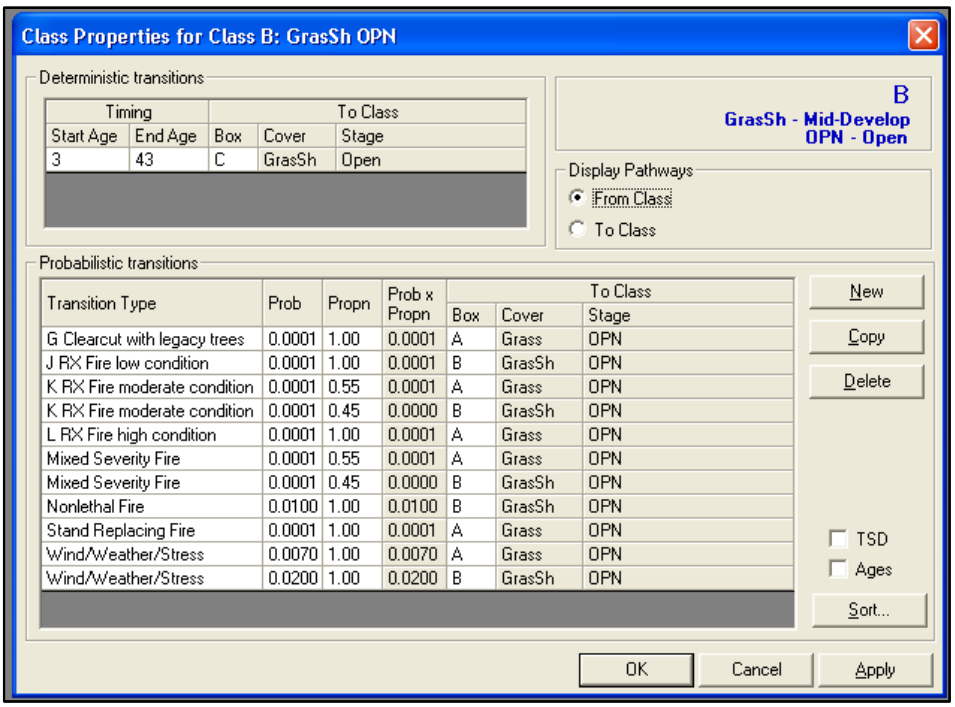
See the state and transition model discussion for semi-desert grassland. Appendix A figures 94 through 99 display the actual VDDT model for Great Basin grassland, developed, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends. This model was pattern after the semi-desert grassland model.




**Appendix A figure 94. Actual VDDT state and transition model used for assessing trends in the Great Basin grassland PNVT on the ASNFs**




**Appendix A figure 95. Great Basin grassland PNVTs' potentially management driven (3) and naturally driven (4) transitions for State A**



Class Properties for Class B: GrasSh OPN

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 3 | 43 | C | GrasSh | Open |

B
GrasSh - Mid-Develop
OPN - Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| G Clearcut with legacy trees | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| J RX Fire low condition | 0.0001 | 1.00 | 0.0001 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0001 | 0.55 | 0.0001 | A | Grass | OPN |
| K RX Fire moderate condition | 0.0001 | 0.45 | 0.0000 | B | GrasSh | OPN |
| L RX Fire high condition | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| Mixed Severity Fire | 0.0001 | 0.55 | 0.0001 | A | Grass | OPN |
| Mixed Severity Fire | 0.0001 | 0.45 | 0.0000 | B | GrasSh | OPN |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | B | GrasSh | OPN |
| Stand Replacing Fire | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| Wind/Weather/Stress | 0.0070 | 1.00 | 0.0070 | A | Grass | OPN |
| Wind/Weather/Stress | 0.0200 | 1.00 | 0.0200 | B | GrasSh | OPN |

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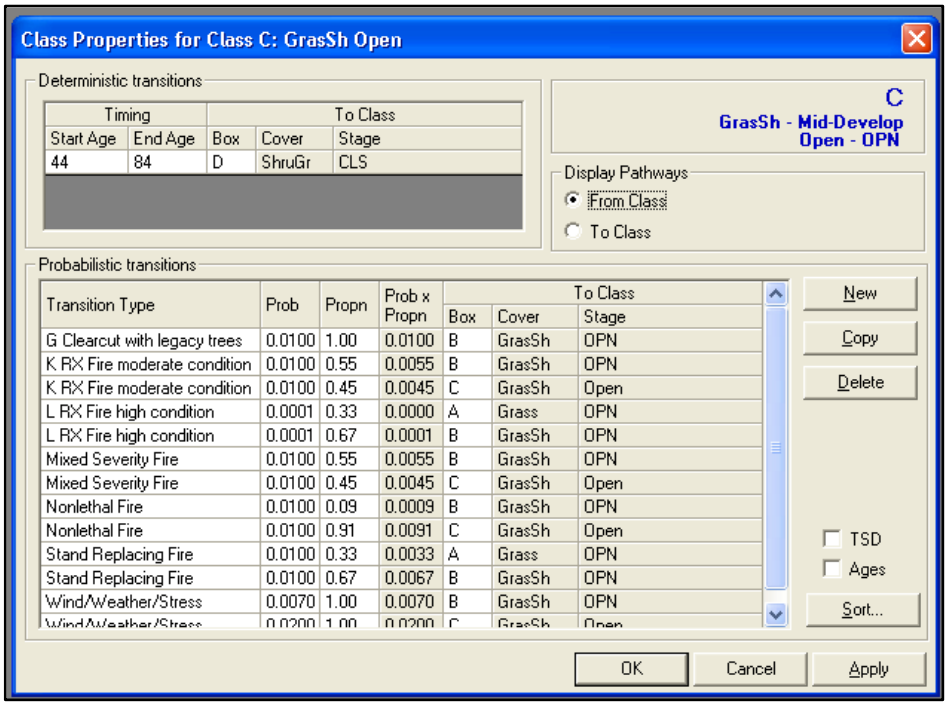
**Appendix A figure 96. Great Basin grassland PNVTs' potentially management driven (5) and naturally driven (6) transitions for State B**



Class Properties for Class C: GrasSh Open

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 44 | 84 | D | ShruGr | CLS |

C
GrasSh - Mid-Develop
Open - OPN

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| G Clearcut with legacy trees | 0.0100 | 1.00 | 0.0100 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0100 | 0.55 | 0.0055 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0100 | 0.45 | 0.0045 | C | GrasSh | Open |
| L RX Fire high condition | 0.0001 | 0.33 | 0.0000 | A | Grass | OPN |
| L RX Fire high condition | 0.0001 | 0.67 | 0.0001 | B | GrasSh | OPN |
| Mixed Severity Fire | 0.0100 | 0.55 | 0.0055 | B | GrasSh | OPN |
| Mixed Severity Fire | 0.0100 | 0.45 | 0.0045 | C | GrasSh | Open |
| Nonlethal Fire | 0.0100 | 0.09 | 0.0009 | B | GrasSh | OPN |
| Nonlethal Fire | 0.0100 | 0.91 | 0.0091 | C | GrasSh | Open |
| Stand Replacing Fire | 0.0100 | 0.33 | 0.0033 | A | Grass | OPN |
| Stand Replacing Fire | 0.0100 | 0.67 | 0.0067 | B | GrasSh | OPN |
| Wind/Weather/Stress | 0.0070 | 1.00 | 0.0070 | B | GrasSh | OPN |
| Wind/Weather/Stress | 0.0200 | 1.00 | 0.0200 | C | GrasSh | Open |

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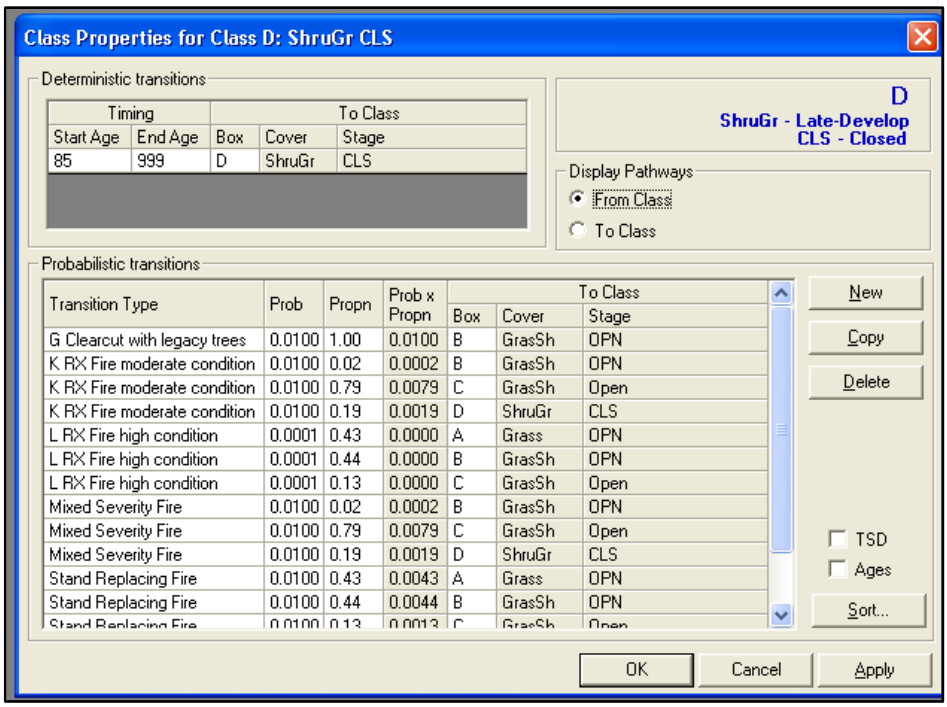
**Appendix A figure 97. Great Basin grassland PNVTs' potentially management driven (5) and naturally driven (8) transitions for State C**



Class Properties for Class D: ShruGr CLS

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 85 | 999 | D | ShruGr | CLS |

D
ShruGr - Late-Develop
CLS - Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| G Clearcut with legacy trees | 0.0100 | 1.00 | 0.0100 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0100 | 0.02 | 0.0002 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0100 | 0.79 | 0.0079 | C | GrasSh | Open |
| K RX Fire moderate condition | 0.0100 | 0.19 | 0.0019 | D | ShruGr | CLS |
| L RX Fire high condition | 0.0001 | 0.43 | 0.0000 | A | Grass | OPN |
| L RX Fire high condition | 0.0001 | 0.44 | 0.0000 | B | GrasSh | OPN |
| L RX Fire high condition | 0.0001 | 0.13 | 0.0000 | C | GrasSh | Open |
| Mixed Severity Fire | 0.0100 | 0.02 | 0.0002 | B | GrasSh | OPN |
| Mixed Severity Fire | 0.0100 | 0.79 | 0.0079 | C | GrasSh | Open |
| Mixed Severity Fire | 0.0100 | 0.19 | 0.0019 | D | ShruGr | CLS |
| Stand Replacing Fire | 0.0100 | 0.43 | 0.0043 | A | Grass | OPN |
| Stand Replacing Fire | 0.0100 | 0.44 | 0.0044 | B | GrasSh | OPN |
| Stand Replacing Fire | 0.0100 | 0.13 | 0.0013 | C | GrasSh | Open |

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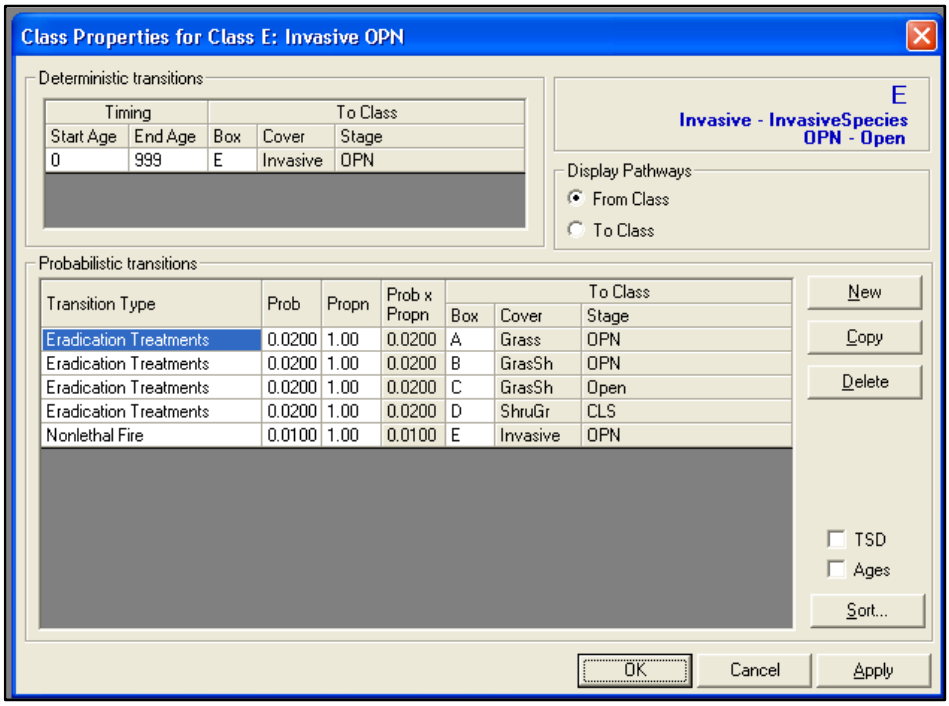
**Appendix A figure 98. Great Basin grassland PNVTs' potentially management driven (7) and naturally driven (8) transitions for State D**



Class Properties for Class E: Invasive OPN

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 999 | E | Invasive | OPN |

E
Invasive - InvasiveSpecies
OPN - Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | A | Grass | OPN |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | B | GrasSh | OPN |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | C | GrasSh | Open |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | D | ShruGr | CLS |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | E | Invasive | OPN |

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**Appendix A figure 99. Great Basin grassland PNVTs' potentially management driven (4) and naturally driven (1) transitions for State E**

## Semi-desert Grassland

**Appendix A table 15. Semi-desert grassland PNVT crosswalks developed by Region 3 (14 October 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Schussman 2006a)**

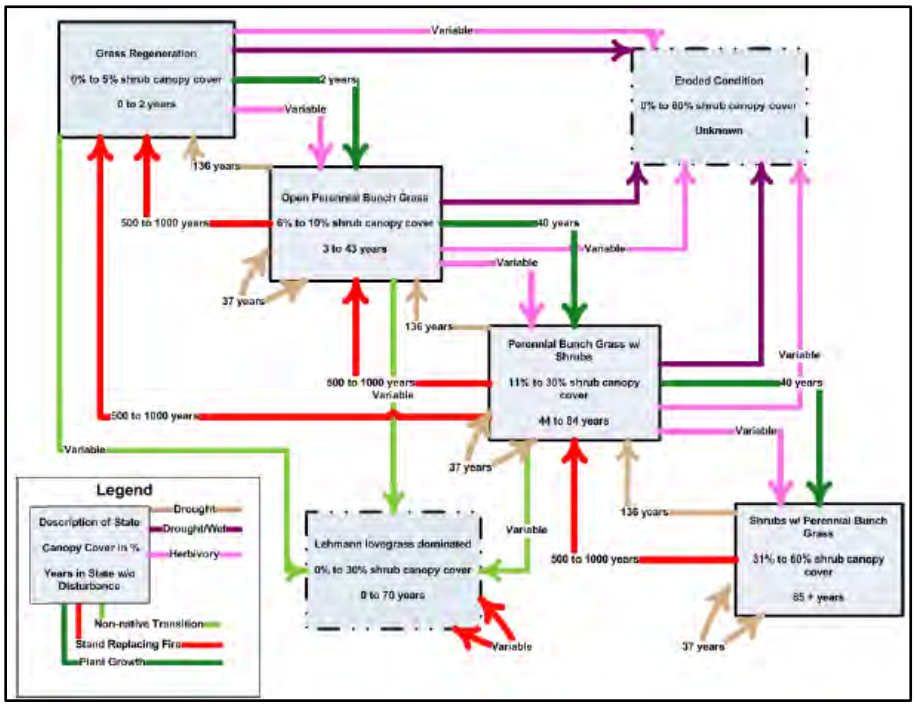
| Model | State | Desired Condition/ Reference Condition | | VDDT Model Vegetation States | | R3 Existing Veg Classes |
|---|---|---|---|---|---|---|
| | | mean (%) | sd (%) | | | Dominance Type Group - Structure Class |
| TNC Semi-Desert Grassland | A | 24 | 10.2 | Grass regeneration | = | Recently burned, sparsely vegetated - N/A |
| | B | 76 | 10.2 | Open perennial bunchgrasses | = | All corresponding herbaceous types - N/A |
| | *Contemporary Landscapes Only …* | | | | | |
| | C | 0 | 0 | Perennial bunchgrasses with shrubs and trees | = | Shrub types: All corresponding shrub types - Shrub - open<br>Tree types: All corresponding tree types - Seedling/sapling, small/medium - open |
| | D | 0 | 0 | Shrubs and trees with perennial bunchgrasses | = | Shrub types: All corresponding shrub types - Shrub - closed<br>Tree types: All corresponding tree types - Very large - open |
| | E† | 0 | 0 | Invasive plants | = | Invasive plants |

†This state was added to the model to reflect the presence of various noxious weeds and invasive plants that makeup a significant portion of the herbaceous vegetation composition; not part of the historic conditions or within historic range of variability and are occurring on contemporary landscapes only

### *State and Transition Models for Semi-desert Grassland*

The following is Schussman's (2006) discussion concerning the current modeling results for semi-desert grasslands.

Appendix A figure 100 displays a conceptual current state and transition model for the semi-desert grassland- vegetation type (Schussman and Smith 2006ab) used in VDDT modeling. In table 15[28], Schussman (2006a) describes the parameters included or not included within the current VDDT models (Schussman and Smith 2006ab), as well as the sources of information and any assumptions used to create the model parameters.




**Appendix A figure 100. Conceptual current state and transition model for the semi-desert grassland mixed native vegetation type. Frequency of transitions are noted when this information is supported by published sources; where no or conflicting information exists on the frequency of transitions, a blank arrow or variable, respectively, is the notation. Dashed outlines represent states which have crossed an ecological threshold (Schussman 2006a, Schussman and Smith 2006ab)**

[28] See Schussman 2006a

**Appendix A table 16. Identification of current transition types, frequency of transitions, sources of information and assumptions used to develop the frequency of transitions and their effects on vegetation states included in the semi-desert grassland mixed native vegetation type VDDT model (adapted from (Schussman 2006a)**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Drought (moderate events) | Every 37 years | Schussman calculated frequency of moderate drought events from 1,000 years of reconstructed winter precipitation data (Ni et al. 2002). We identified droughts effect on shrubs from the following publications: Bock and Bock 1997; McClaran 2003; Turner et al. 2003. | Prolonged drought has been shown to cause declines in shrub density and cover within these grasslands. Based on this, we used moderate drought events (equivalent to 1950's drought) in the model to transition vegetation back to its starting conditions within that state (i.e. lowest shrub cover value) using the average historic moderate drought frequency. |
| Drought (extreme events) | Every 136 years | Schussman calculated frequency of extreme drought events from 1,000 years of reconstructed winter precipitation data (Ni et al. 2002). We identified droughts effect on shrubs from the following publications: Bock and Bock1997; McClaran 2003; Turner et al. 2003. | Prolonged drought has been shown to cause declines in shrub density and cover within these grasslands. Based on this, and the above use of moderate droughts, we used extreme drought events (more severe than 1950's drought) to transition higher shrub density states to lower shrub density states using the average historic extreme drought frequency. |
| Drought/wet | Blank, not included in model | Hennessey et al. 1983 In order to utilize information available on erosion impacts, we included a study from New Mexico. This may result in erroneous information for the mixed native grasslands of the Arizona uplands. | Schussman determined that some level (unknown but probably at least equivalent to the 1950's drought, (Hennessey et al. 1983)) of drought coupled with some level of wet event could create conditions that would lead to a loss of topsoil and an eroded condition. Additionally, transitions out of the eroded condition are not known. Given this lack of information we did not model this transition. |
| Herbivory (non-native) | Variable, not included in model | Schussman identified possible effects of grazing on shrubs from the following publications: Bock and Bock 1997; Brown and Archer 1987; Brown et al. 1997; Drewa and Havstad 2001; McClaran 2003; McPherson 1997; Smith and Schmutz 1975; Valone and Kelt 1999. In order to utilize the breadth of studies on grazing effects we included studies from Arizona, New Mexico, and Texas. This may result in erroneous information for the mixed native grasslands of the Arizona uplands. | Schussman determined that information regarding effects of livestock grazing on shrub cover is conflicting. For example, Valone and Kelt (1999), and Brown and Archer (1987) found *Gutierrezia sarothrae* (Pursh) Britton & Rusby and *Prosopis* L. to be more common on grazed plots. Drewa and Havstad (2001), Smith and Schmutz (1975), and McClaran (2003) found grazing to have no effect on shrub density; while Bock and Bock (1997) identified a negative effect of grazing on *Isocoma* Nutt. spp. density. Given the conflicting results of studies we did not include this transition in our model. |
| Plants (non-native) | Variable, not included in model | Schussman identified information on *Eragrostis lehmanniana* Nees spread from the following publications: Anable et al.1992; Angel and McClaran 2001; Cable 1971; Cox and Ruyle 1986; Gori and Enquist 2003; Ruyle et al. 1988; Schussman et al. in press. | Studies indicate that the transition of a state from native to non-native grassland is dependent on the presence of a non-native seed source and soil type. Given that we were trying to model a large area that has multiple soil types and is likely to only have a seed source on a portion of the landscape, we decided not to model this parameter for the regional model. |
| Stand replacing fire, native plant | Every none to 500 years | Kaib et al. 1996; Swetnam and Betancourt 1998. | Schussman based her estimate of fire on fire-scar data. Specifically, regional fire-scar data shows drastic declines in the number of fires from 1880 to present. Additionally, a fire-scar study that is directly applicable to these grasslands (Kaib et al. 1996) shows decreases to no fires and fire every 25 years. Based on the knowledge that some areas had not seen a fire at all, and others had some fire, we used a range of relatively infrequent fire occurrence (no fire to fire across the whole landscape every 500 years). |
| Stand replacing fire, non-native plant | Variable, not included in model | Schussman identified information on the effects of burning on *E. lehmanniana* Nees spread from the following publications: Anable et al. 1992; Cable 1971; McPherson 1995; Ruyle et al. 1988. Erika Geiger, personal communication with Schussman. | It is well documented that stand replacing fires increase the abundance of *E. lehmanniana* Nees on sites where it already exists, the frequency of fires at sites dominated by *E. lehmanniana* Nees is site specific. Given this constraint, and the regional, not site specific, nature of the model we decided not to model this transition. |

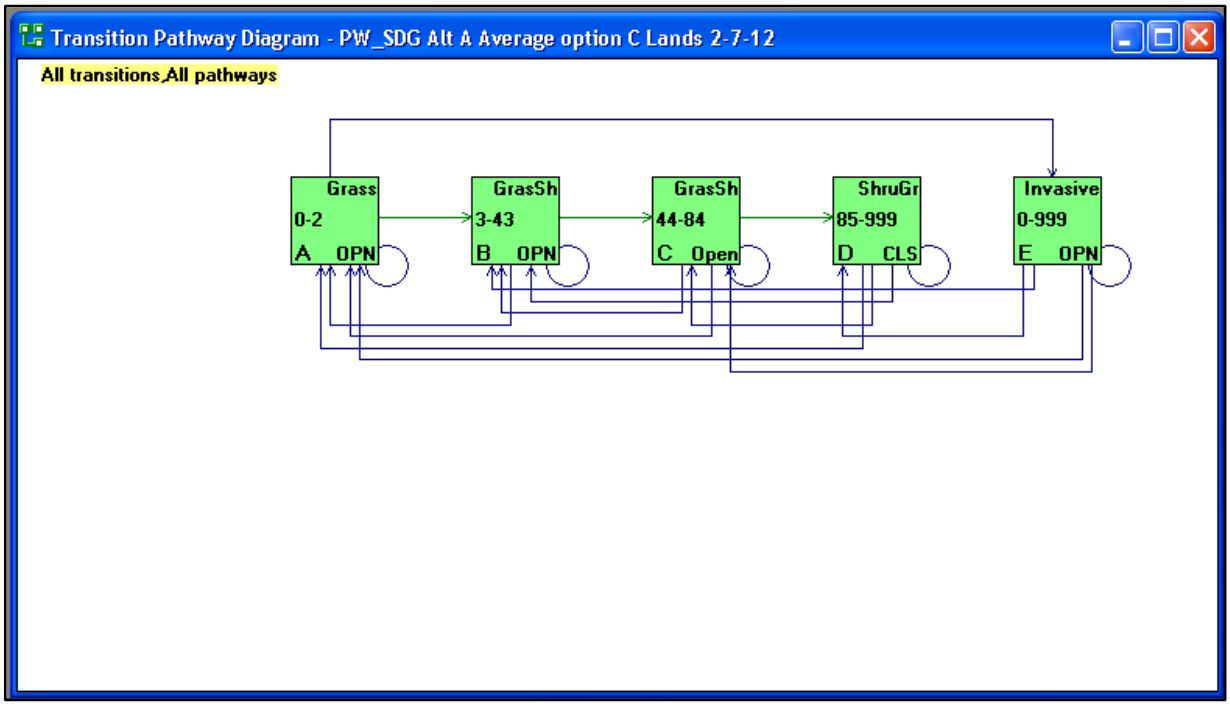
**Appendix A table 16. Continued**

| Transition Type | Transition Frequency or Length | Information Sources | Assumptions |
|---|---|---|---|
| Plant growth following stand replacing fire | 2 years | Schussman identified grass recovery time from the following publications: Bock and Bock 1992; Cable 1972; Martin 1983; Wright 1960. | Studies on grass recovery following fires suggests that perennial grasses recover fully from fire in 1 to 2 growing seasons with average precipitation, but can take 3 to 4 growing seasons to recover under drought conditions. Based on this information, we used a mean value of 2 years to model plant growth immediately following fire. |
| Plant growth without stand replacing fire | 40 years | Schussman calculated frequency of wet events from 1,000 years of reconstructed winter precipitation data (Ni et al. 2002). TNC identified effect of wet events on shrubs from the following publications: Bock and Bock 1992; Brown et al. 1997; McClaran 2003. | Based on the average frequency of low, moderate, and extreme wet winter precipitation events (every 20 years) and the time (about 20 years) it takes for shrubs to show large cover increases (3-fold) following these wet periods, we used a value of 40 years to model the plant growth transition in the absence of stand replacing fire. |

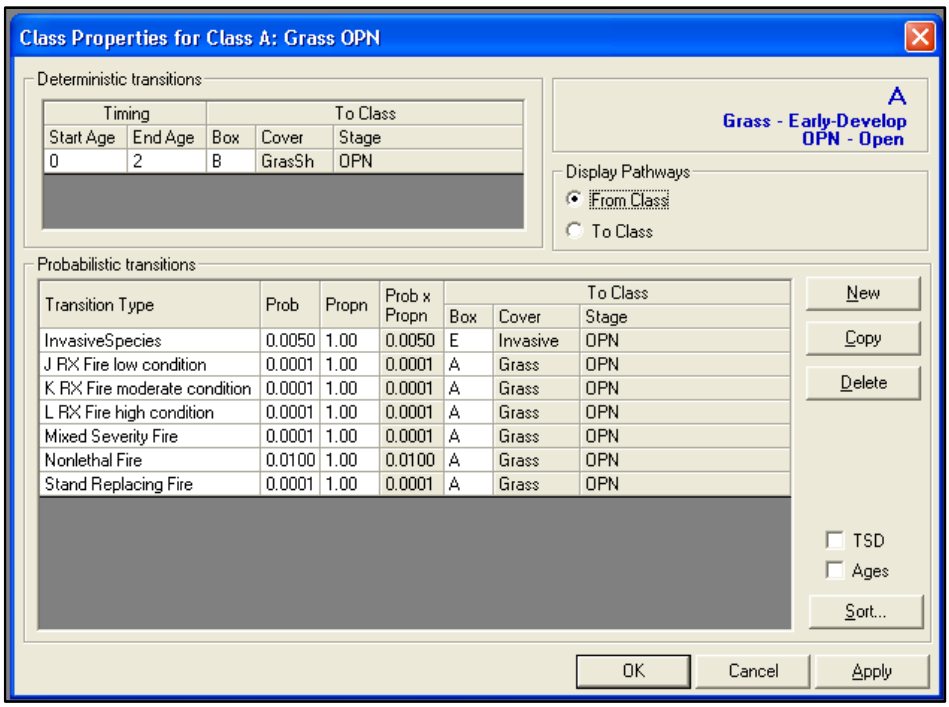
Results of the semi-desert grassland – mixed native historic VDDT model show a good deal of variability in the 900-year average for each state based on the fire return interval. Even with this variability, the pattern was consistent between the three models with the bulk of historic vegetation occurring in the open grass state (82.4%, 75.5% and 56.2% for fire return intervals of 10, 6, and 2.5 years, respectively) and very little of the historic vegetation occurring in the shrub and grass state (0.0%, 0.0%, and 0.0% for fire return intervals 10, 6, and 2.5 years). A comparison of simulated historic conditions and current conditions shows a large decrease in the percent of the landscape in the open grass state (decrease of roughly 61%, 54%, and 35% for fire return intervals 10, 6, and 2.5, respectively) with a correspondingly large increase in the percent of the landscape in the shrub and grass state (roughly 30% to 41% for all fire return interval runs).

This analysis highlights the importance of frequent fire within the semi-desert grassland mixed native vegetation type. In the absence of frequent fire, the model simulates a landscape with increasingly less open grasslands dominated by perennial grasses. This result is in agreement with recent assessments of historic change within southeastern Arizona's semi-desert grasslands that show an increase in shrubs and a loss of open grasslands (Turner et al. 2003; Gori and Enquist 2003; Enquist and Gori 2005). This suggests the need to maintain historic fire regimes if we are to maintain open grassland vegetation.

Appendix A figures 101 through 106 display the actual VDDT model for semi-desert grassland, developed by the USFS Southwest Region 3, and utilized during the planning effort on the ASNFs to determine future departure conditions and assessment of trends.




**Appendix A figure 101. Actual VDDT state and transition model used for assessing trends in the semi-desert grassland PNVT on the ASNFs**



Class Properties for Class A: Grass OPN

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 2 | B | GrasSh | OPN |

A
Grass - Early-Develop
OPN - Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| InvasiveSpecies | 0.0050 | 1.00 | 0.0050 | E | Invasive | OPN |
| J RX Fire low condition | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| K RX Fire moderate condition | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| L RX Fire high condition | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| Mixed Severity Fire | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | A | Grass | OPN |
| Stand Replacing Fire | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |

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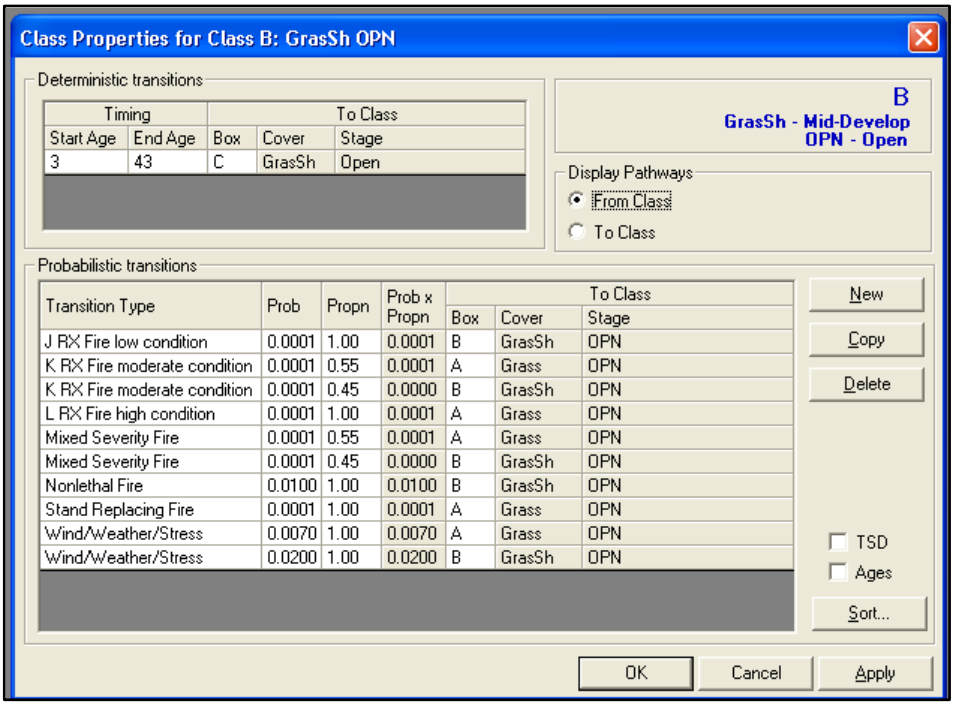
**Appendix A figure 102. Semi-desert grassland PNVTs' potentially management driven (3) and naturally driven (4) transitions for State A**



Class Properties for Class B: GrasSh OPN

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 3 | 43 | C | GrasSh | Open |

B
GrasSh - Mid-Develop
OPN - Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| J RX Fire low condition | 0.0001 | 1.00 | 0.0001 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0001 | 0.55 | 0.0001 | A | Grass | OPN |
| K RX Fire moderate condition | 0.0001 | 0.45 | 0.0000 | B | GrasSh | OPN |
| L RX Fire high condition | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| Mixed Severity Fire | 0.0001 | 0.55 | 0.0001 | A | Grass | OPN |
| Mixed Severity Fire | 0.0001 | 0.45 | 0.0000 | B | GrasSh | OPN |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | B | GrasSh | OPN |
| Stand Replacing Fire | 0.0001 | 1.00 | 0.0001 | A | Grass | OPN |
| Wind/Weather/Stress | 0.0070 | 1.00 | 0.0070 | A | Grass | OPN |
| Wind/Weather/Stress | 0.0200 | 1.00 | 0.0200 | B | GrasSh | OPN |

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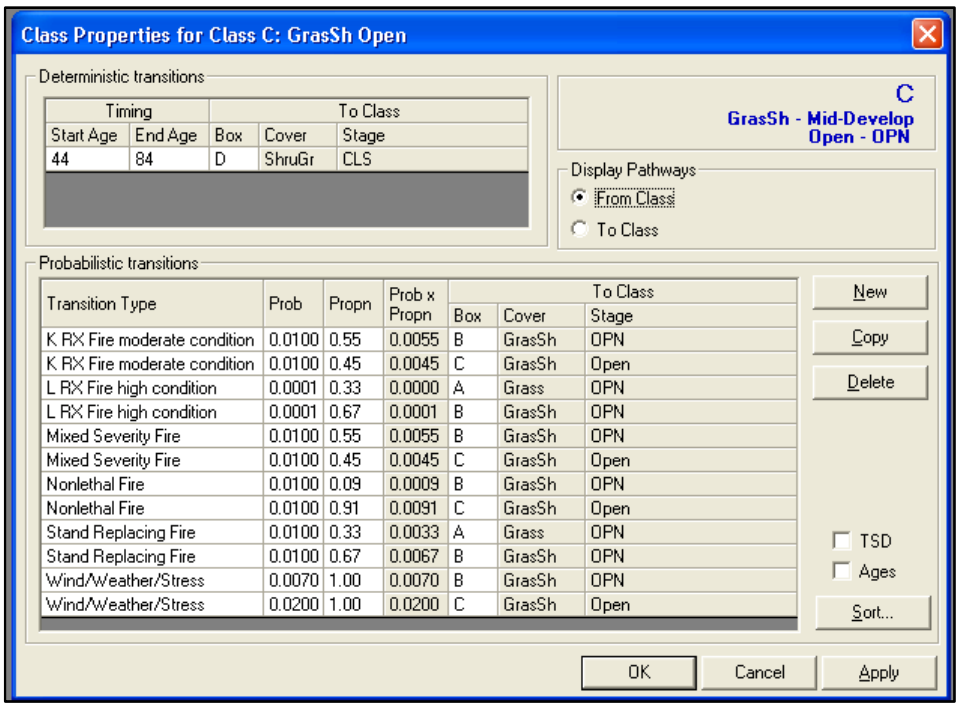
**Appendix A figure 103. Semi-desert grassland PNVTs' potentially management driven (4) and naturally driven (6) transitions for State B**



Class Properties for Class C: GrasSh Open

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 44 | 84 | D | ShruGr | CLS |

C
GrasSh - Mid-Develop
Open - OPN

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| K RX Fire moderate condition | 0.0100 | 0.55 | 0.0055 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0100 | 0.45 | 0.0045 | C | GrasSh | Open |
| L RX Fire high condition | 0.0001 | 0.33 | 0.0000 | A | Grass | OPN |
| L RX Fire high condition | 0.0001 | 0.67 | 0.0001 | B | GrasSh | OPN |
| Mixed Severity Fire | 0.0100 | 0.55 | 0.0055 | B | GrasSh | OPN |
| Mixed Severity Fire | 0.0100 | 0.45 | 0.0045 | C | GrasSh | Open |
| Nonlethal Fire | 0.0100 | 0.09 | 0.0009 | B | GrasSh | OPN |
| Nonlethal Fire | 0.0100 | 0.91 | 0.0091 | C | GrasSh | Open |
| Stand Replacing Fire | 0.0100 | 0.33 | 0.0033 | A | Grass | OPN |
| Stand Replacing Fire | 0.0100 | 0.67 | 0.0067 | B | GrasSh | OPN |
| Wind/Weather/Stress | 0.0070 | 1.00 | 0.0070 | B | GrasSh | OPN |
| Wind/Weather/Stress | 0.0200 | 1.00 | 0.0200 | C | GrasSh | Open |

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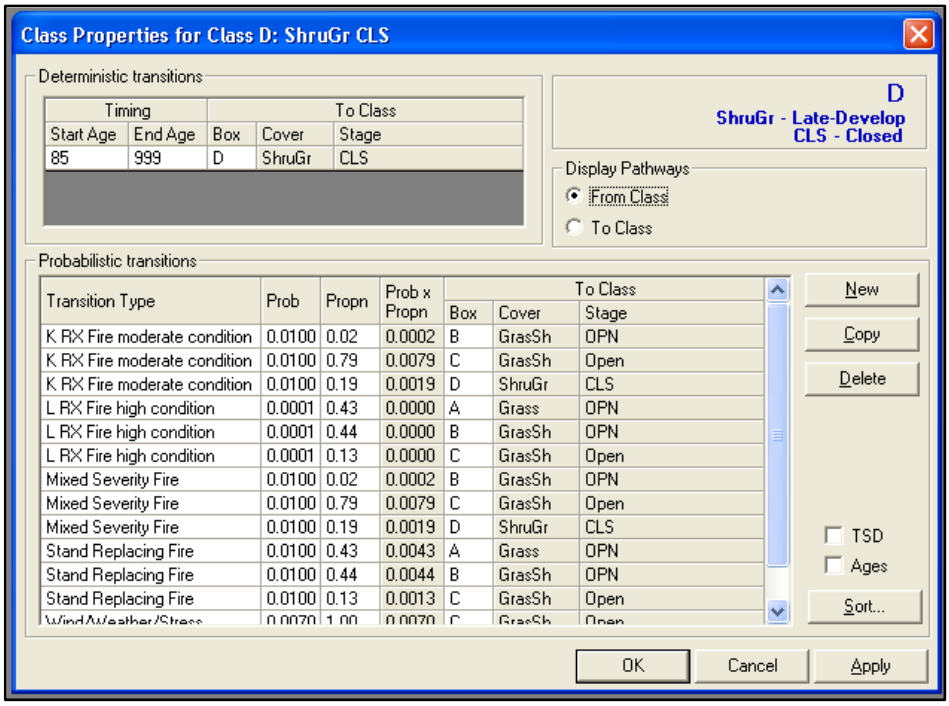
**Appendix A figure 104. Semi-desert grassland PNVTs' potentially management driven (4) and naturally driven (8) transitions for State C**



Class Properties for Class D: ShruGr CLS

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 85 | 999 | D | ShruGr | CLS |

D
ShruGr - Late-Develop
CLS - Closed

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| K RX Fire moderate condition | 0.0100 | 0.02 | 0.0002 | B | GrasSh | OPN |
| K RX Fire moderate condition | 0.0100 | 0.79 | 0.0079 | C | GrasSh | Open |
| K RX Fire moderate condition | 0.0100 | 0.19 | 0.0019 | D | ShruGr | CLS |
| L RX Fire high condition | 0.0001 | 0.43 | 0.0000 | A | Grass | OPN |
| L RX Fire high condition | 0.0001 | 0.44 | 0.0000 | B | GrasSh | OPN |
| L RX Fire high condition | 0.0001 | 0.13 | 0.0000 | C | GrasSh | Open |
| Mixed Severity Fire | 0.0100 | 0.02 | 0.0002 | B | GrasSh | OPN |
| Mixed Severity Fire | 0.0100 | 0.79 | 0.0079 | C | GrasSh | Open |
| Mixed Severity Fire | 0.0100 | 0.19 | 0.0019 | D | ShruGr | CLS |
| Stand Replacing Fire | 0.0100 | 0.43 | 0.0043 | A | Grass | OPN |
| Stand Replacing Fire | 0.0100 | 0.44 | 0.0044 | B | GrasSh | OPN |
| Stand Replacing Fire | 0.0100 | 0.13 | 0.0013 | C | GrasSh | Open |
| Wind/Weather/Stress | 0.0070 | 1.00 | 0.0070 | C | GrasSh | Open |

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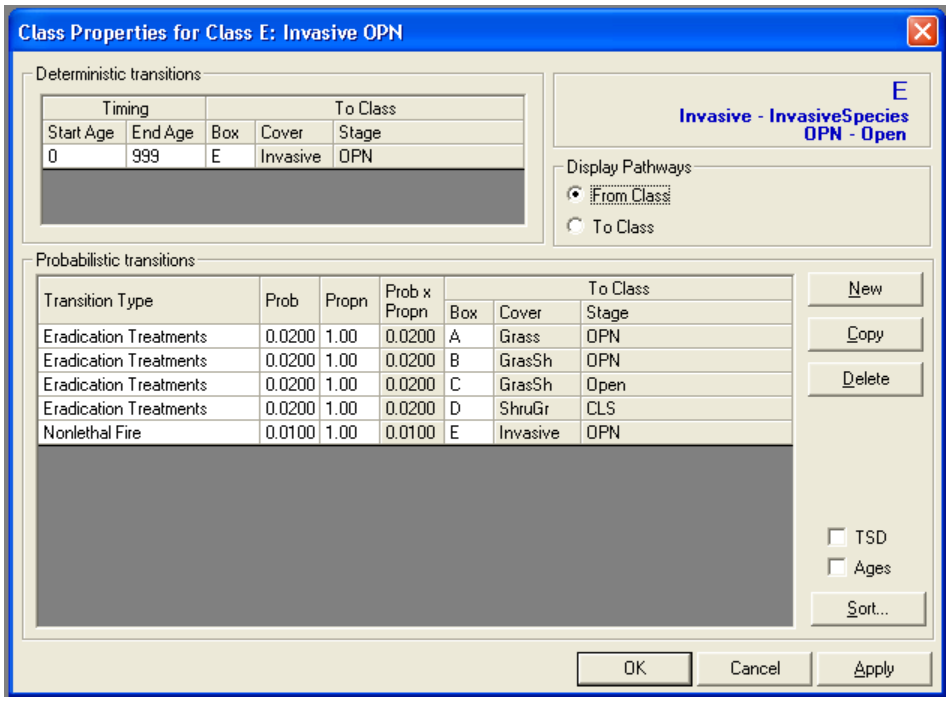
**Appendix A figure 105. Semi-desert grassland PNVTs' potentially management driven (6) and naturally driven (8) transitions for State D**



Class Properties for Class E: Invasive OPN

Deterministic transitions

| Timing | | To Class | | |
|---|---|---|---|---|
| Start Age | End Age | Box | Cover | Stage |
| 0 | 999 | E | Invasive | OPN |

E
Invasive - InvasiveSpecies
OPN - Open

Display Pathways
From Class
To Class

Probabilistic transitions

| Transition Type | Prob | Propn | Prob x Propn | To Class | | |
|---|---|---|---|---|---|---|
| | | | | Box | Cover | Stage |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | A | Grass | OPN |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | B | GrasSh | OPN |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | C | GrasSh | Open |
| Eradication Treatments | 0.0200 | 1.00 | 0.0200 | D | ShruGr | CLS |
| Nonlethal Fire | 0.0100 | 1.00 | 0.0100 | E | Invasive | OPN |

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**Appendix A figure 106. Semi-desert grassland PNVTs' potentially management driven (4) and naturally driven (1) transitions for State E**

## Montane/Subalpine Grasslands

**Appendix A table 17. Montane/subalpine grasslands PNVT crosswalks developed by Region 3 (13 February 2008) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2007c)**

| Model | State | Desired Condition/ Reference Condition (mean %) | VDDT Model Vegetation States | | R3 Existing Veg Classes<br>Dominance Type Group - Structure Class |
|---|---|---|---|---|---|
| LANDFIRE National "Southern Rocky Mountain Montane-Subalpine Grassland" (151146) | A | 20 | Early development 1 - All structures | = | Recently burned, sparsely vegetated - N/A |
| | B, C | 80 | Mid-late development | = | All corresponding grass and forb types - N/A |
| | *Contemporary Landscapes Only …* | | | | |
| | D | 0 | Tree or shrub cover (significant) | = | Shrub types: All corresponding shrub types - All |
| | | | | = | Tree types: All corresponding tree types - Seedling/sapling and all open tree structure classes |
| | E† | 0 | Invasive plants | = | Invasive plants |

†This state was added to the model to reflect the presence of various noxious weeds and invasive plants that makeup a significant portion of the herbaceous vegetation composition; not part of the historic conditions or within historic range of variability and are occurring on contemporary landscapes only

### *State and Transition Models for Montane/Subalpine Grasslands*

The following is Smith's (2007) discussion concerning the current modeling results for montane/subalpine grasslands.

The current high elevation grassland model, which was run for 120 years following the Historic conditions, had very different results from the historic model (appendix A table 17). Native grassland (state A) only occupied 23 to 28% of the landscape after 120 years of fire suppression, grazing, and exotic introductions. Grassland with low density of encroaching trees (state B) occupied 18 to 20% of the landscape, and conifer forest (state C) had invaded 53 to 58% of the landscape. From these model runs, 71 to 78% of the high elevation grassland landscape is anomalous to the historic conditions.

These modeled scenarios underscore the importance of frequent surface fire in maintaining open, high elevation montane grassland ecosystems. The increase in proportion of the landscape that is closed and susceptible to uncharacteristic, stand replacing fires is very high at more than 50%. This proportion is toward the high end of reported values of grassland encroachment for the Valles Caldera grasslands, New Mexico, studied by Coop and Givnish (2007), but close to the value of 55% grassland loss reported by Allen (1984). There are several variables that control grassland invasibility, including precipitation and temperature, and several site characteristics such as topographic position, aspect, slope inclination, soil type and depth, and disturbance history (Allen 1984; Moore and Huffman 2004; Coop and Givnish 2007). Although it could not be quantified for this model, several areas have been invaded by nonnative plant species, including species of bluegrass (*Poa* spp. L.), smooth brome (*Bromus inermis* L.), common dandelion (*Taraxacum officinale* F.H. Wigg.), and other plant species that change habitat suitability for wildlife species (Allen 1984; Dick-Peddie 1993; White 2002). The simplistic model presented here incorporates the factors that have been quantified in the literature to date, and as more data become available, the model can incorporate that information to reflect the level of sophistication of our knowledge.

No USFS Southwestern Regional model was developed for the montane/subalpine grasslands.

**Appendix A table 18. Identification of Current transitions, frequency of transitions, sources of information used, and assumptions used to develop the frequency of transitions and its effect on vegetation included in the VDDT models**

| Transition Type | Transition Frequency or Length | Sources | Assumptions |
|---|---|---|---|
| Microsite characteristics | Not used in model | Allen 1984; Moore and Huffman 2004; Coop and Givnish 2007b. | There are large differences in the 'invasibility' of grasslands, largely controlled by climate, but also controlled by several site gradients. |
| Plant growth | 40 years | Ahlstrand et al. 1980; Allen 1984; Wyant et al. 1986. | During the post-settlement period, tree encroachment began 30-40 years after cattle grazing and fire cessation, leading to the formation of a new ecological state that included more tree species. Several encroaching tree species become resistant to cambium scorching after attaining an age of 15 to 40 years. |
| Fuel build up | Once every year. | Covington and Moore 1994; Swetnam and Baisan 1996; Allen et al. 2002; Fule et al. 2003. | Several authors have documented the cessation of surface fires around 1880, which has led to the accumulation of fuels. |
| Stand replacing fire | Once every 100 years | Cessation of surface fires and accumulation of fuels and development of fuel ladders has led to an increase in the frequency of stand replacing fires (Covington and Moore 1994; Swetnam and Baisan 1996; Covington et al. 1997; Allen et al. 2002). | Smith based his estimate of fire on fire scar data. Specifically, regional fire scar data shows drastic declines in fires from 1900 to present. Given these data, we estimated a fire occurrence of 1 in the last 100 years during the current period. This frequency may have regional variation based on site characteristics, sources of ignition, and suppression success. |
| Non-native grazing | P=1 for all areas | Allen 1984. | Grazing by sheep and cattle, and concomitant reduction in fire frequency have led to increased invasion of high elevation grasslands by coniferous trees and aspen. Invasion followed an approximately 40-year lag period, during which time grazing practices changed in large part from sheep to cattle grazing. |
| Exotic plant introduction | Not used in model | Allen 1984; Dick-Peddie 1993; White 2002. | Canada bluegrass (*Poa compressa* L.) and Kentucky bluegrass (*P. pratensis* L.) and other plant species were introduced into many high elevation grasslands by early settlers and their grazing animals. This factor primarily affects understory composition and habitat quality. However, no transition probability could be discerned from the literature. |
| Prescribed fire and mechanical tree thinning | Not used in model | | Mechanical removal of trees and prescribed burning may be effective in restoring grasslands, but this work has not been well documented. |

## Chaparral PNVT

## Interior Chaparral

**Appendix A table 19. Interior chaparral PNVT crosswalks developed by Region 3 (30 July 2010) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Schussman 2006b)**

| Model | State | Desired Condition/ Reference Condition† (%) | VDDT Model | | R3 MID-SCALE MAPPING |
|---|---|---|---|---|---|
| | | | Vegetation States | | Dominance Type Group - Structure Class |
| TNC Interior Chaparral | A | 2 | Grass and forb regeneration | = | Recently burned, sparsely vegetated, and all corresponding herbaceous types - N/A |
| | B | 5 | Grass and shrub | = | All corresponding shrub types - Shrub - open |
| | C, D | 93 | Mid-late development dense shrub, no understory | = | All corresponding shrub types - Shrub - closed and all tree size and cover classes |

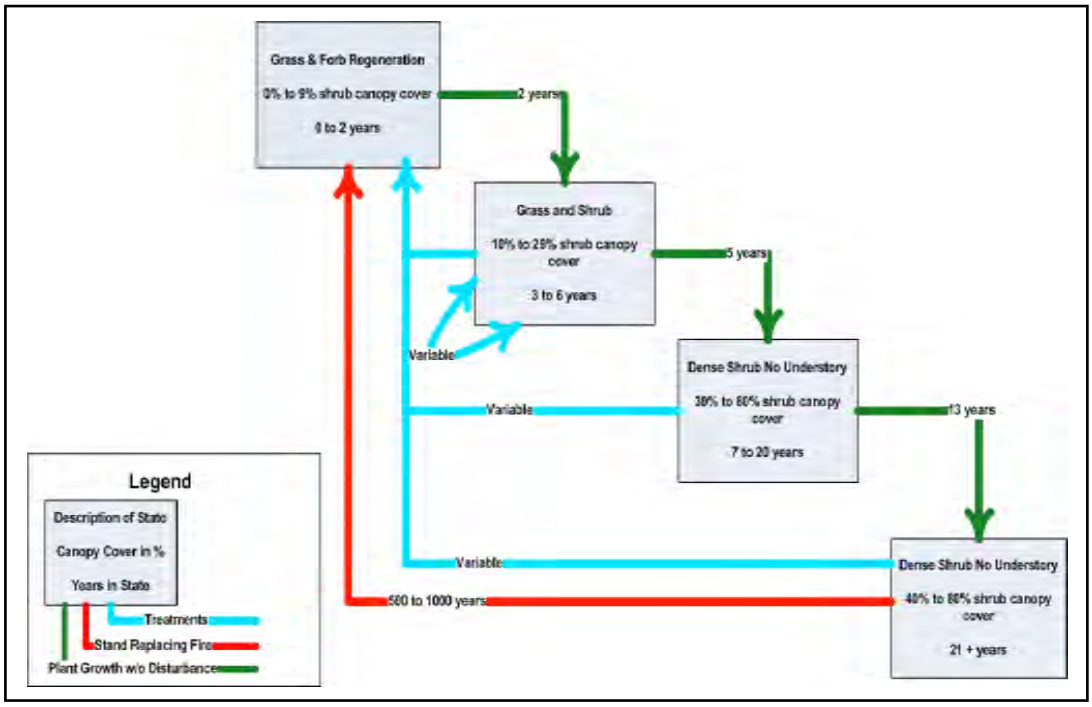
†Based on 60-year fire frequency

### *State and Transition Models for Interior Chaparral*

The following is Schussman's (2006b) discussion concerning the current modeling results for interior chaparral. Interior chaparral appears to be a fairly stable vegetation type due to the majority of its species having the ability to quickly re-sprouting following disturbance events, such as fire and mechanical or chemical removal (Cable 1975; Lillie et al. 1964; Pase and Ingebo 1965; Pond and Cable 1960). Additionally, the few species that regenerate from seed require fire to prepare the seedbed (Carmichael et al. 1978). Historically, this led to quick recovery of chaparral following the dominant natural disturbance, fire. In current times, these same mechanisms have allowed chaparral to maintain its dense canopy cover character regardless of human disturbance but have increased densities due to disturbance exclusion.

Appendix A figure 107 displays a conceptual current state and transition model for the interior chaparral-vegetation type (Schussman and Smith 2006ab) used in VDDT modeling. In appendix A table 19, Schussman (2006b) describes the parameters included or not included within the current VDDT models (Schussman and Smith 2006ab), as well as the sources of information and any assumptions used to create the model parameters.

Results of the interior chaparral historic VDDT model show some variability in the 900 year average percent of the modeled landscape in each state based on the fire return interval range (appendix A table 19). Even with this variability, all models showed a consistent pattern of the majority of the historic vegetation occurring in the Dense Shrub (greater than 21 years olds) state (83.6%, 76.2% and 50.5% +/- 2.3%, 3.2%, and 5.2 % for fire return intervals of 100, 60, and 20 years respectively). A comparison of simulated historic conditions and current conditions shows an increase in the amount of dense shrub (21+ years) present under current management. Specifically, increases of between 50% and 13% are seen for the 100, 60, and 20 year historic runs compared to the 0 to 500 year current runs.



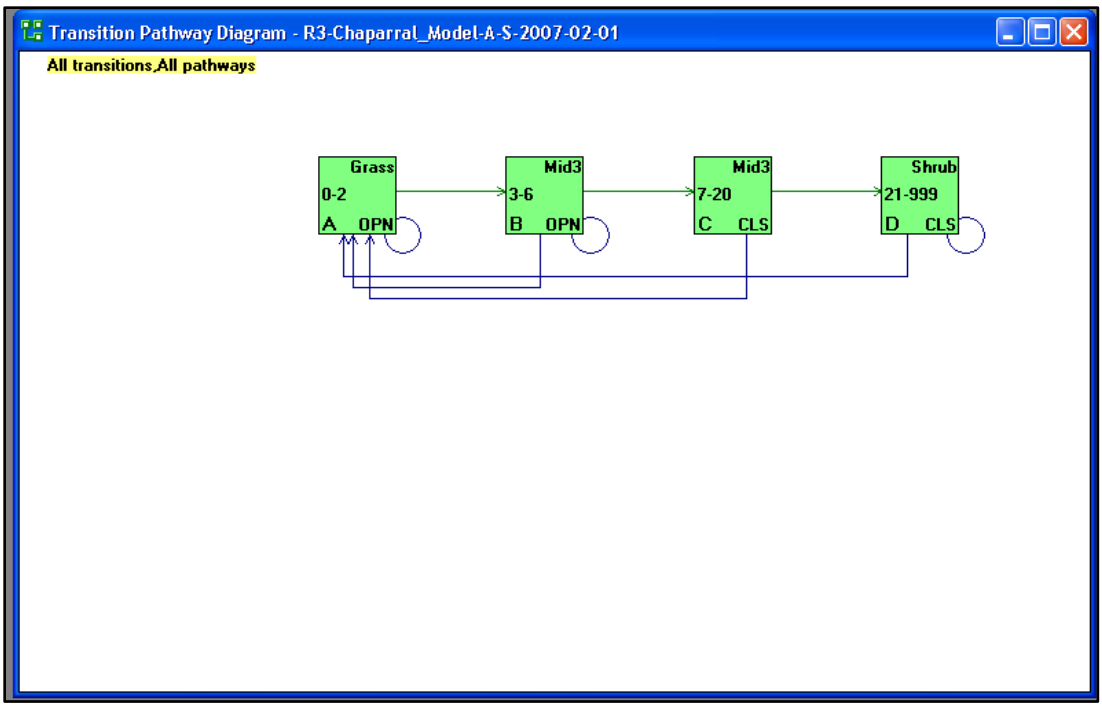

**Appendix A figure 107. Conceptual current state and transition model for the interior chaparral vegetation type. Frequency of transitions are noted when this information is supported by published sources; where no or conflicting information exists on the frequency of transitions, unknown or variable, respectively, is the notation (Schussman and Smith 2006ab, Schussman 2006b)**

These results suggest that the last 120 years of land management, mainly fire suppression, have had some effect on historic chaparral landscape conditions. Changes primarily within stand age and density are reasonable as we wouldn't expect 120 years of fire suppression to have large effects on vegetation structure within a PNVT with a historic fire return interval of 20 to 100 years. Additionally, this is in agreement with changes within chaparral vegetation documented by Huebner et al. (1999). These results suggest that current interior chaparral vegetation has lost the mosaic of less dense and younger aged states. Maintenance of the 20 to 100 year fire return interval will be important for restoring and maintaining the historic range of conditions for this landscape in the future.

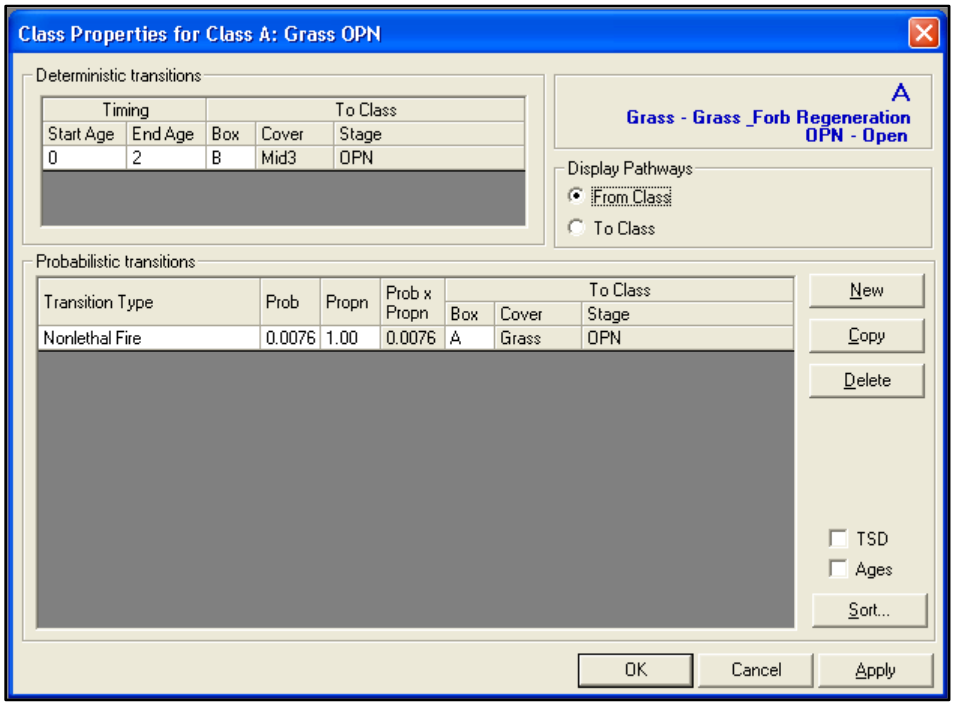
Appendix A figures 108 through 112 display the actual VDDT model for interior chaparral, developed by the USFS Southwest Region 3, and utilized during the planning effort (Phase I) on the ASNFs.

**Appendix A table 20. Identification of current transition types, probabilities, and source of information used to inform the interior chaparral VDDT model (adopted from Schussman 2006)**

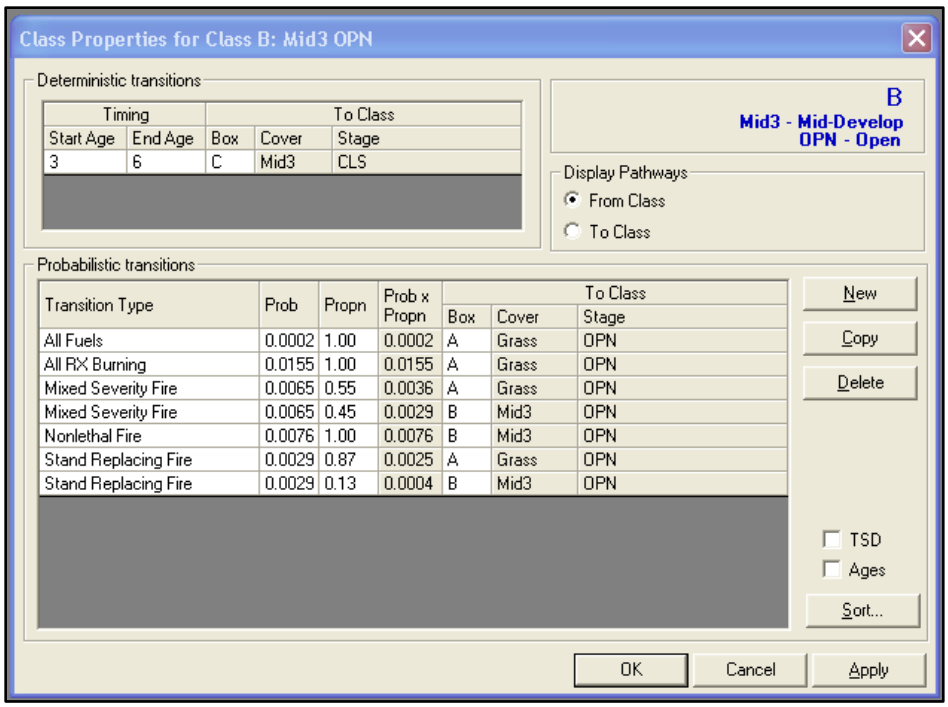
| Transition Type | Transition Frequency or Length | Source | Assumptions |
|---|---|---|---|
| Treatments (mechanical, herbicide, and/or prescribed fire) | Variable, not included in model | Baldwin 1968; Cable 1975; Lillie et al. 1964; Pase and Ingebo 1965; Pond and Cable 1960. | Schussman identified multiple studies, conducted primarily within the Tonto National Forest, which documented a wide range of mechanical, chemical, and fire treatments for interior chaparral vegetation. We concluded that the type of treatment was variable and occurred on a relatively small portion of interior chaparral within Arizona and New Mexico; hence we decided not to model this parameter in the regional current model. |
| Non-native seeding | Variable, not included in model | Cable 1975; Hibbert et al. 1974. | Schussman found documentation of the seeding of non-native perennial grasses (*Eragrostis lehmanniana* Nees and *E. curvula* (Schrad.) Nees) following conversion treatments. However, as with the treatment parameter, we determined that seeding was variable and occurred on a relatively small portion of interior chaparral in Arizona and New Mexico, hence we decided not to model this parameter in the current model. |
| Stand replacing fire | Every 0 to 500 years | Savage and Swetnam 1990; Swetnam and Betancourt 1998; Sneed et al. 2002. | Schussman based the estimate of fire on fire scar data; specifically, regional fire scar data, along with data more localized to southeastern Arizona and the Prescott Basin, Arizona, shows drastic declines in fires from 1900 to present (Savage and Swetnam 1990; Sneed et al. 2002; Swetnam and Betancourt 1998). Given this information, we estimated a fire return interval of 0 to every 500 years. |
| Plant growth without disturbance | 2, 5, and 13 years | Carmichael et al. 1978, Cable 1975; Lillie et al. 1964; Pase and Brown 1982; Pase and Ingebo 1965; Pond and Cable 1960. | Schussman identified multiple sources (with similar results) that documented the time it took chaparral vegetation to reach the various canopy cover classes of each state. Specifically, multiple studies suggest that by 7 years chaparral has returned to pre-burn densities and/or densities high enough to eliminate the grass understory (Cable 1975; Carmichael et al. 1978; Pond and Cable 1962). Additionally, it is suggested that chaparral quickly recover to high cover levels (30 to 80%) but may not burn until roughly 20 years have passed (Cable 1975). Based on these studies we determined how long it would take to transition from one state to the next in the absence of a disturbance. We also used this information to determine the canopy cover ranges for each state. |



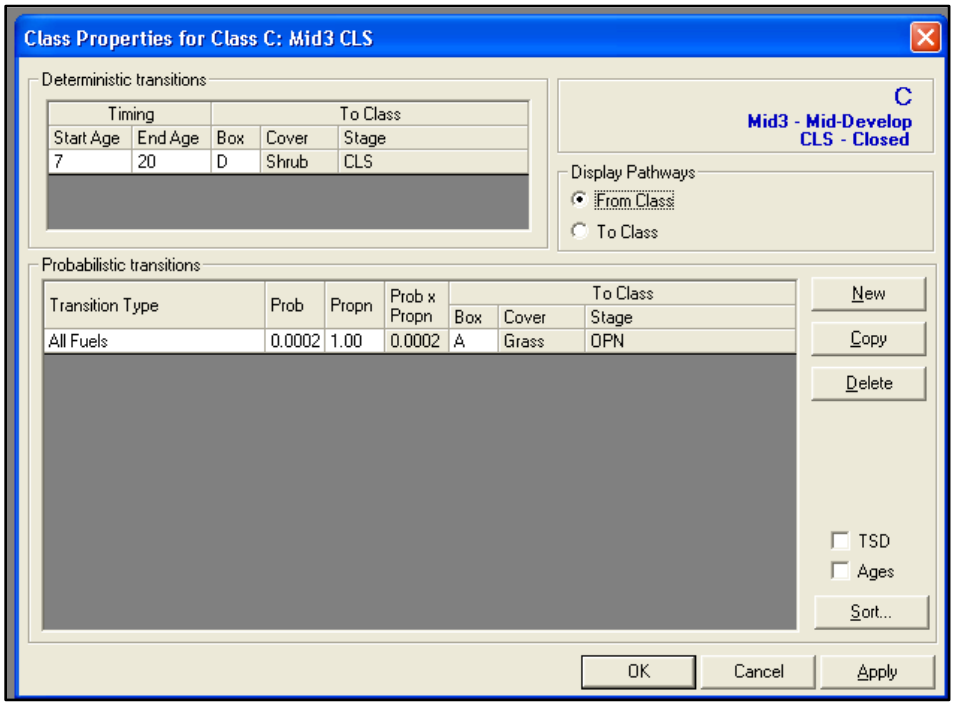

**Appendix A figure 108. Actual VDDT state and transition model used for assessing trends in the interior chaparral PNVT on the ASNFs**



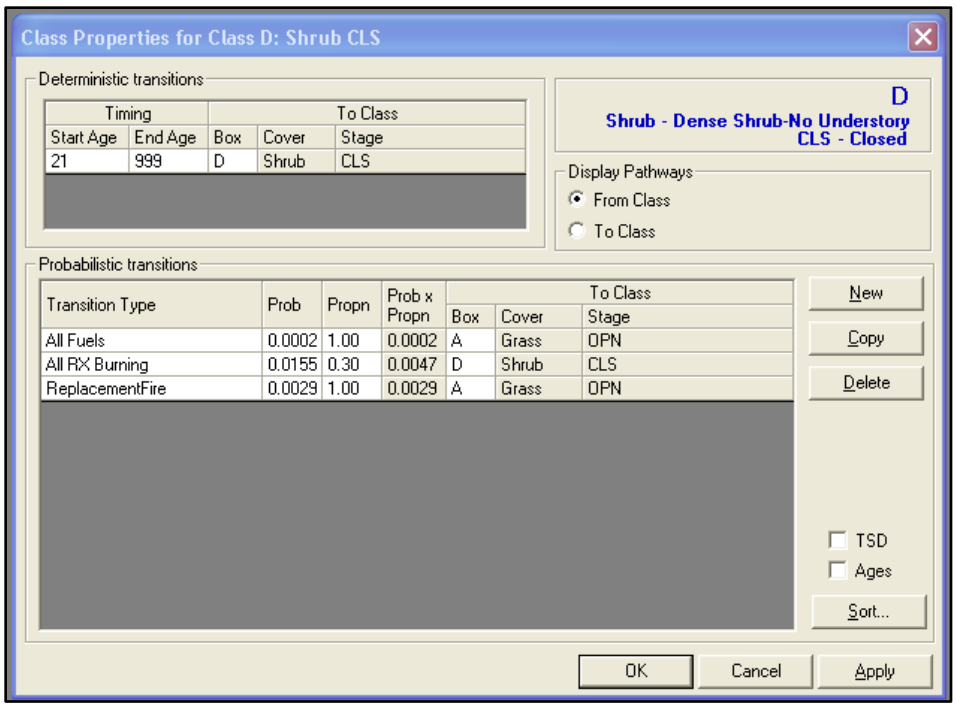

**Appendix A figure 109. Interior chaparral PNVTs' potentially management driven (0) and naturally driven (1) transitions for State A**




**Appendix A figure 110. Interior chaparral PNVTs' potentially management driven (2) and naturally driven (5) transitions for State B**




**Appendix A figure 111. Interior chaparral PNVTs' potentially management driven (1) and naturally driven (0) transitions for State C**




**Appendix A figure 112. Interior chaparral PNVTs' potentially management driven (2) and naturally driven (1) transitions for State D**

## Riparian Areas/Forest PNVTs

## Wetland/Cienega Riparian Areas

**Appendix A table 21. Wetland/cienega riparian areas PNVT crosswalks developed by Region 3 (10 March 2008) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2003)**

| Model | State | Historic Mean (%) | Vegetation States | | Region 3 Existing Vegetation Classes<br>Dominance Type Group - Structure Class |
|---|---|---|---|---|---|
| LANDFIRE RA "Wet Grassland" PNVG (WGRA) | A | 15 | Post replacement | = | Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% tree or shrub canopy cover; early successional development |
| | B, | 80 | Mid development - open | = | Perennial herbaceous vegetation, with < 10% tree or shrub canopy cover; mid successional development |
| | C | 5 | Mid development - closed | = | Shrubs, and seedling and sapling size (< 5” diameter) trees with open (< 30%) or closed (≥ 30) canopy cover, with perennial herbaceous vegetation understory; mid successional development |
| | *Contemporary Landscapes Only …* | | | | |
| | D | 0 | Late development - open, closed | = | Shrubs, small size (5”-9.9” diameter), medium size (10”-19.9” diameter), and large to very large size (> 20” diameter) trees with open (< 30%) or closed (≥ 30) canopy cover, with herbaceous vegetation understory; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only |

## Cottonwood-Willow Riparian Forest

**Appendix A table 22. Cottonwood-willow riparian forest† PNVT crosswalks developed by Region 3 (10 March 2008) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2007d)**

| Model | State | Historic Mean (%) | Vegetation States | | R3 Existing Veg Classes<br>Dominance Type Group - Structure Class |
|---|---|---|---|---|---|
| LANDFIRE National "North American Warm Desert Riparian Systems" (1511551) | A | 20 | Early development 1 Post woody reproduction - All structures | = | Recently burned, all corresponding herbaceous types - N/A |
| | | | | | All corresponding shrub types other than mesquite or mesquite mixes - Shrub - open and closed |
| | | | | | All corresponding tree types - Seedling/sapling |
| | B | 25 | Mid development 1 - closed | = | All corresponding tree types - Small - open and closed, Medium - open and closed |
| | C | 35 | Late development 1 - closed | = | All corresponding tree types - Very large - open and closed |
| | D | 20 | Late development 2 - closed | = | Mesquite or mesquite mixes‡ - Shrub - open and closed |

†There are two "North America Warm Desert Riparian Systems" models (1511551 and 1511552) with very different reference conditions and fire regimes. 1511552 is described in stringers. 1511551 is the regional standard, for which reference conditions have not changed. Jack Triepke, Region 3 Ecologist, revisited the state descriptions, which makes for difficult X-walking without reliable cover type mapping to discern mesquite and cottonwood (Region 3 might need more than one Xwalk for this PNVT). Jack Triepke has revamped the existing X-walk to differentiate mesquite domination (state D), the updated Xwalk assuming that mesquite is mapped as a shrub form (this is true for most of Region 3 mid-scale mapping)

‡Xwalk assumes that mesquite and mesquite mixes are mapped as shrub life forms

## Mixed Broadleaf Deciduous Riparian Forest

**Appendix A table 23. Mixed broadleaf deciduous riparian forest† PNVT crosswalks developed by Region 3 (19 September 2006) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2008)**

| Model | State | Desired Condition/ Historic Mean (%) | Historic Vegetation States | | R3 Existing Veg Classes<br>Dominance Type Group - Structure Class |
|---|---|---|---|---|---|
| LANDFIRE RA "Mesquite Bosques" (R3MEBO) | A | 10 | Early 1 Post woody reproduction - Dominated by resprouts and seedlings of shrubs and trees | = | Recently burned, sparsely vegetated, all corresponding herbaceous and shrub types - N/A |
| | B | 30 | Mid development 1 - closed | = | All corresponding tree types - Small - closed, Medium - closed |
| | C | 25 | Mid development 1 - open | = | All corresponding tree types - Seedling/sapling, Small - open |
| | D | 15 | Late development 1 - open | = | All corresponding tree types - Medium - open, Very large - open |
| | E | 20 | Late development 1 - closed | = | All corresponding tree types - Very large - closed |

†The LANDFIRE model used to represent this PNVT provides a poor depiction of this system. Region 3 is in the process of developing a VDDT model and description for this PNVT

## Montane Willow Riparian Forest

**Appendix A table 24. Montane willow riparian forest† PNVT crosswalks developed by Region 3 (10 March 2008) used in the determination of departure from HRV and DCs. DCs were provided by the Regional Office, and HRV was derived from LANDFIRE (2007e)**

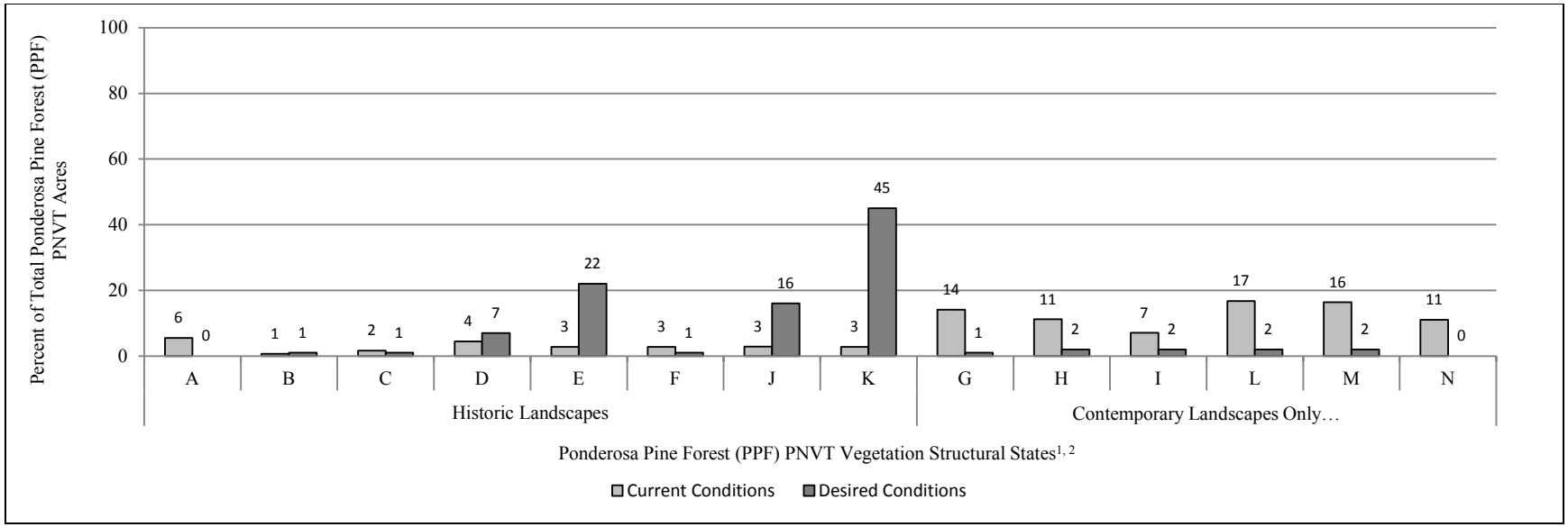
| Model | State | Historic Mean (%) | Vegetation States | | R3 Existing Veg Classes<br>Dominance Type Group - Structure Class |
|---|---|---|---|---|---|
| LANDFIRE National "Montane Riparian Systems" (2411590) | A | 65 | Early development 1 - all | = | Recently burned, all corresponding herbaceous types - N/A |
| | | | | | All corresponding shrub types - Shrub - open |
| | B | 35 | Mid development 1 - closed | = | All corresponding shrub types - Shrub - closed |
| | | | | | All corresponding tree types - All size classes |

# Appendix B

## Potential Natural Vegetation Types Current and Desired Condition Structural States and Resulting Vegetation Structural States by VDDT Model Year Runs over the 50-Year Modeling Period

## Forested PNVTs

## Ponderosa Pine




**Appendix B figure 1. Ponderosa pine forest potential natural vegetation type current and desired vegetation structural states**

[1] Ponderosa Pine Forest (PPF) PNVT Vegetation Structural States. At 602,206 acres or approximately 30% of the forests this PNVT is the largest on the ASNFs

State A - Recently burned, grass, forb and shrub types with < 10% tree canopy cover; early successional development

State B - Seedling and sapling size (< 5” diameter) trees with open (< 30%) canopy cover; all tree types; early successional development

State C - Small size (5”-9.9” diameter) trees, with open canopy cover; all tree types; mid successional development

State D - Medium size (10”-19.9” diameter) trees, single storied, with open canopy cover; all tree types; late successional development

State E - Large to very large size (≥ 20” diameter) trees, single storied, with open canopy cover; all tree types; late successional development

State F - Seedling and sapling size trees with closed (≥ 30%) canopy cover; all tree types; early successional development

State G - Small size trees, with closed canopy cover; all tree types; mid successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State H - Medium size trees, single storied, with closed canopy cover; all shade tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State I - Large to very large size trees, single storied, with closed canopy cover; all tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State J - Medium size trees, multi-storied, with open canopy cover; all tree types; late successional development

State K - Large to very large size trees, multi-storied, with open canopy cover; all tree types; late successional development

State L - Medium size trees, multi-storied, with closed canopy cover; all tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State M - Large to very large size trees, multi-storied, with closed canopy cover; tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State N - Recently burned, grass, forb and shrub types with < 10% tree canopy cover; uncharacteristic early successional development due to fire; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] PPF PNVT has a 77% or high departure rating from Desired Conditions (DC) and a 94% or severe departure rating from Historical Range of Variability (HRV) making it the 2nd and 1st most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Smith 2006a)

## PPF Alternative A

### Appendix B table 1. Alternative A PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 33,334 | 16,959 | 17,675 | 28,273 | 48,196 | 23,296 | 72,731 | 56,901 | 54,986 | 23,323 | 31,211 | 94,321 | 74,666 | 26,334 | 602,206 |
| 15-year planning period | 28,136 | 16,486 | 20,731 | 28,274 | 62,122 | 27,835 | 73,356 | 57,592 | 55,166 | 25,162 | 36,020 | 90,333 | 65,837 | 15,156 | 602,206 |
| 20 years | 21,540 | 15,059 | 22,251 | 27,380 | 73,213 | 32,174 | 75,283 | 53,769 | 63,550 | 24,935 | 37,183 | 86,489 | 59,017 | 10,362 | 602,206 |
| 30 years | 13,695 | 11,225 | 20,141 | 23,826 | 97,100 | 35,293 | 77,435 | 51,950 | 62,451 | 24,782 | 39,092 | 86,161 | 54,525 | 4,528 | 602,206 |
| 40 years | 8,768 | 9,230 | 19,908 | 21,926 | 122,278 | 35,874 | 75,177 | 46,524 | 64,272 | 25,540 | 38,351 | 83,074 | 49,290 | 1,993 | 602,206 |
| 50 years | 7,560 | 9,715 | 18,555 | 23,409 | 130,256 | 32,265 | 74,389 | 47,220 | 64,033 | 25,621 | 42,427 | 80,754 | 44,621 | 1,380 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 3 | 3 | 5 | 8 | 4 | 12 | 9 | 9 | 4 | 5 | 16 | 12 | 4 | 100 |
| 15-year planning period | 5 | 3 | 3 | 5 | 10 | 5 | 12 | 10 | 9 | 4 | 6 | 15 | 11 | 3 | 100 |
| 20 years | 4 | 3 | 4 | 5 | 12 | 5 | 13 | 9 | 11 | 4 | 6 | 14 | 10 | 2 | 100 |
| 30 years | 2 | 2 | 3 | 4 | 16 | 6 | 13 | 9 | 10 | 4 | 6 | 14 | 9 | 1 | 100 |
| 40 years | 1 | 2 | 3 | 4 | 20 | 6 | 12 | 8 | 11 | 4 | 6 | 14 | 8 | 0 | 100 |
| 50 years | 1 | 2 | 3 | 4 | 22 | 5 | 12 | 8 | 11 | 4 | 7 | 13 | 7 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 33 | 64 | 100 | 100 | 100 | 100 | 76 | 88 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 33 | 53 | 100 | 100 | 100 | 100 | 74 | 87 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 35 | 45 | 100 | 100 | 100 | 100 | 74 | 86 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 43 | 27 | 100 | 100 | 100 | 100 | 74 | 86 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 48 | 8 | 100 | 100 | 100 | 100 | 73 | 86 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 44 | 2 | 100 | 100 | 100 | 100 | 73 | 84 | 100 | 100 | 100 | |

## PPF Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 2. Alternative B PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 39,129 | 18,069 | 20,448 | 32,269 | 51,092 | 23,750 | 68,208 | 59,920 | 35,610 | 30,033 | 45,045 | 90,681 | 64,411 | 23,544 | 602,206 |
| 15-year planning period | 32,198 | 21,409 | 23,404 | 33,737 | 65,383 | 29,747 | 64,859 | 56,157 | 32,232 | 34,974 | 53,402 | 85,584 | 55,638 | 13,482 | 602,206 |
| 20 years | 26,259 | 19,778 | 24,379 | 35,523 | 72,385 | 34,730 | 65,519 | 53,600 | 29,206 | 36,951 | 66,137 | 82,362 | 46,830 | 8,548 | 602,206 |
| 30 years | 18,795 | 17,909 | 27,589 | 32,322 | 84,155 | 38,690 | 72,640 | 45,081 | 25,318 | 40,674 | 81,350 | 77,674 | 36,666 | 3,342 | 602,206 |
| 40 years | 15,377 | 16,922 | 26,522 | 32,138 | 89,262 | 39,748 | 73,960 | 44,701 | 21,802 | 41,343 | 90,404 | 73,300 | 34,992 | 1,734 | 602,206 |
| 50 years | 13,696 | 17,280 | 29,489 | 34,031 | 90,601 | 39,890 | 74,765 | 39,178 | 19,899 | 43,903 | 95,608 | 70,019 | 32,884 | 964 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 3 | 3 | 5 | 8 | 4 | 11 | 10 | 6 | 5 | 7 | 15 | 11 | 4 | 100 |
| 15-year planning period | 5 | 4 | 4 | 6 | 11 | 5 | 11 | 9 | 5 | 6 | 9 | 14 | 9 | 2 | 100 |
| 20 years | 4 | 3 | 4 | 6 | 12 | 6 | 11 | 9 | 5 | 6 | 11 | 14 | 8 | 1 | 100 |
| 30 years | 3 | 3 | 5 | 5 | 14 | 6 | 12 | 7 | 4 | 7 | 14 | 13 | 6 | 1 | 100 |
| 40 years | 3 | 3 | 4 | 5 | 15 | 7 | 12 | 7 | 4 | 7 | 15 | 12 | 6 | 0 | 100 |
| 50 years | 2 | 3 | 5 | 6 | 15 | 7 | 12 | 7 | 3 | 7 | 16 | 12 | 5 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 20 | 51 | 100 | 100 | 100 | 100 | 64 | 80 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 16 | 45 | 100 | 100 | 100 | 100 | 62 | 76 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 23 | 36 | 100 | 100 | 100 | 100 | 58 | 70 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 24 | 33 | 100 | 100 | 100 | 100 | 57 | 67 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 19 | 32 | 100 | 100 | 100 | 89 | 54 | 65 | 100 | 100 | 100 | |
| 50 years | 100 | 35 | 100 | 36 | 87 | 100 | 100 | 100 | 100 | 82 | 94 | 100 | 100 | 100 | |

## PPF Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 3. Alternative B PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 35,689 | 17,295 | 19,180 | 28,981 | 43,034 | 23,454 | 72,258 | 62,298 | 39,869 | 25,935 | 37,473 | 97,574 | 74,530 | 24,636 | 602,206 |
| 15-year planning period | 29,720 | 19,348 | 21,494 | 29,215 | 56,437 | 28,858 | 70,259 | 60,222 | 37,965 | 29,789 | 42,826 | 94,574 | 67,568 | 13,933 | 602,206 |
| 20 years | 23,556 | 17,547 | 22,095 | 29,092 | 62,123 | 33,518 | 72,835 | 58,424 | 37,134 | 31,044 | 51,140 | 93,388 | 61,285 | 9,025 | 602,206 |
| 30 years | 15,066 | 15,468 | 23,466 | 27,043 | 71,822 | 37,824 | 78,332 | 51,880 | 35,155 | 33,777 | 61,878 | 92,054 | 54,679 | 3,761 | 602,206 |
| 40 years | 11,468 | 13,354 | 23,734 | 25,268 | 76,809 | 38,679 | 80,040 | 51,437 | 33,937 | 34,307 | 69,220 | 89,926 | 52,438 | 1,588 | 602,206 |
| 50 years | 9,638 | 13,713 | 24,743 | 25,937 | 79,277 | 38,779 | 80,528 | 46,916 | 33,050 | 35,784 | 74,134 | 87,876 | 50,704 | 1,126 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 3 | 3 | 5 | 7 | 4 | 12 | 10 | 7 | 4 | 6 | 16 | 12 | 4 | 100 |
| 15-year planning period | 5 | 3 | 4 | 5 | 9 | 5 | 12 | 10 | 6 | 5 | 7 | 16 | 11 | 2 | 100 |
| 20 years | 4 | 3 | 4 | 5 | 10 | 6 | 12 | 10 | 6 | 5 | 8 | 16 | 10 | 1 | 100 |
| 30 years | 3 | 3 | 4 | 4 | 12 | 6 | 13 | 9 | 6 | 6 | 10 | 15 | 9 | 1 | 100 |
| 40 years | 2 | 2 | 4 | 4 | 13 | 6 | 13 | 9 | 6 | 6 | 11 | 15 | 9 | 0 | 100 |
| 50 years | 2 | 2 | 4 | 4 | 13 | 6 | 13 | 8 | 5 | 6 | 12 | 15 | 8 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 31 | 68 | 100 | 100 | 100 | 100 | 73 | 86 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 31 | 57 | 100 | 100 | 100 | 100 | 69 | 84 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 31 | 53 | 100 | 100 | 100 | 100 | 68 | 81 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 36 | 46 | 100 | 100 | 100 | 100 | 65 | 77 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 40 | 42 | 100 | 100 | 100 | 100 | 64 | 74 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 38 | 40 | 100 | 100 | 100 | 100 | 63 | 73 | 100 | 100 | 100 | |

## PPF Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 4. Alternative B PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 32,248 | 16,521 | 17,912 | 25,694 | 34,976 | 23,158 | 76,309 | 64,675 | 44,128 | 21,838 | 29,902 | 104,468 | 84,649 | 25,728 | 602,206 |
| 15-year planning period | 27,242 | 17,287 | 19,583 | 24,693 | 47,491 | 27,969 | 75,658 | 64,286 | 43,697 | 24,604 | 32,249 | 103,565 | 79,498 | 14,385 | 602,206 |
| 20 years | 20,856 | 15,319 | 19,814 | 22,665 | 51,869 | 32,309 | 80,160 | 63,255 | 45,066 | 25,142 | 36,150 | 104,426 | 75,749 | 9,503 | 602,206 |
| 30 years | 11,337 | 13,027 | 19,343 | 21,764 | 59,490 | 36,958 | 84,024 | 58,679 | 44,993 | 26,881 | 42,406 | 106,433 | 72,691 | 4,181 | 602,206 |
| 40 years | 7,559 | 9,785 | 20,945 | 18,399 | 64,357 | 37,610 | 86,120 | 58,174 | 46,072 | 27,272 | 48,035 | 106,553 | 69,885 | 1,442 | 602,206 |
| 50 years | 5,580 | 10,146 | 19,998 | 17,843 | 67,953 | 37,668 | 86,291 | 54,655 | 46,201 | 27,665 | 52,661 | 105,732 | 68,524 | 1,288 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 5 | 3 | 3 | 4 | 6 | 4 | 13 | 11 | 7 | 4 | 5 | 17 | 14 | 4 | 100 |
| 15-year planning period | 5 | 3 | 3 | 4 | 8 | 5 | 13 | 11 | 7 | 4 | 5 | 17 | 13 | 2 | 100 |
| 20 years | 3 | 3 | 3 | 4 | 9 | 5 | 13 | 11 | 7 | 4 | 6 | 17 | 13 | 2 | 100 |
| 30 years | 2 | 2 | 3 | 4 | 10 | 6 | 14 | 10 | 7 | 4 | 7 | 18 | 12 | 1 | 100 |
| 40 years | 1 | 2 | 3 | 3 | 11 | 6 | 14 | 10 | 8 | 5 | 8 | 18 | 12 | 0 | 100 |
| 50 years | 1 | 2 | 3 | 3 | 11 | 6 | 14 | 9 | 8 | 5 | 9 | 18 | 11 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 39 | 74 | 100 | 100 | 100 | 100 | 77 | 89 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 41 | 64 | 100 | 100 | 100 | 100 | 74 | 88 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 46 | 61 | 100 | 100 | 100 | 100 | 74 | 87 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 48 | 55 | 100 | 100 | 100 | 100 | 72 | 84 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 56 | 51 | 100 | 100 | 100 | 100 | 72 | 82 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 58 | 49 | 100 | 100 | 100 | 100 | 71 | 81 | 100 | 100 | 100 | |

## PPF Alternative C Proposed High Acre Treatment Objectives

**Appendix B table 5. Alternative C PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 52,777 | 26,198 | 34,525 | 37,129 | 55,343 | 23,478 | 61,577 | 47,731 | 25,529 | 37,788 | 70,317 | 69,572 | 39,502 | 20,740 | 602,206 |
| 15-year planning period | 49,890 | 25,449 | 29,282 | 37,932 | 67,396 | 32,403 | 65,545 | 42,136 | 20,058 | 43,577 | 82,144 | 64,590 | 29,407 | 12,398 | 602,206 |
| 20 years | 43,264 | 25,692 | 33,277 | 39,935 | 75,748 | 39,288 | 67,741 | 41,666 | 14,847 | 43,497 | 86,646 | 58,921 | 23,582 | 8,103 | 602,206 |
| 30 years | 38,475 | 26,074 | 36,856 | 37,721 | 85,534 | 42,119 | 72,802 | 39,265 | 10,534 | 41,757 | 89,979 | 57,729 | 18,761 | 4,601 | 602,206 |
| 40 years | 36,534 | 25,703 | 36,807 | 37,135 | 88,444 | 44,403 | 77,079 | 39,497 | 8,595 | 42,922 | 86,032 | 58,100 | 17,871 | 3,084 | 602,206 |
| 50 years | 35,654 | 23,842 | 35,922 | 36,582 | 92,613 | 43,905 | 80,231 | 39,864 | 8,262 | 43,835 | 86,009 | 54,198 | 18,631 | 2,653 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 9 | 4 | 6 | 6 | 9 | 4 | 10 | 8 | 4 | 6 | 12 | 12 | 7 | 3 | 100 |
| 15-year planning period | 8 | 4 | 5 | 6 | 11 | 5 | 11 | 7 | 3 | 7 | 14 | 11 | 5 | 2 | 100 |
| 20 years | 7 | 4 | 6 | 7 | 13 | 7 | 11 | 7 | 2 | 7 | 14 | 10 | 4 | 1 | 100 |
| 30 years | 6 | 4 | 6 | 6 | 14 | 7 | 12 | 7 | 2 | 7 | 15 | 10 | 3 | 1 | 100 |
| 40 years | 6 | 4 | 6 | 6 | 15 | 7 | 13 | 7 | 1 | 7 | 14 | 10 | 3 | 1 | 100 |
| 50 years | 6 | 4 | 6 | 6 | 15 | 7 | 13 | 7 | 1 | 7 | 14 | 9 | 3 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 12 | 58 | 100 | 100 | 100 | 100 | 61 | 74 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 10 | 49 | 100 | 100 | 100 | 90 | 55 | 70 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 5 | 43 | 100 | 100 | 100 | 41 | 55 | 68 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 11 | 35 | 100 | 100 | 100 | 0 | 57 | 67 | 100 | 78 | 100 | |
| 40 years | 100 | 100 | 100 | 12 | 33 | 100 | 100 | 100 | 18 | 55 | 68 | 100 | 70 | 100 | |
| 50 years | 100 | 100 | 100 | 13 | 30 | 100 | 100 | 100 | 22 | 55 | 68 | 100 | 77 | 100 | |

## PPF Alternative C Proposed Average Acre Treatment Objectives

**Appendix B table 6. Alternative C PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 43,609 | 22,104 | 26,531 | 31,333 | 46,140 | 24,294 | 68,268 | 54,773 | 34,343 | 30,282 | 49,891 | 86,989 | 61,521 | 22,128 | 602,206 |
| 15-year planning period | 38,312 | 21,282 | 24,710 | 30,540 | 57,251 | 31,051 | 72,431 | 52,128 | 31,482 | 34,205 | 58,235 | 84,615 | 53,059 | 12,906 | 602,206 |
| 20 years | 32,038 | 20,809 | 27,758 | 30,909 | 63,958 | 36,137 | 75,551 | 50,716 | 28,677 | 34,592 | 63,002 | 81,954 | 47,959 | 8,146 | 602,206 |
| 30 years | 25,531 | 19,690 | 29,879 | 28,658 | 75,908 | 40,251 | 78,604 | 50,589 | 26,921 | 34,769 | 65,403 | 80,478 | 41,530 | 3,994 | 602,206 |
| 40 years | 23,205 | 18,056 | 28,525 | 28,050 | 85,386 | 40,208 | 79,372 | 47,519 | 24,039 | 35,628 | 65,557 | 84,177 | 39,912 | 2,571 | 602,206 |
| 50 years | 21,619 | 16,309 | 28,496 | 26,993 | 90,444 | 39,076 | 82,695 | 46,908 | 23,389 | 35,960 | 68,170 | 80,366 | 39,638 | 2,143 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 7 | 4 | 4 | 5 | 8 | 4 | 11 | 9 | 6 | 5 | 8 | 14 | 10 | 4 | 100 |
| 15-year planning period | 6 | 4 | 4 | 5 | 10 | 5 | 12 | 9 | 5 | 6 | 10 | 14 | 9 | 2 | 100 |
| 20 years | 5 | 3 | 5 | 5 | 11 | 6 | 13 | 8 | 5 | 6 | 10 | 14 | 8 | 1 | 100 |
| 30 years | 4 | 3 | 5 | 5 | 13 | 7 | 13 | 8 | 4 | 6 | 11 | 13 | 7 | 1 | 100 |
| 40 years | 4 | 3 | 5 | 5 | 14 | 7 | 13 | 8 | 4 | 6 | 11 | 14 | 7 | 0 | 100 |
| 50 years | 4 | 3 | 5 | 4 | 15 | 6 | 14 | 8 | 4 | 6 | 11 | 13 | 7 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 26 | 65 | 100 | 100 | 100 | 100 | 69 | 82 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 28 | 57 | 100 | 100 | 100 | 100 | 65 | 79 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 27 | 52 | 100 | 100 | 100 | 100 | 64 | 77 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 32 | 43 | 100 | 100 | 100 | 100 | 64 | 76 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 33 | 36 | 100 | 100 | 100 | 100 | 63 | 76 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 36 | 32 | 100 | 100 | 100 | 100 | 63 | 75 | 100 | 100 | 100 | |

## PPF Alternative C Proposed Low Acre Treatment Objectives

**Appendix B table 7. Alternative C PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 43,609 | 22,104 | 26,531 | 31,333 | 46,140 | 24,294 | 68,268 | 54,773 | 34,343 | 30,282 | 49,891 | 86,989 | 61,521 | 22,128 | 602,206 |
| 15-year planning period | 34,441 | 18,009 | 18,538 | 25,537 | 36,937 | 25,110 | 74,959 | 61,815 | 43,157 | 22,776 | 29,465 | 104,405 | 83,539 | 23,517 | 602,206 |
| 20 years | 26,734 | 17,115 | 20,139 | 23,148 | 47,106 | 29,699 | 79,318 | 62,119 | 42,905 | 24,833 | 34,326 | 104,641 | 76,710 | 13,414 | 602,206 |
| 30 years | 20,812 | 15,926 | 22,239 | 21,883 | 52,168 | 32,985 | 83,362 | 59,766 | 42,508 | 25,688 | 39,359 | 104,988 | 72,336 | 8,188 | 602,206 |
| 40 years | 12,588 | 13,306 | 22,901 | 19,596 | 66,281 | 38,384 | 84,405 | 61,913 | 43,309 | 27,781 | 40,828 | 103,228 | 64,299 | 3,388 | 602,206 |
| 50 years | 9,876 | 10,410 | 20,243 | 18,966 | 82,329 | 36,012 | 81,666 | 55,542 | 39,484 | 28,335 | 45,082 | 110,253 | 61,952 | 2,058 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 3 | 3 | 4 | 6 | 4 | 12 | 10 | 7 | 4 | 5 | 17 | 14 | 4 | 100 |
| 15-year planning period | 4 | 3 | 3 | 4 | 8 | 5 | 13 | 10 | 7 | 4 | 6 | 17 | 13 | 2 | 100 |
| 20 years | 3 | 3 | 4 | 4 | 9 | 5 | 14 | 10 | 7 | 4 | 7 | 17 | 12 | 1 | 100 |
| 30 years | 2 | 2 | 4 | 3 | 11 | 6 | 14 | 10 | 7 | 5 | 7 | 17 | 11 | 1 | 100 |
| 40 years | 2 | 2 | 3 | 3 | 14 | 6 | 14 | 9 | 7 | 5 | 7 | 18 | 10 | 0 | 100 |
| 50 years | 1 | 1 | 4 | 3 | 15 | 6 | 14 | 9 | 6 | 5 | 8 | 18 | 10 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 39 | 72 | 100 | 100 | 100 | 100 | 76 | 89 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 45 | 64 | 100 | 100 | 100 | 100 | 74 | 87 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 48 | 61 | 100 | 100 | 100 | 100 | 73 | 85 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 54 | 50 | 100 | 100 | 100 | 100 | 71 | 85 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 55 | 38 | 100 | 100 | 100 | 100 | 71 | 83 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 59 | 33 | 100 | 100 | 100 | 100 | 71 | 81 | 100 | 100 | 100 | |

## PPF Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 8. Alternative D PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 36,516 | 16,754 | 19,718 | 30,181 | 59,534 | 20,250 | 54,363 | 52,484 | 97,316 | 22,821 | 24,400 | 79,664 | 60,699 | 27,506 | 602,206 |
| 15-year planning period | 31,708 | 18,739 | 22,671 | 29,648 | 81,395 | 20,444 | 49,682 | 46,546 | 113,781 | 23,802 | 24,767 | 71,147 | 50,346 | 17,529 | 602,206 |
| 20 years | 26,982 | 17,150 | 22,359 | 29,637 | 106,867 | 21,937 | 47,690 | 42,412 | 118,874 | 22,958 | 26,090 | 63,971 | 43,658 | 11,622 | 602,206 |
| 30 years | 17,839 | 14,045 | 20,024 | 23,392 | 157,466 | 21,200 | 42,439 | 36,807 | 118,289 | 22,230 | 27,189 | 59,577 | 35,499 | 6,212 | 602,206 |
| 40 years | 12,042 | 10,621 | 18,543 | 20,846 | 197,874 | 18,930 | 39,940 | 31,726 | 116,118 | 19,640 | 29,231 | 50,463 | 33,109 | 3,124 | 602,206 |
| 50 years | 9,800 | 9,858 | 15,611 | 18,677 | 234,063 | 16,095 | 34,565 | 27,883 | 104,478 | 17,127 | 36,017 | 44,532 | 30,731 | 2,768 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 3 | 3 | 5 | 10 | 3 | 9 | 9 | 16 | 4 | 4 | 13 | 10 | 5 | 100 |
| 15-year planning period | 5 | 3 | 4 | 5 | 14 | 3 | 8 | 8 | 19 | 4 | 4 | 12 | 8 | 3 | 100 |
| 20 years | 4 | 3 | 4 | 5 | 18 | 4 | 8 | 7 | 20 | 4 | 4 | 11 | 7 | 2 | 100 |
| 30 years | 3 | 2 | 3 | 4 | 26 | 4 | 7 | 6 | 20 | 4 | 5 | 10 | 6 | 1 | 100 |
| 40 years | 2 | 2 | 3 | 3 | 33 | 3 | 7 | 5 | 19 | 3 | 5 | 8 | 5 | 1 | 100 |
| 50 years | 2 | 2 | 3 | 3 | 39 | 3 | 6 | 5 | 17 | 3 | 6 | 7 | 5 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 28 | 55 | 100 | 100 | 100 | 100 | 76 | 91 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 30 | 39 | 100 | 100 | 100 | 100 | 75 | 91 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 30 | 19 | 100 | 100 | 100 | 100 | 76 | 90 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 45 | 19 | 100 | 100 | 100 | 100 | 77 | 90 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 51 | 49 | 100 | 100 | 100 | 100 | 80 | 89 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 56 | 77 | 100 | 100 | 100 | 100 | 82 | 87 | 100 | 100 | 100 | |

## PPF Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 9. Alternative D PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

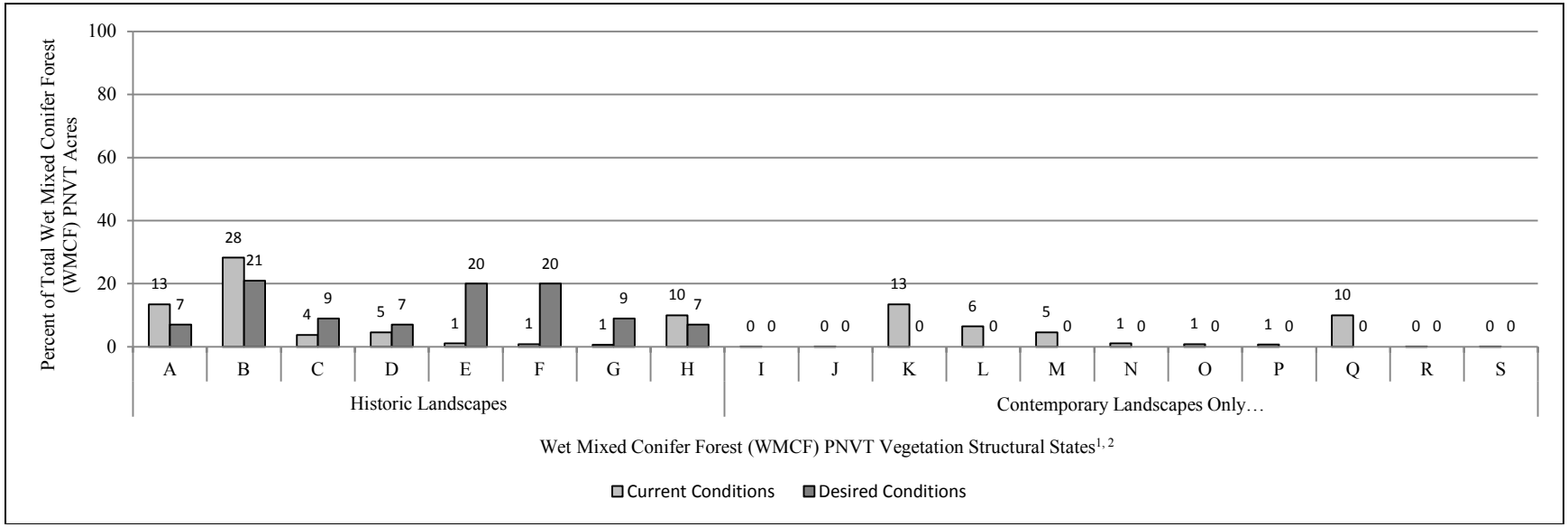
| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 35,731 | 15,642 | 19,798 | 27,231 | 48,729 | 21,949 | 63,559 | 58,848 | 75,554 | 21,904 | 24,464 | 91,193 | 71,398 | 26,207 | 602,206 |
| 15-year planning period | 29,696 | 16,790 | 20,571 | 26,256 | 65,525 | 23,254 | 63,069 | 54,887 | 85,690 | 22,617 | 25,917 | 86,619 | 64,751 | 16,564 | 602,206 |
| 20 years | 24,259 | 14,857 | 21,695 | 25,873 | 83,176 | 26,512 | 61,119 | 51,150 | 91,571 | 22,701 | 26,317 | 82,547 | 59,374 | 11,055 | 602,206 |
| 30 years | 14,382 | 12,679 | 20,054 | 21,836 | 119,140 | 25,394 | 57,854 | 47,136 | 93,647 | 22,892 | 26,406 | 82,072 | 53,090 | 5,625 | 602,206 |
| 40 years | 9,884 | 9,748 | 18,065 | 19,942 | 147,410 | 24,974 | 57,078 | 42,893 | 92,150 | 21,993 | 29,447 | 75,370 | 50,006 | 3,245 | 602,206 |
| 50 years | 7,310 | 8,614 | 16,486 | 17,607 | 171,907 | 22,239 | 53,160 | 38,901 | 89,829 | 20,363 | 33,852 | 72,521 | 47,376 | 2,041 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 3 | 3 | 5 | 10 | 3 | 9 | 9 | 16 | 4 | 4 | 13 | 10 | 5 | 100 |
| 15-year planning period | 5 | 3 | 4 | 5 | 14 | 3 | 8 | 8 | 19 | 4 | 4 | 12 | 8 | 3 | 100 |
| 20 years | 4 | 3 | 4 | 5 | 18 | 4 | 8 | 7 | 20 | 4 | 4 | 11 | 7 | 2 | 100 |
| 30 years | 3 | 2 | 3 | 4 | 26 | 4 | 7 | 6 | 20 | 4 | 5 | 10 | 6 | 1 | 100 |
| 40 years | 2 | 2 | 3 | 3 | 33 | 3 | 7 | 5 | 19 | 3 | 5 | 8 | 5 | 1 | 100 |
| 50 years | 2 | 2 | 3 | 3 | 39 | 3 | 6 | 5 | 17 | 3 | 6 | 7 | 5 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 35 | 63 | 100 | 100 | 100 | 100 | 77 | 91 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 38 | 51 | 100 | 100 | 100 | 100 | 77 | 90 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 39 | 37 | 100 | 100 | 100 | 100 | 76 | 90 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 48 | 10 | 100 | 100 | 100 | 100 | 76 | 90 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 53 | 11 | 100 | 100 | 100 | 100 | 77 | 89 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 58 | 30 | 100 | 100 | 100 | 100 | 79 | 88 | 100 | 100 | 100 | |

## PPF Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 10. Alternative D PPF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | PPF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *3,011* | *6,022* | *42,154* | *132,485* | *3,011* | *6,022* | *10,539* | *10,539* | *96,353* | *270,993* | *10,539* | *10,539* | *0* | *602,206* |
| *Initial Conditions* | *33,258* | *4,053* | *9,880* | *26,848* | *16,876* | *16,422* | *84,972* | *67,302* | *42,379* | *17,165* | *16,876* | *100,953* | *98,884* | *66,338* | *602,206* |
| 10 years | 34,946 | 14,530 | 19,878 | 24,281 | 37,923 | 23,647 | 72,754 | 65,212 | 53,793 | 20,986 | 24,529 | 102,722 | 82,097 | 24,908 | 602,206 |
| 15-year planning period | 27,683 | 14,841 | 18,470 | 22,863 | 49,655 | 26,064 | 76,455 | 63,229 | 57,599 | 21,432 | 27,068 | 102,091 | 79,155 | 15,600 | 602,206 |
| 20 years | 21,536 | 12,564 | 21,032 | 22,108 | 59,485 | 31,087 | 74,549 | 59,889 | 64,268 | 22,443 | 26,543 | 101,124 | 75,090 | 10,488 | 602,206 |
| 30 years | 10,926 | 11,312 | 20,083 | 20,281 | 80,814 | 29,588 | 73,269 | 57,464 | 69,005 | 23,554 | 25,623 | 104,568 | 70,682 | 5,037 | 602,206 |
| 40 years | 7,725 | 8,875 | 17,586 | 19,039 | 96,946 | 31,019 | 74,217 | 54,059 | 68,183 | 24,346 | 29,664 | 100,278 | 66,902 | 3,366 | 602,206 |
| 50 years | 4,820 | 7,370 | 17,360 | 16,537 | 109,751 | 28,384 | 71,754 | 49,919 | 75,180 | 23,598 | 31,687 | 100,510 | 64,020 | 1,315 | 602,206 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *1* | *1* | *7* | *22* | *1* | *1* | *2* | *2* | *16* | *45* | *2* | *2* | *0* | *100* |
| *Initial Conditions* | *6* | *1* | *2* | *4* | *3* | *3* | *14* | *11* | *7* | *3* | *3* | *17* | *16* | *11* | *100* |
| 10 years | 6 | 2 | 3 | 4 | 6 | 4 | 12 | 11 | 9 | 3 | 4 | 17 | 14 | 4 | 100 |
| 15-year planning period | 5 | 2 | 3 | 4 | 8 | 4 | 13 | 10 | 10 | 4 | 4 | 17 | 13 | 3 | 100 |
| 20 years | 4 | 2 | 3 | 4 | 10 | 5 | 12 | 10 | 11 | 4 | 4 | 17 | 12 | 2 | 100 |
| 30 years | 2 | 2 | 3 | 3 | 13 | 5 | 12 | 10 | 11 | 4 | 4 | 17 | 12 | 1 | 100 |
| 40 years | 1 | 1 | 3 | 3 | 16 | 5 | 12 | 9 | 11 | 4 | 5 | 17 | 11 | 1 | 100 |
| 50 years | 1 | 1 | 3 | 3 | 18 | 5 | 12 | 8 | 12 | 4 | 5 | 17 | 11 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *64* | *36* | *87* | *100* | *100* | *100* | *100* | *82* | *94* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 100 | 42 | 71 | 100 | 100 | 100 | 100 | 78 | 91 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 100 | 46 | 63 | 100 | 100 | 100 | 100 | 78 | 90 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 100 | 48 | 55 | 100 | 100 | 100 | 100 | 77 | 90 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 100 | 52 | 39 | 100 | 100 | 100 | 100 | 76 | 91 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 100 | 55 | 27 | 100 | 100 | 100 | 100 | 75 | 89 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 100 | 61 | 17 | 100 | 100 | 100 | 100 | 76 | 88 | 100 | 100 | 100 | |

## Wet Mixed Conifer




**Appendix B figure 2. Wet mixed conifer forest potential natural vegetation type current and desired vegetation structural states**

[1] Wet Mixed Conifer Forest (WMCF) PNVT Vegetation Structural States. At 177,995 acres or approximately 9% of the forests this PNVT ranks 5th in order of size out of the 14 PNVTs on the ASNFs

State A - Recently burned, grass, forb and shrub types, with < 10% tree canopy cover; early successional development with aspen regeneration

State B - Seedling and sapling (< 5" diameter), small (5”-9.9” diameter), medium (10”-19.9” diameter), large to very large (≥ 20” diameter) size trees, with open (> 10% & ≤ 30%) or closed (> 30%) canopy cover, consisting of all aspen, deciduous tree mix, and evergreen-deciduous mix tree types; with a plurality of shade intolerant tree types

State C - Seedling and sapling, and small size trees, with open or closed canopy cover; with a plurality of shade tolerant tree types

State D - Medium size trees, single or mufti-storied, with open or closed canopy cover; with a plurality of mixed shade tolerant tree types; with aspen regeneration

State E - Large to very large size trees, single storied, with closed canopy cover; with a plurality of shade tolerant tree types; with aspen regeneration

State F - Large to very large size trees, multi-storied, with closed canopy cover; with a plurality of mixed shade tolerant tree types; with aspen regeneration

State G - Seedling and sapling, and small size trees, with open canopy cover; shade intolerant tree types; with aspen regeneration

State H - Medium size trees, single or multi-storied, with open or closed canopy cover; with a plurality of mixed shade tolerant tree types

State I - Large to very large size trees, single storied, with open canopy cover; with a plurality of shade tolerant tree types; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State J - Large to very large size trees, multi-storied, with open canopy cover; with a plurality of shade tolerant tree types; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State K - Recently burned, grass, forb and shrub types, with < 10% tree canopy cover; early successional development; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State L - Seedling and sapling, and small size trees, with closed canopy cover; with a plurality of mixed shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State M - Medium size trees, single or multi-storied, with open or closed canopy cover; with a plurality of mixed shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State N - Large to very large size trees, single storied, with open canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the

historic conditions or within historic range of variability, found on contemporary landscapes only

State O - Large to very large size trees, multi-storied, with closed canopy cover; with a plurality of mixed shade tolerant tree types; state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State P - Seedling and sapling, and small size trees, with open canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State Q - Medium size trees, single or multi-storied, with open or closed canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State R - Large to very large size trees, single storied, with open canopy cover; with a plurality of mixed shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State S - Large to very large size trees, multi-storied, with open canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] WMCF PNVT has a 54% or moderate departure rating from Desired Conditions (DC) and a 61% or high departure rating from Historic Range of Variability (HRV) making it tied with montane/subalpine grasslands for the 6$^{th}$ most departed PNVT for DC; and 7$^{th}$ most departed PNVT for HRV on the ASNFs. Desired Conditions were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Smith 2006b)

## WMCF Alternative A

### Appendix B table 11. Alternative A WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 195 | 46,600 | 12,933 | 12,954 | 1,423 | 2,970 | 4,576 | 9,478 | 3,450 | 2,870 | 1,645 | 20,806 | 11,672 | 1,211 | 3,806 | 28,120 | 8,670 | 2,080 | 2,535 | 177,995 |
| 15-year planning period | 340 | 44,345 | 15,016 | 13,355 | 1,472 | 3,909 | 5,716 | 7,992 | 4,406 | 3,694 | 549 | 23,615 | 12,476 | 1,162 | 5,181 | 22,450 | 7,224 | 2,091 | 3,004 | 177,995 |
| 20 years | 99 | 42,235 | 15,154 | 15,743 | 1,549 | 4,957 | 7,389 | 7,454 | 4,479 | 3,384 | 540 | 23,519 | 14,539 | 1,141 | 5,357 | 18,660 | 6,576 | 2,258 | 2,963 | 177,995 |
| 30 years | 180 | 36,964 | 17,194 | 17,383 | 1,949 | 5,890 | 9,433 | 7,582 | 6,059 | 4,678 | 504 | 20,580 | 15,478 | 856 | 6,667 | 14,197 | 5,955 | 2,933 | 3,514 | 177,995 |
| 40 years | 140 | 33,551 | 19,851 | 19,492 | 1,960 | 7,493 | 10,825 | 7,649 | 6,931 | 4,457 | 495 | 17,001 | 15,574 | 1,061 | 7,006 | 11,640 | 5,870 | 2,854 | 4,146 | 177,995 |
| 50 years | 176 | 31,601 | 20,818 | 21,687 | 2,146 | 7,375 | 12,376 | 8,204 | 7,582 | 5,629 | 572 | 14,754 | 14,187 | 1,260 | 6,969 | 9,684 | 6,315 | 2,858 | 3,802 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *13* | *28* | *4* | *5* | *1* | *1* | *1* | *10* | *0* | *0* | *13* | *6* | *5* | *1* | *1* | *1* | *10* | *0* | *0* | *100* |
| 10 years | 0 | 26 | 7 | 7 | 1 | 2 | 3 | 5 | 2 | 2 | 1 | 12 | 7 | 1 | 2 | 16 | 5 | 1 | 1 | 100 |
| 15-year planning period | 0 | 25 | 8 | 8 | 1 | 2 | 3 | 4 | 2 | 2 | 0 | 13 | 7 | 1 | 3 | 13 | 4 | 1 | 2 | 100 |
| 20 years | 0 | 24 | 9 | 9 | 1 | 3 | 4 | 4 | 3 | 2 | 0 | 13 | 8 | 1 | 3 | 10 | 4 | 1 | 2 | 100 |
| 30 years | 0 | 21 | 10 | 10 | 1 | 3 | 5 | 4 | 3 | 3 | 0 | 12 | 9 | 0 | 4 | 8 | 3 | 2 | 2 | 100 |
| 40 years | 0 | 19 | 11 | 11 | 1 | 4 | 6 | 4 | 4 | 3 | 0 | 10 | 9 | 1 | 4 | 7 | 3 | 2 | 2 | 100 |
| 50 years | 0 | 18 | 12 | 12 | 1 | 4 | 7 | 5 | 4 | 3 | 0 | 8 | 8 | 1 | 4 | 5 | 4 | 2 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 25 | 19 | 4 | 96 | 92 | 71 | 24 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 19 | 6 | 7 | 96 | 89 | 64 | 36 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 13 | 5 | 26 | 96 | 86 | 54 | 40 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 1 | 7 | 40 | 95 | 83 | 41 | 39 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 10 | 24 | 56 | 94 | 79 | 32 | 39 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 15 | 30 | 74 | 94 | 79 | 23 | 34 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 12. Alternative B WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 419 | 44,368 | 13,374 | 13,746 | 1,778 | 3,881 | 5,643 | 7,447 | 3,108 | 7,464 | 2,187 | 20,101 | 10,898 | 1,218 | 4,140 | 26,743 | 7,593 | 1,094 | 2,792 | 177,995 |
| 15-year planning period | 554 | 40,124 | 15,662 | 16,656 | 1,720 | 4,964 | 6,660 | 6,705 | 3,400 | 7,736 | 1,291 | 21,858 | 12,036 | 1,275 | 4,996 | 21,302 | 6,098 | 1,499 | 3,461 | 177,995 |
| 20 years | 486 | 37,112 | 15,626 | 17,851 | 1,962 | 5,989 | 7,569 | 7,055 | 3,886 | 8,142 | 960 | 21,897 | 13,785 | 1,095 | 5,643 | 17,511 | 5,166 | 1,518 | 4,211 | 177,995 |
| 30 years | 489 | 31,581 | 18,300 | 20,673 | 2,081 | 7,764 | 9,450 | 7,347 | 4,706 | 9,749 | 1,094 | 19,175 | 13,296 | 1,135 | 6,698 | 13,736 | 4,977 | 1,562 | 4,182 | 177,995 |
| 40 years | 359 | 27,961 | 20,159 | 21,839 | 2,233 | 9,003 | 10,840 | 7,777 | 4,977 | 10,787 | 835 | 16,208 | 12,923 | 1,306 | 7,275 | 11,598 | 5,235 | 1,963 | 4,717 | 177,995 |
| 50 years | 433 | 24,706 | 21,316 | 22,953 | 2,534 | 10,420 | 12,183 | 8,522 | 5,145 | 10,922 | 890 | 14,846 | 12,385 | 1,350 | 7,531 | 10,303 | 4,598 | 1,732 | 5,226 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *13* | *28* | *4* | *5* | *1* | *1* | *1* | *10* | *0* | *0* | *13* | *6* | *5* | *1* | *1* | *1* | *10* | *0* | *0* | *100* |
| 10 years | 0 | 25 | 8 | 8 | 1 | 2 | 3 | 4 | 2 | 4 | 1 | 11 | 6 | 1 | 2 | 15 | 4 | 1 | 2 | 100 |
| 15-year planning period | 0 | 23 | 9 | 9 | 1 | 3 | 4 | 4 | 2 | 4 | 1 | 12 | 7 | 1 | 3 | 12 | 3 | 1 | 2 | 100 |
| 20 years | 0 | 21 | 9 | 10 | 1 | 3 | 4 | 4 | 2 | 5 | 1 | 12 | 8 | 1 | 3 | 10 | 3 | 1 | 2 | 100 |
| 30 years | 0 | 18 | 10 | 12 | 1 | 4 | 5 | 4 | 3 | 5 | 1 | 11 | 7 | 1 | 4 | 8 | 3 | 1 | 2 | 100 |
| 40 years | 0 | 16 | 11 | 12 | 1 | 5 | 6 | 4 | 3 | 6 | 0 | 9 | 7 | 1 | 4 | 7 | 3 | 1 | 3 | 100 |
| 50 years | 0 | 14 | 12 | 13 | 1 | 6 | 7 | 5 | 3 | 6 | 1 | 8 | 7 | 1 | 4 | 6 | 3 | 1 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 19 | 17 | 10 | 95 | 89 | 65 | 40 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 7 | 2 | 34 | 95 | 86 | 58 | 46 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 1 | 2 | 43 | 94 | 83 | 53 | 43 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 16 | 14 | 66 | 94 | 78 | 41 | 41 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 25 | 26 | 75 | 94 | 75 | 32 | 38 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 34 | 33 | 84 | 93 | 71 | 24 | 32 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 13. Alternative B WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 266 | 45,490 | 13,453 | 12,529 | 1,534 | 3,404 | 4,827 | 7,736 | 2,744 | 5,612 | 1,853 | 21,150 | 11,791 | 1,147 | 4,149 | 27,735 | 8,605 | 1,407 | 2,565 | 177,995 |
| 15-year planning period | 352 | 41,830 | 15,799 | 14,476 | 1,376 | 4,174 | 5,955 | 6,345 | 3,258 | 5,807 | 877 | 24,117 | 12,965 | 1,220 | 5,178 | 22,203 | 7,297 | 1,607 | 3,161 | 177,995 |
| 20 years | 290 | 39,003 | 16,316 | 15,368 | 1,439 | 5,083 | 7,187 | 6,322 | 3,529 | 6,163 | 679 | 24,722 | 14,583 | 979 | 5,802 | 18,163 | 6,648 | 1,742 | 3,977 | 177,995 |
| 30 years | 317 | 34,242 | 18,762 | 17,091 | 1,468 | 6,540 | 8,875 | 6,515 | 3,898 | 6,829 | 717 | 22,734 | 15,225 | 1,036 | 6,843 | 14,351 | 6,381 | 1,974 | 4,196 | 177,995 |
| 40 years | 251 | 30,642 | 20,683 | 18,295 | 1,587 | 7,052 | 10,131 | 6,645 | 4,114 | 7,493 | 621 | 19,585 | 16,041 | 1,360 | 7,808 | 12,220 | 6,437 | 2,193 | 4,836 | 177,995 |
| 50 years | 273 | 27,339 | 22,067 | 19,150 | 1,786 | 8,079 | 11,457 | 7,082 | 4,428 | 7,634 | 628 | 18,046 | 15,539 | 1,360 | 8,192 | 10,683 | 6,278 | 2,262 | 5,713 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| 10 years | 13 | 28 | 4 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | 13 | 6 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | 100 |
| 15-year planning period | 0 | 26 | 8 | 7 | 1 | 2 | 3 | 4 | 2 | 3 | 1 | 12 | 7 | 1 | 2 | 16 | 5 | 1 | 1 | 100 |
| 20 years | 0 | 24 | 9 | 8 | 1 | 2 | 3 | 4 | 2 | 3 | 0 | 14 | 7 | 1 | 3 | 12 | 4 | 1 | 2 | 100 |
| 30 years | 0 | 22 | 9 | 9 | 1 | 3 | 4 | 4 | 2 | 3 | 0 | 14 | 8 | 1 | 3 | 10 | 4 | 1 | 2 | 100 |
| 40 years | 0 | 19 | 11 | 10 | 1 | 4 | 5 | 4 | 2 | 4 | 0 | 13 | 9 | 1 | 4 | 8 | 4 | 1 | 2 | 100 |
| 50 years | 0 | 17 | 12 | 10 | 1 | 4 | 6 | 4 | 2 | 4 | 0 | 11 | 9 | 1 | 4 | 7 | 4 | 1 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 22 | 16 | 1 | 96 | 90 | 70 | 38 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 12 | 1 | 16 | 96 | 88 | 63 | 49 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 4 | 2 | 23 | 96 | 86 | 55 | 49 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 8 | 17 | 37 | 96 | 82 | 45 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 18 | 29 | 47 | 96 | 80 | 37 | 47 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 27 | 38 | 54 | 95 | 77 | 28 | 43 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 14. Alternative B WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 113 | 46,612 | 13,532 | 11,311 | 1,291 | 2,927 | 4,011 | 8,024 | 2,380 | 3,759 | 1,518 | 22,199 | 12,683 | 1,076 | 4,157 | 28,726 | 9,618 | 1,720 | 2,338 | 177,995 |
| 15-year planning period | 149 | 43,535 | 15,936 | 12,295 | 1,032 | 3,384 | 5,250 | 5,985 | 3,116 | 3,878 | 463 | 26,377 | 13,893 | 1,166 | 5,359 | 23,104 | 8,496 | 1,716 | 2,861 | 177,995 |
| 20 years | 92 | 40,777 | 16,956 | 12,839 | 912 | 4,161 | 6,784 | 5,571 | 3,161 | 4,166 | 395 | 27,473 | 15,338 | 859 | 5,944 | 18,762 | 8,110 | 1,962 | 3,732 | 177,995 |
| 30 years | 145 | 36,904 | 19,224 | 13,508 | 854 | 5,316 | 8,300 | 5,682 | 3,090 | 3,909 | 341 | 26,292 | 17,155 | 938 | 6,988 | 14,966 | 7,786 | 2,387 | 4,210 | 177,995 |
| 40 years | 142 | 33,322 | 21,207 | 14,752 | 940 | 5,102 | 9,423 | 5,514 | 3,251 | 4,200 | 408 | 22,961 | 19,159 | 1,414 | 8,342 | 12,843 | 7,638 | 2,422 | 4,955 | 177,995 |
| 50 years | 113 | 29,972 | 22,817 | 15,347 | 1,038 | 5,739 | 10,730 | 5,642 | 3,710 | 4,346 | 367 | 21,247 | 18,693 | 1,370 | 8,852 | 11,063 | 7,957 | 2,792 | 6,199 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| 10 years | 13 | 28 | 4 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | 13 | 6 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | 100 |
| 15-year planning period | 0 | 26 | 8 | 6 | 1 | 2 | 2 | 5 | 1 | 2 | 1 | 12 | 7 | 1 | 2 | 16 | 5 | 1 | 1 | 100 |
| 20 years | 0 | 24 | 9 | 7 | 1 | 2 | 3 | 3 | 2 | 2 | 0 | 15 | 8 | 1 | 3 | 13 | 5 | 1 | 2 | 100 |
| 30 years | 0 | 23 | 10 | 7 | 1 | 2 | 4 | 3 | 2 | 2 | 0 | 15 | 9 | 0 | 3 | 11 | 5 | 1 | 2 | 100 |
| 40 years | 0 | 21 | 11 | 8 | 0 | 3 | 5 | 3 | 2 | 2 | 0 | 15 | 10 | 1 | 4 | 8 | 4 | 1 | 2 | 100 |
| 50 years | 0 | 19 | 12 | 8 | 1 | 3 | 5 | 3 | 2 | 2 | 0 | 13 | 11 | 1 | 5 | 7 | 4 | 1 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 25 | 16 | 9 | 96 | 92 | 75 | 36 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 16 | 1 | 1 | 97 | 90 | 67 | 52 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 9 | 6 | 3 | 97 | 88 | 58 | 55 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 1 | 20 | 8 | 98 | 85 | 48 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 11 | 32 | 18 | 97 | 86 | 41 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 20 | 42 | 23 | 97 | 84 | 33 | 55 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative C Proposed High Acre Treatment Objectives

**Appendix B table 15. Alternative C WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 1,528 | 40,845 | 14,391 | 8,522 | 1,519 | 3,645 | 6,814 | 5,604 | 3,349 | 10,192 | 4,648 | 21,228 | 10,439 | 1,044 | 3,906 | 31,991 | 4,732 | 1,034 | 2,562 | 177,995 |
| 15-year planning period | 1,634 | 36,197 | 16,134 | 9,309 | 1,397 | 4,709 | 7,835 | 4,984 | 4,040 | 11,198 | 3,133 | 24,574 | 11,785 | 811 | 4,738 | 27,472 | 4,021 | 1,097 | 2,927 | 177,995 |
| 20 years | 1,448 | 32,331 | 16,880 | 9,958 | 1,395 | 5,541 | 9,515 | 5,384 | 4,343 | 10,704 | 3,195 | 26,209 | 13,225 | 813 | 5,134 | 24,020 | 3,883 | 1,127 | 2,889 | 177,995 |
| 30 years | 1,443 | 26,538 | 18,073 | 10,976 | 1,316 | 7,053 | 11,214 | 5,739 | 4,927 | 11,461 | 2,615 | 26,037 | 13,955 | 940 | 6,083 | 21,199 | 3,788 | 1,209 | 3,427 | 177,995 |
| 40 years | 1,310 | 22,610 | 19,609 | 11,915 | 1,587 | 7,721 | 12,184 | 5,976 | 5,229 | 11,568 | 2,649 | 24,976 | 15,244 | 1,004 | 6,609 | 19,055 | 3,790 | 1,170 | 3,787 | 177,995 |
| 50 years | 1,274 | 20,189 | 20,299 | 11,934 | 1,651 | 8,112 | 13,388 | 6,057 | 5,779 | 12,113 | 2,354 | 23,342 | 16,099 | 1,009 | 7,399 | 18,040 | 3,762 | 1,315 | 3,879 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| 10 years | 1 | 23 | 8 | 5 | 1 | 2 | 4 | 3 | 2 | 6 | 3 | 12 | 6 | 1 | 2 | 18 | 3 | 1 | 1 | 100 |
| 15-year planning period | 1 | 20 | 9 | 5 | 1 | 3 | 4 | 3 | 2 | 6 | 2 | 14 | 7 | 0 | 3 | 15 | 2 | 1 | 2 | 100 |
| 20 years | 1 | 18 | 9 | 6 | 1 | 3 | 5 | 3 | 2 | 6 | 2 | 15 | 7 | 0 | 3 | 13 | 2 | 1 | 2 | 100 |
| 30 years | 1 | 15 | 10 | 6 | 1 | 4 | 6 | 3 | 3 | 6 | 1 | 15 | 8 | 1 | 3 | 12 | 2 | 1 | 2 | 100 |
| 40 years | 1 | 13 | 11 | 7 | 1 | 4 | 7 | 3 | 3 | 6 | 1 | 14 | 9 | 1 | 4 | 11 | 2 | 1 | 2 | 100 |
| 50 years | 1 | 11 | 11 | 7 | 1 | 5 | 8 | 3 | 3 | 7 | 1 | 13 | 9 | 1 | 4 | 10 | 2 | 1 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 9 | 10 | 32 | 96 | 90 | 57 | 55 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 3 | 1 | 25 | 96 | 87 | 51 | 60 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 14 | 5 | 20 | 96 | 84 | 41 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 29 | 13 | 12 | 96 | 80 | 30 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 40 | 22 | 4 | 96 | 78 | 24 | 52 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 46 | 27 | 4 | 95 | 77 | 16 | 51 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative C Proposed Average Acre Treatment Objectives

**Appendix B table 16. Alternative C WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 1,528 | 40,845 | 14,391 | 8,522 | 1,519 | 3,645 | 6,814 | 5,604 | 3,349 | 10,192 | 4,648 | 21,228 | 10,439 | 1,044 | 3,906 | 31,991 | 4,732 | 1,034 | 2,562 | 177,995 |
| 15-year planning period | 1,634 | 36,197 | 16,134 | 9,309 | 1,397 | 4,709 | 7,835 | 4,984 | 4,040 | 11,198 | 3,133 | 24,574 | 11,785 | 811 | 4,738 | 27,472 | 4,021 | 1,097 | 2,927 | 177,995 |
| 20 years | 1,448 | 32,331 | 16,880 | 9,958 | 1,395 | 5,541 | 9,515 | 5,384 | 4,343 | 10,704 | 3,195 | 26,209 | 13,225 | 813 | 5,134 | 24,020 | 3,883 | 1,127 | 2,889 | 177,995 |
| 30 years | 1,443 | 26,538 | 18,073 | 10,976 | 1,316 | 7,053 | 11,214 | 5,739 | 4,927 | 11,461 | 2,615 | 26,037 | 13,955 | 940 | 6,083 | 21,199 | 3,788 | 1,209 | 3,427 | 177,995 |
| 40 years | 1,310 | 22,610 | 19,609 | 11,915 | 1,587 | 7,721 | 12,184 | 5,976 | 5,229 | 11,568 | 2,649 | 24,976 | 15,244 | 1,004 | 6,609 | 19,055 | 3,790 | 1,170 | 3,787 | 177,995 |
| 50 years | 1,274 | 20,189 | 20,299 | 11,934 | 1,651 | 8,112 | 13,388 | 6,057 | 5,779 | 12,113 | 2,354 | 23,342 | 16,099 | 1,009 | 7,399 | 18,040 | 3,762 | 1,315 | 3,879 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| 10 years | 0 | 24 | 8 | 5 | 1 | 2 | 3 | 4 | 2 | 4 | 2 | 12 | 6 | 1 | 2 | 17 | 4 | 1 | 1 | 100 |
| 15-year planning period | 1 | 22 | 9 | 6 | 1 | 2 | 4 | 3 | 2 | 4 | 1 | 14 | 7 | 1 | 3 | 14 | 3 | 1 | 2 | 100 |
| 20 years | 0 | 21 | 10 | 6 | 1 | 3 | 5 | 3 | 2 | 4 | 1 | 15 | 8 | 1 | 3 | 12 | 3 | 1 | 2 | 100 |
| 30 years | 0 | 18 | 11 | 6 | 1 | 3 | 6 | 3 | 2 | 5 | 1 | 15 | 9 | 1 | 4 | 10 | 3 | 1 | 2 | 100 |
| 40 years | 0 | 16 | 11 | 7 | 1 | 4 | 6 | 3 | 2 | 5 | 1 | 14 | 10 | 1 | 4 | 9 | 3 | 1 | 2 | 100 |
| 50 years | 0 | 14 | 12 | 7 | 1 | 4 | 7 | 3 | 3 | 5 | 1 | 13 | 10 | 1 | 5 | 9 | 3 | 1 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 17 | 10 | 24 | 96 | 91 | 64 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 6 | 0 | 18 | 97 | 89 | 58 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 2 | 6 | 15 | 97 | 87 | 48 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 17 | 19 | 8 | 97 | 84 | 37 | 58 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 26 | 27 | 3 | 97 | 82 | 32 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 34 | 34 | 1 | 96 | 81 | 23 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative C Proposed Low Acre Treatment Objectives

**Appendix B table 17. Alternative C WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 236 | 46,362 | 14,317 | 10,339 | 1,188 | 3,077 | 4,840 | 7,478 | 2,350 | 4,373 | 1,527 | 22,171 | 12,234 | 1,215 | 3,960 | 29,059 | 9,282 | 1,318 | 2,668 | 177,995 |
| 15-year planning period | 248 | 43,413 | 16,046 | 11,026 | 1,019 | 3,476 | 5,672 | 5,901 | 3,124 | 4,374 | 842 | 26,655 | 14,823 | 1,141 | 4,785 | 22,976 | 7,752 | 1,680 | 3,039 | 177,995 |
| 20 years | 295 | 40,849 | 17,225 | 11,236 | 844 | 3,813 | 7,127 | 5,418 | 3,312 | 4,774 | 492 | 27,901 | 15,663 | 1,247 | 5,794 | 19,792 | 6,882 | 1,871 | 3,460 | 177,995 |
| 30 years | 252 | 35,868 | 20,128 | 11,893 | 761 | 4,581 | 8,829 | 4,707 | 3,526 | 4,659 | 767 | 26,872 | 17,976 | 1,022 | 7,709 | 15,707 | 6,560 | 2,238 | 3,939 | 177,995 |
| 40 years | 223 | 32,838 | 21,118 | 12,359 | 887 | 5,329 | 9,741 | 4,798 | 3,469 | 4,933 | 618 | 24,316 | 18,975 | 1,324 | 8,138 | 14,111 | 7,168 | 2,593 | 5,057 | 177,995 |
| 50 years | 253 | 29,330 | 22,679 | 13,241 | 1,001 | 5,513 | 11,353 | 4,680 | 3,969 | 5,244 | 526 | 22,609 | 19,407 | 1,480 | 8,882 | 12,669 | 7,247 | 2,449 | 5,463 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| 10 years | 0 | 26 | 8 | 6 | 1 | 2 | 3 | 4 | 1 | 2 | 1 | 12 | 7 | 1 | 2 | 16 | 5 | 1 | 1 | 100 |
| 15-year planning period | 0 | 24 | 9 | 6 | 1 | 2 | 3 | 3 | 2 | 2 | 0 | 15 | 8 | 1 | 3 | 13 | 4 | 1 | 2 | 100 |
| 20 years | 0 | 23 | 10 | 6 | 0 | 2 | 4 | 3 | 2 | 3 | 0 | 16 | 9 | 1 | 3 | 11 | 4 | 1 | 2 | 100 |
| 30 years | 0 | 20 | 11 | 7 | 0 | 3 | 5 | 3 | 2 | 3 | 0 | 15 | 10 | 1 | 4 | 9 | 4 | 1 | 2 | 100 |
| 40 years | 0 | 18 | 12 | 7 | 0 | 3 | 5 | 3 | 2 | 3 | 0 | 14 | 11 | 1 | 5 | 8 | 4 | 1 | 3 | 100 |
| 50 years | 0 | 16 | 13 | 7 | 1 | 3 | 6 | 3 | 2 | 3 | 0 | 13 | 11 | 1 | 5 | 7 | 4 | 1 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 24 | 11 | 17 | 97 | 91 | 70 | 40 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 16 | 0 | 12 | 97 | 90 | 65 | 53 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 9 | 8 | 10 | 98 | 89 | 56 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 4 | 26 | 5 | 98 | 87 | 45 | 62 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 12 | 32 | 1 | 98 | 85 | 39 | 61 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 22 | 42 | 6 | 97 | 85 | 29 | 62 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 18. Alternative D WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 549 | 42,560 | 11,190 | 14,586 | 1,803 | 3,998 | 4,708 | 12,318 | 4,426 | 5,214 | 3,027 | 18,144 | 9,656 | 1,009 | 4,079 | 25,375 | 10,159 | 2,304 | 2,890 | 177,995 |
| 15-year planning period | 513 | 38,488 | 13,334 | 16,647 | 2,075 | 5,404 | 5,767 | 11,322 | 6,579 | 5,992 | 1,827 | 19,235 | 10,356 | 1,115 | 4,935 | 19,584 | 8,594 | 2,681 | 3,547 | 177,995 |
| 20 years | 483 | 34,268 | 14,637 | 18,209 | 2,103 | 7,195 | 8,081 | 11,715 | 7,529 | 6,955 | 1,313 | 17,953 | 11,088 | 1,191 | 5,316 | 15,269 | 7,879 | 2,782 | 4,028 | 177,995 |
| 30 years | 422 | 29,031 | 16,628 | 22,158 | 2,675 | 8,954 | 9,268 | 12,159 | 9,320 | 8,097 | 1,237 | 14,194 | 10,405 | 1,272 | 6,984 | 11,131 | 6,683 | 2,736 | 4,639 | 177,995 |
| 40 years | 491 | 24,700 | 17,607 | 24,647 | 3,252 | 10,783 | 10,657 | 13,196 | 10,525 | 9,091 | 1,247 | 11,433 | 9,289 | 1,321 | 6,974 | 8,628 | 6,302 | 3,166 | 4,689 | 177,995 |
| 50 years | 425 | 21,776 | 18,552 | 26,761 | 2,915 | 12,399 | 11,540 | 14,051 | 10,884 | 9,953 | 964 | 9,455 | 8,234 | 1,470 | 6,679 | 7,516 | 5,618 | 3,706 | 5,098 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| 10 years | 0 | 24 | 6 | 8 | 1 | 2 | 3 | 7 | 2 | 3 | 2 | 10 | 5 | 1 | 2 | 14 | 6 | 1 | 2 | 100 |
| 15-year planning period | 0 | 22 | 7 | 9 | 1 | 3 | 3 | 6 | 4 | 3 | 1 | 11 | 6 | 1 | 3 | 11 | 5 | 2 | 2 | 100 |
| 20 years | 0 | 19 | 8 | 10 | 1 | 4 | 5 | 7 | 4 | 4 | 1 | 10 | 6 | 1 | 3 | 9 | 4 | 2 | 2 | 100 |
| 30 years | 0 | 16 | 9 | 12 | 2 | 5 | 5 | 7 | 5 | 5 | 1 | 8 | 6 | 1 | 4 | 6 | 4 | 2 | 3 | 100 |
| 40 years | 0 | 14 | 10 | 14 | 2 | 6 | 6 | 7 | 6 | 5 | 1 | 6 | 5 | 1 | 4 | 5 | 4 | 2 | 3 | 100 |
| 50 years | 0 | 12 | 10 | 15 | 2 | 7 | 6 | 8 | 6 | 6 | 1 | 5 | 5 | 1 | 4 | 4 | 3 | 2 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 3 | 17 | 34 | 94 | 85 | 64 | 9 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 8 | 9 | 46 | 94 | 80 | 50 | 6 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 22 | 4 | 78 | 92 | 75 | 42 | 2 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 34 | 10 | 98 | 91 | 70 | 33 | 6 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 42 | 16 | 100 | 92 | 65 | 28 | 13 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 3 | 17 | 34 | 94 | 85 | 64 | 9 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 19. Alternative D WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

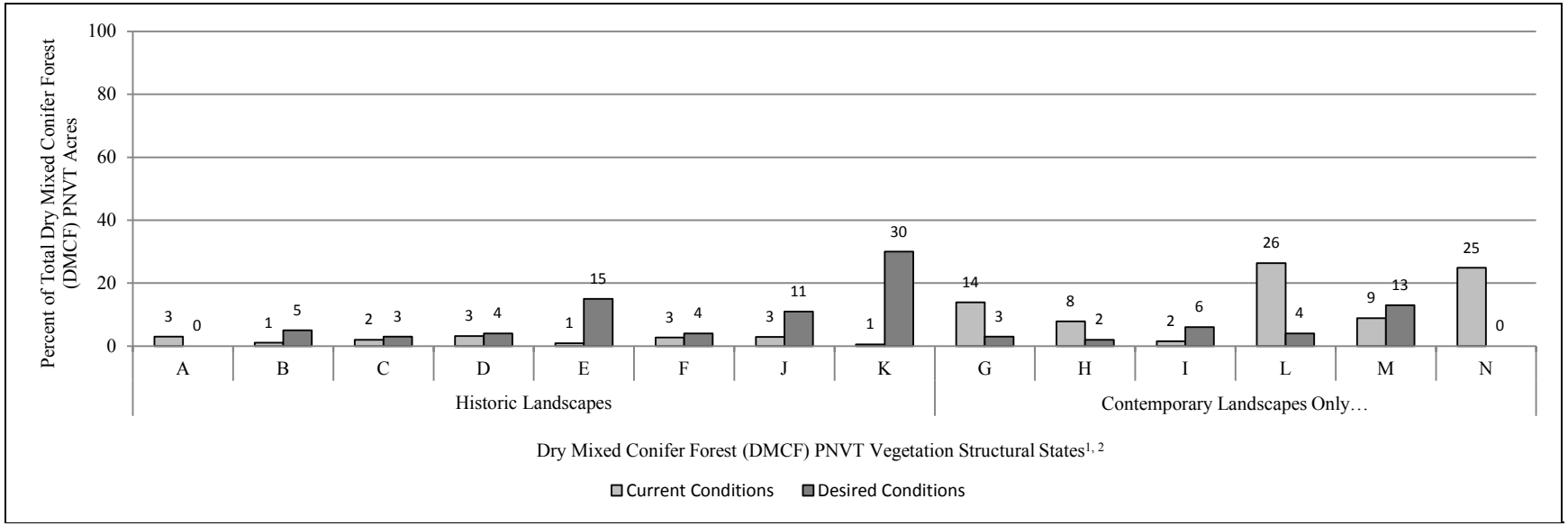
| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 363 | 44,111 | 12,039 | 13,620 | 1,521 | 3,488 | 4,266 | 10,510 | 3,343 | 3,953 | 2,338 | 20,406 | 10,762 | 1,094 | 4,014 | 27,175 | 10,340 | 1,934 | 2,716 | 177,995 |
| 15-year planning period | 334 | 40,497 | 14,117 | 14,836 | 1,536 | 4,639 | 5,525 | 9,105 | 4,916 | 4,739 | 1,288 | 22,673 | 12,220 | 1,134 | 4,906 | 21,138 | 8,699 | 2,400 | 3,294 | 177,995 |
| 20 years | 296 | 37,095 | 15,519 | 16,102 | 1,584 | 5,691 | 7,173 | 9,220 | 5,543 | 5,294 | 943 | 22,037 | 13,224 | 1,119 | 5,681 | 17,231 | 7,987 | 2,447 | 3,809 | 177,995 |
| 30 years | 304 | 32,113 | 17,307 | 18,743 | 2,077 | 7,090 | 8,580 | 9,407 | 6,849 | 5,980 | 873 | 19,364 | 13,544 | 1,316 | 7,261 | 12,713 | 7,428 | 2,502 | 4,544 | 177,995 |
| 40 years | 334 | 28,723 | 18,483 | 20,875 | 2,291 | 8,278 | 9,794 | 9,685 | 7,424 | 6,489 | 885 | 16,528 | 13,580 | 1,181 | 7,559 | 10,468 | 7,425 | 3,106 | 4,888 | 177,995 |
| 50 years | 300 | 25,597 | 19,613 | 22,242 | 2,172 | 9,527 | 11,220 | 10,244 | 7,927 | 7,200 | 727 | 14,408 | 13,031 | 1,501 | 7,659 | 9,116 | 6,616 | 3,477 | 5,416 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | 13 | 28 | 4 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | 13 | 6 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | *100* |
| 10 years | 0 | 25 | 7 | 8 | 1 | 2 | 2 | 6 | 2 | 2 | 1 | 11 | 6 | 1 | 2 | 15 | 6 | 1 | 2 | 100 |
| 15-year planning period | 0 | 23 | 8 | 8 | 1 | 3 | 3 | 5 | 3 | 3 | 1 | 13 | 7 | 1 | 3 | 12 | 5 | 1 | 2 | 100 |
| 20 years | 0 | 21 | 9 | 9 | 1 | 3 | 4 | 5 | 3 | 3 | 1 | 12 | 7 | 1 | 3 | 10 | 4 | 1 | 2 | 100 |
| 30 years | 0 | 18 | 10 | 11 | 1 | 4 | 5 | 5 | 4 | 3 | 0 | 11 | 8 | 1 | 4 | 7 | 4 | 1 | 3 | 100 |
| 40 years | 0 | 16 | 10 | 12 | 1 | 5 | 6 | 5 | 4 | 4 | 0 | 9 | 8 | 1 | 4 | 6 | 4 | 2 | 3 | 100 |
| 50 years | 0 | 14 | 11 | 12 | 1 | 5 | 6 | 6 | 4 | 4 | 0 | 8 | 7 | 1 | 4 | 5 | 4 | 2 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 3 | 17 | 34 | 94 | 85 | 64 | 9 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 8 | 9 | 46 | 94 | 80 | 50 | 6 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 22 | 4 | 78 | 92 | 75 | 42 | 2 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 34 | 10 | 98 | 91 | 70 | 33 | 6 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 42 | 16 | 100 | 92 | 65 | 28 | 13 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 3 | 17 | 34 | 94 | 85 | 64 | 9 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## WMCF Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 20. Alternative D WMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | WMCF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *12,460* | *37,379* | *16,020* | *12,460* | *35,599* | *35,599* | *16,020* | *12,460* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *177,995* |
| *Initial Conditions* | *23,958* | *50,355* | *6,721* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *23,958* | *11,381* | *8,185* | *1,925* | *1,512* | *1,079* | *17,813* | *167* | *131* | *177,995* |
| 10 years | 178 | 45,662 | 12,887 | 12,654 | 1,239 | 2,979 | 3,823 | 8,703 | 2,259 | 2,693 | 1,650 | 22,669 | 11,868 | 1,179 | 3,950 | 28,975 | 10,521 | 1,563 | 2,542 | 177,995 |
| 15-year planning period | 155 | 42,505 | 14,900 | 13,025 | 997 | 3,875 | 5,282 | 6,888 | 3,254 | 3,486 | 750 | 26,111 | 14,083 | 1,153 | 4,877 | 22,691 | 8,803 | 2,119 | 3,041 | 177,995 |
| 20 years | 109 | 39,923 | 16,401 | 13,995 | 1,065 | 4,187 | 6,264 | 6,726 | 3,558 | 3,634 | 572 | 26,121 | 15,360 | 1,046 | 6,045 | 19,193 | 8,094 | 2,113 | 3,589 | 177,995 |
| 30 years | 186 | 35,194 | 17,986 | 15,328 | 1,480 | 5,226 | 7,891 | 6,655 | 4,379 | 3,862 | 509 | 24,534 | 16,684 | 1,360 | 7,539 | 14,295 | 8,173 | 2,267 | 4,449 | 177,995 |
| 40 years | 178 | 32,745 | 19,359 | 17,104 | 1,330 | 5,774 | 8,931 | 6,173 | 4,323 | 3,886 | 524 | 21,623 | 17,870 | 1,041 | 8,144 | 12,308 | 8,548 | 3,045 | 5,087 | 177,995 |
| 50 years | 176 | 29,418 | 20,673 | 17,724 | 1,430 | 6,655 | 10,901 | 6,438 | 4,971 | 4,448 | 490 | 19,360 | 17,829 | 1,532 | 8,640 | 10,715 | 7,613 | 3,248 | 5,735 | 177,995 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *7* | *21* | *9* | *7* | *20* | *20* | *9* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | 13 | 28 | 4 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | 13 | 6 | 5 | 1 | 1 | 1 | 10 | 0 | 0 | *100* |
| 10 years | 0 | 26 | 7 | 7 | 1 | 2 | 2 | 5 | 1 | 2 | 1 | 13 | 7 | 1 | 2 | 16 | 6 | 1 | 1 | 100 |
| 15-year planning period | 0 | 24 | 8 | 7 | 1 | 2 | 3 | 4 | 2 | 2 | 0 | 15 | 8 | 1 | 3 | 13 | 5 | 1 | 2 | 100 |
| 20 years | 0 | 22 | 9 | 8 | 1 | 2 | 4 | 4 | 2 | 2 | 0 | 15 | 9 | 1 | 3 | 11 | 5 | 1 | 2 | 100 |
| 30 years | 0 | 20 | 10 | 9 | 1 | 3 | 4 | 4 | 2 | 2 | 0 | 14 | 9 | 1 | 4 | 8 | 5 | 1 | 2 | 100 |
| 40 years | 0 | 18 | 11 | 10 | 1 | 3 | 5 | 3 | 2 | 2 | 0 | 12 | 10 | 1 | 5 | 7 | 5 | 2 | 3 | 100 |
| 50 years | 0 | 17 | 12 | 10 | 1 | 4 | 6 | 4 | 3 | 2 | 0 | 11 | 10 | 1 | 5 | 6 | 4 | 2 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *35* | *58* | *34* | *95* | *96* | *93* | *43* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 22 | 20 | 2 | 97 | 92 | 76 | 30 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 14 | 7 | 5 | 97 | 89 | 67 | 45 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 7 | 2 | 12 | 97 | 88 | 61 | 46 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 6 | 12 | 23 | 96 | 85 | 51 | 47 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 12 | 21 | 37 | 96 | 84 | 44 | 50 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 21 | 29 | 42 | 96 | 81 | 32 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## Dry Mixed Conifer




**Appendix B figure 15. Dry mixed conifer forest potential natural vegetation type current and desired vegetation structural states**

[1] Dry Mixed Conifer Forest (DMCF) PNVT Vegetation Structural States. At 147,885 acres or approximately 7% of the forests this PNVT ranks 6th in order of size out of the 14 PNVTs on the ASNFs

State A - Recently burned, grass, forb and shrub types with < 10% tree canopy cover; early successional development

State B - Seedling and sapling size (< 5” diameter) trees with open (< 30%) canopy cover; all tree types; early successional development

State C - Small size (5”-9.9” diameter) trees, with open canopy cover; all tree types; mid successional development

State D - Medium size (10”-19.9” diameter) trees, single storied, with open canopy cover; all tree types; late successional development

State E - Large to very large size (≥ 20” diameter) trees, single storied, with open canopy cover; all tree types; late successional development

State F - Seedling and sapling size trees with closed (≥ 30%) canopy cover; all tree types; early successional development

State G - Small size trees, with closed canopy cover; all tree types; mid successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State H - Medium size trees, single storied, with closed canopy cover; all shade tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State I - Large to very large size trees, single storied, with closed canopy cover; all tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State J - Medium size trees, multi-storied, with open canopy cover; all tree types; late successional development

State K - Large to very large size trees, multi-storied, with open canopy cover; all tree types; late successional development

State L - Medium size trees, multi-storied, with closed canopy cover; all tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State M - Large to very large size trees, multi-storied, with closed canopy cover; tree types; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State N - Recently burned, grass, forb and shrub types with < 10% tree canopy cover; uncharacteristic early successional development due to fire; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] DMCF PNVT has a 67% or high departure rating from Desired Conditions (DC) and a 77% or high departure rating from Historical Range of Variability (HRV) making it tied with Great Basin grassland for the 3rd most departed PNVT for DC; and 3rd most departed PNVT for HRV on the ASNFs. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2007a)

## DMCF Alternative A

### Appendix B table 21. Alternative A DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,452 | 1,077 | 1,026 | 4,438 | 5,242 | 33,524 | 16,020 | 16,251 | 6,026 | 5,061 | 4,573 | 24,089 | 10,804 | 14,301 | 147,885 |
| 15-year planning period | 3,678 | 1,341 | 954 | 4,317 | 6,753 | 40,252 | 16,397 | 14,024 | 6,385 | 5,120 | 6,146 | 23,214 | 10,788 | 8,519 | 147,885 |
| 20 years | 2,780 | 1,177 | 954 | 3,818 | 8,359 | 41,941 | 17,751 | 12,836 | 6,731 | 4,917 | 6,800 | 22,201 | 11,777 | 5,844 | 147,885 |
| 30 years | 1,420 | 1,474 | 1,226 | 3,955 | 10,087 | 43,563 | 18,367 | 10,839 | 6,875 | 4,732 | 9,156 | 21,363 | 12,546 | 2,283 | 147,885 |
| 40 years | 1,162 | 1,564 | 1,212 | 3,423 | 11,366 | 42,348 | 19,239 | 9,585 | 6,445 | 4,751 | 10,338 | 20,499 | 14,379 | 1,567 | 147,885 |
| 50 years | 1,054 | 1,748 | 1,288 | 3,223 | 13,047 | 40,170 | 19,424 | 9,053 | 6,642 | 4,683 | 11,564 | 20,347 | 14,484 | 1,160 | 147,885 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 3 | 4 | 23 | 11 | 11 | 4 | 3 | 3 | 16 | 7 | 10 | 100 |
| 15-year planning period | 2 | 1 | 1 | 3 | 5 | 27 | 11 | 9 | 4 | 3 | 4 | 16 | 7 | 6 | 100 |
| 20 years | 2 | 1 | 1 | 3 | 6 | 28 | 12 | 9 | 5 | 3 | 5 | 15 | 8 | 4 | 100 |
| 30 years | 1 | 1 | 1 | 3 | 7 | 29 | 12 | 7 | 5 | 3 | 6 | 14 | 8 | 2 | 100 |
| 40 years | 1 | 1 | 1 | 2 | 8 | 29 | 13 | 6 | 4 | 3 | 7 | 14 | 10 | 1 | 100 |
| 50 years | 1 | 1 | 1 | 2 | 9 | 27 | 13 | 6 | 4 | 3 | 8 | 14 | 10 | 1 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 85 | 77 | 55 | 73 | 100 | 100 | 100 | 27 | 74 | 88 | 100 | 34 | 100 | |
| 15-year planning period | 100 | 82 | 78 | 56 | 66 | 100 | 100 | 100 | 22 | 74 | 84 | 100 | 34 | 100 | |
| 20 years | 100 | 84 | 78 | 61 | 58 | 100 | 100 | 100 | 18 | 75 | 83 | 100 | 28 | 100 | |
| 30 years | 100 | 80 | 72 | 60 | 49 | 100 | 100 | 100 | 16 | 76 | 77 | 100 | 24 | 100 | |
| 40 years | 100 | 79 | 73 | 65 | 42 | 100 | 100 | 100 | 22 | 76 | 74 | 100 | 12 | 100 | |
| 50 years | 100 | 76 | 71 | 67 | 34 | 100 | 100 | 100 | 19 | 76 | 71 | 100 | 12 | 100 | |

## DMCF Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 22. Alternative B DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,619 | 1,868 | 1,206 | 5,084 | 5,248 | 34,107 | 15,205 | 13,639 | 5,415 | 7,075 | 9,820 | 20,537 | 9,969 | 13,094 | 147,885 |
| 15-year planning period | 4,080 | 1,973 | 1,191 | 4,595 | 6,377 | 40,748 | 15,163 | 11,275 | 5,781 | 7,586 | 13,328 | 18,613 | 9,711 | 7,464 | 147,885 |
| 20 years | 2,517 | 1,372 | 960 | 4,137 | 7,051 | 43,986 | 16,887 | 9,781 | 5,475 | 7,247 | 15,995 | 17,451 | 10,659 | 4,369 | 147,885 |
| 30 years | 1,491 | 1,546 | 1,160 | 3,531 | 8,181 | 43,607 | 19,260 | 7,640 | 5,622 | 6,474 | 20,487 | 15,286 | 11,750 | 1,851 | 147,885 |
| 40 years | 1,041 | 1,433 | 1,097 | 3,023 | 8,766 | 41,562 | 20,250 | 6,733 | 5,613 | 5,478 | 24,708 | 14,612 | 12,685 | 884 | 147,885 |
| 50 years | 984 | 1,371 | 1,227 | 2,978 | 9,626 | 40,019 | 19,722 | 6,115 | 5,439 | 5,129 | 26,211 | 14,269 | 14,203 | 592 | 147,885 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 3 | 4 | 23 | 10 | 9 | 4 | 5 | 7 | 14 | 7 | 4 | 100 |
| 15-year planning period | 3 | 1 | 1 | 3 | 4 | 28 | 10 | 8 | 4 | 5 | 9 | 13 | 7 | 3 | 100 |
| 20 years | 2 | 1 | 1 | 3 | 5 | 30 | 11 | 7 | 4 | 5 | 11 | 12 | 7 | 2 | 100 |
| 30 years | 1 | 1 | 1 | 2 | 6 | 29 | 13 | 5 | 4 | 4 | 14 | 10 | 8 | 1 | 100 |
| 40 years | 1 | 1 | 1 | 2 | 6 | 28 | 14 | 5 | 4 | 4 | 17 | 10 | 9 | 1 | 100 |
| 50 years | 1 | 1 | 1 | 2 | 7 | 27 | 13 | 4 | 4 | 3 | 18 | 10 | 10 | 1 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 75 | 73 | 48 | 73 | 100 | 100 | 100 | 34 | 64 | 75 | 100 | 39 | 100 | |
| 15-year planning period | 100 | 73 | 73 | 53 | 68 | 100 | 100 | 100 | 30 | 62 | 66 | 100 | 41 | 100 | |
| 20 years | 100 | 81 | 78 | 58 | 64 | 100 | 100 | 100 | 33 | 63 | 59 | 100 | 35 | 100 | |
| 30 years | 100 | 79 | 74 | 64 | 58 | 100 | 100 | 86 | 32 | 67 | 48 | 86 | 28 | 100 | |
| 40 years | 100 | 81 | 75 | 69 | 56 | 100 | 100 | 64 | 32 | 72 | 37 | 78 | 23 | 100 | |
| 50 years | 100 | 81 | 72 | 70 | 51 | 100 | 100 | 49 | 34 | 74 | 34 | 74 | 14 | 100 | |

## DMCF Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 23. Alternative B DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,438 | 1,373 | 1,072 | 4,568 | 5,095 | 34,160 | 16,318 | 14,693 | 5,798 | 5,761 | 6,731 | 22,907 | 10,664 | 13,307 | 147,885 |
| 15-year planning period | 3,697 | 1,334 | 1,021 | 4,036 | 6,269 | 40,859 | 16,690 | 12,534 | 6,317 | 6,014 | 9,130 | 21,234 | 10,901 | 7,849 | 147,885 |
| 20 years | 2,404 | 1,114 | 893 | 3,571 | 7,164 | 43,755 | 17,921 | 11,179 | 6,371 | 5,919 | 10,980 | 20,357 | 11,429 | 4,829 | 147,885 |
| 30 years | 1,339 | 1,184 | 1,070 | 2,963 | 8,640 | 43,798 | 20,131 | 9,018 | 6,599 | 5,458 | 14,253 | 18,772 | 12,624 | 2,034 | 147,885 |
| 40 years | 815 | 1,107 | 1,001 | 2,631 | 9,627 | 41,935 | 21,332 | 8,081 | 6,815 | 4,802 | 17,052 | 18,043 | 13,730 | 915 | 147,885 |
| 50 years | 731 | 1,115 | 1,099 | 2,439 | 10,477 | 40,284 | 21,151 | 7,204 | 6,738 | 4,626 | 18,416 | 17,990 | 14,992 | 623 | 147,885 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 3 | 3 | 23 | 11 | 10 | 4 | 4 | 5 | 15 | 7 | 9 | 100 |
| 15-year planning period | 2 | 1 | 1 | 3 | 4 | 28 | 11 | 8 | 4 | 4 | 6 | 14 | 7 | 5 | 100 |
| 20 years | 2 | 1 | 1 | 2 | 5 | 30 | 12 | 8 | 4 | 4 | 7 | 14 | 8 | 3 | 100 |
| 30 years | 1 | 1 | 1 | 2 | 6 | 30 | 14 | 6 | 4 | 4 | 10 | 13 | 9 | 1 | 100 |
| 40 years | 1 | 1 | 1 | 2 | 7 | 28 | 14 | 5 | 5 | 3 | 12 | 12 | 9 | 1 | 100 |
| 50 years | 0 | 1 | 1 | 2 | 7 | 27 | 14 | 5 | 5 | 3 | 12 | 12 | 10 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 81 | 76 | 54 | 74 | 100 | 100 | 100 | 29 | 71 | 83 | 100 | 35 | 100 | |
| 15-year planning period | 100 | 82 | 77 | 59 | 68 | 100 | 100 | 100 | 23 | 69 | 77 | 100 | 34 | 100 | |
| 20 years | 100 | 85 | 80 | 64 | 64 | 100 | 100 | 100 | 23 | 70 | 72 | 100 | 30 | 100 | |
| 30 years | 100 | 84 | 76 | 70 | 56 | 100 | 100 | 100 | 20 | 72 | 64 | 100 | 23 | 100 | |
| 40 years | 100 | 85 | 77 | 73 | 51 | 100 | 100 | 97 | 17 | 76 | 57 | 100 | 16 | 100 | |
| 50 years | 100 | 85 | 75 | 75 | 47 | 100 | 100 | 75 | 18 | 77 | 53 | 100 | 9 | 100 | |

## DMCF Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 24. Alternative B DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,258 | 878 | 938 | 4,052 | 4,942 | 34,214 | 17,431 | 15,748 | 6,181 | 4,447 | 3,642 | 25,278 | 11,359 | 13,520 | 147,885 |
| 15-year planning period | 3,315 | 695 | 851 | 3,476 | 6,161 | 40,969 | 18,216 | 13,794 | 6,853 | 4,442 | 4,932 | 23,854 | 12,091 | 8,234 | 147,885 |
| 20 years | 2,292 | 857 | 825 | 3,004 | 7,277 | 43,525 | 18,955 | 12,577 | 7,267 | 4,591 | 5,964 | 23,263 | 12,199 | 5,289 | 147,885 |
| 30 years | 1,188 | 823 | 980 | 2,396 | 9,100 | 43,989 | 21,002 | 10,395 | 7,577 | 4,442 | 8,019 | 22,258 | 13,499 | 2,216 | 147,885 |
| 40 years | 588 | 781 | 905 | 2,239 | 10,489 | 42,308 | 22,413 | 9,429 | 8,017 | 4,127 | 9,395 | 21,474 | 14,775 | 945 | 147,885 |
| 50 years | 478 | 859 | 971 | 1,900 | 11,328 | 40,550 | 22,580 | 8,293 | 8,037 | 4,123 | 10,620 | 21,711 | 15,781 | 654 | 147,885 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 3 | 3 | 23 | 12 | 11 | 4 | 3 | 2 | 17 | 8 | 9 | 100 |
| 15-year planning period | 2 | 0 | 1 | 2 | 4 | 28 | 12 | 9 | 5 | 3 | 3 | 16 | 8 | 6 | 100 |
| 20 years | 2 | 1 | 1 | 2 | 5 | 29 | 13 | 9 | 5 | 3 | 4 | 16 | 8 | 4 | 100 |
| 30 years | 1 | 1 | 1 | 2 | 6 | 30 | 14 | 7 | 5 | 3 | 5 | 15 | 9 | 1 | 100 |
| 40 years | 0 | 1 | 1 | 2 | 7 | 29 | 15 | 6 | 5 | 3 | 6 | 15 | 10 | 1 | 100 |
| 50 years | 0 | 1 | 1 | 1 | 8 | 27 | 15 | 6 | 5 | 3 | 7 | 15 | 11 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 88 | 79 | 59 | 75 | 100 | 100 | 100 | 25 | 77 | 91 | 100 | 31 | 100 | |
| 15-year planning period | 100 | 91 | 81 | 65 | 69 | 100 | 100 | 100 | 17 | 77 | 87 | 100 | 26 | 100 | |
| 20 years | 100 | 88 | 81 | 70 | 63 | 100 | 100 | 100 | 12 | 77 | 85 | 100 | 26 | 100 | |
| 30 years | 100 | 89 | 78 | 76 | 54 | 100 | 100 | 100 | 8 | 77 | 80 | 100 | 18 | 100 | |
| 40 years | 100 | 89 | 80 | 77 | 47 | 100 | 100 | 100 | 2 | 79 | 76 | 100 | 10 | 100 | |
| 50 years | 100 | 88 | 78 | 81 | 43 | 100 | 100 | 100 | 2 | 79 | 73 | 100 | 4 | 100 | |

## DMCF Alternative C Proposed High Acre Treatment Objectives

**Appendix B table 25. Alternative C DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 6,329 | 2,169 | 1,001 | 5,010 | 2,587 | 37,009 | 15,294 | 10,047 | 4,385 | 10,124 | 16,374 | 16,304 | 8,696 | 12,558 | 147,885 |
| 15-year planning period | 4,333 | 1,907 | 1,284 | 4,457 | 2,886 | 44,402 | 15,856 | 8,075 | 4,103 | 9,195 | 20,048 | 14,484 | 9,079 | 7,778 | 147,885 |
| 20 years | 3,486 | 2,090 | 1,183 | 4,388 | 3,429 | 47,218 | 16,406 | 6,967 | 4,151 | 8,375 | 21,743 | 13,669 | 9,908 | 4,872 | 147,885 |
| 30 years | 2,571 | 1,788 | 1,468 | 3,692 | 4,140 | 47,657 | 18,930 | 5,645 | 4,304 | 7,271 | 24,741 | 12,765 | 10,827 | 2,086 | 147,885 |
| 40 years | 2,261 | 1,770 | 1,306 | 3,462 | 4,548 | 46,486 | 20,060 | 5,439 | 4,337 | 6,527 | 26,111 | 12,370 | 12,064 | 1,145 | 147,885 |
| 50 years | 2,485 | 1,956 | 1,282 | 3,289 | 5,397 | 44,017 | 20,128 | 4,867 | 4,664 | 6,207 | 27,931 | 11,986 | 12,943 | 736 | 147,885 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 3 | 2 | 25 | 10 | 7 | 3 | 7 | 11 | 11 | 6 | 8 | 100 |
| 15-year planning period | 3 | 1 | 1 | 3 | 2 | 30 | 11 | 5 | 3 | 6 | 14 | 10 | 6 | 5 | 100 |
| 20 years | 2 | 1 | 1 | 3 | 2 | 32 | 11 | 5 | 3 | 6 | 15 | 9 | 7 | 3 | 100 |
| 30 years | 2 | 1 | 1 | 2 | 3 | 32 | 13 | 4 | 3 | 5 | 17 | 9 | 7 | 1 | 100 |
| 40 years | 2 | 1 | 1 | 2 | 3 | 31 | 14 | 4 | 3 | 4 | 18 | 8 | 8 | 1 | 100 |
| 50 years | 2 | 1 | 1 | 2 | 4 | 30 | 14 | 3 | 3 | 4 | 19 | 8 | 9 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 71 | 77 | 49 | 87 | 100 | 100 | 100 | 47 | 49 | 58 | 98 | 47 | 100 | |
| 15-year planning period | 100 | 74 | 71 | 55 | 85 | 100 | 100 | 96 | 50 | 53 | 49 | 76 | 45 | 100 | |
| 20 years | 100 | 72 | 73 | 56 | 83 | 100 | 100 | 69 | 50 | 58 | 45 | 66 | 40 | 100 | |
| 30 years | 100 | 76 | 67 | 63 | 79 | 100 | 100 | 37 | 48 | 63 | 37 | 55 | 34 | 100 | |
| 40 years | 100 | 76 | 71 | 65 | 77 | 100 | 100 | 32 | 47 | 67 | 34 | 50 | 27 | 100 | |
| 50 years | 100 | 74 | 71 | 67 | 73 | 100 | 100 | 18 | 43 | 69 | 29 | 46 | 21 | 100 | |

## DMCF Alternative C Proposed Average Acre Treatment Objectives

**Appendix B table 26. Alternative C DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,863 | 1,500 | 853 | 4,522 | 2,205 | 35,307 | 16,412 | 13,296 | 5,472 | 7,543 | 10,500 | 21,347 | 10,115 | 12,949 | 147,885 |
| 15-year planning period | 3,760 | 1,367 | 1,090 | 3,986 | 2,453 | 42,633 | 16,909 | 11,370 | 5,474 | 7,134 | 12,974 | 20,055 | 10,747 | 7,933 | 147,885 |
| 20 years | 2,936 | 1,329 | 995 | 3,876 | 2,863 | 45,099 | 17,791 | 10,273 | 5,713 | 6,748 | 14,521 | 19,074 | 11,682 | 4,985 | 147,885 |
| 30 years | 1,836 | 1,223 | 1,167 | 3,259 | 3,474 | 45,479 | 19,896 | 8,663 | 6,263 | 6,079 | 17,110 | 18,713 | 12,606 | 2,118 | 147,885 |
| 40 years | 1,465 | 1,187 | 1,150 | 2,969 | 3,777 | 43,955 | 21,113 | 7,865 | 6,431 | 5,749 | 18,780 | 18,104 | 14,303 | 1,038 | 147,885 |
| 50 years | 1,566 | 1,262 | 1,132 | 2,720 | 4,680 | 41,934 | 20,939 | 7,257 | 6,554 | 5,509 | 20,279 | 17,786 | 15,561 | 706 | 147,885 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 3 | 1 | 24 | 11 | 9 | 4 | 5 | 7 | 14 | 7 | 9 | 100 |
| 15-year planning period | 3 | 1 | 1 | 3 | 2 | 29 | 11 | 8 | 4 | 5 | 9 | 14 | 7 | 5 | 100 |
| 20 years | 2 | 1 | 1 | 3 | 2 | 30 | 12 | 7 | 4 | 5 | 10 | 13 | 8 | 3 | 100 |
| 30 years | 1 | 1 | 1 | 2 | 2 | 31 | 13 | 6 | 4 | 4 | 12 | 13 | 9 | 1 | 100 |
| 40 years | 1 | 1 | 1 | 2 | 3 | 30 | 14 | 5 | 4 | 4 | 13 | 12 | 10 | 1 | 100 |
| 50 years | 1 | 1 | 1 | 2 | 3 | 28 | 14 | 5 | 4 | 4 | 14 | 12 | 11 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 80 | 81 | 54 | 89 | 100 | 100 | 100 | 33 | 62 | 73 | 100 | 38 | 100 | |
| 15-year planning period | 100 | 82 | 75 | 60 | 88 | 100 | 100 | 100 | 33 | 64 | 67 | 100 | 35 | 100 | |
| 20 years | 100 | 82 | 78 | 61 | 85 | 100 | 100 | 100 | 31 | 66 | 63 | 100 | 29 | 100 | |
| 30 years | 100 | 83 | 74 | 67 | 82 | 100 | 100 | 100 | 24 | 69 | 57 | 100 | 23 | 100 | |
| 40 years | 100 | 84 | 74 | 70 | 81 | 100 | 100 | 91 | 22 | 71 | 52 | 100 | 13 | 100 | |
| 50 years | 100 | 83 | 74 | 72 | 76 | 100 | 100 | 77 | 20 | 72 | 49 | 100 | 5 | 100 | |

## DMCF Alternative C Proposed Low Acre Treatment Objectives

**Appendix B table 27. Alternative C DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,397 | 831 | 705 | 4,034 | 1,824 | 33,605 | 17,531 | 16,546 | 6,559 | 4,962 | 4,626 | 26,391 | 11,535 | 13,341 | *147,885* |
| 15-year planning period | 3,188 | 827 | 896 | 3,515 | 2,020 | 40,865 | 17,963 | 14,666 | 6,845 | 5,073 | 5,900 | 25,626 | 12,414 | 8,088 | *147,885* |
| 20 years | 2,386 | 567 | 807 | 3,363 | 2,297 | 42,981 | 19,177 | 13,579 | 7,275 | 5,122 | 7,298 | 24,480 | 13,457 | 5,097 | *147,885* |
| 30 years | 1,100 | 658 | 866 | 2,827 | 2,807 | 43,301 | 20,863 | 11,680 | 8,222 | 4,888 | 9,479 | 24,661 | 14,385 | 2,149 | *147,885* |
| 40 years | 669 | 603 | 993 | 2,475 | 3,006 | 41,424 | 22,167 | 10,292 | 8,526 | 4,971 | 11,449 | 23,839 | 16,542 | 931 | *147,885* |
| 50 years | 647 | 569 | 981 | 2,152 | 3,962 | 39,851 | 21,751 | 9,647 | 8,445 | 4,811 | 12,628 | 23,587 | 18,180 | 676 | *147,885* |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 0 | 3 | 1 | 23 | 12 | 11 | 4 | 3 | 3 | 18 | 8 | 9 | 100 |
| 15-year planning period | 2 | 1 | 1 | 2 | 1 | 28 | 12 | 10 | 5 | 3 | 4 | 17 | 8 | 5 | 100 |
| 20 years | 2 | 0 | 1 | 2 | 2 | 29 | 13 | 9 | 5 | 3 | 5 | 17 | 9 | 3 | 100 |
| 30 years | 1 | 0 | 1 | 2 | 2 | 29 | 14 | 8 | 6 | 3 | 6 | 17 | 10 | 1 | 100 |
| 40 years | 0 | 0 | 1 | 2 | 2 | 28 | 15 | 7 | 6 | 3 | 8 | 16 | 11 | 1 | 100 |
| 50 years | 1 | 1 | 4 | 3 | 15 | 6 | 14 | 9 | 6 | 5 | 8 | 18 | 10 | 0 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 89 | 84 | 59 | 91 | 100 | 100 | 100 | 20 | 75 | 88 | 100 | 30 | 100 | |
| 15-year planning period | 100 | 89 | 80 | 64 | 90 | 100 | 100 | 100 | 17 | 74 | 85 | 100 | 24 | 100 | |
| 20 years | 100 | 92 | 82 | 66 | 88 | 100 | 100 | 100 | 12 | 74 | 81 | 100 | 18 | 100 | |
| 30 years | 100 | 91 | 80 | 71 | 86 | 100 | 100 | 100 | 0 | 75 | 76 | 100 | 12 | 100 | |
| 40 years | 100 | 92 | 78 | 75 | 85 | 100 | 100 | 100 | 4 | 75 | 71 | 100 | 1 | 100 | |
| 50 years | 100 | 92 | 78 | 78 | 80 | 100 | 100 | 100 | 3 | 76 | 68 | 100 | 11 | 100 | |

## DMCF Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 28. Alternative D DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,618 | 2,146 | 1,189 | 6,981 | 3,829 | 31,811 | 13,828 | 14,094 | 14,018 | 5,554 | 4,908 | 20,991 | 9,749 | 13,170 | *147,885* |
| 15-year planning period | 3,844 | 2,353 | 1,198 | 7,152 | 5,081 | 36,038 | 13,581 | 12,487 | 16,144 | 6,610 | 6,141 | 19,042 | 9,629 | 8,584 | *147,885* |
| 20 years | 2,589 | 2,242 | 1,368 | 6,997 | 6,620 | 37,099 | 14,620 | 10,886 | 17,441 | 6,743 | 7,433 | 18,226 | 10,367 | 5,254 | *147,885* |
| 30 years | 1,788 | 2,335 | 1,476 | 7,034 | 8,864 | 36,271 | 14,142 | 10,226 | 17,899 | 6,670 | 9,301 | 17,854 | 11,805 | 2,220 | *147,885* |
| 40 years | 1,456 | 2,269 | 1,298 | 6,243 | 11,557 | 34,972 | 14,121 | 9,322 | 17,206 | 6,236 | 11,080 | 17,828 | 12,956 | 1,344 | *147,885* |
| 50 years | 1,125 | 2,682 | 1,268 | 6,446 | 12,236 | 33,457 | 13,829 | 9,475 | 16,188 | 6,165 | 12,070 | 18,363 | 13,638 | 942 | *147,885* |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 5 | 3 | 22 | 9 | 10 | 9 | 4 | 3 | 14 | 7 | 9 | 100 |
| 15-year planning period | 3 | 2 | 1 | 5 | 3 | 24 | 9 | 8 | 11 | 4 | 4 | 13 | 7 | 6 | 100 |
| 20 years | 2 | 2 | 1 | 5 | 4 | 25 | 10 | 7 | 12 | 5 | 5 | 12 | 7 | 4 | 100 |
| 30 years | 1 | 2 | 1 | 5 | 6 | 25 | 10 | 7 | 12 | 5 | 6 | 12 | 8 | 2 | 100 |
| 40 years | 1 | 2 | 1 | 4 | 8 | 24 | 10 | 6 | 12 | 4 | 7 | 12 | 9 | 1 | 100 |
| 50 years | 1 | 2 | 1 | 4 | 8 | 23 | 9 | 6 | 11 | 4 | 8 | 12 | 9 | 1 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | 100 | 100 | *44* | *82* | *97* | 100 | *35* | *100* | |
| 10 years | 100 | 71 | 73 | 29 | 81 | 100 | 100 | 100 | 70 | 72 | 88 | 100 | 41 | 100 | |
| 15-year planning period | 100 | 68 | 73 | 27 | 74 | 100 | 100 | 100 | 96 | 66 | 84 | 100 | 41 | 100 | |
| 20 years | 100 | 70 | 69 | 29 | 66 | 100 | 100 | 100 | 100 | 66 | 81 | 100 | 37 | 100 | |
| 30 years | 100 | 68 | 67 | 29 | 55 | 100 | 100 | 100 | 100 | 66 | 76 | 100 | 28 | 100 | |
| 40 years | 100 | 69 | 71 | 37 | 41 | 100 | 100 | 100 | 100 | 68 | 72 | 100 | 21 | 100 | |
| 50 years | 100 | 64 | 71 | 35 | 38 | 100 | 100 | 100 | 97 | 69 | 69 | 100 | 17 | 100 | |

## DMCF Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 29. Alternative D DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

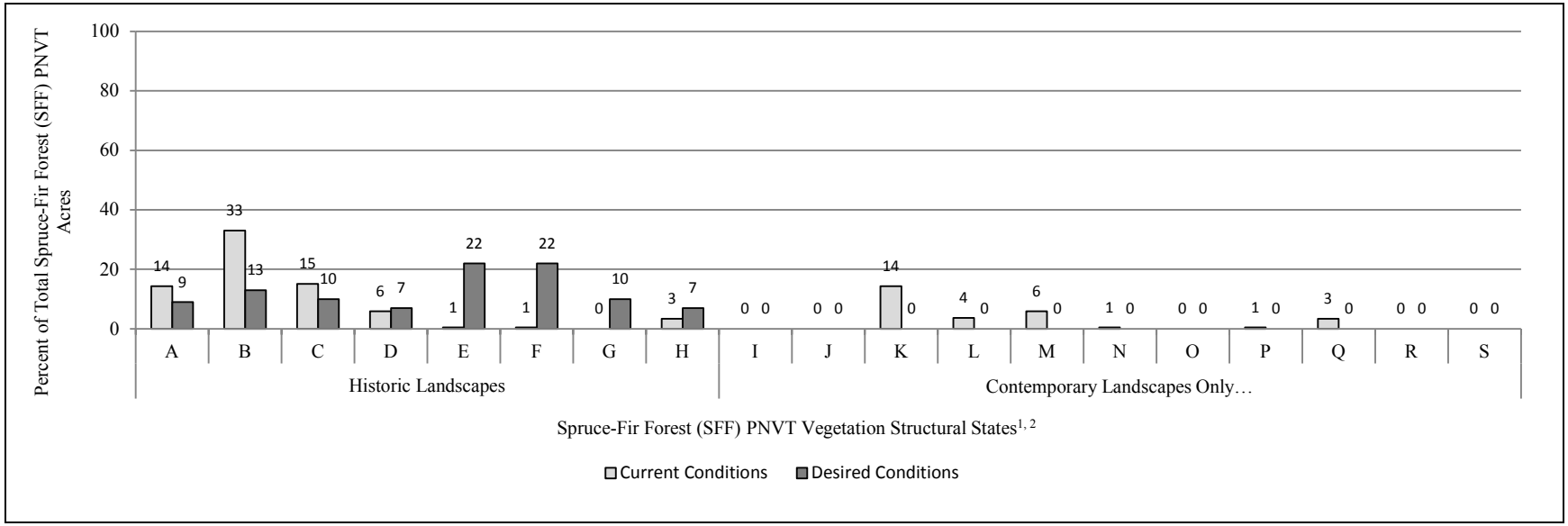
| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,332 | 1,530 | 1,022 | 5,756 | 2,899 | 32,691 | 15,502 | 15,776 | 10,676 | 5,032 | 4,003 | 23,714 | 10,489 | 13,484 | *147,885* |
| 15-year planning period | 3,700 | 1,708 | 1,046 | 5,856 | 3,730 | 37,911 | 15,234 | 14,090 | 11,873 | 5,586 | 5,133 | 22,557 | 10,861 | 8,600 | *147,885* |
| 20 years | 2,499 | 1,566 | 1,061 | 5,536 | 4,682 | 39,347 | 16,575 | 12,837 | 13,160 | 5,664 | 6,092 | 21,564 | 11,862 | 5,441 | *147,885* |
| 30 years | 1,464 | 1,674 | 1,197 | 5,331 | 6,003 | 39,089 | 16,775 | 11,851 | 13,637 | 5,738 | 7,828 | 21,663 | 13,423 | 2,213 | *147,885* |
| 40 years | 1,245 | 1,559 | 1,103 | 4,790 | 7,794 | 37,415 | 17,335 | 10,340 | 13,754 | 5,698 | 9,133 | 21,545 | 14,881 | 1,294 | *147,885* |
| 50 years | 840 | 1,803 | 1,171 | 4,790 | 8,564 | 35,431 | 17,219 | 10,193 | 13,463 | 5,376 | 10,477 | 22,229 | 15,480 | 848 | *147,885* |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 4 | 1 | 1 | 4 | 2 | 22 | 10 | 11 | 7 | 3 | 3 | 16 | 7 | 9 | 100 |
| 15-year planning period | 3 | 1 | 1 | 4 | 3 | 26 | 10 | 10 | 8 | 4 | 3 | 15 | 7 | 6 | 100 |
| 20 years | 2 | 1 | 1 | 4 | 3 | 27 | 11 | 9 | 9 | 4 | 4 | 15 | 8 | 4 | 100 |
| 30 years | 1 | 1 | 1 | 4 | 4 | 26 | 11 | 8 | 9 | 4 | 5 | 15 | 9 | 1 | 100 |
| 40 years | 1 | 1 | 1 | 3 | 5 | 25 | 12 | 7 | 9 | 4 | 6 | 15 | 10 | 1 | 100 |
| 50 years | 1 | 1 | 1 | 3 | 6 | 24 | 12 | 7 | 9 | 4 | 7 | 15 | 10 | 1 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 79 | 77 | 42 | 85 | 100 | 100 | 100 | 30 | 74 | 90 | 100 | 36 | 100 | |
| 15-year planning period | 100 | 77 | 76 | 41 | 81 | 100 | 100 | 100 | 44 | 72 | 87 | 100 | 34 | 100 | |
| 20 years | 100 | 79 | 76 | 44 | 76 | 100 | 100 | 100 | 60 | 71 | 85 | 100 | 28 | 100 | |
| 30 years | 100 | 77 | 73 | 46 | 70 | 100 | 100 | 100 | 66 | 71 | 80 | 100 | 18 | 100 | |
| 40 years | 100 | 79 | 75 | 51 | 60 | 100 | 100 | 100 | 67 | 71 | 77 | 100 | 9 | 100 | |
| 50 years | 100 | 76 | 74 | 51 | 57 | 100 | 100 | 100 | 64 | 73 | 73 | 100 | 6 | 100 | |

## DMCF Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 30. Alternative D DMCF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | DMCF Vegetation Structural State | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *7,394* | *4,437* | *9,864* | *19,713* | *5,915* | *4,437* | *4,111* | *8,222* | *19,708* | *39,436* | *8,222* | *16,425* | *0* | *147,885* |
| *Initial Conditions* | *4,507* | *1,653* | *2,944* | *5,514* | *1,196* | *4,059* | *20,598* | *20,281* | *4,567* | *3,526* | *1,196* | *30,422* | *10,657* | *36,766* | *147,885* |
| 10 years | 5,045 | 914 | 856 | 4,532 | 1,970 | 33,571 | 17,176 | 17,458 | 7,334 | 4,511 | 3,097 | 26,436 | 11,228 | 13,798 | *147,885* |
| 15-year planning period | 3,556 | 1,062 | 894 | 4,559 | 2,380 | 39,784 | 16,886 | 15,692 | 7,603 | 4,563 | 4,126 | 26,073 | 12,093 | 8,616 | *147,885* |
| 20 years | 2,410 | 890 | 754 | 4,075 | 2,743 | 41,595 | 18,529 | 14,788 | 8,880 | 4,585 | 4,750 | 24,901 | 13,357 | 5,627 | *147,885* |
| 30 years | 1,141 | 1,013 | 917 | 3,628 | 3,141 | 41,907 | 19,408 | 13,475 | 9,375 | 4,805 | 6,356 | 25,473 | 15,041 | 2,206 | *147,885* |
| 40 years | 1,034 | 849 | 909 | 3,337 | 4,032 | 39,858 | 20,549 | 11,358 | 10,302 | 5,160 | 7,185 | 25,263 | 16,806 | 1,243 | *147,885* |
| 50 years | 555 | 924 | 1,075 | 3,135 | 4,892 | 37,404 | 20,609 | 10,911 | 10,739 | 4,586 | 8,885 | 26,095 | 17,322 | 753 | *147,885* |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *5* | *3* | *7* | *13* | *4* | *3* | *3* | *6* | *13* | *27* | *6* | *11* | *0* | *100* |
| *Initial Conditions* | *3* | *1* | *2* | *4* | *1* | *3* | *14* | *14* | *3* | *2* | *1* | *21* | *7* | *25* | *100* |
| 10 years | 3 | 1 | 1 | 3 | 1 | 23 | 12 | 12 | 5 | 3 | 2 | 18 | 8 | 9 | 100 |
| 15-year planning period | 2 | 1 | 1 | 3 | 2 | 27 | 11 | 11 | 5 | 3 | 3 | 18 | 8 | 6 | 100 |
| 20 years | 2 | 1 | 1 | 3 | 2 | 28 | 13 | 10 | 6 | 3 | 3 | 17 | 9 | 4 | 100 |
| 30 years | 1 | 1 | 1 | 2 | 2 | 28 | 13 | 9 | 6 | 3 | 4 | 17 | 10 | 1 | 100 |
| 40 years | 1 | 1 | 1 | 2 | 3 | 27 | 14 | 8 | 7 | 3 | 5 | 17 | 11 | 1 | 100 |
| 50 years | 0 | 1 | 1 | 2 | 3 | 25 | 14 | 7 | 7 | 3 | 6 | 18 | 12 | 1 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *78* | *34* | *44* | *94* | *31* | *100* | *100* | *44* | *82* | *97* | *100* | *35* | *100* | |
| 10 years | 100 | 88 | 81 | 54 | 90 | 100 | 100 | 100 | 11 | 77 | 92 | 100 | 32 | 100 | |
| 15-year planning period | 100 | 86 | 80 | 54 | 88 | 100 | 100 | 100 | 8 | 77 | 90 | 100 | 26 | 100 | |
| 20 years | 100 | 88 | 83 | 59 | 86 | 100 | 100 | 100 | 8 | 77 | 88 | 100 | 19 | 100 | |
| 30 years | 100 | 86 | 79 | 63 | 84 | 100 | 100 | 100 | 14 | 76 | 84 | 100 | 8 | 100 | |
| 40 years | 100 | 89 | 80 | 66 | 80 | 100 | 100 | 100 | 25 | 74 | 82 | 100 | 2 | 100 | |
| 50 years | 100 | 88 | 76 | 68 | 75 | 100 | 100 | 100 | 31 | 77 | 77 | 100 | 5 | 100 | |

## Spruce-Fir




**Appendix B figure 4. Spruce-fir forest potential natural vegetation type current and desired vegetation structural states**

[1] Spruce-Fir Forest (SFF) PNVT Vegetation Structural States. At 17,667 acres or approximately 0.9% of the forests this PNVT ranks 11th in order of size out of the 14 PNVTs on the ASNFs

State A - Recently burned, grass, forb and shrub types, with < 10% tree canopy cover; early successional development with aspen regeneration

State B - Seedling and sapling (< 5" diameter), small (5”-9.9” diameter), medium (10”-19.9” diameter), large to very large (≥ 20” diameter) size trees, with open (> 10% & ≤ 30%) or closed (> 30%) canopy cover, consisting of all aspen, deciduous tree mix, and evergreen-deciduous mix tree types; with a plurality of shade intolerant tree types

State C - Seedling and sapling, and small size trees, with open or closed canopy cover; with a plurality of shade tolerant tree types

State D - Medium size trees, single or mufti-storied, with open or closed canopy cover; with a plurality of mixed shade tolerant tree types; with aspen regeneration

State E - Large to very large size trees, single storied, with closed canopy cover; with a plurality of shade tolerant tree types; with aspen regeneration

State F - Large to very large size trees, multi-storied, with closed canopy cover; with a plurality of mixed shade tolerant tree types; with aspen regeneration

State G - Seedling and sapling, and small size trees, with open canopy cover; shade intolerant tree types; with aspen regeneration

State H - Medium size trees, single or multi-storied, with open or closed canopy cover; with a plurality of mixed shade tolerant tree types

State I - Large to very large size trees, single storied, with open canopy cover; with a plurality of shade tolerant tree types; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State J - Large to very large size trees, multi-storied, with open canopy cover; with a plurality of shade tolerant tree types; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State K - Recently burned, grass, forb and shrub types, with < 10% tree canopy cover; early successional development; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State L - Seedling and sapling, and small size trees, with closed canopy cover; with a plurality of mixed shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State M - Medium size trees, single or multi-storied, with open or closed canopy cover; with a plurality of mixed shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State N - Large to very large size trees, single storied, with open canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the

historic conditions or within historic range of variability, found on contemporary landscapes only

State O - Large to very large size trees, multi-storied, with closed canopy cover; with a plurality of mixed shade tolerant tree types; state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State P - Seedling and sapling, and small size trees, with open canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State Q - Medium size trees, single or multi-storied, with open or closed canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State R - Large to very large size trees, single storied, with open canopy cover; with a plurality of mixed shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State S - Large to very large size trees, multi-storied, with open canopy cover; with a plurality of shade tolerant tree types; this state exists with elk and no aspen regeneration; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] SFF PNVT has a 59% or moderate departure rating from Desired Conditions (DC) and a 62% or high departure rating from Historical Range of Variability (HRV) making it the 5th most departed PNVT on the ASNFs for DC and the 6th most departed for HRV. Desired Conditions were provided by the Regional Office, and reference conditions were derived from the Nature Conservancy (Smith 2006c)

## SFF Alternative A

### Appendix B table 31. Alternative A SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 32 | 6,370 | 1,219 | 863 | 131 | 142 | 357 | 594 | 368 | 265 | 102 | 4,052 | 858 | 70 | 140 | 723 | 884 | 335 | 162 | 17,667 |
| 15-year planning period | 30 | 6,226 | 1,171 | 941 | 161 | 175 | 362 | 505 | 482 | 367 | 81 | 3,965 | 946 | 96 | 184 | 508 | 829 | 384 | 254 | 17,667 |
| 20 years | 34 | 6,032 | 1,224 | 999 | 185 | 217 | 333 | 489 | 586 | 418 | 68 | 3,661 | 1,038 | 87 | 218 | 409 | 920 | 474 | 274 | 17,667 |
| 30 years | 35 | 5,677 | 1,229 | 1,124 | 226 | 289 | 368 | 502 | 693 | 570 | 46 | 3,167 | 1,094 | 154 | 281 | 385 | 825 | 659 | 342 | 17,667 |
| 40 years | 29 | 5,523 | 1,202 | 1,084 | 317 | 332 | 379 | 532 | 828 | 610 | 49 | 2,808 | 1,112 | 183 | 329 | 309 | 856 | 769 | 415 | 17,667 |
| 50 years | 25 | 5,317 | 1,169 | 1,072 | 325 | 323 | 385 | 524 | 1,056 | 722 | 60 | 2,549 | 972 | 193 | 330 | 311 | 889 | 893 | 552 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 36 | 7 | 5 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 23 | 5 | 0 | 1 | 4 | 5 | 2 | 1 | 100 |
| 15-year planning period | 0 | 35 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 22 | 5 | 1 | 1 | 3 | 5 | 2 | 1 | 100 |
| 20 years | 0 | 34 | 7 | 6 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 21 | 6 | 0 | 1 | 2 | 5 | 3 | 2 | 100 |
| 30 years | 0 | 32 | 7 | 6 | 1 | 2 | 2 | 3 | 4 | 3 | 0 | 18 | 6 | 1 | 2 | 2 | 5 | 4 | 2 | 100 |
| 40 years | 0 | 31 | 7 | 6 | 2 | 2 | 2 | 3 | 5 | 3 | 0 | 16 | 6 | 1 | 2 | 2 | 5 | 4 | 2 | 100 |
| 50 years | 0 | 30 | 7 | 6 | 2 | 2 | 2 | 3 | 6 | 4 | 0 | 14 | 6 | 1 | 2 | 2 | 5 | 5 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 31 | 30 | 97 | 96 | 80 | 52 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 34 | 24 | 96 | 95 | 80 | 59 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 31 | 19 | 95 | 94 | 81 | 60 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 30 | 9 | 94 | 93 | 79 | 59 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 32 | 12 | 92 | 91 | 79 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 34 | 13 | 92 | 92 | 78 | 58 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 32. Alternative B SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 35 | 6,022 | 1,017 | 1,174 | 199 | 189 | 554 | 823 | 606 | 404 | 96 | 3,230 | 871 | 86 | 157 | 650 | 1,042 | 313 | 200 | 17,667 |
| 15-year planning period | 25 | 5,836 | 1,008 | 1,386 | 242 | 238 | 531 | 752 | 785 | 574 | 60 | 2,759 | 947 | 105 | 220 | 453 | 1,026 | 452 | 268 | 17,667 |
| 20 years | 33 | 5,604 | 895 | 1,515 | 332 | 282 | 546 | 809 | 1,008 | 665 | 56 | 2,327 | 960 | 111 | 243 | 389 | 1,030 | 526 | 335 | 17,667 |
| 30 years | 29 | 5,198 | 861 | 1,544 | 400 | 425 | 533 | 875 | 1,477 | 869 | 42 | 1,655 | 835 | 156 | 259 | 288 | 1,003 | 749 | 468 | 17,667 |
| 40 years | 26 | 4,937 | 864 | 1,549 | 450 | 512 | 537 | 897 | 1,776 | 1,097 | 44 | 1,223 | 657 | 195 | 308 | 204 | 957 | 877 | 558 | 17,667 |
| 50 years | 29 | 4,715 | 885 | 1,599 | 503 | 575 | 499 | 810 | 1,972 | 1,243 | 43 | 1,017 | 512 | 181 | 336 | 181 | 958 | 979 | 631 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 34 | 6 | 7 | 1 | 1 | 3 | 5 | 3 | 2 | 1 | 18 | 5 | 0 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 33 | 6 | 8 | 1 | 1 | 3 | 4 | 4 | 3 | 0 | 16 | 5 | 1 | 1 | 3 | 6 | 3 | 2 | 100 |
| 20 years | 0 | 32 | 5 | 9 | 2 | 2 | 3 | 5 | 6 | 4 | 0 | 13 | 5 | 1 | 1 | 2 | 6 | 3 | 2 | 100 |
| 30 years | 0 | 29 | 5 | 9 | 2 | 2 | 3 | 5 | 8 | 5 | 0 | 9 | 5 | 1 | 1 | 2 | 6 | 4 | 3 | 100 |
| 40 years | 0 | 28 | 5 | 9 | 3 | 3 | 3 | 5 | 10 | 6 | 0 | 7 | 4 | 1 | 2 | 1 | 5 | 5 | 3 | 100 |
| 50 years | 0 | 27 | 5 | 9 | 3 | 3 | 3 | 5 | 11 | 7 | 0 | 6 | 3 | 1 | 2 | 1 | 5 | 6 | 4 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 42 | 5 | 95 | 95 | 69 | 33 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 43 | 12 | 94 | 94 | 70 | 39 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 49 | 22 | 91 | 93 | 69 | 35 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 51 | 25 | 90 | 89 | 70 | 29 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 51 | 25 | 88 | 87 | 70 | 27 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 50 | 29 | 87 | 85 | 72 | 35 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 33. Alternative B SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 34 | 6,206 | 1,149 | 989 | 173 | 154 | 470 | 720 | 474 | 313 | 85 | 3,636 | 827 | 80 | 149 | 686 | 1,035 | 305 | 193 | 17,667 |
| 15-year planning period | 16 | 6,053 | 1,142 | 1,137 | 205 | 209 | 457 | 628 | 624 | 428 | 41 | 3,329 | 942 | 97 | 195 | 465 | 999 | 451 | 247 | 17,667 |
| 20 years | 22 | 5,831 | 1,103 | 1,222 | 261 | 229 | 475 | 674 | 766 | 510 | 47 | 2,936 | 1,004 | 102 | 235 | 392 | 1,011 | 521 | 326 | 17,667 |
| 30 years | 22 | 5,453 | 1,056 | 1,271 | 304 | 342 | 473 | 704 | 1,105 | 673 | 37 | 2,378 | 971 | 146 | 263 | 315 | 993 | 716 | 446 | 17,667 |
| 40 years | 18 | 5,176 | 1,074 | 1,298 | 367 | 410 | 462 | 718 | 1,330 | 832 | 33 | 1,971 | 849 | 182 | 311 | 257 | 964 | 889 | 524 | 17,667 |
| 50 years | 19 | 5,024 | 1,085 | 1,337 | 390 | 456 | 464 | 671 | 1,454 | 964 | 32 | 1,683 | 742 | 196 | 346 | 220 | 991 | 983 | 609 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 35 | 7 | 6 | 1 | 1 | 3 | 4 | 3 | 2 | 0 | 21 | 5 | 0 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 34 | 6 | 6 | 1 | 1 | 3 | 4 | 4 | 2 | 0 | 19 | 5 | 1 | 1 | 3 | 6 | 3 | 1 | 100 |
| 20 years | 0 | 33 | 6 | 7 | 1 | 1 | 3 | 4 | 4 | 3 | 0 | 17 | 6 | 1 | 1 | 2 | 6 | 3 | 2 | 100 |
| 30 years | 0 | 31 | 6 | 7 | 2 | 2 | 3 | 4 | 6 | 4 | 0 | 13 | 5 | 1 | 1 | 2 | 6 | 4 | 3 | 100 |
| 40 years | 0 | 29 | 6 | 7 | 2 | 2 | 3 | 4 | 8 | 5 | 0 | 11 | 5 | 1 | 2 | 1 | 5 | 5 | 3 | 100 |
| 50 years | 0 | 28 | 6 | 8 | 2 | 3 | 3 | 4 | 8 | 5 | 0 | 10 | 4 | 1 | 2 | 1 | 6 | 6 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 35 | 20 | 96 | 96 | 73 | 42 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 35 | 8 | 95 | 95 | 74 | 49 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 38 | 1 | 93 | 94 | 73 | 46 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 40 | 3 | 92 | 91 | 73 | 43 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 39 | 5 | 91 | 89 | 74 | 42 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 39 | 8 | 90 | 88 | 74 | 46 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 34. Alternative B SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 34 | 6,382 | 1,281 | 803 | 147 | 119 | 387 | 617 | 341 | 221 | 73 | 4,042 | 783 | 74 | 142 | 721 | 1,028 | 296 | 187 | 17,667 |
| 15-year planning period | 7 | 6,271 | 1,275 | 888 | 168 | 180 | 384 | 505 | 463 | 283 | 23 | 3,900 | 937 | 89 | 169 | 477 | 972 | 450 | 227 | 17,667 |
| 20 years | 10 | 6,058 | 1,311 | 930 | 189 | 175 | 405 | 539 | 524 | 355 | 37 | 3,545 | 1,049 | 92 | 228 | 395 | 992 | 516 | 317 | 17,667 |
| 30 years | 14 | 5,708 | 1,251 | 999 | 207 | 259 | 413 | 532 | 733 | 478 | 32 | 3,101 | 1,106 | 137 | 266 | 341 | 983 | 683 | 423 | 17,667 |
| 40 years | 10 | 5,416 | 1,284 | 1,048 | 284 | 308 | 387 | 539 | 884 | 568 | 22 | 2,720 | 1,041 | 170 | 314 | 311 | 970 | 901 | 491 | 17,667 |
| 50 years | 9 | 5,334 | 1,285 | 1,074 | 277 | 338 | 430 | 532 | 936 | 685 | 21 | 2,349 | 971 | 211 | 355 | 259 | 1,025 | 986 | 588 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 36 | 7 | 5 | 1 | 1 | 2 | 3 | 2 | 1 | 0 | 23 | 4 | 0 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 35 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 22 | 5 | 1 | 1 | 3 | 6 | 3 | 1 | 100 |
| 20 years | 0 | 34 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 20 | 6 | 1 | 1 | 2 | 6 | 3 | 2 | 100 |
| 30 years | 0 | 32 | 7 | 6 | 1 | 1 | 2 | 3 | 4 | 3 | 0 | 18 | 6 | 1 | 2 | 2 | 6 | 4 | 2 | 100 |
| 40 years | 0 | 31 | 7 | 6 | 2 | 2 | 2 | 3 | 5 | 3 | 0 | 15 | 6 | 1 | 2 | 2 | 5 | 5 | 3 | 100 |
| 50 years | 0 | 30 | 7 | 6 | 2 | 2 | 2 | 3 | 5 | 4 | 0 | 13 | 5 | 1 | 2 | 1 | 6 | 6 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 28 | 35 | 96 | 97 | 78 | 50 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 28 | 28 | 96 | 95 | 78 | 59 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 26 | 25 | 95 | 95 | 77 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 29 | 19 | 95 | 93 | 77 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 27 | 15 | 93 | 92 | 78 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 27 | 13 | 93 | 91 | 76 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative C Proposed High Acre Treatment Objectives

**Appendix B table 35. Alternative C SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 53 | 5,822 | 889 | 1,285 | 232 | 207 | 554 | 893 | 679 | 528 | 169 | 3,010 | 838 | 110 | 148 | 729 | 1,040 | 284 | 196 | 17,667 |
| 15-year planning period | 44 | 5,404 | 880 | 1,507 | 280 | 281 | 556 | 966 | 978 | 675 | 122 | 2,521 | 868 | 119 | 201 | 564 | 1,062 | 384 | 254 | 17,667 |
| 20 years | 39 | 5,186 | 754 | 1,650 | 361 | 381 | 543 | 983 | 1,249 | 754 | 100 | 2,106 | 879 | 126 | 235 | 412 | 1,022 | 530 | 359 | 17,667 |
| 30 years | 33 | 4,797 | 758 | 1,787 | 476 | 482 | 536 | 1,055 | 1,636 | 1,003 | 67 | 1,444 | 690 | 153 | 275 | 290 | 1,000 | 728 | 459 | 17,667 |
| 40 years | 41 | 4,542 | 739 | 1,691 | 551 | 546 | 517 | 989 | 2,037 | 1,232 | 67 | 1,112 | 603 | 161 | 314 | 188 | 927 | 914 | 496 | 17,667 |
| 50 years | 33 | 4,266 | 747 | 1,708 | 608 | 656 | 486 | 961 | 2,242 | 1,435 | 70 | 899 | 457 | 185 | 318 | 181 | 793 | 991 | 631 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 33 | 5 | 7 | 1 | 1 | 3 | 5 | 4 | 3 | 1 | 17 | 5 | 1 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 31 | 5 | 9 | 2 | 2 | 3 | 5 | 6 | 4 | 1 | 14 | 5 | 1 | 1 | 3 | 6 | 2 | 1 | 100 |
| 20 years | 0 | 29 | 4 | 9 | 2 | 2 | 3 | 6 | 7 | 4 | 1 | 12 | 5 | 1 | 1 | 2 | 6 | 3 | 2 | 100 |
| 30 years | 0 | 27 | 4 | 10 | 3 | 3 | 3 | 6 | 9 | 6 | 0 | 8 | 4 | 1 | 2 | 2 | 6 | 4 | 3 | 100 |
| 40 years | 0 | 26 | 4 | 10 | 3 | 3 | 3 | 6 | 12 | 7 | 0 | 6 | 3 | 1 | 2 | 1 | 5 | 5 | 3 | 100 |
| 50 years | 0 | 24 | 4 | 10 | 3 | 4 | 3 | 5 | 13 | 8 | 0 | 5 | 3 | 1 | 2 | 1 | 4 | 6 | 4 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 50 | 4 | 94 | 95 | 69 | 28 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 50 | 22 | 93 | 93 | 69 | 22 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 57 | 33 | 91 | 90 | 69 | 21 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 57 | 44 | 88 | 88 | 70 | 15 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 58 | 37 | 86 | 86 | 71 | 20 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 58 | 38 | 84 | 83 | 72 | 22 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative C Proposed Average Acre Treatment Objectives

**Appendix B table 36. Alternative C SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 39 | 6,066 | 1,060 | 1,042 | 192 | 170 | 479 | 731 | 519 | 364 | 137 | 3,607 | 822 | 93 | 144 | 692 | 1,049 | 289 | 174 | 17,667 |
| 15-year planning period | 32 | 5,735 | 1,073 | 1,194 | 237 | 219 | 472 | 755 | 741 | 479 | 84 | 3,232 | 938 | 99 | 181 | 521 | 1,037 | 396 | 244 | 17,667 |
| 20 years | 27 | 5,551 | 1,001 | 1,298 | 279 | 289 | 471 | 768 | 893 | 534 | 74 | 2,932 | 964 | 118 | 221 | 413 | 974 | 527 | 331 | 17,667 |
| 30 years | 26 | 5,179 | 983 | 1,413 | 362 | 362 | 470 | 792 | 1,189 | 740 | 53 | 2,324 | 901 | 147 | 267 | 342 | 991 | 691 | 435 | 17,667 |
| 40 years | 27 | 4,931 | 1,006 | 1,325 | 423 | 424 | 455 | 758 | 1,474 | 901 | 50 | 1,970 | 833 | 155 | 301 | 263 | 981 | 878 | 510 | 17,667 |
| 50 years | 25 | 4,669 | 989 | 1,383 | 434 | 512 | 455 | 737 | 1,627 | 1,045 | 55 | 1,679 | 743 | 199 | 331 | 229 | 943 | 997 | 616 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 34 | 6 | 6 | 1 | 1 | 3 | 4 | 3 | 2 | 1 | 20 | 5 | 1 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 32 | 6 | 7 | 1 | 1 | 3 | 4 | 4 | 3 | 0 | 18 | 5 | 1 | 1 | 3 | 6 | 2 | 1 | 100 |
| 20 years | 0 | 31 | 6 | 7 | 2 | 2 | 3 | 4 | 5 | 3 | 0 | 17 | 5 | 1 | 1 | 2 | 6 | 3 | 2 | 100 |
| 30 years | 0 | 29 | 6 | 8 | 2 | 2 | 3 | 4 | 7 | 4 | 0 | 13 | 5 | 1 | 2 | 2 | 6 | 4 | 2 | 100 |
| 40 years | 0 | 28 | 6 | 7 | 2 | 2 | 3 | 4 | 8 | 5 | 0 | 11 | 5 | 1 | 2 | 1 | 6 | 5 | 3 | 100 |
| 50 years | 0 | 26 | 6 | 8 | 2 | 3 | 3 | 4 | 9 | 6 | 0 | 10 | 4 | 1 | 2 | 1 | 5 | 6 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 40 | 16 | 95 | 96 | 73 | 41 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 39 | 3 | 94 | 94 | 73 | 39 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 43 | 5 | 93 | 93 | 73 | 38 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 44 | 14 | 91 | 91 | 73 | 36 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 43 | 7 | 89 | 89 | 74 | 39 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 44 | 12 | 89 | 87 | 74 | 40 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative C Proposed Low Acre Treatment Objectives

**Appendix B table 37. Alternative C SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 24 | 6,309 | 1,232 | 798 | 152 | 132 | 404 | 568 | 360 | 201 | 105 | 4,204 | 805 | 75 | 141 | 655 | 1,057 | 294 | 151 | 17,667 |
| 15-year planning period | 21 | 6,065 | 1,266 | 882 | 194 | 157 | 387 | 543 | 503 | 283 | 46 | 3,943 | 1,007 | 78 | 160 | 478 | 1,013 | 408 | 233 | 17,667 |
| 20 years | 15 | 5,917 | 1,249 | 946 | 197 | 198 | 399 | 553 | 538 | 315 | 47 | 3,758 | 1,050 | 110 | 207 | 415 | 926 | 524 | 303 | 17,667 |
| 30 years | 20 | 5,562 | 1,207 | 1,038 | 247 | 243 | 405 | 530 | 742 | 477 | 39 | 3,205 | 1,111 | 140 | 258 | 394 | 983 | 654 | 411 | 17,667 |
| 40 years | 14 | 5,320 | 1,274 | 959 | 295 | 302 | 393 | 527 | 911 | 571 | 33 | 2,828 | 1,063 | 149 | 289 | 338 | 1,035 | 842 | 524 | 17,667 |
| 50 years | 16 | 5,073 | 1,231 | 1,059 | 261 | 368 | 424 | 513 | 1,013 | 655 | 40 | 2,458 | 1,028 | 212 | 343 | 276 | 1,093 | 1,002 | 601 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 36 | 7 | 5 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 24 | 5 | 0 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 34 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 22 | 6 | 0 | 1 | 3 | 6 | 2 | 1 | 100 |
| 20 years | 0 | 33 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 21 | 6 | 1 | 1 | 2 | 5 | 3 | 2 | 100 |
| 30 years | 0 | 31 | 7 | 6 | 1 | 1 | 2 | 3 | 4 | 3 | 0 | 18 | 6 | 1 | 1 | 2 | 6 | 4 | 2 | 100 |
| 40 years | 0 | 30 | 7 | 5 | 2 | 2 | 2 | 3 | 5 | 3 | 0 | 16 | 6 | 1 | 2 | 2 | 6 | 5 | 3 | 100 |
| 50 years | 0 | 29 | 7 | 6 | 1 | 2 | 2 | 3 | 6 | 4 | 0 | 14 | 6 | 1 | 2 | 2 | 6 | 6 | 3 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 30 | 35 | 96 | 97 | 77 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 28 | 29 | 95 | 96 | 78 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 29 | 24 | 95 | 95 | 77 | 55 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 32 | 16 | 94 | 94 | 77 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 28 | 22 | 92 | 92 | 78 | 57 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 30 | 14 | 93 | 91 | 76 | 59 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 38. Alternative D SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 31 | 5,860 | 814 | 1,331 | 248 | 204 | 501 | 1,009 | 752 | 351 | 156 | 2,837 | 855 | 78 | 192 | 694 | 1,241 | 290 | 226 | 17,667 |
| 15-year planning period | 31 | 5,489 | 835 | 1,577 | 256 | 296 | 514 | 963 | 1,059 | 568 | 85 | 2,245 | 932 | 90 | 219 | 455 | 1,324 | 470 | 257 | 17,667 |
| 20 years | 39 | 5,320 | 809 | 1,769 | 347 | 374 | 522 | 951 | 1,279 | 681 | 84 | 1,665 | 834 | 113 | 242 | 354 | 1,314 | 601 | 368 | 17,667 |
| 30 years | 49 | 4,791 | 744 | 1,822 | 439 | 521 | 513 | 1,005 | 1,820 | 928 | 70 | 1,137 | 625 | 176 | 310 | 224 | 1,191 | 774 | 528 | 17,667 |
| 40 years | 37 | 4,422 | 646 | 1,834 | 574 | 574 | 555 | 1,001 | 2,201 | 1,218 | 56 | 793 | 463 | 209 | 325 | 210 | 957 | 994 | 600 | 17,667 |
| 50 years | 38 | 4,250 | 672 | 1,683 | 661 | 663 | 536 | 1,006 | 2,545 | 1,381 | 49 | 573 | 319 | 228 | 313 | 124 | 864 | 1,097 | 665 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 33 | 5 | 8 | 1 | 1 | 3 | 6 | 4 | 2 | 1 | 16 | 5 | 0 | 1 | 4 | 7 | 2 | 1 | 100 |
| 15-year planning period | 0 | 31 | 5 | 9 | 1 | 2 | 3 | 5 | 6 | 3 | 0 | 13 | 5 | 1 | 1 | 3 | 7 | 3 | 1 | 100 |
| 20 years | 0 | 30 | 5 | 10 | 2 | 2 | 3 | 5 | 7 | 4 | 0 | 9 | 5 | 1 | 1 | 2 | 7 | 3 | 2 | 100 |
| 30 years | 0 | 27 | 4 | 10 | 2 | 3 | 3 | 6 | 10 | 5 | 0 | 6 | 4 | 1 | 2 | 1 | 7 | 4 | 3 | 100 |
| 40 years | 0 | 25 | 4 | 10 | 3 | 3 | 3 | 6 | 12 | 7 | 0 | 4 | 3 | 1 | 2 | 1 | 5 | 6 | 3 | 100 |
| 50 years | 0 | 24 | 4 | 10 | 4 | 4 | 3 | 6 | 14 | 8 | 0 | 3 | 2 | 1 | 2 | 1 | 5 | 6 | 4 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 54 | 8 | 94 | 95 | 72 | 18 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 53 | 27 | 93 | 92 | 71 | 22 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 54 | 43 | 91 | 90 | 70 | 23 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 58 | 47 | 89 | 87 | 71 | 19 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 63 | 48 | 85 | 85 | 69 | 19 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 62 | 36 | 83 | 83 | 70 | 19 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## SFF Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 39. Alternative D SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 29 | 6,133 | 993 | 1,055 | 196 | 176 | 451 | 823 | 548 | 288 | 112 | 3,424 | 869 | 75 | 158 | 682 | 1,164 | 288 | 210 | 17,667 |
| 15-year planning period | 21 | 5,822 | 1,033 | 1,251 | 225 | 236 | 456 | 786 | 778 | 427 | 63 | 3,015 | 925 | 88 | 187 | 445 | 1,215 | 435 | 260 | 17,667 |
| 20 years | 26 | 5,648 | 1,031 | 1,391 | 275 | 296 | 462 | 766 | 952 | 498 | 49 | 2,533 | 920 | 103 | 227 | 388 | 1,178 | 592 | 332 | 17,667 |
| 30 years | 34 | 5,311 | 978 | 1,416 | 333 | 381 | 472 | 775 | 1,318 | 712 | 44 | 1,998 | 837 | 150 | 287 | 270 | 1,104 | 769 | 480 | 17,667 |
| 40 years | 25 | 4,920 | 989 | 1,490 | 432 | 448 | 487 | 773 | 1,592 | 862 | 42 | 1,586 | 741 | 211 | 317 | 257 | 996 | 926 | 573 | 17,667 |
| 50 years | 24 | 4,790 | 941 | 1,393 | 500 | 509 | 496 | 809 | 1,847 | 1,004 | 34 | 1,278 | 615 | 205 | 328 | 189 | 979 | 1,078 | 648 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 35 | 6 | 6 | 1 | 1 | 3 | 5 | 3 | 2 | 1 | 19 | 5 | 0 | 1 | 4 | 7 | 2 | 1 | 100 |
| 15-year planning period | 0 | 33 | 6 | 7 | 1 | 1 | 3 | 4 | 4 | 2 | 0 | 17 | 5 | 0 | 1 | 3 | 7 | 2 | 1 | 100 |
| 20 years | 0 | 32 | 6 | 8 | 2 | 2 | 3 | 4 | 5 | 3 | 0 | 14 | 5 | 1 | 1 | 2 | 7 | 3 | 2 | 100 |
| 30 years | 0 | 30 | 6 | 8 | 2 | 2 | 3 | 4 | 7 | 4 | 0 | 11 | 5 | 1 | 2 | 2 | 6 | 4 | 3 | 100 |
| 40 years | 0 | 28 | 6 | 8 | 2 | 3 | 3 | 4 | 9 | 5 | 0 | 9 | 4 | 1 | 2 | 1 | 6 | 5 | 3 | 100 |
| 50 years | 0 | 27 | 5 | 8 | 3 | 3 | 3 | 5 | 10 | 6 | 0 | 7 | 3 | 1 | 2 | 1 | 6 | 6 | 4 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 44 | 15 | 95 | 95 | 74 | 33 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 42 | 1 | 94 | 94 | 74 | 36 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 42 | 12 | 93 | 92 | 74 | 38 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 45 | 14 | 91 | 90 | 73 | 37 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 44 | 20 | 89 | 88 | 72 | 38 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 47 | 13 | 87 | 87 | 72 | 35 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

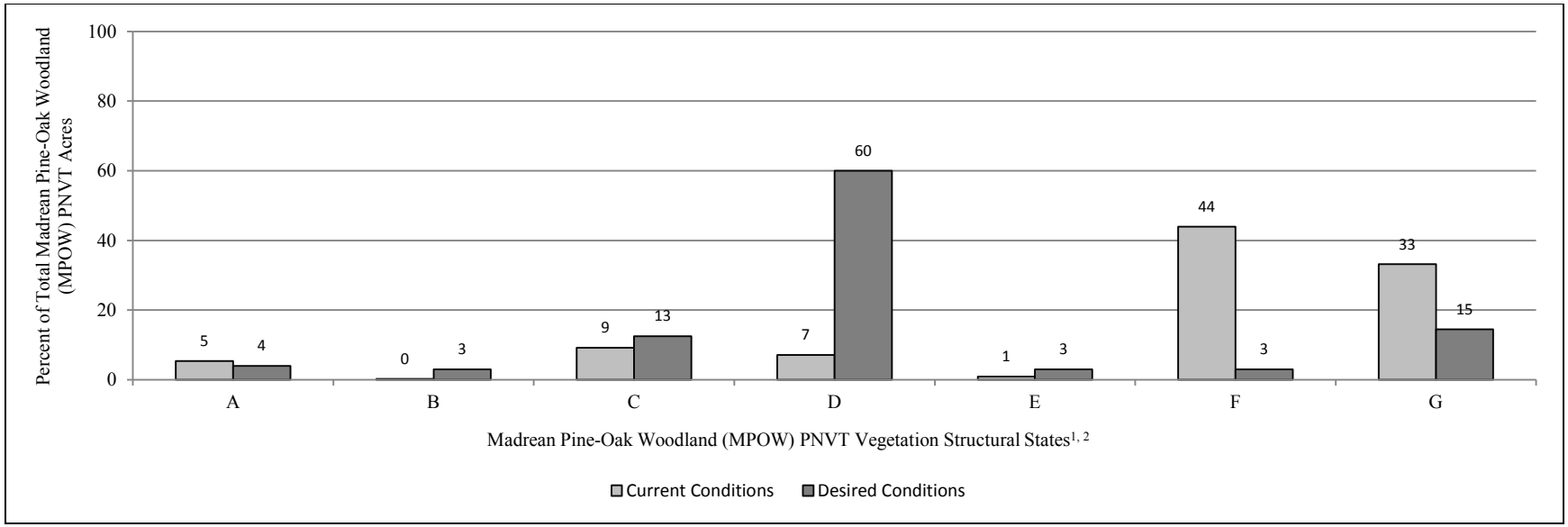
## SFF Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 40. Alternative D SFF resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | SFF Vegetation Structural State | | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | |
| **Number of acres in each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *1,590* | *2,297* | *1,767* | *1,237* | *3,887* | *3,887* | *1,767* | *1,237* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *17,667* |
| *Initial Conditions* | *1,887* | *5,875* | *1,324* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *1,887* | *2,488* | *600* | *93* | *73* | *62* | *1,261* | *8* | *6* | *17,667* |
| 10 years | 27 | 6,404 | 1,173 | 778 | 143 | 147 | 402 | 638 | 343 | 225 | 67 | 4,012 | 883 | 73 | 124 | 669 | 1,088 | 287 | 194 | 17,667 |
| 15-year planning period | 10 | 6,155 | 1,232 | 925 | 194 | 175 | 398 | 608 | 498 | 285 | 40 | 3,784 | 919 | 85 | 154 | 436 | 1,106 | 400 | 262 | 17,667 |
| 20 years | 14 | 5,975 | 1,254 | 1,012 | 204 | 218 | 402 | 581 | 624 | 315 | 13 | 3,401 | 1,006 | 94 | 213 | 421 | 1,042 | 583 | 295 | 17,667 |
| 30 years | 18 | 5,831 | 1,211 | 1,010 | 227 | 241 | 430 | 544 | 817 | 495 | 18 | 2,858 | 1,048 | 123 | 265 | 316 | 1,017 | 764 | 432 | 17,667 |
| 40 years | 14 | 5,417 | 1,332 | 1,146 | 290 | 322 | 419 | 545 | 982 | 505 | 28 | 2,380 | 1,020 | 214 | 309 | 304 | 1,035 | 859 | 545 | 17,667 |
| 50 years | 9 | 5,331 | 1,210 | 1,103 | 339 | 356 | 455 | 613 | 1,149 | 626 | 20 | 1,983 | 912 | 183 | 342 | 254 | 1,095 | 1,059 | 632 | 17,667 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *9* | *13* | *10* | *7* | *22* | *22* | *10* | *7* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *11* | *33* | *7* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *11* | *14* | *3* | *1* | *0* | *0* | *7* | *0* | *0* | *100* |
| 10 years | 0 | 36 | 7 | 4 | 1 | 1 | 2 | 4 | 2 | 1 | 0 | 23 | 5 | 0 | 1 | 4 | 6 | 2 | 1 | 100 |
| 15-year planning period | 0 | 35 | 7 | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 0 | 21 | 5 | 0 | 1 | 2 | 6 | 2 | 1 | 100 |
| 20 years | 0 | 34 | 7 | 6 | 1 | 1 | 2 | 3 | 4 | 2 | 0 | 19 | 6 | 1 | 1 | 2 | 6 | 3 | 2 | 100 |
| 30 years | 0 | 33 | 7 | 6 | 1 | 1 | 2 | 3 | 5 | 3 | 0 | 16 | 6 | 1 | 1 | 2 | 6 | 4 | 2 | 100 |
| 40 years | 0 | 31 | 8 | 6 | 2 | 2 | 2 | 3 | 6 | 3 | 0 | 13 | 6 | 1 | 2 | 2 | 6 | 5 | 3 | 100 |
| 50 years | 0 | 30 | 7 | 6 | 2 | 2 | 3 | 3 | 7 | 4 | 0 | 11 | 5 | 1 | 2 | 1 | 6 | 6 | 4 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | | | | | | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *100* | *25* | *51* | *98* | *98* | *96* | *2* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | |
| 10 years | 100 | 100 | 34 | 37 | 96 | 96 | 77 | 48 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 15-year planning period | 100 | 100 | 30 | 25 | 95 | 95 | 77 | 51 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 20 years | 100 | 100 | 29 | 18 | 95 | 94 | 77 | 53 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 30 years | 100 | 100 | 31 | 18 | 94 | 94 | 76 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 40 years | 100 | 100 | 25 | 7 | 93 | 92 | 76 | 56 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| 50 years | 100 | 100 | 32 | 11 | 91 | 91 | 74 | 50 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |

## Woodland PNVTs

## Madrean Pine-Oak




**Appendix B figure 5. Madrean pine-oak woodland potential natural vegetation type current and desired vegetation structural states**

[1] Madrean Pine-Oak Woodland (MPOW) PNVT Vegetation Structural States. At 394,928 acres or approximately 20% of the forests this PNVT ranks 2nd in order of size out of the 14 PNVTs on the ASNFs

State A - Recently burned, grass, forb and shrub types with < 10% tree canopy cover; early successional development
State B - Seedling and sapling size (< 5" diameter) trees with open (< 30%) canopy cover; all tree types; early successional development
State C - Small size (5"-9.9" diameter) trees, with open canopy cover; all tree types; mid successional development
State D - Medium and large to very large size (≥ 10" diameter) trees, with open canopy cover; all tree types; late successional development
State E - Seedling and sapling size trees with closed (≥ 30%) canopy cover; all tree types; early successional development
State F - Small size trees, with closed canopy cover; all tree types; mid successional development
State G - Medium and large to very large size trees, with closed canopy cover; all tree types; late successional development

[2] MPOW PNVT has a 61% or high departure rating from Desired Conditions (DC) and a 72% or high departure rating from Historical Range of Variability (HRV) making it the 4th most departed PNVT on the ASNFs for both DC and HRV. Desired Conditions were provided by the Regional Office, and HRRV was derived from the Nature Conservancy (Schussman and Gori 2006)

## MPOW Alternative A

### Appendix B table 41. Alternative A MPOW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 22,629 | 4,423 | 21,168 | 44,587 | 3,673 | 139,765 | 158,683 | *394,928* |
| 15year planning period | 22,748 | 4,700 | 17,416 | 48,576 | 4,028 | 122,151 | 175,309 | *394,928* |
| 20 years | 23,182 | 5,805 | 14,968 | 52,091 | 4,739 | 109,079 | 185,064 | *394,928* |
| 30 years | 24,683 | 6,832 | 11,453 | 56,949 | 4,818 | 91,860 | 198,333 | *394,928* |
| 40 years | 25,710 | 6,477 | 9,439 | 60,819 | 6,240 | 75,036 | 211,207 | *394,928* |
| 50 years | 26,658 | 7,188 | 8,254 | 66,387 | 4,779 | 66,585 | 215,077 | *394,928* |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 6 | 1 | 5 | 11 | 1 | 35 | 40 | 100 |
| 15year planning period | 6 | 1 | 4 | 12 | 1 | 31 | 44 | 100 |
| 20 years | 6 | 1 | 4 | 13 | 1 | 28 | 47 | 100 |
| 30 years | 6 | 2 | 3 | 14 | 1 | 23 | 50 | 100 |
| 40 years | 7 | 2 | 2 | 15 | 2 | 19 | 53 | 100 |
| 50 years | 7 | 2 | 2 | 17 | 1 | 17 | 54 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 63 | 59 | 81 | 69 | 100 | 100 | |
| 15year planning period | 100 | 60 | 66 | 80 | 66 | 100 | 100 | |
| 20 years | 100 | 51 | 71 | 78 | 60 | 100 | 100 | |
| 30 years | 100 | 42 | 78 | 76 | 59 | 100 | 100 | |
| 40 years | 100 | 45 | 82 | 74 | 47 | 100 | 100 | |
| 50 years | 100 | 39 | 84 | 72 | 60 | 100 | 100 | |

## MPOW Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 42. Alternative B MPOW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 15,679 | 4,779 | 40,204 | 79,538 | 3,357 | 108,684 | 142,687 | 394,928 |
| 15year planning period | 19,588 | 6,003 | 38,268 | 98,732 | 4,147 | 91,623 | 136,566 | 394,928 |
| 20 years | 23,143 | 7,780 | 35,070 | 113,937 | 3,989 | 79,973 | 131,037 | 394,928 |
| 30 years | 28,553 | 10,268 | 29,106 | 137,593 | 5,766 | 55,566 | 128,075 | 394,928 |
| 40 years | 33,411 | 11,927 | 23,261 | 148,177 | 6,595 | 49,445 | 122,112 | 394,928 |
| 50 years | 36,254 | 14,928 | 21,682 | 152,126 | 7,188 | 42,139 | 120,611 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 4 | 1 | 10 | 20 | 1 | 28 | 36 | 100 |
| 15year planning period | 5 | 2 | 10 | 25 | 1 | 23 | 35 | 100 |
| 20 years | 6 | 2 | 9 | 29 | 1 | 20 | 33 | 100 |
| 30 years | 7 | 3 | 7 | 35 | 1 | 14 | 32 | 100 |
| 40 years | 8 | 3 | 6 | 38 | 2 | 13 | 31 | 100 |
| 50 years | 9 | 4 | 5 | 39 | 2 | 11 | 31 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 60 | 22 | 66 | 72 | 100 | 100 | |
| 15year planning period | 100 | 49 | 25 | 58 | 65 | 100 | 100 | |
| 20 years | 100 | 34 | 32 | 52 | 66 | 100 | 100 | |
| 30 years | 100 | 13 | 43 | 42 | 51 | 100 | 100 | |
| 40 years | 100 | 1 | 55 | 37 | 44 | 100 | 100 | |
| 50 years | 100 | 26 | 58 | 36 | 39 | 100 | 100 | |

## MPOW Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 43. Alternative B MPOW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 13,921 | 4,147 | 33,075 | 66,605 | 3,772 | 118,715 | 154,693 | 394,928 |
| 15year planning period | 17,811 | 5,450 | 31,614 | 79,795 | 4,048 | 101,220 | 154,989 | 394,928 |
| 20 years | 20,753 | 6,556 | 27,823 | 93,144 | 3,989 | 90,004 | 152,659 | 394,928 |
| 30 years | 25,493 | 8,767 | 23,893 | 111,863 | 5,233 | 66,585 | 153,094 | 394,928 |
| 40 years | 29,620 | 9,972 | 19,154 | 121,855 | 6,240 | 56,336 | 151,751 | 394,928 |
| 50 years | 31,515 | 11,729 | 17,831 | 126,061 | 6,694 | 48,971 | 152,126 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 4 | 1 | 8 | 17 | 1 | 30 | 39 | 100 |
| 15year planning period | 5 | 1 | 8 | 20 | 1 | 26 | 39 | 100 |
| 20 years | 5 | 2 | 7 | 24 | 1 | 23 | 39 | 100 |
| 30 years | 6 | 2 | 6 | 28 | 1 | 17 | 39 | 100 |
| 40 years | 8 | 3 | 5 | 31 | 2 | 14 | 38 | 100 |
| 50 years | 8 | 3 | 5 | 32 | 2 | 12 | 39 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 65 | 36 | 72 | 68 | 100 | 100 | |
| 15year planning period | 100 | 54 | 38 | 66 | 66 | 100 | 100 | |
| 20 years | 100 | 45 | 46 | 61 | 66 | 100 | 100 | |
| 30 years | 100 | 26 | 53 | 53 | 56 | 100 | 100 | |
| 40 years | 100 | 16 | 63 | 49 | 47 | 100 | 100 | |
| 50 years | 100 | 1 | 65 | 47 | 44 | 100 | 100 | |

## MPOW Alternative B Proposed Low Acre Treatment Objectives

### Appendix B table 44. Alternative B MPOW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 12,164 | 3,515 | 25,947 | 53,671 | 4,186 | 128,746 | 166,699 | 394,928 |
| 15year planning period | 16,034 | 4,897 | 24,959 | 60,858 | 3,949 | 110,817 | 173,413 | 394,928 |
| 20 years | 18,364 | 5,332 | 20,576 | 72,351 | 3,989 | 100,035 | 174,282 | 394,928 |
| 30 years | 22,432 | 7,267 | 18,680 | 86,134 | 4,700 | 77,603 | 178,112 | 394,928 |
| 40 years | 25,828 | 8,017 | 15,047 | 95,533 | 5,884 | 63,228 | 181,390 | 394,928 |
| 50 years | 26,776 | 8,530 | 13,980 | 99,996 | 6,200 | 55,803 | 183,641 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 3 | 1 | 7 | 14 | 1 | 33 | 42 | 100 |
| 15year planning period | 4 | 1 | 6 | 15 | 1 | 28 | 44 | 100 |
| 20 years | 5 | 1 | 5 | 18 | 1 | 25 | 44 | 100 |
| 30 years | 6 | 2 | 5 | 22 | 1 | 20 | 45 | 100 |
| 40 years | 7 | 2 | 4 | 24 | 1 | 16 | 46 | 100 |
| 50 years | 7 | 2 | 4 | 25 | 2 | 14 | 46 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 70 | 49 | 77 | 65 | 100 | 100 | |
| 15year planning period | 100 | 59 | 51 | 74 | 67 | 100 | 100 | |
| 20 years | 100 | 55 | 60 | 69 | 66 | 100 | 100 | |
| 30 years | 100 | 39 | 64 | 64 | 60 | 100 | 100 | |
| 40 years | 100 | 32 | 71 | 60 | 50 | 100 | 100 | |
| 50 years | 100 | 28 | 73 | 58 | 48 | 100 | 100 | |

## MPOW Alternative C Proposed High Acre Treatment Objectives

**Appendix B table 45. Alternative C MPOW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 26,421 | 4,028 | 30,291 | 59,002 | 3,317 | 123,810 | 148,058 | 394,928 |
| 15year planning period | 33,529 | 5,213 | 27,092 | 72,509 | 3,831 | 108,487 | 144,267 | 394,928 |
| 20 years | 40,441 | 7,701 | 24,012 | 83,369 | 3,989 | 96,323 | 139,094 | 394,928 |
| 30 years | 50,472 | 10,229 | 20,931 | 98,416 | 5,253 | 71,640 | 137,988 | 394,928 |
| 40 years | 57,422 | 12,598 | 18,246 | 104,103 | 6,200 | 61,925 | 134,433 | 394,928 |
| 50 years | 59,871 | 12,677 | 16,705 | 115,042 | 8,017 | 55,290 | 127,325 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 7 | 1 | 8 | 15 | 1 | 31 | 37 | 100 |
| 15year planning period | 8 | 1 | 7 | 18 | 1 | 27 | 37 | 100 |
| 20 years | 10 | 2 | 6 | 21 | 1 | 24 | 35 | 100 |
| 30 years | 13 | 3 | 5 | 25 | 1 | 18 | 35 | 100 |
| 40 years | 15 | 3 | 5 | 26 | 2 | 16 | 34 | 100 |
| 50 years | 15 | 3 | 4 | 29 | 2 | 14 | 32 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 66 | 41 | 75 | 72 | 100 | 100 | |
| 15year planning period | 100 | 56 | 47 | 69 | 68 | 100 | 100 | |
| 20 years | 100 | 35 | 53 | 65 | 66 | 100 | 100 | |
| 30 years | 100 | 14 | 59 | 58 | 56 | 100 | 100 | |
| 40 years | 100 | 6 | 64 | 56 | 48 | 100 | 100 | |
| 50 years | 100 | 7 | 67 | 51 | 32 | 100 | 100 | |

## MPOW Alternative C Proposed Average Acre Treatment Objectives

**Appendix B table 46. Alternative C MPOW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 19,312 | 4,009 | 25,295 | 52,091 | 3,633 | 129,556 | 161,032 | 394,928 |
| 15year planning period | 24,288 | 4,700 | 22,669 | 61,846 | 3,949 | 114,687 | 162,789 | 394,928 |
| 20 years | 28,632 | 6,042 | 19,983 | 70,001 | 4,009 | 101,358 | 164,902 | 394,928 |
| 30 years | 35,603 | 8,096 | 16,468 | 81,632 | 4,700 | 80,111 | 168,318 | 394,928 |
| 40 years | 40,144 | 9,636 | 14,810 | 87,476 | 5,272 | 66,585 | 171,004 | 394,928 |
| 50 years | 42,257 | 9,834 | 13,210 | 95,493 | 7,030 | 59,042 | 168,061 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 5 | 1 | 6 | 13 | 1 | 33 | 41 | 100 |
| 15year planning period | 6 | 1 | 6 | 16 | 1 | 29 | 41 | 100 |
| 20 years | 7 | 2 | 5 | 18 | 1 | 26 | 42 | 100 |
| 30 years | 9 | 2 | 4 | 21 | 1 | 20 | 43 | 100 |
| 40 years | 10 | 2 | 4 | 22 | 1 | 17 | 43 | 100 |
| 50 years | 11 | 2 | 3 | 24 | 2 | 15 | 43 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 66 | 51 | 78 | 69 | 100 | 100 | |
| 15year planning period | 100 | 60 | 56 | 74 | 67 | 100 | 100 | |
| 20 years | 100 | 49 | 61 | 70 | 66 | 100 | 100 | |
| 30 years | 100 | 32 | 68 | 66 | 60 | 100 | 100 | |
| 40 years | 100 | 19 | 71 | 63 | 56 | 100 | 100 | |
| 50 years | 100 | 17 | 74 | 60 | 41 | 100 | 100 | |

## MPOW Alternative C Proposed Low Acre Treatment Objectives

### Appendix B table 47. Alternative C MPOW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 12,203 | 3,989 | 20,299 | 45,180 | 3,949 | 135,302 | 174,005 | 394,928 |
| 15year planning period | 15,047 | 4,186 | 18,246 | 51,183 | 4,068 | 120,887 | 181,311 | 394,928 |
| 20 years | 16,824 | 4,384 | 15,955 | 56,633 | 4,028 | 106,393 | 190,711 | 394,928 |
| 30 years | 20,734 | 5,963 | 12,006 | 64,847 | 4,147 | 88,582 | 198,649 | 394,928 |
| 40 years | 22,866 | 6,674 | 11,374 | 70,850 | 4,344 | 71,245 | 207,574 | 394,928 |
| 50 years | 24,643 | 6,990 | 9,715 | 75,945 | 6,042 | 62,793 | 208,798 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 3 | 1 | 5 | 11 | 1 | 34 | 44 | 100 |
| 15year planning period | 4 | 1 | 5 | 13 | 1 | 31 | 46 | 100 |
| 20 years | 4 | 1 | 4 | 14 | 1 | 27 | 48 | 100 |
| 30 years | 5 | 2 | 3 | 16 | 1 | 22 | 50 | 100 |
| 40 years | 6 | 2 | 3 | 18 | 1 | 18 | 53 | 100 |
| 50 years | 6 | 2 | 2 | 19 | 2 | 16 | 53 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 66 | 60 | 81 | 67 | 100 | 100 | |
| 15year planning period | 100 | 65 | 64 | 78 | 66 | 100 | 100 | |
| 20 years | 100 | 63 | 69 | 76 | 66 | 100 | 100 | |
| 30 years | 100 | 50 | 77 | 73 | 65 | 100 | 100 | |
| 40 years | 100 | 44 | 78 | 70 | 63 | 100 | 100 | |
| 50 years | 100 | 41 | 81 | 68 | 49 | 100 | 100 | |

## MPOW Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 48. Alternative D MPOW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 17,495 | 6,714 | 60,503 | 108,684 | 3,475 | 84,199 | 113,858 | 394,928 |
| 15year planning period | 22,590 | 8,609 | 55,132 | 134,947 | 3,791 | 66,150 | 103,708 | 394,928 |
| 20 years | 27,250 | 10,347 | 46,009 | 154,614 | 4,423 | 55,566 | 96,678 | 394,928 |
| 30 years | 35,149 | 13,112 | 37,795 | 175,664 | 4,897 | 42,534 | 85,778 | 394,928 |
| 40 years | 42,060 | 17,258 | 30,449 | 183,878 | 6,911 | 34,438 | 79,933 | 394,928 |
| 50 years | 44,153 | 19,154 | 28,079 | 189,012 | 6,556 | 30,409 | 77,564 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 4 | 2 | 15 | 28 | 1 | 21 | 29 | 100 |
| 15year planning period | 6 | 2 | 14 | 34 | 1 | 17 | 26 | 100 |
| 20 years | 7 | 3 | 12 | 39 | 1 | 14 | 24 | 100 |
| 30 years | 9 | 3 | 10 | 44 | 1 | 11 | 22 | 100 |
| 40 years | 11 | 4 | 8 | 47 | 2 | 9 | 20 | 100 |
| 50 years | 11 | 5 | 7 | 48 | 2 | 8 | 20 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 43 | 18 | 54 | 71 | 100 | 92 | |
| 15year planning period | 100 | 27 | 7 | 43 | 68 | 100 | 75 | |
| 20 years | 100 | 13 | 10 | 35 | 63 | 100 | 63 | |
| 30 years | 100 | 11 | 26 | 26 | 59 | 100 | 45 | |
| 40 years | 100 | 46 | 41 | 22 | 42 | 100 | 35 | |
| 50 years | 100 | 62 | 45 | 20 | 45 | 100 | 31 | |

## MPOW Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 49. Alternative D MPOW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

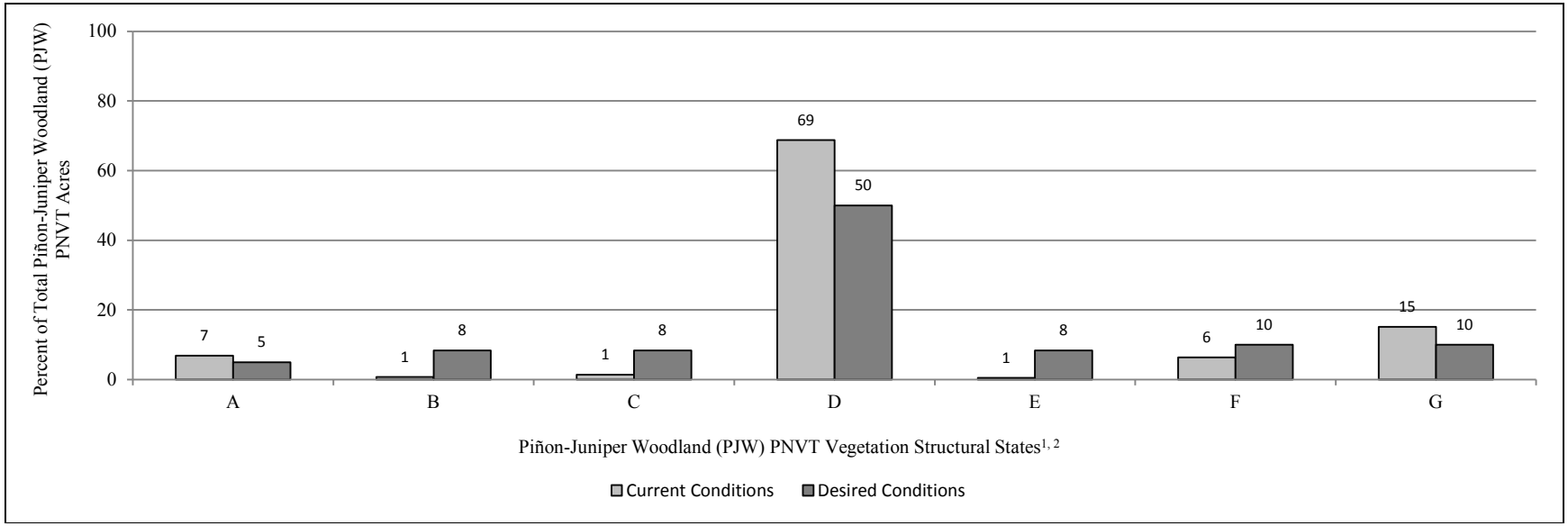
| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 14,770 | 5,253 | 43,837 | 80,723 | 3,633 | 105,959 | 140,752 | 394,928 |
| 15year planning period | 19,036 | 6,437 | 38,723 | 100,272 | 3,594 | 88,878 | 137,988 | 394,928 |
| 20 years | 23,202 | 7,800 | 33,984 | 113,976 | 4,226 | 76,241 | 135,480 | 394,928 |
| 30 years | 29,106 | 9,893 | 27,842 | 131,975 | 4,364 | 57,896 | 133,871 | 394,928 |
| 40 years | 33,450 | 12,322 | 23,715 | 139,844 | 6,121 | 49,011 | 130,464 | 394,928 |
| 50 years | 35,761 | 14,217 | 20,319 | 146,005 | 6,200 | 42,830 | 129,595 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 4 | 1 | 11 | 20 | 1 | 27 | 36 | 100 |
| 15year planning period | 5 | 2 | 10 | 25 | 1 | 23 | 35 | 100 |
| 20 years | 6 | 2 | 9 | 29 | 1 | 19 | 34 | 100 |
| 30 years | 7 | 3 | 7 | 33 | 1 | 15 | 34 | 100 |
| 40 years | 8 | 3 | 6 | 35 | 2 | 12 | 33 | 100 |
| 50 years | 9 | 4 | 5 | 37 | 2 | 11 | 33 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 56 | 15 | 66 | 69 | 100 | 100 | |
| 15year planning period | 100 | 46 | 25 | 58 | 70 | 100 | 100 | |
| 20 years | 100 | 34 | 34 | 52 | 64 | 100 | 100 | |
| 30 years | 100 | 16 | 46 | 44 | 63 | 100 | 100 | |
| 40 years | 100 | 4 | 54 | 41 | 48 | 100 | 100 | |
| 50 years | 100 | 20 | 60 | 38 | 48 | 100 | 100 | |

## MPOW Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 50. Alternative D MPOW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | MPOW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *15,797* | *11,848* | *51,341* | *236,957* | *11,848* | *11,848* | *59,239* | *394,928* |
| *Initial Conditions* | *21,376* | *957* | *36,392* | *28,040* | *3,591* | *173,599* | *130,972* | *394,928* |
| 10 years | 12,045 | 3,791 | 27,171 | 52,762 | 3,791 | 127,720 | 167,647 | 394,928 |
| 15year planning period | 15,481 | 4,265 | 22,313 | 65,597 | 3,396 | 111,607 | 172,267 | 394,928 |
| 20 years | 19,154 | 5,253 | 21,958 | 73,338 | 4,028 | 96,915 | 174,282 | 394,928 |
| 30 years | 23,064 | 6,674 | 17,890 | 88,266 | 3,831 | 73,259 | 181,943 | 394,928 |
| 40 years | 24,841 | 7,385 | 16,982 | 95,809 | 5,332 | 63,583 | 180,995 | 394,928 |
| 50 years | 27,368 | 9,281 | 12,559 | 102,997 | 5,845 | 55,250 | 181,627 | 394,928 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *4* | *3* | *13* | *60* | *3* | *3* | *15* | *100* |
| *Initial Conditions* | *5* | *0* | *9* | *7* | *1* | *44* | *33* | *100* |
| 10 years | 3 | 1 | 7 | 13 | 1 | 32 | 42 | 100 |
| 15year planning period | 4 | 1 | 6 | 17 | 1 | 28 | 44 | 100 |
| 20 years | 5 | 1 | 6 | 19 | 1 | 25 | 44 | 100 |
| 30 years | 6 | 2 | 5 | 22 | 1 | 19 | 46 | 100 |
| 40 years | 6 | 2 | 4 | 24 | 1 | 16 | 46 | 100 |
| 50 years | 7 | 2 | 3 | 26 | 1 | 14 | 46 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *92* | *29* | *88* | *70* | *100* | *100* | |
| 10 years | 100 | 68 | 47 | 78 | 68 | 100 | 100 | |
| 15year planning period | 100 | 64 | 57 | 72 | 71 | 100 | 100 | |
| 20 years | 100 | 56 | 57 | 69 | 66 | 100 | 100 | |
| 30 years | 100 | 44 | 65 | 63 | 68 | 100 | 100 | |
| 40 years | 100 | 38 | 67 | 60 | 55 | 100 | 100 | |
| 50 years | 100 | 22 | 76 | 57 | 51 | 100 | 100 | |

## Piñon-Juniper




**Appendix B figure 6. Piñon-juniper woodland potential natural vegetation type current and desired vegetation structural states**

[1] Piñon-Juniper Woodland (PJW) PNVT Vegetation Structural States. At 222,166 acres or approximately 11% of the forests this PNVT ranks 3rd in order of size out of the 14 PNVTs on the ASNFs

State A - Recently burned, grass, forb and shrub types with < 10% tree canopy cover; early successional development
State B - Seedling and sapling size (< 5" diameter) trees with open (< 30%) canopy cover; all tree types; early successional development
State C - Small size (5"-9.9" diameter) trees, with open canopy cover; all tree types; mid successional development
State D - Medium and large to very large size (≥ 10" diameter) trees, with open canopy cover; all tree types; late successional development
State E - Seedling and sapling size trees with closed (≥ 30%) canopy cover; all tree types; early successional development
State F - Small size trees, with closed canopy cover; all tree types; mid successional development
State G - Medium and large to very large size trees, with closed canopy cover; all tree types; late successional development

[2] PJW PNVT has a 26% or low departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the 9th and 11th most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2005)

## PJW Alternative A

### Appendix B table 51. Alternative A PJW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 14,192 | 7,923 | 4,100 | 120,116 | 5,512 | 15,466 | 54,849 | 222,159 |
| 15year planning period | 13,721 | 8,883 | 3,928 | 106,592 | 7,029 | 17,210 | 64,796 | 222,159 |
| 20 years | 13,724 | 9,606 | 4,811 | 95,046 | 8,202 | 18,767 | 72,003 | 222,159 |
| 30 years | 12,932 | 9,101 | 4,360 | 78,013 | 9,716 | 21,749 | 86,288 | 222,159 |
| 40 years | 12,477 | 8,695 | 4,003 | 64,265 | 9,153 | 26,763 | 96,803 | 222,159 |
| 50 years | 12,570 | 7,859 | 4,382 | 55,361 | 8,019 | 27,252 | 106,716 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *5* | *3* | *7* | *13* | *4* | *3* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 6 | 4 | 2 | 54 | 2 | 7 | 25 | 100 |
| 15year planning period | 6 | 4 | 2 | 48 | 3 | 8 | 29 | 100 |
| 20 years | 6 | 4 | 2 | 43 | 4 | 8 | 32 | 100 |
| 30 years | 6 | 4 | 2 | 35 | 4 | 10 | 39 | 100 |
| 40 years | 6 | 4 | 2 | 29 | 4 | 12 | 44 | 100 |
| 50 years | 6 | 4 | 2 | 25 | 4 | 12 | 48 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 55 | 77 | 8 | 69 | 30 | 100 | |
| 15year planning period | 100 | 50 | 78 | 4 | 60 | 23 | 100 | |
| 20 years | 100 | 46 | 73 | 14 | 54 | 16 | 100 | |
| 30 years | 100 | 49 | 75 | 30 | 45 | 2 | 100 | |
| 40 years | 100 | 51 | 77 | 42 | 48 | 20 | 100 | |
| 50 years | 100 | 56 | 75 | 50 | 55 | 23 | 100 | |

## PJW Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 52. Alternative B PJW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 12,514 | 7,914 | 7,665 | 131,844 | 5,581 | 12,533 | 44,107 | 222,159 |
| 15year planning period | 11,492 | 10,040 | 8,580 | 124,605 | 8,120 | 12,851 | 46,470 | 222,159 |
| 20 years | 10,938 | 10,697 | 9,363 | 117,757 | 9,273 | 15,475 | 48,657 | 222,159 |
| 30 years | 9,548 | 11,087 | 10,864 | 110,271 | 11,252 | 18,393 | 50,743 | 222,159 |
| 40 years | 7,866 | 10,737 | 12,057 | 106,457 | 10,437 | 20,673 | 53,931 | 222,159 |
| 50 years | 7,513 | 11,368 | 12,374 | 102,878 | 11,622 | 21,305 | 55,099 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 6 | 4 | 3 | 59 | 3 | 6 | 20 | 100 |
| 15year planning period | 5 | 5 | 4 | 56 | 4 | 6 | 21 | 100 |
| 20 years | 5 | 5 | 4 | 53 | 4 | 7 | 22 | 100 |
| 30 years | 4 | 5 | 5 | 50 | 5 | 8 | 23 | 100 |
| 40 years | 4 | 5 | 5 | 48 | 5 | 9 | 24 | 100 |
| 50 years | 3 | 5 | 6 | 46 | 5 | 10 | 25 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 55 | 57 | 19 | 69 | 44 | 99 | |
| 15year planning period | 100 | 44 | 52 | 12 | 54 | 42 | 100 | |
| 20 years | 100 | 40 | 47 | 6 | 48 | 30 | 100 | |
| 30 years | 100 | 38 | 39 | 1 | 37 | 17 | 100 | |
| 40 years | 100 | 40 | 32 | 4 | 41 | 7 | 100 | |
| 50 years | 100 | 36 | 30 | 7 | 35 | 4 | 100 | |

## PJW Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 53. Alternative B PJW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 12,251 | 8,257 | 6,396 | 127,946 | 5,595 | 13,359 | 48,355 | 222,159 |
| 15year planning period | 11,287 | 9,746 | 7,035 | 119,789 | 7,819 | 14,172 | 52,311 | 222,159 |
| 20 years | 10,164 | 10,235 | 7,809 | 111,691 | 8,920 | 17,005 | 56,336 | 222,159 |
| 30 years | 8,899 | 10,361 | 8,709 | 100,787 | 11,002 | 20,049 | 62,350 | 222,159 |
| 40 years | 7,580 | 9,702 | 9,790 | 95,222 | 10,504 | 22,300 | 67,061 | 222,159 |
| 50 years | 7,317 | 9,972 | 9,996 | 90,100 | 10,940 | 24,162 | 69,672 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 6 | 4 | 3 | 58 | 3 | 6 | 22 | 100 |
| 15year planning period | 5 | 4 | 3 | 54 | 4 | 6 | 24 | 100 |
| 20 years | 5 | 5 | 4 | 50 | 4 | 8 | 25 | 100 |
| 30 years | 4 | 5 | 4 | 45 | 5 | 9 | 28 | 100 |
| 40 years | 3 | 4 | 4 | 43 | 5 | 10 | 30 | 100 |
| 50 years | 3 | 4 | 4 | 41 | 5 | 11 | 31 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 54 | 64 | 15 | 69 | 40 | 100 | |
| 15year planning period | 100 | 45 | 60 | 8 | 56 | 36 | 100 | |
| 20 years | 100 | 42 | 56 | 1 | 50 | 23 | 100 | |
| 30 years | 100 | 42 | 51 | 9 | 38 | 10 | 100 | |
| 40 years | 100 | 45 | 45 | 14 | 41 | 0 | 100 | |
| 50 years | 100 | 44 | 44 | 19 | 38 | 9 | 100 | |

## PJW Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 54. Alternative B PJW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 11,987 | 8,600 | 5,126 | 124,049 | 5,608 | 14,185 | 52,603 | 222,159 |
| 15year planning period | 11,082 | 9,452 | 5,489 | 114,973 | 7,518 | 15,492 | 58,152 | 222,159 |
| 20 years | 9,390 | 9,773 | 6,254 | 105,625 | 8,568 | 18,534 | 64,015 | 222,159 |
| 30 years | 8,250 | 9,636 | 6,553 | 91,303 | 10,753 | 21,705 | 73,958 | 222,159 |
| 40 years | 7,293 | 8,667 | 7,522 | 83,988 | 10,571 | 23,927 | 80,191 | 222,159 |
| 50 years | 7,121 | 8,576 | 7,617 | 77,321 | 10,258 | 27,020 | 84,246 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 5 | 4 | 2 | 56 | 3 | 6 | 24 | 100 |
| 15year planning period | 5 | 4 | 2 | 52 | 3 | 7 | 26 | 100 |
| 20 years | 4 | 4 | 3 | 48 | 4 | 8 | 29 | 100 |
| 30 years | 4 | 4 | 3 | 41 | 5 | 10 | 33 | 100 |
| 40 years | 3 | 4 | 3 | 38 | 5 | 11 | 36 | 100 |
| 50 years | 3 | 4 | 3 | 35 | 5 | 12 | 38 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 90 | 82 | 38 | 94 | 36 | 51 | |
| 15year planning period | 100 | 52 | 71 | 12 | 68 | 36 | 100 | |
| 20 years | 100 | 47 | 69 | 4 | 58 | 30 | 100 | |
| 30 years | 100 | 45 | 65 | 5 | 52 | 17 | 100 | |
| 40 years | 100 | 46 | 63 | 18 | 39 | 2 | 100 | |
| 50 years | 100 | 51 | 58 | 24 | 41 | 8 | 100 | |

## PJW Alternative C Proposed High Acre Treatment Objectives

**Appendix B table 55. Alternative C PJW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 15,803 | 8,947 | 8,059 | 124,899 | 5,723 | 13,003 | 45,724 | 222,159 |
| 15year planning period | 15,241 | 10,137 | 8,445 | 116,311 | 6,826 | 14,582 | 50,616 | 222,159 |
| 20 years | 15,034 | 11,078 | 10,470 | 106,726 | 8,669 | 16,047 | 54,134 | 222,159 |
| 30 years | 14,864 | 11,224 | 11,350 | 94,815 | 9,801 | 21,093 | 59,011 | 222,159 |
| 40 years | 14,474 | 11,104 | 10,690 | 85,467 | 10,815 | 24,179 | 65,429 | 222,159 |
| 50 years | 12,846 | 9,709 | 10,518 | 82,183 | 10,094 | 27,017 | 69,792 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 7 | 4 | 4 | 56 | 3 | 6 | 21 | 100 |
| 15year planning period | 7 | 5 | 4 | 52 | 3 | 7 | 23 | 100 |
| 20 years | 7 | 5 | 5 | 48 | 4 | 7 | 24 | 100 |
| 30 years | 7 | 5 | 5 | 43 | 4 | 9 | 27 | 100 |
| 40 years | 7 | 5 | 5 | 38 | 5 | 11 | 29 | 100 |
| 50 years | 6 | 4 | 5 | 37 | 5 | 12 | 31 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 50 | 55 | 12 | 68 | 41 | 100 | |
| 15year planning period | 100 | 43 | 52 | 5 | 62 | 34 | 100 | |
| 20 years | 100 | 38 | 41 | 4 | 51 | 28 | 100 | |
| 30 years | 100 | 37 | 36 | 15 | 45 | 5 | 100 | |
| 40 years | 100 | 38 | 40 | 23 | 39 | 9 | 100 | |
| 50 years | 100 | 45 | 41 | 26 | 43 | 22 | 100 | |

## PJW Alternative C Proposed Average Acre Treatment Objectives

**Appendix B table 56. Alternative C PJW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 14,045 | 8,711 | 6,618 | 123,433 | 5,423 | 13,902 | 50,027 | 222,159 |
| 15year planning period | 13,161 | 9,565 | 6,817 | 113,030 | 6,885 | 15,756 | 56,946 | 222,159 |
| 20 years | 13,156 | 10,140 | 7,975 | 103,122 | 8,317 | 17,701 | 61,748 | 222,159 |
| 30 years | 11,918 | 10,145 | 8,852 | 90,454 | 9,780 | 22,387 | 68,623 | 222,159 |
| 40 years | 11,613 | 10,057 | 8,622 | 79,706 | 10,232 | 25,122 | 76,806 | 222,159 |
| 50 years | 10,536 | 8,786 | 8,413 | 74,541 | 9,382 | 27,748 | 82,754 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 6 | 4 | 3 | 56 | 2 | 6 | 23 | 100 |
| 15year planning period | 6 | 4 | 3 | 51 | 3 | 7 | 26 | 100 |
| 20 years | 6 | 5 | 4 | 46 | 4 | 8 | 28 | 100 |
| 30 years | 5 | 5 | 4 | 41 | 4 | 10 | 31 | 100 |
| 40 years | 5 | 5 | 4 | 36 | 5 | 11 | 35 | 100 |
| 50 years | 5 | 4 | 4 | 34 | 4 | 12 | 37 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 51 | 63 | 11 | 69 | 37 | 100 | |
| 15year planning period | 100 | 46 | 62 | 2 | 61 | 29 | 100 | |
| 20 years | 100 | 43 | 55 | 7 | 53 | 20 | 100 | |
| 30 years | 100 | 43 | 50 | 19 | 45 | 1 | 100 | |
| 40 years | 100 | 43 | 51 | 28 | 42 | 13 | 100 | |
| 50 years | 100 | 51 | 53 | 33 | 47 | 25 | 100 | |

## PJW Alternative C Proposed Low Acre Treatment Objectives

### Appendix B table 57. Alternative C PJW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 12,286 | 8,475 | 5,177 | 121,966 | 5,123 | 14,801 | 54,331 | 222,159 |
| 15year planning period | 11,080 | 8,992 | 5,189 | 109,748 | 6,944 | 16,930 | 63,276 | 222,159 |
| 20 years | 11,278 | 9,202 | 5,480 | 99,518 | 7,964 | 19,355 | 69,362 | 222,159 |
| 30 years | 8,971 | 9,065 | 6,354 | 86,094 | 9,759 | 23,681 | 78,235 | 222,159 |
| 40 years | 8,753 | 9,010 | 6,554 | 73,945 | 9,649 | 26,065 | 88,184 | 222,159 |
| 50 years | 8,225 | 7,864 | 6,307 | 66,899 | 8,669 | 28,479 | 95,715 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 6 | 4 | 2 | 55 | 2 | 7 | 24 | 100 |
| 15year planning period | 5 | 4 | 2 | 49 | 3 | 8 | 28 | 100 |
| 20 years | 5 | 4 | 2 | 45 | 4 | 9 | 31 | 100 |
| 30 years | 4 | 4 | 3 | 39 | 4 | 11 | 35 | 100 |
| 40 years | 4 | 4 | 3 | 33 | 4 | 12 | 40 | 100 |
| 50 years | 4 | 4 | 3 | 30 | 4 | 13 | 43 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 52 | 71 | 10 | 71 | 33 | 100 | |
| 15year planning period | 100 | 49 | 71 | 1 | 61 | 24 | 100 | |
| 20 years | 100 | 48 | 69 | 10 | 55 | 13 | 100 | |
| 30 years | 100 | 49 | 64 | 22 | 45 | 7 | 100 | |
| 40 years | 100 | 49 | 63 | 33 | 46 | 17 | 100 | |
| 50 years | 100 | 56 | 65 | 40 | 51 | 28 | 100 | |

## PJW Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 58. Alternative D PJW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 17,832 | 9,124 | 8,233 | 139,483 | 5,313 | 8,416 | 33,757 | 222,159 |
| 15year planning period | 19,428 | 11,246 | 9,294 | 133,852 | 7,827 | 8,373 | 32,139 | 222,159 |
| 20 years | 20,272 | 12,069 | 9,676 | 131,142 | 8,809 | 9,458 | 30,734 | 222,159 |
| 30 years | 21,389 | 14,328 | 11,117 | 123,613 | 10,071 | 11,174 | 30,467 | 222,159 |
| 40 years | 21,495 | 14,504 | 12,768 | 119,508 | 11,748 | 13,174 | 28,962 | 222,159 |
| 50 years | 20,552 | 15,299 | 14,189 | 117,369 | 11,893 | 14,392 | 28,465 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 8 | 4 | 4 | 63 | 2 | 4 | 15 | 100 |
| 15year planning period | 9 | 5 | 4 | 60 | 4 | 4 | 14 | 100 |
| 20 years | 9 | 5 | 4 | 59 | 4 | 4 | 14 | 100 |
| 30 years | 10 | 6 | 5 | 56 | 5 | 5 | 14 | 100 |
| 40 years | 10 | 7 | 6 | 54 | 5 | 6 | 13 | 100 |
| 50 years | 9 | 7 | 6 | 53 | 5 | 6 | 13 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 49 | 54 | 26 | 70 | 62 | 52 | |
| 15year planning period | 100 | 37 | 48 | 21 | 56 | 62 | 45 | |
| 20 years | 100 | 32 | 46 | 18 | 50 | 57 | 38 | |
| 30 years | 100 | 19 | 37 | 11 | 43 | 50 | 37 | |
| 40 years | 100 | 18 | 28 | 8 | 34 | 41 | 30 | |
| 50 years | 100 | 14 | 20 | 6 | 33 | 35 | 28 | |

## PJW Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 59. Alternative D PJW resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 16,221 | 8,823 | 6,614 | 131,803 | 5,679 | 11,297 | 41,723 | 222,159 |
| 15year planning period | 16,659 | 10,443 | 7,374 | 123,708 | 7,097 | 11,919 | 44,959 | 222,159 |
| 20 years | 17,153 | 11,241 | 7,482 | 117,569 | 8,402 | 13,318 | 46,994 | 222,159 |
| 30 years | 17,319 | 12,348 | 8,202 | 107,510 | 9,846 | 16,066 | 50,868 | 222,159 |
| 40 years | 16,971 | 11,816 | 9,162 | 101,920 | 11,070 | 18,367 | 52,853 | 222,159 |
| 50 years | 16,213 | 12,501 | 10,481 | 98,239 | 10,432 | 19,219 | 55,074 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 7 | 4 | 3 | 59 | 3 | 5 | 19 | 100 |
| 15year planning period | 7 | 5 | 3 | 56 | 3 | 5 | 20 | 100 |
| 20 years | 8 | 5 | 3 | 53 | 4 | 6 | 21 | 100 |
| 30 years | 8 | 6 | 4 | 48 | 4 | 7 | 23 | 100 |
| 40 years | 8 | 5 | 4 | 46 | 5 | 8 | 24 | 100 |
| 50 years | 7 | 6 | 5 | 44 | 5 | 9 | 25 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 50 | 63 | 19 | 68 | 49 | 88 | |
| 15year planning period | 100 | 41 | 59 | 11 | 60 | 46 | 100 | |
| 20 years | 100 | 37 | 58 | 6 | 53 | 40 | 100 | |
| 30 years | 100 | 31 | 54 | 3 | 45 | 28 | 100 | |
| 40 years | 100 | 34 | 48 | 8 | 38 | 17 | 100 | |
| 50 years | 100 | 30 | 41 | 12 | 41 | 13 | 100 | |

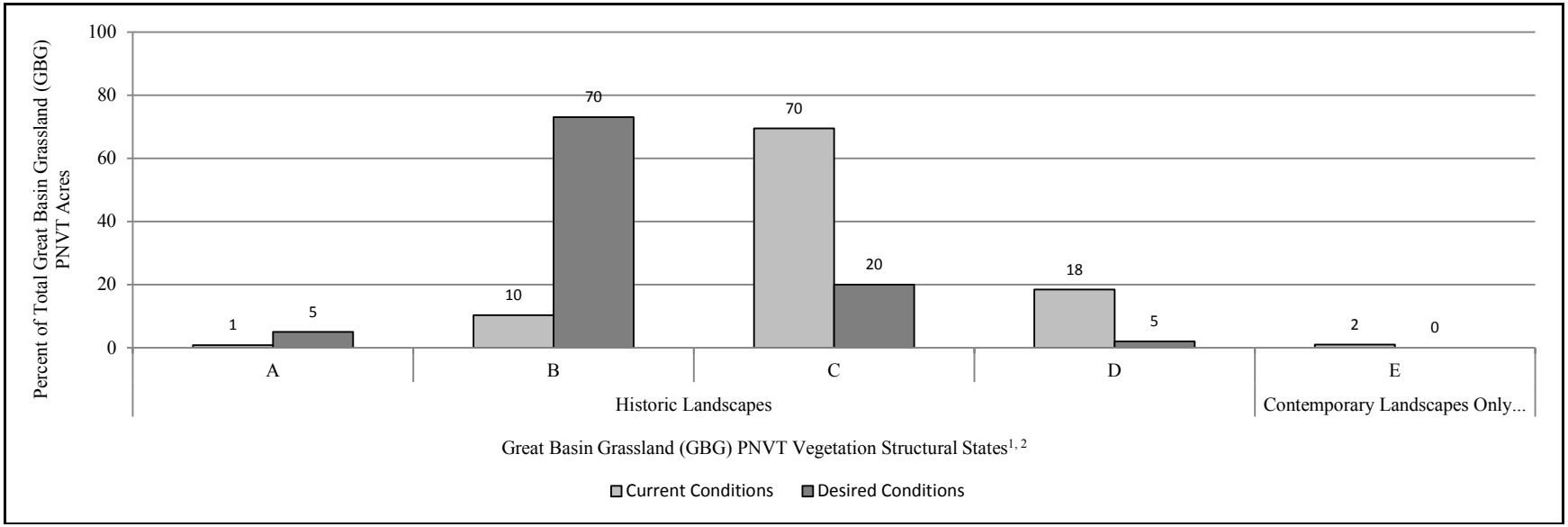
## PJW Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 60. Alternative D PJW vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | PJW Vegetation Structural State | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | |
| **Number of acres in each vegetation state** | | | | | | | | |
| *Desired Conditions* | *11,108* | *17,773* | *17,773* | *111,080* | *17,773* | *22,216* | *22,216* | *222,159* |
| *Initial Conditions* | *15,378* | *1,756* | *3,228* | *152,867* | *1,138* | *14,198* | *33,594* | *222,159* |
| 10 years | 14,609 | 8,521 | 4,994 | 124,123 | 6,046 | 14,178 | 49,688 | 222,159 |
| 15year planning period | 13,889 | 9,640 | 5,453 | 113,564 | 6,368 | 15,465 | 57,780 | 222,159 |
| 20 years | 14,033 | 10,413 | 5,288 | 103,997 | 7,995 | 17,178 | 63,255 | 222,159 |
| 30 years | 13,248 | 10,369 | 5,287 | 91,407 | 9,620 | 20,958 | 71,269 | 222,159 |
| 40 years | 12,447 | 9,128 | 5,555 | 84,332 | 10,392 | 23,560 | 76,744 | 222,159 |
| 50 years | 11,875 | 9,703 | 6,773 | 79,108 | 8,972 | 24,046 | 81,682 | 222,159 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | | | |
| *Desired Conditions* | *5* | *8* | *8* | *50* | *8* | *10* | *10* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *6* | *15* | *100* |
| 10 years | 7 | 4 | 2 | 56 | 3 | 6 | 22 | 100 |
| 15year planning period | 6 | 4 | 2 | 51 | 3 | 7 | 26 | 100 |
| 20 years | 6 | 5 | 2 | 47 | 4 | 8 | 28 | 100 |
| 30 years | 6 | 5 | 2 | 41 | 4 | 9 | 32 | 100 |
| 40 years | 6 | 4 | 3 | 38 | 5 | 11 | 35 | 100 |
| 50 years | 5 | 4 | 3 | 36 | 4 | 11 | 37 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *90* | *82* | *38* | *94* | *36* | *51* | |
| 10 years | 100 | 52 | 72 | 12 | 66 | 36 | 100 | |
| 15year planning period | 100 | 46 | 69 | 2 | 64 | 30 | 100 | |
| 20 years | 100 | 41 | 70 | 6 | 55 | 23 | 100 | |
| 30 years | 100 | 42 | 70 | 18 | 46 | 6 | 100 | |
| 40 years | 100 | 49 | 69 | 24 | 42 | 6 | 100 | |
| 50 years | 100 | 45 | 62 | 29 | 50 | 8 | 100 | |

## Grassland PNVTs

## Great Basin




**Appendix B figure 7. Great Basin grassland potential natural vegetation type current and desired vegetation structural states**

[1] Great Basin Grassland (GBG) PNVT Vegetation Structural States. At 185,523 acres or approximately 9% of the forests this PNVT ranks 4th in order of size out of the 14 PNVTs on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% tree or shrub canopy cover; early successional development

State B - Open perennial herbaceous vegetation, with < 10% tree or shrub canopy cover; mid successional development

State C - Perennial herbaceous vegetation with shrubs, seedling and sapling size (< 5” diameter), small size (5”-9.9” diameter), and medium size (10”-19.9” diameter) trees with open (< 30%) canopy cover; late successional development

State D - Shrubs, seedling and sapling, small, medium, and large to very large size (> 20” diameter) trees with closed (≥ 30%) canopy cover, and large to very large size trees with open canopy cover with perennial herbaceous vegetation understory, mid successional development

State E - Various noxious weeds and invasive plants makeup a significant portion of the herbaceous vegetation composition; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] GBG PNVT has a 67% or high departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it tied with dry mixed conifer forest for the 3rd most departed PNVT for DC; and 5th most departed PNVT for HRV on the ASNFs. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2007b)

## GBG Alternative A

### Appendix B table 61. Alternative A GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 223 | 25,695 | 95,099 | 60,759 | 3,748 | 185,523 |
| 15year planning period | 297 | 27,940 | 79,756 | 73,801 | 3,729 | 185,523 |
| 20 years | 334 | 30,277 | 65,861 | 85,285 | 3,766 | 185,523 |
| 30 years | 445 | 32,318 | 40,871 | 108,104 | 3,785 | 185,523 |
| 40 years | 445 | 35,435 | 20,983 | 124,857 | 3,803 | 185,523 |
| 50 years | 260 | 29,387 | 25,806 | 126,211 | 3,859 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 14 | 51 | 33 | 2 | 100 |
| 15year planning period | 0 | 15 | 43 | 40 | 2 | 100 |
| 20 years | 0 | 16 | 36 | 46 | 2 | 100 |
| 30 years | 0 | 17 | 22 | 58 | 2 | 100 |
| 40 years | 0 | 19 | 11 | 67 | 2 | 100 |
| 50 years | 0 | 16 | 14 | 68 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 81 | 100 | 100 | 100 | |
| 15year planning period | 100 | 79 | 100 | 100 | 100 | |
| 20 years | 100 | 78 | 77 | 100 | 100 | |
| 30 years | 100 | 76 | 10 | 100 | 100 | |
| 40 years | 100 | 74 | 43 | 100 | 100 | |
| 50 years | 100 | 78 | 30 | 100 | 100 | |

## GBG Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 62. Alternative B GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 427 | 118,512 | 43,246 | 19,628 | 3,710 | 185,523 |
| 15year planning period | 427 | 140,052 | 28,367 | 12,968 | 3,710 | 185,523 |
| 20 years | 334 | 155,098 | 17,903 | 8,441 | 3,748 | 185,523 |
| 30 years | 371 | 168,344 | 9,332 | 3,692 | 3,785 | 185,523 |
| 40 years | 297 | 173,168 | 6,901 | 1,373 | 3,785 | 185,523 |
| 50 years | 334 | 107,492 | 73,189 | 612 | 3,896 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 64 | 23 | 11 | 2 | 100 |
| 15year planning period | 0 | 75 | 15 | 7 | 2 | 100 |
| 20 years | 0 | 84 | 10 | 5 | 2 | 100 |
| 30 years | 0 | 91 | 5 | 2 | 2 | 100 |
| 40 years | 0 | 93 | 4 | 1 | 2 | 100 |
| 50 years | 0 | 58 | 39 | 0 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 86 | 100 | 100 | 100 | |
| 15year planning period | 100 | 12 | 17 | 100 | 100 | |
| 20 years | 100 | 3 | 24 | 100 | 100 | |
| 30 years | 100 | 15 | 52 | 100 | 100 | |
| 40 years | 100 | 24 | 75 | 0 | 100 | |
| 50 years | 100 | 28 | 81 | 63 | 100 | |

## GBG Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 63. Alternative B GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 352 | 99,988 | 54,340 | 27,133 | 3,710 | 185,523 |
| 15year planning period | 399 | 120,228 | 38,320 | 22,847 | 3,729 | 185,523 |
| 20 years | 297 | 135,933 | 27,216 | 18,348 | 3,729 | 185,523 |
| 30 years | 362 | 152,528 | 16,734 | 12,133 | 3,766 | 185,523 |
| 40 years | 288 | 160,849 | 12,616 | 7,987 | 3,785 | 185,523 |
| 50 years | 343 | 108,364 | 67,929 | 5,028 | 3,859 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 54 | 29 | 15 | 2 | 100 |
| 15year planning period | 0 | 65 | 21 | 12 | 2 | 100 |
| 20 years | 0 | 73 | 15 | 10 | 2 | 100 |
| 30 years | 0 | 82 | 9 | 7 | 2 | 100 |
| 40 years | 0 | 87 | 7 | 4 | 2 | 100 |
| 50 years | 0 | 58 | 37 | 3 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 26 | 46 | 100 | 100 | |
| 15year planning period | 100 | 11 | 3 | 100 | 100 | |
| 20 years | 100 | 0 | 27 | 100 | 100 | |
| 30 years | 100 | 13 | 55 | 100 | 100 | |
| 40 years | 100 | 19 | 66 | 100 | 100 | |
| 50 years | 100 | 20 | 83 | 36 | 100 | |

## GBG Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 64. Alternative B GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 278 | 81,463 | 65,434 | 34,637 | 3,710 | 185,523 |
| 15year planning period | 371 | 100,405 | 48,273 | 32,726 | 3,748 | 185,523 |
| 20 years | 260 | 116,768 | 36,530 | 28,255 | 3,710 | 185,523 |
| 30 years | 352 | 136,712 | 24,137 | 20,575 | 3,748 | 185,523 |
| 40 years | 278 | 148,530 | 18,330 | 14,601 | 3,785 | 185,523 |
| 50 years | 352 | 109,236 | 62,670 | 9,443 | 3,822 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 44 | 35 | 19 | 2 | 100 |
| 15year planning period | 0 | 54 | 26 | 18 | 2 | 100 |
| 20 years | 0 | 63 | 20 | 15 | 2 | 100 |
| 30 years | 0 | 74 | 13 | 11 | 2 | 100 |
| 40 years | 0 | 80 | 10 | 8 | 2 | 100 |
| 50 years | 0 | 59 | 34 | 5 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 40 | 76 | 100 | 100 | |
| 15year planning period | 100 | 26 | 30 | 100 | 100 | |
| 20 years | 100 | 14 | 2 | 100 | 100 | |
| 30 years | 100 | 1 | 35 | 100 | 100 | |
| 40 years | 100 | 10 | 51 | 100 | 100 | |
| 50 years | 100 | 19 | 69 | 100 | 100 | |

## GBG Alternative C

### Appendix B table 65. Alternative C GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 223 | 25,695 | 95,099 | 60,759 | 3,748 | 185,523 |
| 15year planning period | 297 | 27,940 | 79,756 | 73,801 | 3,729 | 185,523 |
| 20 years | 334 | 30,277 | 65,861 | 85,285 | 3,766 | 185,523 |
| 30 years | 445 | 32,318 | 40,871 | 108,104 | 3,785 | 185,523 |
| 40 years | 445 | 35,435 | 20,983 | 124,857 | 3,803 | 185,523 |
| 50 years | 260 | 29,387 | 25,806 | 126,211 | 3,859 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 14 | 51 | 33 | 2 | 100 |
| 15year planning period | 0 | 15 | 43 | 40 | 2 | 100 |
| 20 years | 0 | 16 | 36 | 46 | 2 | 100 |
| 30 years | 0 | 17 | 22 | 58 | 2 | 100 |
| 40 years | 0 | 19 | 11 | 67 | 2 | 100 |
| 50 years | 0 | 16 | 14 | 68 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 81 | 100 | 100 | 100 | |
| 15year planning period | 100 | 79 | 100 | 100 | 100 | |
| 20 years | 100 | 78 | 77 | 100 | 100 | |
| 30 years | 100 | 76 | 10 | 100 | 100 | |
| 40 years | 100 | 74 | 43 | 100 | 100 | |
| 50 years | 100 | 78 | 30 | 100 | 100 | |

## GBG Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 66. Alternative D GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 315 | 107,448 | 53,354 | 20,639 | 3,766 | 185,523 |
| 15year planning period | 533 | 130,781 | 35,565 | 14,913 | 3,730 | 185,523 |
| 20 years | 461 | 145,782 | 24,695 | 10,819 | 3,766 | 185,523 |
| 30 years | 500 | 160,994 | 15,268 | 4,959 | 3,803 | 185,523 |
| 40 years | 555 | 170,093 | 8,906 | 2,148 | 3,821 | 185,523 |
| 50 years | 316 | 117,129 | 63,328 | 907 | 3,842 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 58 | 29 | 11 | 2 | 100 |
| 15year planning period | 0 | 70 | 19 | 8 | 2 | 100 |
| 20 years | 0 | 79 | 13 | 6 | 2 | 100 |
| 30 years | 0 | 87 | 8 | 3 | 2 | 100 |
| 40 years | 0 | 92 | 5 | 1 | 2 | 100 |
| 50 years | 0 | 63 | 34 | 0 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 21 | 44 | 100 | 100 | |
| 15year planning period | 100 | 3 | 4 | 100 | 100 | |
| 20 years | 100 | 8 | 33 | 100 | 100 | |
| 30 years | 100 | 19 | 59 | 34 | 100 | |
| 40 years | 100 | 26 | 76 | 42 | 100 | |
| 50 years | 100 | 14 | 71 | 76 | 100 | |

## GBG Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 67. Alternative D GBG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

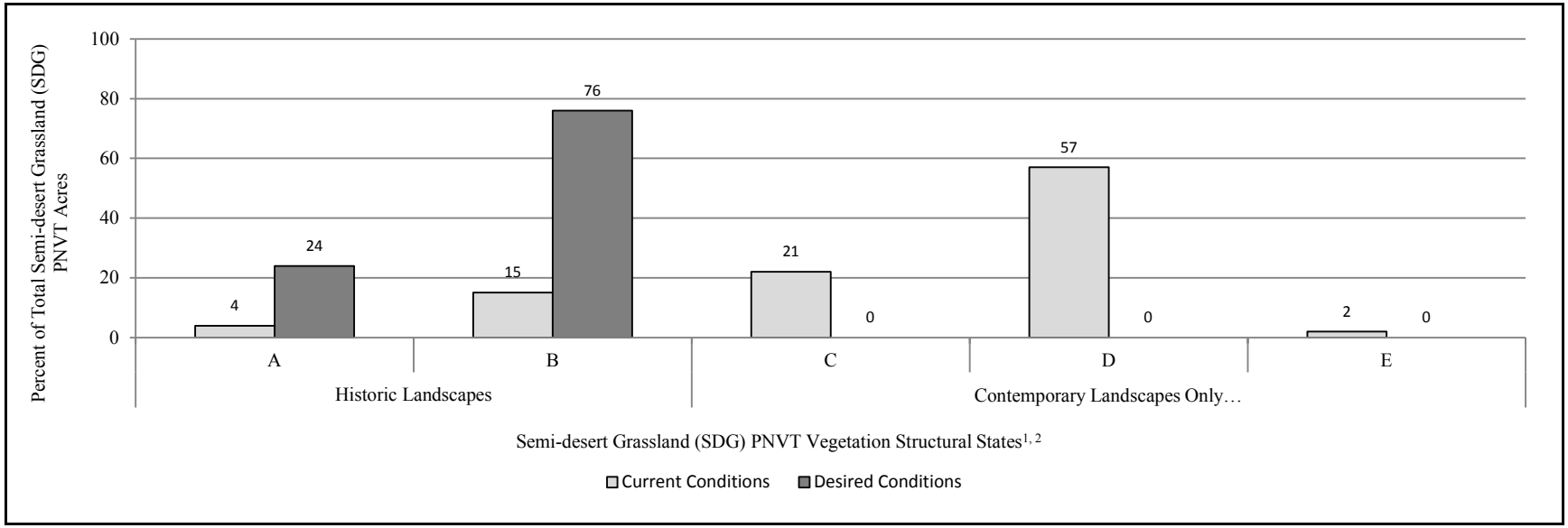
| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 270 | 90,373 | 62,734 | 28,408 | 3,738 | 185,523 |
| 15year planning period | 451 | 110,600 | 46,248 | 24,484 | 3,739 | 185,523 |
| 20 years | 443 | 125,401 | 34,567 | 21,364 | 3,748 | 185,523 |
| 30 years | 427 | 143,536 | 23,455 | 14,330 | 3,775 | 185,523 |
| 40 years | 491 | 155,094 | 16,565 | 9,570 | 3,803 | 185,523 |
| 50 years | 362 | 112,412 | 63,028 | 5,925 | 3,796 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 49 | 34 | 15 | 2 | 100 |
| 15year planning period | 0 | 60 | 25 | 13 | 2 | 100 |
| 20 years | 0 | 68 | 19 | 12 | 2 | 100 |
| 30 years | 0 | 77 | 13 | 8 | 2 | 100 |
| 40 years | 0 | 84 | 9 | 5 | 2 | 100 |
| 50 years | 0 | 61 | 34 | 3 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 33 | 69 | 100 | 100 | |
| 15year planning period | 100 | 18 | 25 | 100 | 100 | |
| 20 years | 100 | 7 | 7 | 100 | 100 | |
| 30 years | 100 | 6 | 37 | 100 | 100 | |
| 40 years | 100 | 15 | 55 | 100 | 100 | |
| 50 years | 100 | 17 | 70 | 60 | 100 | |

## GBG Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 68. Alternative D GBG vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | GBG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *185,523* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *185,523* |
| 10 years | 224 | 73,298 | 72,114 | 36,176 | 3,711 | 185,523 |
| 15year planning period | 369 | 90,419 | 56,930 | 34,055 | 3,749 | 185,523 |
| 20 years | 425 | 105,020 | 44,439 | 31,910 | 3,729 | 185,523 |
| 30 years | 354 | 126,078 | 31,642 | 23,701 | 3,748 | 185,523 |
| 40 years | 427 | 140,095 | 24,224 | 16,992 | 3,785 | 185,523 |
| 50 years | 407 | 107,695 | 62,727 | 10,943 | 3,751 | 185,523 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *5* | *73* | *20* | *2* | *0* | *100* |
| *Initial Conditions* | *7* | *1* | *1* | *69* | *1* | *100* |
| 10 years | 0 | 40 | 39 | 19 | 2 | 100 |
| 15year planning period | 0 | 49 | 31 | 18 | 2 | 100 |
| 20 years | 0 | 57 | 24 | 17 | 2 | 100 |
| 30 years | 0 | 68 | 17 | 13 | 2 | 100 |
| 40 years | 0 | 76 | 13 | 9 | 2 | 100 |
| 50 years | 0 | 58 | 34 | 6 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *86* | *100* | *100* | *100* | |
| 10 years | 100 | 46 | 94 | 100 | 100 | |
| 15year planning period | 100 | 33 | 53 | 100 | 100 | |
| 20 years | 100 | 22 | 20 | 100 | 100 | |
| 30 years | 100 | 7 | 15 | 100 | 100 | |
| 40 years | 100 | 3 | 35 | 100 | 100 | |
| 50 years | 100 | 20 | 69 | 100 | 100 | |

## Semi-desert




**Appendix B figure 8. Semi-desert grassland potential natural vegetation type current and desired vegetation structural states**

[1] Semi-desert Grassland (SDG) PNVT Vegetation Structural States. At 106,952 acres or approximately 5% of the forests this PNVT ranks 7th in order of size out of the 14 PNVTs on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% tree or shrub canopy cover; early successional development

State B - Perennial herbaceous vegetation, with < 10% tree or shrub canopy cover; mid successional development

State C Perennial herbaceous vegetation with shrubs, seedling and sapling size (< 5” diameter), small size (5”-9.9” diameter), and medium size (10”-19.9” diameter) trees with open (< 30%) canopy cover; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State D - Shrubs, seedling and sapling, small, medium, and large to very large size (> 20” diameter) trees with closed (≥ 30%) canopy cover, and large to very large size trees with open canopy cover with perennial herbaceous vegetation understory, mid successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State E - Various noxious weeds and invasive plants makeup a significant portion of the herbaceous vegetation composition; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] SDG PNVT has a 79% or high departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the 1st and 2nd most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Schussman 2006a)

## SDG Alternative A

### Appendix B table 69. Alternative A SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *25,668* | *81,284* | *0* | *0* | *0* | *106,952* |
| *Initial Conditions* | *1,014* | *21,216* | *23,444* | *59,141* | *2,137* | *106,952* |
| 10 years | 21 | 18,535 | 22,877 | 63,369 | 2,150 | 106,952 |
| 15year planning period | 21 | 16,952 | 22,438 | 65,380 | 2,160 | 106,952 |
| 20 years | 32 | 14,909 | 21,422 | 68,417 | 2,171 | 106,952 |
| 30 years | 43 | 11,369 | 20,567 | 72,834 | 2,139 | 106,952 |
| 40 years | 53 | 7,722 | 20,096 | 76,930 | 2,150 | 106,952 |
| 50 years | 43 | 5,893 | 18,353 | 80,492 | 2,171 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 0 | 17 | 21 | 59 | 2 | 100 |
| 15year planning period | 0 | 16 | 21 | 61 | 2 | 100 |
| 20 years | 0 | 14 | 20 | 64 | 2 | 100 |
| 30 years | 0 | 11 | 19 | 68 | 2 | 100 |
| 40 years | 0 | 7 | 19 | 72 | 2 | 100 |
| 50 years | 0 | 6 | 17 | 75 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 77 | 100 | 100 | 100 | |
| 15year planning period | 100 | 79 | 100 | 100 | 100 | |
| 20 years | 100 | 82 | 100 | 100 | 100 | |
| 30 years | 100 | 86 | 100 | 100 | 100 | |
| 40 years | 100 | 90 | 100 | 100 | 100 | |
| 50 years | 100 | 93 | 100 | 100 | 100 | |

## SDG Alternative B Proposed High Acre Treatment Objectives

**Appendix B table 70. Alternative B SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *25,668* | *81,284* | *0* | *0* | *0* | *106,952* |
| *Initial Conditions* | *1,014* | *21,216* | *23,444* | *59,141* | *2,137* | *106,952* |
| 10 years | 781 | 32,214 | 25,508 | 46,342 | 2,107 | 106,952 |
| 15year planning period | 578 | 36,118 | 26,546 | 41,615 | 2,096 | 106,952 |
| 20 years | 652 | 39,925 | 27,112 | 37,155 | 2,107 | 106,952 |
| 30 years | 620 | 48,695 | 27,797 | 27,679 | 2,160 | 106,952 |
| 40 years | 449 | 55,337 | 27,583 | 21,444 | 2,139 | 106,952 |
| 50 years | 556 | 50,278 | 34,995 | 18,920 | 2,203 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 1 | 30 | 24 | 43 | 2 | 100 |
| 15year planning period | 1 | 34 | 25 | 39 | 2 | 100 |
| 20 years | 1 | 37 | 25 | 35 | 2 | 100 |
| 30 years | 1 | 46 | 26 | 26 | 2 | 100 |
| 40 years | 0 | 52 | 26 | 20 | 2 | 100 |
| 50 years | 1 | 47 | 33 | 18 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 60 | 100 | 100 | 100 | |
| 15year planning period | 100 | 56 | 100 | 100 | 100 | |
| 20 years | 100 | 51 | 100 | 100 | 100 | |
| 30 years | 100 | 40 | 100 | 100 | 100 | |
| 40 years | 100 | 32 | 100 | 100 | 100 | |
| 50 years | 100 | 38 | 100 | 100 | 100 | |

## SDG Alternative B Proposed Average Acre Treatment Objectives

**Appendix B table 71. Alternative B SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *25,668* | *81,284* | *0* | *0* | *0* | *106,952* |
| *Initial Conditions* | *1,014* | *21,216* | *23,444* | *59,141* | *2,137* | *106,952* |
| 10 years | 636 | 30,128 | 24,877 | 49,214 | 2,096 | 106,952 |
| 15year planning period | 545 | 33,717 | 25,813 | 44,770 | 2,107 | 106,952 |
| 20 years | 561 | 36,096 | 27,300 | 40,888 | 2,107 | 106,952 |
| 30 years | 561 | 36,096 | 27,300 | 40,888 | 2,107 | 106,952 |
| 40 years | 503 | 43,289 | 28,114 | 32,873 | 2,173 | 106,952 |
| 50 years | 422 | 44,610 | 34,701 | 25,043 | 2,176 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 1 | 28 | 23 | 46 | 2 | 100 |
| 15year planning period | 1 | 32 | 24 | 42 | 2 | 100 |
| 20 years | 1 | 34 | 26 | 38 | 2 | 100 |
| 30 years | 1 | 34 | 26 | 38 | 2 | 100 |
| 40 years | 0 | 40 | 26 | 31 | 2 | 100 |
| 50 years | 0 | 42 | 32 | 23 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 63 | 100 | 100 | 100 | |
| 15year planning period | 100 | 59 | 100 | 100 | 100 | |
| 20 years | 100 | 56 | 100 | 100 | 100 | |
| 30 years | 100 | 56 | 100 | 100 | 100 | |
| 40 years | 100 | 47 | 100 | 100 | 100 | |
| 50 years | 100 | 45 | 100 | 100 | 100 | |

## SDG Alternative B Proposed Low Acre Treatment Objectives

**Appendix B table 72. Alternative B SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *106,952* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *106,952* |
| 10 years | 492 | 28,043 | 24,246 | 52,086 | 2,086 | 106,952 |
| 15year planning period | 513 | 31,316 | 25,080 | 47,925 | 2,118 | 106,952 |
| 20 years | 471 | 32,267 | 27,487 | 44,620 | 2,107 | 106,952 |
| 30 years | 384 | 37,721 | 28,318 | 37,924 | 2,177 | 106,952 |
| 40 years | 460 | 42,663 | 28,663 | 33,037 | 2,128 | 106,952 |
| 50 years | 289 | 38,941 | 34,406 | 31,166 | 2,150 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 0 | 26 | 23 | 49 | 2 | 100 |
| 15year planning period | 0 | 29 | 23 | 45 | 2 | 100 |
| 20 years | 0 | 30 | 26 | 42 | 2 | 100 |
| 30 years | 0 | 35 | 26 | 35 | 2 | 100 |
| 40 years | 0 | 40 | 27 | 31 | 2 | 100 |
| 50 years | 0 | 36 | 32 | 29 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 65 | 100 | 100 | 100 | |
| 15year planning period | 100 | 61 | 100 | 100 | 100 | |
| 20 years | 100 | 60 | 100 | 100 | 100 | |
| 30 years | 100 | 54 | 100 | 100 | 100 | |
| 40 years | 100 | 48 | 100 | 100 | 100 | |
| 50 years | 100 | 52 | 100 | 100 | 100 | |

## SDG Alternative C

### Appendix B table 73. Alternative C SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *106,952* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *106,952* |
| 10 years | 21 | 18,535 | 22,877 | 63,369 | 2,150 | 106,952 |
| 15year planning period | 21 | 16,952 | 22,438 | 65,380 | 2,160 | 106,952 |
| 20 years | 32 | 14,909 | 21,422 | 68,417 | 2,171 | 106,952 |
| 30 years | 43 | 11,369 | 20,567 | 72,834 | 2,139 | 106,952 |
| 40 years | 53 | 7,722 | 20,096 | 76,930 | 2,150 | 106,952 |
| 50 years | 43 | 5,893 | 18,353 | 80,492 | 2,171 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 0 | 17 | 21 | 59 | 2 | 100 |
| 15year planning period | 0 | 16 | 21 | 61 | 2 | 100 |
| 20 years | 0 | 14 | 20 | 64 | 2 | 100 |
| 30 years | 0 | 11 | 19 | 68 | 2 | 100 |
| 40 years | 0 | 7 | 19 | 72 | 2 | 100 |
| 50 years | 0 | 6 | 17 | 75 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 77 | 100 | 100 | 100 | |
| 15year planning period | 100 | 79 | 100 | 100 | 100 | |
| 20 years | 100 | 82 | 100 | 100 | 100 | |
| 30 years | 100 | 86 | 100 | 100 | 100 | |
| 40 years | 100 | 90 | 100 | 100 | 100 | |
| 50 years | 100 | 93 | 100 | 100 | 100 | |

## SDG Alternative D Proposed High Acre Treatment Objectives

**Appendix B table 74. Alternative D SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed high acre treatment objectives**

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *106,952* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *106,952* |
| 10 years | 781 | 32,214 | 25,508 | 46,342 | 2,107 | 106,952 |
| 15year planning period | 578 | 36,118 | 26,545 | 41,615 | 2,096 | 106,952 |
| 20 years | 652 | 39,925 | 27,112 | 37,155 | 2,107 | 106,952 |
| 30 years | 620 | 48,695 | 27,797 | 27,679 | 2,160 | 106,952 |
| 40 years | 449 | 55,337 | 27,583 | 21,444 | 2,139 | 106,952 |
| 50 years | 556 | 50,278 | 34,995 | 18,920 | 2,203 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 1 | 30 | 24 | 43 | 2 | 100 |
| 15year planning period | 1 | 34 | 25 | 39 | 2 | 100 |
| 20 years | 1 | 37 | 25 | 35 | 2 | 100 |
| 30 years | 1 | 46 | 26 | 26 | 2 | 100 |
| 40 years | 0 | 52 | 26 | 20 | 2 | 100 |
| 50 years | 1 | 47 | 33 | 18 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 60 | 100 | 100 | 100 | |
| 15year planning period | 100 | 56 | 100 | 100 | 100 | |
| 20 years | 100 | 51 | 100 | 100 | 100 | |
| 30 years | 100 | 40 | 100 | 100 | 100 | |
| 40 years | 100 | 32 | 100 | 100 | 100 | |
| 50 years | 100 | 38 | 100 | 100 | 100 | |

## SDG Alternative D Proposed Average Acre Treatment Objectives

**Appendix B table 75. Alternative D SDG resulting vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed average acre treatment objectives**

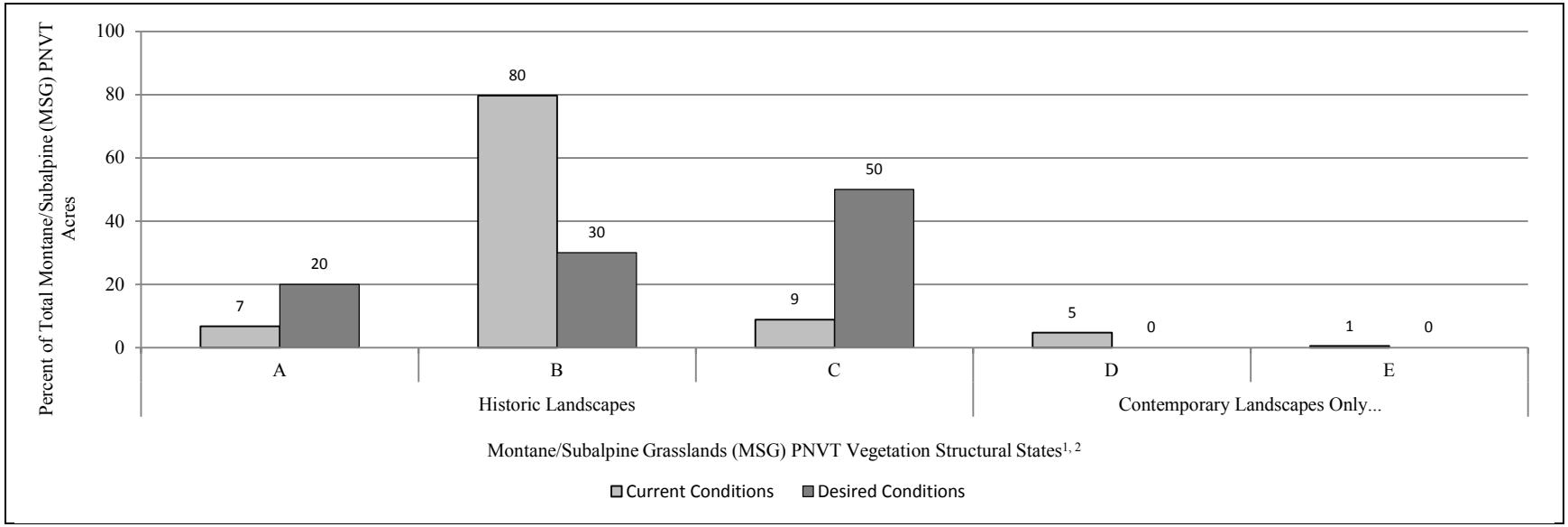
| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *106,952* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *106,952* |
| 10 years | 636 | 30,128 | 24,877 | 49,214 | 2,096 | 106,952 |
| 15year planning period | 545 | 33,717 | 25,813 | 44,770 | 2,107 | 106,952 |
| 20 years | 519 | 38,901 | 27,770 | 37,615 | 2,146 | 106,952 |
| 30 years | 503 | 43,284 | 28,114 | 32,878 | 2,173 | 106,952 |
| 40 years | 455 | 49,000 | 28,123 | 27,241 | 2,134 | 106,952 |
| 50 years | 422 | 44,610 | 34,700 | 25,043 | 2,176 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 1 | 28 | 23 | 46 | 2 | 100 |
| 15year planning period | 1 | 32 | 24 | 42 | 2 | 100 |
| 20 years | 0 | 36 | 26 | 35 | 2 | 100 |
| 30 years | 0 | 40 | 26 | 31 | 2 | 100 |
| 40 years | 0 | 46 | 26 | 25 | 2 | 100 |
| 50 years | 0 | 42 | 32 | 23 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | *74* | *100* | *100* | *100* | |
| 10 years | 100 | 63 | 100 | 100 | 100 | |
| 15year planning period | 100 | 59 | 100 | 100 | 100 | |
| 20 years | 100 | 52 | 100 | 100 | 100 | |
| 30 years | 100 | 47 | 100 | 100 | 100 | |
| 40 years | 100 | 40 | 100 | 100 | 100 | |
| 50 years | 100 | 45 | 100 | 100 | 100 | |

## SDG Alternative D Proposed Low Acre Treatment Objectives

**Appendix B table 76. Alternative D SDG vegetation structural state acreage by VDDT model year runs over the 50-year modeling period, for the proposed low acre treatment objectives**

| Model Year Runs | SDG Vegetation Structural State | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| **Number of acres in each vegetation state** | | | | | | |
| *Desired Conditions* | *9,276* | *135,432* | *37,105* | *3,710* | *0* | *106,952* |
| *Initial Conditions* | *1,494* | *18,840* | *127,541* | *33,939* | *3,709* | *106,952* |
| 10 years | 492 | 28,043 | 24,246 | 52,085 | 2,086 | 106,952 |
| 15year planning period | 513 | 31,315 | 25,080 | 47,925 | 2,118 | 106,952 |
| 20 years | 384 | 37,721 | 28,318 | 37,924 | 2,177 | 106,952 |
| 30 years | 386 | 37,872 | 28,431 | 38,076 | 2,186 | 106,952 |
| 40 years | 460 | 42,663 | 28,663 | 33,037 | 2,128 | 106,952 |
| 50 years | 289 | 38,941 | 34,406 | 31,166 | 2,150 | 106,952 |
| **Percent of total PNVT contributed by each vegetation state** | | | | | | |
| *Desired Conditions* | *24* | *76* | *0* | *0* | *0* | *100* |
| *Initial Conditions* | *1* | *20* | *22* | *55* | *2* | *100* |
| 10 years | 0 | 26 | 23 | 49 | 2 | 100 |
| 15year planning period | 0 | 29 | 23 | 45 | 2 | 100 |
| 20 years | 0 | 35 | 26 | 35 | 2 | 100 |
| 30 years | 0 | 35 | 27 | 36 | 2 | 100 |
| 40 years | 0 | 40 | 27 | 31 | 2 | 100 |
| 50 years | 0 | 36 | 32 | 29 | 2 | 100 |
| **Percent departure for each vegetation state from desired conditions** | | | | | | |
| *Desired Conditions* | *0* | *0* | *0* | *0* | *0* | |
| *Initial Conditions* | *100* | 74 | *100* | *100* | *100* | |
| 10 years | 100 | 65 | 100 | 100 | 100 | |
| 15year planning period | 100 | 61 | 100 | 100 | 100 | |
| 20 years | 100 | 54 | 100 | 100 | 100 | |
| 30 years | 100 | 53 | 100 | 100 | 100 | |
| 40 years | 100 | 48 | 100 | 100 | 100 | |
| 50 years | 100 | 52 | 100 | 100 | 100 | |

## Montane/Subalpine




**Appendix B figure 9. Montane/subalpine grasslands potential natural vegetation type current and desired vegetation structural states**

[1] Montane/Subalpine Grasslands (MSG) PNVT Vegetation Structural States. At 51,559 acres or approximately 3% of the forests this PNVT ranks 9th in order of size out of the 14 PNVTs on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% tree or shrub canopy cover; early successional development

State B - Perennial herbaceous vegetation, with < 10% tree or shrub canopy cover; mid successional development

State C - Perennial herbaceous vegetation, with < 10% tree or shrub canopy cover; late successional development

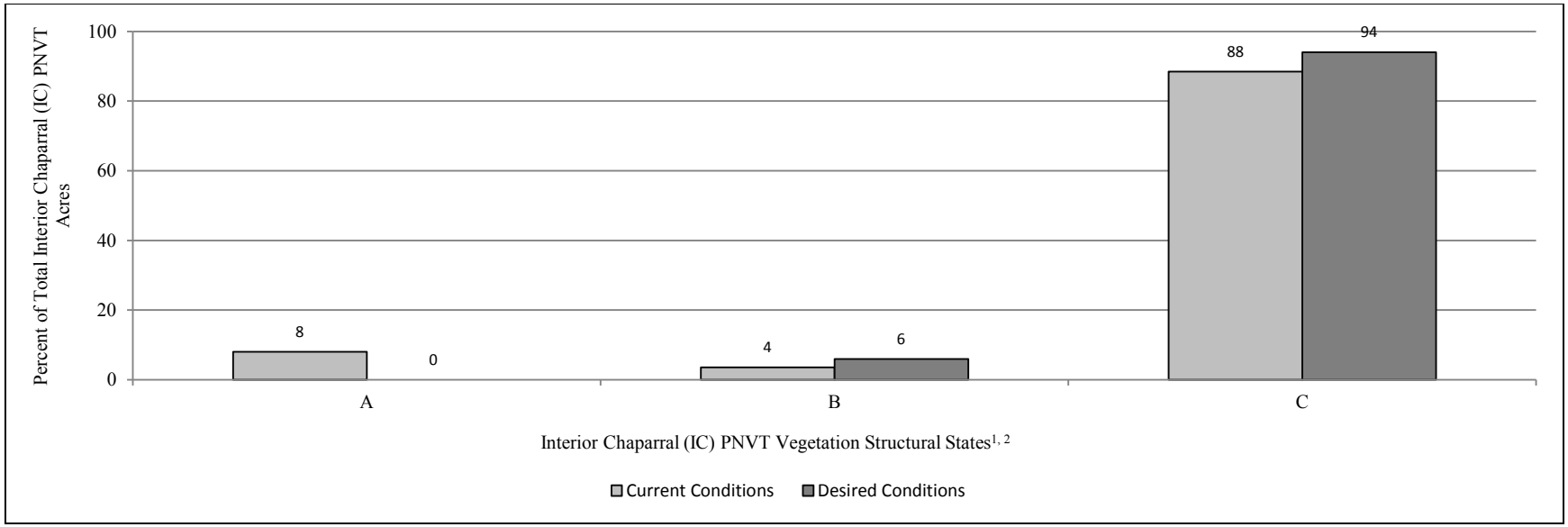
State D - Shrubs, seedling and sapling size (< 5” diameter), small size (5”-9.9” diameter), medium size (10”-19.9” diameter), and large to very large size (> 20” diameter) trees with open (< 30%) or closed (≥ 30) canopy cover, with perennial herbaceous vegetation understory; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

State E - Various noxious weeds and invasive plants makeup a significant portion of the herbaceous vegetation composition; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] MSG PNVT has a 54% or moderate departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it tied with wet mixed conifer forest for the 6th most departed PNVT for DC; and 8th most departed PNVT for HRV on the ASNFs. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2007c)

## Chaparral PNVT

## Interior




**Appendix B figure 10. Interior chaparral potential natural vegetation type current and desired vegetation structural states**

[1] Interior Chaparral (IC) PNVT Vegetation Structural States. At 55,981 acres or approximately 3% of the forests this PNVT ranks 8th in order of size out of the 14 PNVTs on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% shrub or tree canopy cover; early successional development

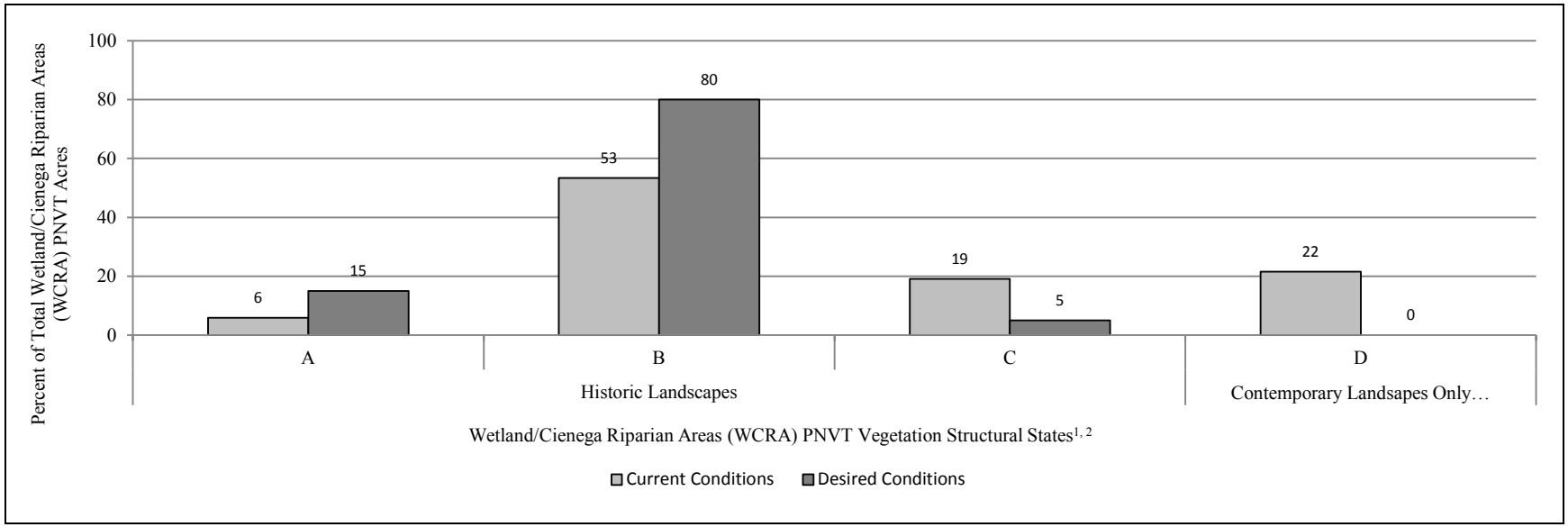
State B - Open perennial herbaceous vegetation, with shrubs, seedling and sapling size (< 5” diameter) and small size (5”-9.9” diameter) trees with open (< 30% canopy cover; mid successional development

State C - Shrubs, seedling and sapling, small, medium size (10”-19.9” diameter), and large to very large size (> 20” diameter) trees with closed (≥ 30) canopy cover, and medium and large to very large size (> 20” diameter) trees with open canopy cover and no herbaceous vegetation understory; late successional development

[2] IC PNVT has a 8% or no departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the least departed PNVT on the ASNFs for both DC and HRV. Desired Conditions were provided by the Regional Office, and HRV was derived from the Nature Conservancy (Schussman 2006b)

## Riparian Areas/Riparian Forest PNVTs

## Wetland/Cienega




**Appendix B figure 11. Wetland/cienega riparian areas potential natural vegetation type current and desired vegetation structural states**

[1] Wetland/Cienega Riparian Areas (WCRA) PNVT Vegetation Structural States. At 17,900 acres or approximately 0.9% of the forests this PNVT ranks 10th in order of size out of the 14 PNVTs on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% tree or shrub canopy cover; early successional development

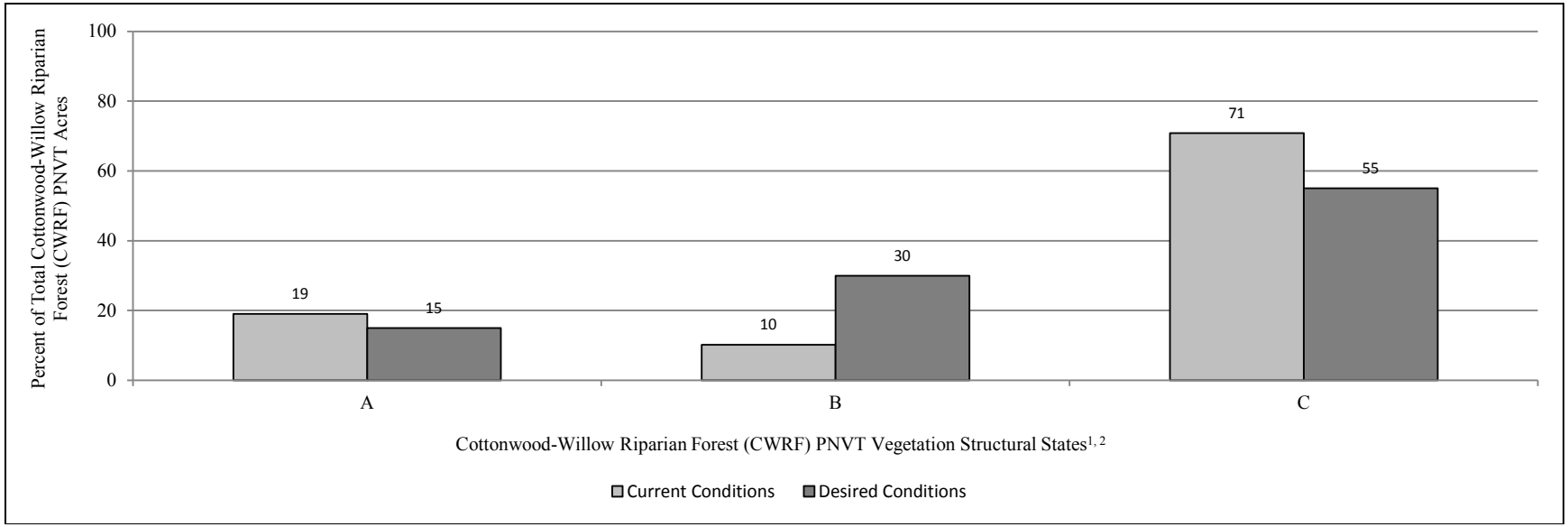
State B - Perennial herbaceous vegetation, with < 10% tree or shrub canopy cover; mid successional development

State C - Shrubs, and seedling and sapling size (< 5” diameter) trees with open (< 30%) or closed (≥ 30) canopy cover, with perennial herbaceous vegetation understory; mid successional development

State D - Shrubs, small size (5”-9.9” diameter), medium size (10”-19.9” diameter), and large to very large size (> 20” diameter) trees with open (< 30%) or closed (≥ 30) canopy cover, with herbaceous vegetation understory; late successional development; not part of the historic conditions or within historic range of variability, found on contemporary landscapes only

[2] WCRA PNVT has a 36% or low departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the 7th and 9th most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2003)

## Cottonwood-Willow




**Appendix B figure 12. Cottonwood-willow riparian forest potential natural vegetation type current and desired vegetation structural states**

[1] Cottonwood-Willow Riparian Forest (CWRF) PNVT Vegetation Structural States. At 15,876 acres or approximately 0.8% of the forests this PNVT ranks 12th in order of size out of the 14 PNVTs on the ASNFs

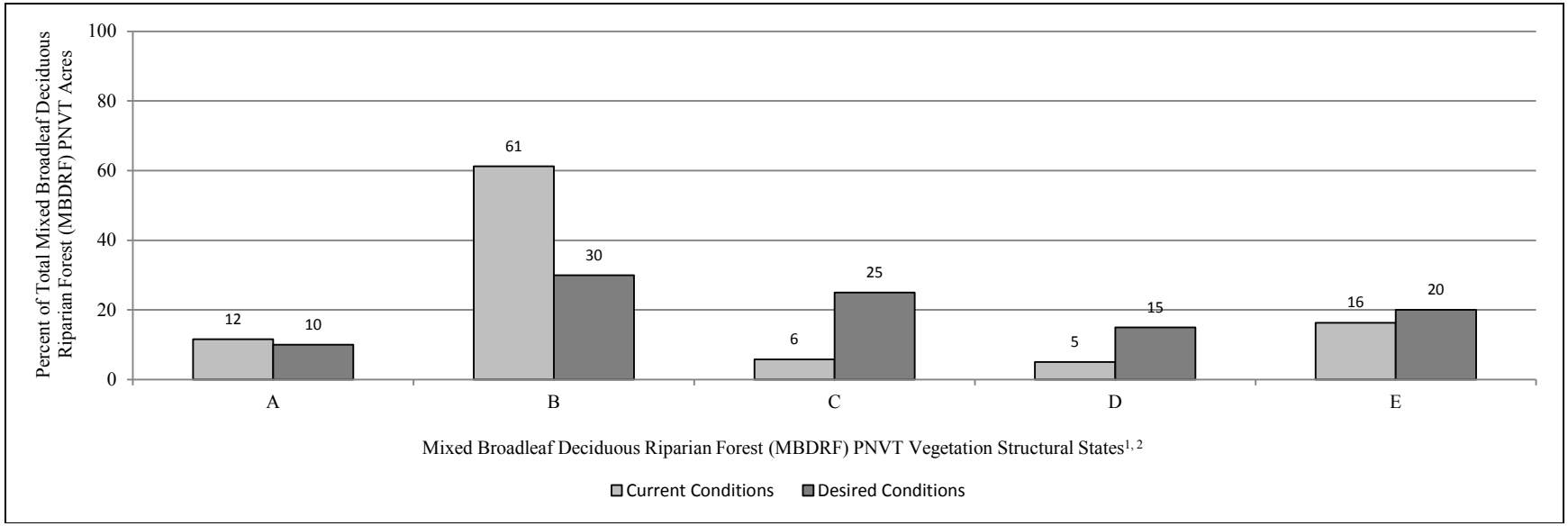
State A - Herbaceous vegetation dominated with shrubs, seedling and sapling size (< 5" diameter) trees with open (< 30%) or closed (≥ 30%) canopy cover; early successional development

State B - Tall shrubs and small size (5-9.9" diameter) trees with open or closed canopy cover; mid successional development

State C - Medium size (10-19.9" diameter) and large to very large (> 20" diameter) size trees with open or closed canopy cover; late successional development

[2] CWRF PNVT has a 20% or no departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the 11th and 13th most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2007d)

## Mixed Broadleaf Deciduous




**Appendix B figure 13. Mixed broadleaf deciduous riparian forest potential natural vegetation type current and desired vegetation structural states**

[1] Mixed Broadleaf Deciduous Riparian Forest (MBDRF) PNVT Vegetation Structural States. At 9,657 acres or approximately 0.5% of the forests this PNVT ranks 13th in order of size out of the 14 PNVTs on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, sparsely vegetated; with < 10% tree or shrub canopy cover; early successional development

State B - Shrubs, seedling and sapling size (< 5” diameter), small size (5”-9.9” diameter), and medium size (10”-19.9” diameter) trees with closed (> 30%) canopy cover; mid successional development

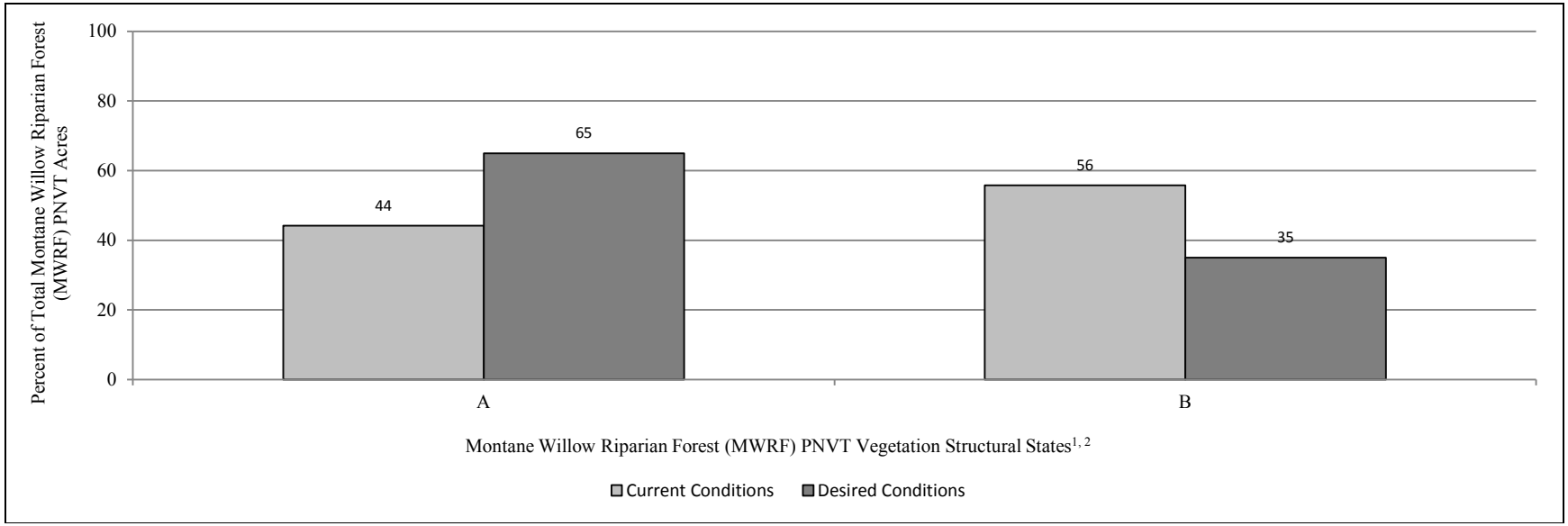
State C - Shrubs, seedling and sapling, and small size trees with open (< 30%) canopy cover; mid successional development

State D - Shrubs, medium size, and large to very large size (> 20” diameter) trees with open canopy cover; late successional development

State E - Shrubs, and large to very large size trees with closed canopy cover; late successional development

[2] MBDRF PNVT has a 33% or low departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the 8th and 10th most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2008)

## Montane Willow




**Appendix B figure 14. Montane willow riparian forest potential natural vegetation type current and desired vegetation structural states**

[1] Montane Willow Riparian Forest (MWRF) PNVT Vegetation Structural States. At 4,808 acres or approximately 0.2% of the forests this PNVT is the smallest on the ASNFs

State A - Herbaceous vegetation regeneration, recently burned, and shrubs, and seedling and sapling size (< 5” diameter) trees with open (< 30%) canopy cover; early successional development

State B - Shrubs, seedling and sapling, small size (5”-9.9” diameter) trees with closed (≥ 30%) canopy cover, and medium size (10”-19.9” diameter), and large to very large (> 20” diameter) size trees with open or closed canopy cover; mid to late successional development

[2] MWRF PNVT has a 21% or low departure rating from Desired Conditions (DC) and Historical Range of Variability (HRV) making it the 10th and 12th most departed PNVT on the ASNFs for DC and HRV, respectively. Desired Conditions were provided by the Regional Office, and HRV was derived from LANDFIRE (2007e)

# Appendix C

## Threat/Risk Assessment for all Apache-Sitgreaves National Forests PNVTs

## Threat/Risk Assessment for Forested PNVTs

### Ponderosa Pine Forest PNVT

When assessing threats and risks to ponderosa pine forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 1). In this case, assess legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility (shaded area). In relation to HRV, departure is severe, however, the current trend is toward HRV (shaded area); therefore, risks are addressed. Continue current management however, restoration opportunities should be identified for this PNVT.

**Appendix C table 1. Recommended actions in evaluating threats/risks for the ponderosa pine forest PNVT in relation to its severe departure from HRV and current trend toward HRV**

| Current Departure from HRV† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV‡ | away from HRV (or unknown) |
| Significant (low, moderate, high or **severe** departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | **Risk addressed; continue current management and identify restoration opportunities** | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 3; under current management (Alternative A), within the 15-year planning period, movement is towards HRV

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to ponderosa pine forest include (appendix C table 2) fire suppression, forest management practices (vegetation treatments), human-caused fires and roads, highways and corridors (some areas also have a high density road network established for the removal of timber). These threats types include modification of natural processes, consumptive biological use and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing and off highway vehicles (OHV). Invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include urban development and insect, disease, parasites and/or pathogens outbreaks (epidemic), and wild ungulate grazing/browsing. These threats types include habitat conversion and invasive species which have negative consequences to ecological composition, structure, function and processes. Uncharacteristic wildfire is an additional threat.

**Appendix C table 2. ASNFs' risks to the ponderosa pine forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)-H∫ | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Forest management practices (vegetation treatments) | Consumptive biological use/ habitat conversion | H | M | C | S | F | - |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Insect, disease, parasites and/or pathogens outbreaks (epidemic) | Invasive species/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | H | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| Wind events (blowdown) | Habitat conversion | low (L) | L | C | S | - | P |
| **Total (under/outside agency management authority)** | | | | **8/7** | **7/7** | **7/6** | **7/6** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres and moderate and high burn severity acres within this PNVT

Quite possibly, the most important and far reaching threats under agency authority (appendix C, table 2) for ponderosa pine forests include managing the legacy of past and current livestock grazing/browsing, which removed fine fuels necessary for supporting frequent, low intensity surface fires; forest management practices (vegetation treatments), which have changed forest age class distribution, composition, density, and cover values; and the cessation of frequent fire regimes (fire suppression), which prior to about 1900 ranged in frequency between 2 and 17 years. The contemporary ponderosa pine forest has and estimated fire frequency for all fires of 1 in 75 years and has gone from an FRCC of 1 to 3.

Anthropogenic disturbance has led to major changes in ponderosa pine forest structure and function. With the introduction of grazing animals at various times during the 19$^{th}$ century, low intensity and frequent surface fires have been replaced with high intensity and infrequent crown fires. Although the effects of these large, stand-replacing fires are variable, several fires have led to long-term changes from forested systems to grasslands, woodlands, and areas of dense pine regeneration (Savage and Mast 2005; Dahms and Geils 1997). Areas that have not burned yet have higher density of trees, especially of the smaller size class and younger age class, changing the quality of habitat for wildlife and humans (Covington and Moore 1994; Dahms and Geils 1997; Allen et al. 2002). There are also interactions between human-caused disturbance and climate change, which may intensify or confound their effects.

*Risks:* The above threats pose the following risks, many of these risks when functioning together are additive and have compounding affects with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: urban development. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as, epidemic insect, disease and parasites and/or pathogens outbreaks may be partially reversible depending on spatial scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification, loss and/or fragmentation (reduces species' population and/or viability). Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale. Risks from fire suppression, human-caused fires, and roads, highways and corridors, and OHVs can be minimized and in many cases be reversed. Some effects of livestock grazing/browsing are also reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote forest vegetative structure and composition that approximates HRV to promote stands of larger trees in more open canopy configuration and reduction in the small sized trees with closed canopies.; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management, vegetation treatments and fire suppression. Improved travel management, and road maintenance and design; aggressive invasive plant management and implementation of applicable Best Management Practices (BMPs).

There is a need for ecological change within this PNVT so that it is more resistant (withstand and maintain normal function) and resilient (recover from) to disturbances within its HRV. Resiliency requires forest characteristics such as fuel loading, species composition and stand structures be compatible with restoration of frequent surface fire functional processes. Desired changes include management activities that also influence understory herbaceous species cover and species richness that is more closely associated with HRV by:

- Reducing overstory density to restore open forest conditions
- Restoring dominance of seral fire-adapted species
- Promoting regeneration of shade intolerant seral species
- Reducing understory and overstory dominance of shade tolerant species
- Reducing fuel loading to levels commensurate with re-introduction of frequent surface fire (reduction of FRCC from 3 to 1)
- Restoring frequent surface fire as a functional ecological process
- Preventing, controlling and eradicating invasive plants

There is a need to maintain or improve ecosystem conditions to be resistant to and resilient in response to climate change.

According to Tausch (2008), a warming climate will often lead to an upward elevational migration of plant species. Because of the rapidity of expected changes in climate, individuals of a native plant species may be lost from their lower-elevation limits faster than they will be able to migrate upward and establish into newly created habitat. This will result in stressed communities with fewer plant species distributed over large areas of the landscape. As ecosystems become simplified, their trophic levels are truncated and their trophic interactions reduced (Tausch 2008).

Such ecosystems potentially have an increase in the quantity of unused resources. These stressed communities thus become more open and their resources more available for the invasion and establishment of invasive plant species. These invaders may also be better adapted than native species to the new environmental conditions resulting from climate change. An exception might be native species of plants that can migrate from adjacent areas or regions into locations where they previously were excluded by climate as the new locations become more suitable. The greater the change, the more likely this facilitation of invasive species will be. In addition to climate change are the species of invaders involved, the effects of the interactions of their species composition on the ecosystems, and the disturbance patterns those ecosystems are experiencing. On landscape scales, this ecosystem spatial and temporal variability have major effects on ecosystem susceptibility to invasive species. Climate change and associated vegetation change interacting with invasive species are also increasingly leading to uncharacteristic wildfires that can further facilitate the establishment of additional invasive plant species (Tausch 2008).

## Wet Mixed Conifer Forest PNVT

When assessing threats and risks to wet mixed conifer forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 3). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility (shaded area). In relation to HRV, departure is high, however, the current trend is toward HRV (shaded area); therefore, risks are addressed. Continue current management however, restoration opportunities should be identified for this PNVT.

**Appendix C table 3. Recommended actions in evaluating threats/risks for the wet mixed conifer forest PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV‡ | away from HRV (or unknown) |
| Significant (low, moderate, **high** or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | **Risk addressed; continue current management and identify restoration opportunities** | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 5; under current management (Alternative A), within the 15-year planning period, movement is towards HRV

*Threats:* The most important threat, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to wet mixed conifer forests is (appendix C table 4) the potential for human-caused fires. This threat type presents the possibility for habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include insect, disease, parasites and/or pathogens outbreaks (epidemic), and wild ungulate grazing/browsing. These

threats types include habitat conversion and invasive species which have negative consequences to ecological composition, structure, function and processes. Uncharacteristic wildfire is an additional threat.

**Appendix C table 4. ASNFs' risks to the wet mixed conifer forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)-H∫ | C | S | F | P |
| Forest management practices (vegetation treatments) | Consumptive biological use/ habitat conversion | H | M | C | S | F | - |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Insect, disease, parasites and/or pathogens outbreaks (epidemic) | Invasive species/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| Wind events (blowdown) | Habitat conversion | low (L) | L | C | S | - | P |
| **Total (under/outside agency management authority)** | | | | **5/6** | **5/6** | **5/5** | **4/6** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres and moderate and high burn severity acres within this PNVT

*Risks:* Under current management, risks are addressed.

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote forest vegetative structure and composition that approximates HRV; manage fire as an integral component of ecosystem sustainability; aggressive invasive plant management and implementation of applicable BMPs.

## Ecological Need for Change in Management Activities

There is a need for ecological change within this PNVT so that it is more resistant (withstand and maintain normal function) and resilient (recover from) to disturbances within its HRV. Desired changes include management activities that also influence understory herbaceous species cover and species richness that is more closely associated with HRV by:

- Preventing human-caused fires
- Preventing, controlling and eradicating invasive plants

There is a need to maintain ecosystem conditions to be resistant to and resilient in response to climate change.

## Dry Mixed Conifer Forest PNVT

When assessing threats and risks to dry mixed conifer forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 5). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility (shaded area). In relation to HRV, departure is high, however, the current trend is toward HRV (shaded area); therefore, risks are addressed. Continue current management however, restoration opportunities should be identified for this PNVT.

**Appendix C table 5. Recommended actions in evaluating threats/risks for the dry mixed conifer forest PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV‡ | away from HRV (or unknown) |
| Significant (low, moderate, **high** or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | **Risk addressed; continue current management and identify restoration opportunities** | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 5; under current management (Alternative A), within the 15-year planning period, movement is towards HRV

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to dry mixed conifer forest include (appendix C table 6) fire suppression, human-caused fires and roads, highways and corridors (some areas also have a high density road network established for the removal of timber). These threats types include modification of natural processes, consumptive biological use and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include insect, disease, parasites and/or pathogens outbreaks (epidemic), and wild ungulate grazing/browsing. These threats types include habitat conversion and invasive species which have negative consequences to ecological composition, structure, function and processes. Uncharacteristic wildfire is an additional threat.

Quite possibly, the most important and far reaching threats under agency authority (appendix C table 6) for dry mixed conifer forest include managing the legacy of past and current livestock grazing/browsing, which removed fine fuels needed for carrying frequent, low intensity surface fires; forest management practices (vegetation treatments), which have changed forest age class distribution, composition, density, and cover values; and the cessation of frequent fire regimes (fire suppression), which prior to about 1900 ranged in frequency between 10 and 22 years. The contemporary dry mixed conifer forest has and estimated fire frequency for all fires of 1 in 70 years and has gone from an FRCC of 1 to 3.

Unfortunately, little has been quantified on the effects of anthropogenic disturbance on mixed conifer forests. However, a combination of anthropogenic factors, namely grazing management, fire management, and silvicultural practices have had several profound effects on general trends in dry mixed conifer forest form and function. The historical mixed severity fire regime of small patches of infrequent, high severity fire within a broader matrix of low severity, frequent fires has been replaced with a more uniform and large scale, low frequency and high severity fire regime. This change in disturbance, combined with selective logging techniques that preferentially removed the larger, older Rocky Mountain

Douglas-fir trees has resulted in more homogenous mixed conifer forests, with greater numbers of smaller, fire susceptible trees. There are also interactions between human-caused disturbance and climate change, which may intensify or confound their effects.

**Appendix C table 6. ASNFs' risks to the dry mixed conifer forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)-H∫ | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Forest management practices (vegetation treatments) | Consumptive biological use/habitat conversion | H | M | C | S | F | - |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/habitat conversation | H | M-H∫ | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Insect, disease, parasites and/or pathogens outbreaks (epidemic) | Invasive species/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| Wind events (blowdown) | Habitat conversion | low (L) | L | C | S | - | P |
| **Total (under/outside agency management authority)** | | | | **8/6** | **7/6** | **7/6** | **7/6** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres and moderate and high burn severity acres within this PNVT

*Risks:* The above threats pose the following risks, many of these risks when functioning together are additive and have compounding affects with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: urban development. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as, epidemic insect, disease and parasites and/or pathogens outbreaks may be partially

reversible depending on spatial scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification, loss and/or fragmentation (reduces species' population and/or viability). Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale. Risks from fire suppression, human-caused fires, and roads, highways and corridors, and OHVs can be minimized and in many cases be reversed. Some effects of livestock grazing/browsing are also reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote forest vegetative structure and composition that approximates HRV to promote stands of larger trees in more open canopy configuration and reduction in the small sized trees with closed canopies; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management, vegetation treatments and fire suppression. Improved travel management, and road maintenance and design; aggressive invasive plant management and implementation of applicable BMPs.

### Ecological Need for Change in Management Activities

There is a need for ecological change within this PNVT so that it is more resistant (withstand and maintain normal function) and resilient (recover from) to disturbances within its HRV. Resiliency requires forest characteristics such as fuel loading, species composition and stand structures be compatible with restoration of frequent surface fire functional processes. Desired changes include management activities that also influence understory herbaceous species cover and species richness that is more closely associated with HRV by:

- Reducing overstory density to restore open forest conditions
- Restoring dominance of seral fire-adapted species
- Promoting regeneration of shade intolerant seral species
- Reducing understory and overstory dominance of shade tolerant species
- Reducing fuel loading to levels commensurate with re-introduction of frequent surface fire (reduction of FRCC from 3 to 1)
- Restoring frequent surface fire as a functional ecological process
- Preventing, controlling and eradicating invasive plants

There is a need to maintain or improve ecosystem conditions to be resistant to and resilient in response to climate change.

## Spruce-Fir Forest PNVT

When assessing threats and risks to spruce-fir forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 7). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility (shaded area). In relation to HRV, departure is high, however, the current trend is toward HRV (shaded area); therefore, risks are addressed. Continue current management however, restoration opportunities should be identified for this PNVT.

**Appendix C table 7. Recommended actions in evaluating threats/risks for the spruce-fir forest PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV‡ | away from HRV (or unknown) |
| Significant (low, moderate, **high** or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | **Risk addressed; continue current management and identify restoration opportunities** | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

‡See figure 9; under current management (Alternative A), within the 15-year planning period, movement is towards HRV

*Threats:* The most important threat, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to spruce-fir forest is (appendix C table 8) the potential for human-caused fires. This threat type presents the possibility for habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include insect, disease, parasites and/or pathogens outbreaks (epidemic), and wild ungulate grazing/browsing. These threats types include habitat conversion and invasive species which have negative consequences to ecological composition, structure, function and processes. Uncharacteristic wildfire is an additional threat.

**Appendix C table 8. ASNFs' risks to the spruce-fir forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)∫ | C | S | F | P |
| Forest management practices (vegetation treatments) | Consumptive biological use/habitat conversion | H | M | C | S | F | - |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/habitat conversion | H | M∫ | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Insect, disease, parasites and/or pathogens outbreaks (epidemic) | Invasive species/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M∫ | C | S | F | P |
| Wind events (blowdown) | Habitat conversion | low (L) | L | C | S | - | P |
| **Total (under/outside agency management authority)** | | | | **5/6** | **5/6** | **5/5** | **4/6** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of moderate and high burn severity acres within this PNVT

*Risks:* Under current management, risks are addressed.

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote forest vegetative structure and composition that approximates HRV; manage fire as an integral component of ecosystem sustainability; aggressive invasive plant management and implementation of applicable BMPs.

## Ecological Need for Change in Management Activities

There is a need for ecological change within this PNVT so that it is more resistant (withstand and maintain normal function) and resilient (recover from) to disturbances within its HRV. Desired changes include management activities that also influence understory herbaceous species cover and species richness that is more closely associated with HRV by:

- Preventing human-caused fires
- Preventing, controlling and eradicating invasive plants

There is a need to maintain ecosystem conditions to be resistant to and resilient in response to climate change.

## Threat/Risk Assessment for Woodland PNVTs

### Madrean Pine-Oak Woodland PNVT

When assessing threats and risks to Madrean pine-oak woodland it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 9). In this case, assess legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility (shaded area). In relation to HRV, departure is high and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 9. Recommended actions in evaluating threats/risks for the Madrean pine-oak woodland PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown)‡ |
| Significant (low, moderate, **high** or severe) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 13; under current management (Alternative A), within the 15-year planning period, movement is away from HRV

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to Madrean pine-oak woodland include (appendix C table 10) fire suppression and human-caused fires. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include insect, disease, parasites and/or pathogens outbreaks (epidemic), and wild ungulate grazing/browsing. These threats types include habitat conversion and invasive species which have negative consequences to ecological composition, structure, function and processes. Uncharacteristic erosion, sedimentation and wildfire are additional threats.

**Appendix C table 10. ASNFs' risks to the Madrean pine-oak woodland PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)-H∫ | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Forest management practices (vegetation treatments) | Consumptive biological use | M | M | C | S | F | - |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Insect, disease, parasites and/or pathogens outbreaks (epidemic) | Invasive species/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **6/7** | **6/7** | **6/7** | **5/7** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres and moderate and high burn severity acres within this PNVT

Quite possibly, the most important and far reaching threats under agency authority for Madrean pine-oak woodland include managing the legacy of past and current livestock grazing/browsing and fire suppression. According to Schussman and Gori (2006), the cessation of widespread fires in the Madrean pine-oak woodlands in the late 1880s has been attributed to the lack of fine fuel availability due to heavy livestock grazing (Bahre 1991; Swetnam et al. 1992; Swetnam and Baisan 1996; Swetnam and Betancourt 1998; Fulé et al. 2005), and the introduction of invasive plants. Jones (2000) found that livestock grazing had significantly detrimental impacts on dry ecosystems. Soils, litter cover, and biomass were found to be the most negatively affected variables.

*Risks:* The above threats pose the following risks, many of these risks when functioning together are additive and have compounding affects with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as drought. Even though this threat/risk is not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks may be reversible such as, epidemic insect, disease and parasites and/or pathogens outbreaks depending on spatial scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification, loss and/or fragmentation (reduces species' population and/or viability). Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale. Risks from fire suppression and human-caused fires can be minimized and in many cases reversed. Some effects of livestock grazing/browsing are also reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote woodland vegetative structure and composition that approximates HRV to promote stands of larger trees in more open canopy configuration and reduction in the small sized trees with closed canopies.; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management and fire suppression. Improved travel management, and road maintenance and design; aggressive invasive plant management strategies and implementation of applicable BMPs.

### Ecological Need for Change in Management Activities

There is a need for ecological change because this PNVT has experienced similar stand structural shifts as in the ponderosa pine and dry mixed conifer forest PNVTs. More woody stems per acre have resulted in decreased herbaceous vegetation, increased bare ground with subsequent reductions in organic matter, soil fertility and concurrent increases in erosion and sedimentation.

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community. Within the Madrean pine-oak woodland there is an over representation of young aged woody species with a closed canopy aspect. The current type and rate of management activities (where recurring disturbances, such as grazing (e.g., zootic disclimax[29]) exert the predominant influence in maintaining the structure and composition of the steady-state vegetation within this PNVT) will not restore or move the composition and structure of these woodlands on the ASNFs to anything approaching their HRV, and therefore, will not likely prevent additional losses of soil and site productivity or to reduce the fire severity or change fire frequency. There has been a steady-state shift in understory vegetation structure and composition from tall- and mid-grass cool-season species to mid- and short-grass warm-season species. This PNVT contributes roughly 20 percent of the ASNFs' acres and is continuing to expand its range into neighboring grassland communities. In addition, invasive plants will continue to displace native species and disrupt and/or modify ecological processes within these communities. There is a need for change to prevent, eradicate and/or control invasive plant infestations to avert the loss of biological diversity, disruption and/or modification ecological processes within these woodlands.

[29] Disclimax or "disturbance climax" describes a community that is held at an earlier successional stage by repeated but unpredictable disturbances that prevent succession from reaching the climax community that might be expected for the climate of the area. A zootic or "animal" disclimax describes a community that is held at an earlier successional stage by some animal influence such as domestic livestock, for example; a grassland community that has been altered to woodland/shrubland by overgrazing.

## Piñon-Juniper Woodland PNVT

When assessing threats and risks to piñon-juniper woodland it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 11). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, departure is low and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 11. Recommended actions in evaluating threats/risks for the piñon-juniper woodland PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV‡ | away from HRV (or unknown) |
| Significant (**low**, moderate, high or severe) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | **Risk addressed; continue current management and identify restoration opportunities** | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 14; under current management (Alternative A), within the 15-year planning period, movement is towards HRV

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to piñon-juniper woodland include (appendix C table 12) fire suppression, human-caused fires and roads, highways and utility corridors. These threats types include modification of natural processes, transportation and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include insect, disease, parasites and/or pathogens outbreaks (epidemic), wild ungulate grazing/browsing, and urban development. These threats types include habitat conversion and invasive species which have negative consequences to ecological composition, structure, function and processes. Excessive ungulate grazing/browsing, uncharacteristic erosion and sedimentation are additional threats.

Quite possibly, the most important and far reaching threats under agency authority for piñon-juniper woodland include managing the legacy of past and current livestock grazing/browsing and fire suppression. According to Gori and Bate (2007), the cessation of widespread fires in the piñon-juniper woodlands in the late 1880s has been attributed to the lack of fine fuels available due to heavy livestock grazing (Bahre 1991; Swetnam et al. 1992; Swetnam and Baisan 1996; Swetnam and Betancourt 1998; Fulé et al. 2005), and the introduction of invasive plants.

*Risks:* The above threats pose the following risks, many of these risks when functioning together are additive and have compounding affects with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species

extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

**Appendix C table 12. ASNFs' risks to the piñon-juniper woodland PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)-H∫ | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Forest management practices (vegetation treatments) | Consumptive biological use | M | M | C | S | F | - |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Insect, disease, parasites and/or pathogens outbreaks (epidemic) | Invasive species/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **8/7** | **7/7** | **7/7** | **7/6** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres within this PNVT

Again, the decline in herbaceous cover due to livestock grazing in concert with the disruption of the fire regime has been cited in a number of studies as the primary causative factor for the observed increase in tree densities in many piñon-juniper woodlands over the last 120 years. Subtle shifts in herbaceous composition also occurred with grazing, with warm-season perennial grasses being favored at the expense of cool-season species (Jameson et al. 1962; Arnold et al. 1964; Baxter 1977). Ungulate herbivory can alter vegetation composition, structure and function, as well as cause soil compaction and erosion, loss of soil microorganisms, reduction of moisture infiltration rates and increased runoff (Stoddart and Smith 1955; Klemmedson 1956; Ellison 1960; Heady 1975; Stoddart et al. 1975; Wood 1980; Holechek et al. 1998; Heitschmidt and Stuth 1991; Fleischner 1994; Belsky et al. 1999; Jamison and Raish 2000). Jones (2000) found that livestock grazing had significantly detrimental impacts on soils, litter cover, and biomass. The decline in herbaceous cover along with the direct effects of livestock grazing on soil compaction have also led to increased soil erosion rates at many sites (Baxter 1977; Carrara and Carroll 1979; Gottfried et al. 1995; Ernst and Pieper 1996; Wilcox et al. 1996; Bogan et al. 1998; Allen 2001; Wood and Javed 2001; Huffman et al. 2006b). When erosion is severe, changes in the physical properties of soils and in the distribution and abundance of limiting nutrients can impede the re-establishment of herbaceous vegetation even when livestock grazing is eliminated (Koniak and Everett 1982; Klopatek

1987; Klopatek and Klopatek 1987; Klopatek et al. 1990; Laycock 1991; Gottfried et al. 1995; Davenport et al. 1998; Breshears and Barnes 1999; Allen 2001). Alternative hypotheses implicating livestock grazing (without fire regime disruption), drought and climate variation in the post-settlement loss of grass cover, tree increases, and increased soil erosion have also been proposed. Additional studies are needed to disentangle the effects of these factors on the historical fire regime and on post-settlement structural changes in the piñon-juniper woodland. Most piñon-juniper woodlands in the Southwest have high soil erosion potential (i.e. erosion rates are more sensitive to changing vegetative cover and can cross a threshold more easily than in regions with lower intensity precipitation events) (Gori and Bate 2007). In addition, there has been a loss of cool season perennial grasses which historically predominate in the herbaceous layer where winter rainfall exceeded summer (Ernest et al. 1993). It has also been reported (Brockway et al. 2002), that a combination of frequent fire and competition from cool-season grasses effectively exclude juniper during the critical period of seedling establishment.

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as urban development. Even though this threat/risk is not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks may be reversible such as, epidemic insect, disease and parasites and/or pathogens outbreaks depending on spatial scale. With uncharacteristic erosion – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification, loss and/or fragmentation (reduces species' population and/or viability). Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale. Risks from fire suppression and human-caused fires can be minimized and in many cases reversed. Some effects of livestock grazing and OHVs are also reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote woodland vegetative structure and composition that approximates HRV to promote stands of larger trees in more open canopy configuration and reduction in the small sized trees with closed canopies.; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management and fire suppression. Improved travel management, and road maintenance and design; aggressive invasive plant management strategies and implementation of applicable BMPs.

## Ecological Need for Change in Management Activities

There is a need for ecological change because this PNVT has experienced similar stand structural shifts as in the Madrean pine-oak woodland PNVTs. More woody stems per acre have resulted in decreased herbaceous vegetation, increased bare ground with subsequent reductions in organic matter, soil fertility and concurrent increases in erosion and sedimentation.

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community. Within the piñon-juniper woodland there is an over representation of young-aged woody species with a closed canopy aspect. The current type and rate of management activities (where recurring disturbances, such as grazing (e.g., zootic disclimax) exert the predominant influence in maintaining the structure and composition of the steady-state vegetation within this PNVT) will not restore or move the composition and structure of these woodlands on the ASNFs to anything approaching their HRV, and therefore, will not likely prevent additional losses of soil and site productivity or to reduce the fire severity or change fire frequency. There has been a steady-state shift in understory vegetation structure and composition from tall- and mid-grass cool-season species to mid- and short-grass warm-season species. This PNVT contributes roughly 12 percent of the ASNFs' acres and is continuing to expand its range into neighboring grassland communities. In addition, invasive plants will continue to

displace native species and disrupt and/or modify ecological processes within these communities. There is a need for change to prevent, eradicate and/or control invasive plant infestations to avert the loss of biological diversity, disruption and/or modification ecological processes within these woodlands.

Because of the degree of departure and proportion of these PNVT off-forests; the ASNFs provide a notable contribution to the sustainability of this woodland PNVT. Desired changes include management activities that also influence understory herbaceous species cover and species richness that is more closely associated with HRV by:

- Reducing overstory density to restore open woodland conditions
- Restoring dominance of seral fire-adapted species
- Promoting regeneration of shade intolerant seral species
- Reducing understory and overstory dominance of shade tolerant species
- Restoring frequent surface fire as a functional ecological process
- Preventing, controlling and eradicating invasive plants

There is also a need to maintain or improve ecosystem conditions to be resistant to and resilient in response to climate change.

## Threat/Risk Assessment for Grassland PNVTs

### Great Basin Grassland PNVT

When assessing threats and risks to Great Basin grassland it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 13). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, departure is high and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 13. Recommended actions in evaluating threats/risks for the Great Basin grassland PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown)‡ |
| Significant (low, moderate, **high** or severe) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 17; under current management (Alternative A), within the 15-year planning period, movement is away from HRV

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to Great Basin grassland include (appendix C table 14) fire suppression, woody species encroachment and establishment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include urban development, wild ungulate grazing/browsing, uncharacteristic erosion, sedimentation and wildfire. These threats types include habitat conversion and consumptive biological uses which have negative consequences to ecological composition, structure, function and processes. Drought is an additional threat.

**Appendix C table 14. ASNFs' risks to the Great Basin grassland PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | H∫ | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Woody species encroachment and establishment | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | moderate (M) | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | H∫ | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Excessive ungulate grazing/browsing | Consumptive biological use | M | H | C | S | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **8/8** | **7/8** | **8/8** | **8/7** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres within this PNVT

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

According to Gori and Enquist (2003) and Enquist and Gori (2005), changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacey 1995). Finch (2004) identified and summarized the major threats to grassland biological diversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, erosion, and habitat fragmentation. The Arizona Statewide Grasslands Assessment (Gori and Enquist 2003; Enquist and Gori 2005) documented several of these factors as threats to grasslands on the ASNFs. In particular, over 70 percent of grasslands on the ASNFs whose current condition were assessed are woody species invaded.

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: drought, uncharacteristic erosion and sedimentation and excessive ungulate grazing. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification/loss/fragmentation (reduces species' population and/or viability), Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, Risks from fire suppression, human-caused fires and roads, highways and corridors can be minimized and in many cases be reversed, Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

Woody species encroachment and establishment into the Great Basin grasslands has been extensive spatially. It is estimated that roughly 68 percent or over 120,800 acres have been invaded, to a lesser or greater degree. Roughly 70 percent or over 84,500 acres may not be restorable to their former grassland state depending on the severity of change (presence of woody species, loss of soil, productivity and production potential).

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote grassland vegetative structure and composition that approximates HRV; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management. Improved travel management, and road maintenance and design; aggressive invasive plant management and implementation of applicable BMPs. As noted by Finch (2004), maintaining grasslands at sufficient scales is vital for supporting grassland-dependent species, as habitat fragmentation has detrimental effects on grassland biological diversity. These grassland areas provide a valuable opportunity to manage grasslands on the forests, and to partner with adjacent landowners, to restore grassland function and structure at sufficient scales to ensure the sustainability of species that depend on this system.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community Restoration of conditions such that the Great Basin grassland is resistant and resilient to disturbances within its HRV. The Arizona Grassland Assessment (Gori and Enquist 2003; Enquist and Gori 2005) identified approximately 346,700 acres of extant and historic grasslands on the ASNFs consisting of both the Great Basin and semi-desert grasslands (appendix C table 15), representing approximately 14 percent of the Forests. An additional 23,600 acres of historic grassland were identified, but no locations were given; however, the current condition of these grasslands was not determined and these acres are not included in percentage calculations. Overall, the ASNFs manage roughly 18 percent of all grasslands, 23 percent of restorable grasslands, and 40 percent of former grasslands that occur on National Forests in Arizona. The majority (70 percent) of grasslands on the ASNFs are in restorable native condition, with the remainder (30 percent) in former grassland condition.

**Appendix C table 15. Acres of Great Basin grassland PNVT in two condition types, restorable and non-restorable occurring on three ranger districts on the ASNFs (adopted and modified from Gori and Enquist 2003; Schussman and Gori 2004; Enquist and Gori 2005; Vander Lee et al. 2006)**

| Ranger District | Native Grassland Type | | | | | |
|---|---|---|---|---|---|---|
| | Restorable | | Non-restorable (former grassland) | | Total | |
| | acres | percent† | acres | percent† | acres | percent‡ |
| Black Mesa | 105,617 | 100 | 0 | 0 | 105,617 | 57 |
| Lakeside | 23,164 | 31 | 52,785 | 70 | 75,949 | 41 |
| Springerville | 0 | 0 | 3,956 | 100 | 3,956 | 2 |
| Total | 128,782 | - | 56,741 | - | 185,523 | 100 |

†Percent of total grasslands on each ranger district in that grassland condition type
‡Percent of total grasslands on ASNFs on each ranger district

The largest proportion of identified Great Basin grassland occurs on the Black Mesa RD followed by the Lakeside RD. According to Gori and Enquist (2003), all of the grasslands on the Black Mesa RD were identified as being in restorable native condition, meaning that they have been encroached by woody species, but have the potential to be restored to open native condition. This area of restorable grasslands is the largest contiguous area on National Forests in Arizona with this potential. On the Lakeside RD, a large proportion of grasslands has woody species encroachment, and has likely undergone a type conversion with little potential to be restored to open native grassland condition.

A key characteristic of these encroached grasslands are their potential for restoration. The potential to restore woody encroached grasslands is affected by a complex web of interacting physical and biological factors that include soil, climate, topography, grazing, invasive plants, and fire. Woody cover can be reduced with prescribed burns when sufficient fuels are present to carry a fire of adequate intensity (Gori and Backer 2005). Often, the fuels required to allow fires of adequate intensity to achieve this goal are lacking, and areas must be rested from grazing to allow fuels to accumulate. The number of growing seasons of rest needed to accumulate these fuels varies from site to site.

Approximately 129,866 acres (70%) of the Great Basin grasslands on the ASNFs have exceeded a threshold of woody canopy cover between 10 and 30 percent and another 33,394 acres (18%) have exceeded a threshold of woody canopy cover greater than 30 percent. These numbers indicate a type conversion from grassland to shrub/woodland. This transition can result in a likely permanent loss of grassland systems and the species that depend on them. Even given long periods (50 years) of grazing rest, it is unlikely that some of these former grasslands can be restored to open native conditions (Hennessy et al. 1983). While increases in perennial grass cover may occur (Valone et al. 2002) at certain sites based upon soil type, erosion, levels of soil trampling and compaction and shrub species composition, it is unlikely that these sites will accumulate sufficient fine fuels to carry a fire intense enough to reduce shrub cover and restore open grassland conditions.

There is a need to maintain or improve ecosystem conditions to be resistant to and resilient in response to climate change.

## Semi-desert Grassland PNVT

When assessing threats and risks to semi-desert grassland it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 16). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, departure is high and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 16. Recommended actions in evaluating threats/risks for the semi-desert grassland PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown)‡ |
| Significant (low, moderate, **high** or severe) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)
‡See figure 18; under current management (Alternative A), within the 15-year planning period, movement away from HRV

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to semi-desert grassland include (appendix C table 17) fire suppression, woody species encroachment and establishment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include urban development, wild ungulate grazing/browsing, uncharacteristic erosion, sedimentation and wildfire. These threats types include habitat conversion and consumptive biological uses which have negative consequences to ecological composition, structure, function and processes. Drought is an additional threat.

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

According to Gori and Enquist (2003), changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacey 1995). Finch (2004) identified and summarized the major threats to grassland biological diversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, erosion, and habitat fragmentation. The *Arizona Statewide Grasslands Assessment* (Gori and Enquist 2003; Enquist and Gori 2005) documented several of these factors as threats to grasslands on the ASNFs. In particular, over 70 percent of grasslands on the ASNFs whose current condition were assessed are woody species invaded.

**Appendix C table 17. ASNFs' risks to the semi-desert grassland PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | H∫ | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | H∫ | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | moderate (M) | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | F | P |
| Woody species encroachment and establishment | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **8/7** | **7/7** | **8/7** | **8/6** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres within this PNVT

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: drought, uncharacteristic erosion and sedimentation and excessive ungulate grazing. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification/loss/fragmentation (reduces species' population and/or viability), Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, Risks from fire suppression, human-caused fires and roads, highways and corridors can be minimized and in many cases be reversed, Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

Woody species encroachment and establishment into the semi-desert grasslands has been extensive spatially. It is estimated that roughly 80 percent or over 86,000 acres have been encroached, to a lesser or greater degree. Roughly 36 percent or nearly 38,500 acres may not be restorable to their former grassland state depending on the severity of change (presence of woody species, loss of soil, productivity and production potential).

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote grassland

vegetative structure and composition that approximates HRV; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management. Improved travel management, and road maintenance and design; aggressive invasive plant management and implementation of applicable BMPs. As noted by Finch (2004), maintaining grasslands at sufficient scales is vital for supporting grassland-dependent species, as habitat fragmentation has detrimental effects on grassland biological diversity. These grassland areas provide a valuable opportunity to manage grasslands on the forests, and to partner with adjacent landowners, to restore grassland function and structure at sufficient scales to ensure the sustainability of species that depend on this system.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community; restoration of conditions such that the semi-desert grassland is resistant and resilient to disturbances within its HRV. Gori and Enquist (2003) identified approximately 346,700 acres of extant and historic grasslands on the ASNFs consisting of both the semi-desert and Great Basin grasslands, representing approximately 14 percent of the Forests.

A key characteristic of woody invaded grasslands is its restoration potential. The potential to restore woody-invaded grasslands is affected by a complex web of interacting physical and biological factors that include climate, topography, grazing, invasive plants, and fire. Woody cover can be reduced with prescribed burns when sufficient fuels are present to carry a fire of adequate intensity (Gori and Backer 2005). Often, the fuels required to allow fires of adequate intensity to achieve this goal are lacking, and areas must be rested from grazing to allow fuels to accumulate. The number of growing seasons of rest needed to accumulate these fuels varies from site to site.

According to Gori and Enquist (2003), approximately 30 percent of grasslands on the ASNFs have exceeded a threshold of 35 percent woody cover that indicates a type conversion from grassland to shrub/woodland (appendix C table 18). This transition can result in a likely permanent loss of grassland systems and the species that depend on them. Even given long periods (50 years) of grazing rest, it is unlikely that some of these former grasslands can be restored to open native conditions (Hennessy et al. 1983). While increases in perennial grass cover may occur (Valone et al. 2002) at certain sites based upon soil type, erosion and shrub species composition, it is unlikely that these sites will accumulate sufficient fine fuels to carry a fire intense enough to reduce shrub cover and restore open grassland conditions.

**Appendix C table 18. Acres of semi-desert grassland PNVT in two condition types, restorable and non-restorable occurring on the ASNFs (adopted and modified from Gori and Enquist 2003; Schussman and Gori 2004; Enquist and Gori 2005; Vander Lee et al. 2006)**

| Clifton Ranger District | Native Grassland Type | | | | | |
|---|---|---|---|---|---|---|
| | Restorable | | Non-restorable (former grassland) | | Total | |
| | acres | percent† | acres | percent† | acres | percent‡ |
| Total | 68,664 | 64.2 | 38,288 | 35.8 | 106,592 | 100.0 |

†Percent of total grasslands on each ranger district in that grassland condition type
‡Percent of total grasslands on ASNFs on each ranger district

Approximately 23,529 acres (22%) of the semi-desert grasslands on the ASNFs have exceeded a threshold of woody canopy cover between 10 and 30 percent and another 60,963 acres (57%) have exceeded a threshold of woody canopy cover greater than 30 percent. These numbers indicate a type conversion from grassland to shrub/woodland. This transition can result in a likely permanent loss of grassland systems and the species that depend on them. Even given long periods (50 years) of grazing rest, it is unlikely that some of these former grasslands can be restored to open native conditions (Hennessy et al. 1983). While increases in perennial grass cover may occur (Valone et al. 2002) at certain

sites based upon soil type, erosion, levels of soil trampling and compaction, and shrub species composition, it is unlikely that these sites will accumulate sufficient fine fuels to carry a fire intense enough to reduce shrub cover and restore open grassland conditions.

There is a need to maintain or improve ecosystem conditions to be resistant to and resilient in response to climate change.

## Montane/Subalpine Grasslands PNVT

When assessing threats and risks to montane/subalpine grasslands it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 19). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, departure is moderate and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 19. Recommended actions in evaluating threats/risks for the montane/subalpine grasslands PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Deviation† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown) |
| Significant (low, **moderate**, high or severe) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to montane/subalpine grasslands include (appendix C table 20) fire suppression, woody species encroachment and establishment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include urban development, wild ungulate grazing/browsing, uncharacteristic erosion, sedimentation and wildfire. These threats types include habitat conversion and consumptive biological uses which have negative consequences to ecological composition, structure, function and processes.

**Appendix C table 20. ASNFs' risks to the montane/subalpine grasslands PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M) | C | S | F | P |
| Fire suppression policy | Modification of natural processes | H | H | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | F | P |
| Woody species encroachment and establishment | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **8/8** | **7/8** | **8/8** | **8/7** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

The major anthropogenic processes that cause changes in high elevation grasslands include grazing by sheep and cattle, and concomitant reduction in fire frequency (White 2002), both of which have led to increased invasion by coniferous trees (Allen 1984; Moore and Huffman 2004), and loss of soil, soil compaction, and soil productivity (White 2002). Early settlers and their grazing animals also have likely introduced one or more non-native grass species (Allen 1984), of which Kentucky bluegrass (*Poa pratensis* L.) and Canada bluegrass (*P. compressa* L.) have proven to be successful in out-competing and replacing native perennial bunchgrasses in wet meadows and other valley bottom grasslands. Long-term, chronically low to high levels of grazing by introduced herbivores have resulted in shifts in species composition away from palatable species to dominance by less palatable grasses and forbs (White 2002), although the specific mechanisms and community composition changes have not been well described. The interaction of late 18$^{th}$ century and early 19$^{th}$ century grazing and fire suppression has led to tree invasion of many, but not all high elevation grasslands. In some areas, tree invasion appears to be correlated with changes in climate that occurred around the same time as changes in grazing practices (Dyer and Moffett 1999). Many of the valley bottom grasslands have been impacted by the change in dominance from native perennial bunchgrasses to non-native Canada and Kentucky bluegrasses (Dick-Peddie 1993) and low seral forb species (White 2002).

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by affecting vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered

watershed and hydrologic functions, reduced water quality and quantity, riparian, aquatic and terrestrial locales loss, degradation and fragmentation of these habitats within this PNVT, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

According to Gori and Enquist (2003), changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacey 1995). Finch (2004) identified and summarized the major threats to grassland biological diversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, erosion, and habitat fragmentation.

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: drought, uncharacteristic erosion and sedimentation and excessive ungulate grazing. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification/loss/fragmentation (reduces species' population and/or viability), Some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, Risks from fire suppression, human-caused fires and roads, highways and corridors can be minimized and in many cases be reversed, Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

Woody species encroachment and establishment into the montane/subalpine grasslands has not been extensive spatially. It is estimated that roughly 10 percent or over 5,600 acres have been invaded, to a lesser or greater degree. There is no estimate of how many acres may not be restorable to their former grassland state depending on the severity of change (presence of woody species, loss of soil, productivity and production potential).

*Opportunities:* Vegetation treatments and silvicultural opportunities that restore and promote grassland vegetative structure and composition that approximates HRV; manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by the legacy of livestock management. Improved travel management, and road maintenance and design; aggressive invasive plant management and implementation of applicable BMPs. As noted by Finch (2004), maintaining grasslands at sufficient scales is vital for supporting grassland-dependent species, as habitat fragmentation has detrimental effects on grassland biological diversity. These grassland areas provide a valuable opportunity to manage grasslands on the forests, and to partner with adjacent landowners, to restore grassland function and structure at sufficient scales to ensure the sustainability of species that depend on this system.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community; restoration of conditions such that the montane/subalpine grasslands are resistant and resilient to disturbances within its HRV. Fire management has led to uncharacteristic conditions and has moved this PNVT from a FRCC of 1 to 2. Past and current wild and domestic ungulate herbivory management has led to uncharacteristic conditions. Substantial change has occurred across the Montane/subalpine grasslands where bare ground has increased, on average, nearly 116 percent (White 2002). Conversely, vegetation and litter cover have declined by nearly 39 and 29 percent, respectively.

According to Smith and Wischmeier (1962) the amount and distribution of exposed soil is one of the most important contributors to site stability relative to site potential and is a direct indication of site susceptibility to accelerated wind or water erosion.

A key characteristic of woody invaded grasslands is its restoration potential. The potential to restore woody-invaded grasslands is affected by a complex web of interacting physical and biological factors that include climate, topography, grazing, invasive plants, and fire. Woody cover can be reduced with prescribed burns when sufficient fuels are present to carry a fire of adequate intensity (Gori and Backer 2005). Often, the fuels required to allow fires of adequate intensity to achieve this goal are lacking, and areas must be rested from grazing to allow fuels to accumulate. The number of growing seasons of rest needed to accumulate these fuels varies from site to site.

According to Gori and Enquist (2003), approximately 30 percent of grasslands on the ASNFs have exceeded a threshold of 35 percent woody cover that indicates a type conversion from grassland to shrub/woodland. This transition can result in a likely permanent loss of grassland systems and the species that depend on them. Even given long periods (50 years) of grazing rest, it is unlikely that some of these former grasslands can be restored to open native conditions (Hennessy et al. 1983). While increases in perennial grass cover may occur (Valone et al. 2002) at certain sites based upon soil type, erosion, levels of soil trampling and compaction, and shrub species composition, it is unlikely that these sites will accumulate sufficient fine fuels to carry a fire intense enough to reduce shrub cover and restore open grassland conditions.

Changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacey 1995; Gori and Enquist 2003; Enquist and Gori 2005). Finch (2004) identified and summarized the major threats to grassland biological diversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, erosion, and habitat fragmentation. Gori and Enquist (2003), and Enquist and Gori (2005), documented several of these factors as threats to grasslands on the ASNFs. In particular, over 70 percent of all grasslands on the ASNFs whose current condition were assessed are woody species invaded.

There is a need to maintain or improve ecosystem conditions to be resistant to and resilient in response to climate change.

## Threat/Risk Assessment for Chaparral PNVT

### Interior Chaparral PNVT

When assessing threats and risks to interior chaparral it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 21). In this case, assess legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility (shaded area). In relation to HRV, there is no departure and the current trend is static (shaded area); therefore, risks are addressed. Continue current management however, restoration opportunities should be identified for this PNVT.

**Appendix C table 21. Recommended actions in evaluating threats/risks for the interior chaparral PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Departure† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown) |
| Significant (low, moderate, high or severe) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (no departure, **within HRV**) | **No risk; continue current management** | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

*Threats:* The most important threat, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to interior chaparral is (appendix C table 22) the potential for human-caused fires. This threat type presents the possibility for habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate and livestock grazing/browsing, and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include uncharacteristic erosion and sedimentation, and wild ungulate grazing/browsing. These threats types result in habitat conversion which has negative consequences to ecological composition, structure, function and processes.

**Appendix C table 22. ASNFs' risks to the interior chaparral PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | high (H) | moderate (M)-H∫ | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Outside Agency Management Authority** | | | | | | | |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **4/4** | **4/4** | **4/4** | **4/4** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderately low ecological condition herbaceous vegetation acres within this PNVT

*Risks:* Under current management, risks to interior chaparral are addressed.

## Ecological Need for Change in Management Activities

At this time, there is no ecological need to restore composition and structure and sustain ecological processes in this PNVT. However, there is a need to maintain ecosystem conditions to be resistant to and resilient in response to climate change.

## Threat/Risk Assessment for Riparian Areas and Riparian Forest PNVTs

### Wetland/Cienega Riparian Areas PNVT

When assessing threats and risks to wetland/cienega riparian areas it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 23). In this case, assess legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, departure is low and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 23. Recommended actions in evaluating threats/risks for the wetland/cienega riparian areas PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Departure from HRV† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown) |
| Significant (**low**, moderate, high or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to wetland/cienega riparian areas include (appendix C table 24) livestock grazing/browsing, fire suppression, inundation (diversions, dams and impoundments) and drying of the riparian communities below the impoundment and concurrently flooding those communities above the impoundment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate grazing/browsing, and off highway vehicles (OHV), invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include groundwater depletion/contamination. This threat type includes habitat conversion which has negative consequences to ecological composition, structure, function and processes. Uncharacteristic erosion, sedimentation and wildfire are additional threats.

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by loss of wetlands/cienegas themselves, as-well-as affects to vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), uncharacteristic wildfire, and inability to re-establish natural wildfire processes.

**Appendix C table 24. ASNFs' risks to the wetland/cienega riparian areas PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | low (L) | high (H) | C | S | - | P |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | moderate (M)-H∫ | C | S | F | P |
| Fire suppression | Modification of natural processes | H | H | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Inundation (diversions, dams and impoundments)/de-watering | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use | H | M-H∫ | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | L | H | C | S | - | P |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Groundwater depletion/contamination | Habitat conversion | H | H | - | - | F | P |
| Inundation/de-watering | Habitat conversion | M | M | C | S | - | - |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Water withdrawal | Abiotic resource use | L | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **9/9** | **8/9** | **7/8** | **9/8** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderatly low ecological condition herbaceous vegetation acres within this PNVT

Changes in the structure and function of wetland/cienega riparian systems have been noted as the primary cause of the loss of biological diversity within these systems. The causes of adverse change in the ecological character of wetland/cienegas can be grouped in five broad categories:

- Changes to the water regime
- Water pollution
- Physical modification
- Exploitation of biological products
- Introduction of invasive species

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: uncharacteristic erosion and sedimentation, and excessive wild ungulate and domestic livestock grazing. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With uncharacteristic fires – there may be irreversible conditions – soil loss, uncharacteristic succession,

Habitat modification/loss/fragmentation (reduces species' population and/or viability), some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, Risks from fire suppression and human-caused fires can be minimized and in many cases be reversed. Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation management that promotes structural composition that approximates HRV. Manage fire as an integral component of ecosystem sustainability; Restoration of natural processes and existing conditions that have been compromised by livestock grazing. Improved travel management and road maintenance and design; Aggressive invasive plant management and Implementation of applicable BMPs.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community. The wetland/cienega riparian areas PNVT on the ASNFs has the second greatest road density of any riparian PNVT; nearly 2.9 linear miles of road per one square mile. Rehabilitating land that has been roaded is difficult at best. Desired changes include management activities that influence herbaceous species cover and species richness more closely associated with proper functioning conditions by:

- Maintain and/or improve hydrologic and hydraulic processes
- Maintain and/or improve geomorphic processes
- Maintain and/or improve physical and chemical characteristics
- Maintain and/or improve biological community characteristics
- Maintain and/or improving functions and dynamic equilibrium
- Re-establish dominance of the native plant community
- Limit the presence of invasive plants.

## Cottonwood-Willow Riparian Forest PNVT

When assessing threats and risks to cottonwood-willow riparian forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 25). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, there is no departure, however, the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 25. Recommended actions in evaluating threats/risks for the cottonwood-willow riparian forest PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Departure from HRV† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown) |
| Significant (low, moderate, high or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | Potential for high risk; evaluate threats and system reversibility |
| Non-significant (no departure; **within HRV**) | No risk; continue current management | No risk; continue current management | **Potential risk; evaluate magnitude of future deviations, threats and system reversibility** |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to cottonwood-willow riparian forest include (appendix C table 26) livestock grazing/browsing, fire suppression, inundation (diversions, dams and impoundments) and drying of the riparian communities below the impoundment and concurrently flooding those communities above the impoundment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate grazing/browsing, OHVs and recreation. Invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include groundwater depletion/contamination, wild ungulate grazing/browsing, and urban development. These threat types include habitat conversion which has negative consequences to ecological composition, structure, function and processes. Uncharacteristic soil compaction and erosion, sedimentation and wildfire are additional threats.

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by loss of these riparian areas themselves, as-well-as affects to vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), and inability to re-establish natural wildfire processes.

Changes in the structure and function of cottonwood-willow riparian forests have been noted as the primary cause of the loss of biological diversity within these systems. The causes of adverse change in the ecological character of these systems can be grouped in five broad categories:

- Changes to the water regime
- Water pollution
- Physical modification
- Exploitation of biological products
- Introduction of invasive species

**Appendix C table 26. ASNFs' risks to the cottonwood-willow riparian forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | low (L) | high (H) | C | S | - | P |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | moderate (M)-H∫ | C | S | F | P |
| Fire suppression | Modification of natural processes | H | H | C | S | F | P |
| Inundation (diversions, dams and impoundments)/de-watering | Habitat conversion | H | H | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | M | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Recreation activities | Non-consumptive biological use | M | M | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | L | H | C | S | - | P |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Inundation/de-watering | Habitat conversion | M | M | C | S | - | - |
| Groundwater depletion/contamination | Habitat conversion | H | H | - | - | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Water withdrawal | Abiotic resource use | L | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **10/10** | **8/10** | **8/9** | **10/8** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderatly low ecological condition herbaceous vegetation acres within this PNVT

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: urban development, uncharacteristic erosion and sedimentation. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With OHVs – there may be irreversible conditions – soil loss, uncharacteristic succession, Habitat modification/loss/fragmentation (reduces species' population and/or viability), some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, Risks from fire suppression and human-caused fires can be minimized and in many cases be reversed. Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation management that promotes structural composition that approximates HRV. Manage fire as an integral component of ecosystem sustainability; Restoration of natural processes and existing conditions that have been compromised by livestock grazing. Improved travel management and

road maintenance and design; Aggressive invasive plant management and implementation of applicable BMPs.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community. The cottonwood-willow riparian Forests PNVT on the ASNFs has the third greatest road density of any riparian PNVT; nearly 2.6 linear miles of road per one square mile. Rehabilitating land that has been roaded is difficult at best. Desired changes include management activities that influence herbaceous species cover and species richness more closely associated with proper functioning conditions by:

- Maintain and/or improve hydrologic and hydraulic processes
- Maintain and/or improve geomorphic processes
- Maintain and/or improve physical and chemical characteristics
- Maintain and/or improve biological community characteristics
- Maintain and/or improving functions and dynamic equilibrium
- Re-establish dominance of the native plant community
- Limit the presence of invasive plants

## Mixed Broadleaf Deciduous Riparian Forest PNVT

When assessing threats and risks to mixed broadleaf deciduous riparian forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 27). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, there is a low departure and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 27. Recommended actions in evaluating threats/risks for the mixed broadleaf deciduous riparian forest PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Departure from HRV† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown) |
| Significant (**low**, moderate, high or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to mixed broadleaf deciduous riparian forest include (appendix C table 28) livestock grazing/browsing, inundation (diversions, dams and impoundments) and drying of the riparian communities below the impoundment and concurrently flooding those communities above the impoundment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate grazing/browsing, and OHVs, invasive plants are an additional threat. The most important threat, based on high likelihood of

occurrence and high threat severity outside of agency authority is climate change. Other threats outside Forest Service management authority include groundwater depletion/contamination, wild ungulate grazing/browsing, and urban development. These threat types include habitat conversion which has negative consequences to ecological composition, structure, function and processes. Uncharacteristic erosion and sedimentation are additional threats.

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by loss of these riparian areas themselves, as-well-as affects to vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), and inability to re-establish natural wildfire processes.

Changes in the structure and function of mixed broadleaf deciduous riparian forests have been noted as the primary cause of the loss of biological diversity within these systems. The causes of adverse change in the ecological character of these systems can be grouped in five broad categories:

- Changes to the water regime
- Water pollution
- Physical modification
- Exploitation of biological products
- Introduction of invasive species

**Appendix C table 28. ASNFs' risks to the mixed broadleaf deciduous riparian forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | low (L) | high (H) | C | S | - | P |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | moderate (M)-H∫ | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Inundation (diversions, dams and impoundments)/de-watering | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Recreation activities | Non-consumptive biological use | M | M | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | L | H | C | S | - | P |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Groundwater depletion/contamination | Habitat conversion | H | H | - | - | F | P |
| Inundation/de-watering | Habitat conversion | M | M | C | S | - | - |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Water withdrawal | Abiotic resource use | L | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | 9/9 | 7/10 | 7/8 | 9/7 |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderatly low ecological condition herbaceous vegetation acres within this PNVT

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: urban development, uncharacteristic erosion and sedimentation. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With OHVs – there may be irreversible conditions – soil compaction, soil erosion and soil loss, uncharacteristic succession, habitat modification, loss and/or fragmentation (reduces species' population and/or viability), some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, risks from fire suppression and human-caused fires can be minimized and in many cases be reversed. Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation management that promotes structural composition that approximates HRV. Manage fire as an integral component of ecosystem sustainability; restoration of natural processes and existing conditions that have been compromised by livestock grazing. Improved travel management and road maintenance and design; aggressive invasive plant management and implementation of applicable

BMPs.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this riparian community. The mixed broadleaf deciduous riparian forests PNVT on the ASNFs has the fourth greatest road density of any riparian PNVT; nearly 1.8 linear miles of road per one square mile. Rehabilitating land that has been roaded is difficult at best. Desired changes include management activities that influence herbaceous species cover and species richness more closely associated with proper functioning conditions by:

- Maintain and/or improve hydrologic and hydraulic processes
- Maintain and/or improve geomorphic processes
- Maintain and/or improve physical and chemical characteristics
- Maintain and/or improve biological community characteristics
- Maintain and/or improving functions and dynamic equilibrium
- Re-establish dominance of the native plant community
- Limit the presence of invasive plants.

## Montane Willow Riparian Forest PNVT

When assessing threats and risks to montane willow riparian forest it is necessary to evaluate the relationship between current departure from HRV and trend in relation to HRV (appendix C table 29). In this case, assess the legacy of past management or deviation from ongoing management activities, evaluate threats/risks and system reversibility. In relation to HRV, there is a low departure and the current trend is away from HRV (shaded area); therefore, risks are not addressed. Discontinue current management and identify restoration opportunities for this PNVT.

**Appendix C table 29. Recommended actions in evaluating threats/risks for the montane willow riparian forest PNVT in relation to its high departure from HRV and current trend away HRV**

| Current Departure from HRV† | Trend in Relation to HRV | | |
|---|---|---|---|
| | static (neither towards nor away) | towards HRV | away from HRV (or unknown) |
| Significant (**low**, moderate, high or severe departure) | Legacy of past management or deviation from ongoing activities; evaluate threats/risks and system reversibility | Risk addressed; continue current management and identify restoration opportunities | **Potential for high risk; evaluate threats and system reversibility** |
| Non-significant (no departure; within HRV) | No risk; continue current management | No risk; continue current management | Potential risk; evaluate magnitude of future deviations, threats and system reversibility |

†Departure is separated into 5 categories: 1. Within HRV (departure index of 0-20%); 2. low (departure index of 21-40%); 3. moderate (departure index of 41-60%); 4. high (departure index of 61-80%); and 5. severe (departure index of 81-100%)

*Threats:* The most important threats, based on high likelihood of occurrence and high threat severity, under Forest Service management authority to montane willow riparian forest include (appendix C table 30) livestock grazing/browsing, fire suppression, inundation (diversions, dams and impoundments) and drying of the riparian communities below the impoundment and concurrently flooding those communities above the impoundment, human-caused fires and roads, highways and corridors. These threats types include modification of natural processes and habitat conversion which have negative consequences to ecological composition, structure, function and processes. Other anthropogenic threats with either a lower likelihood of occurrence and/or lower threat severity include feral equine-ungulate grazing/browsing, OHVs and recreation, invasive plants are an additional threat. The most important threat, based on high likelihood of occurrence and high threat severity outside of agency authority is climate change. Other

threats outside Forest Service management authority include groundwater depletion/contamination and urban development. These threat types include habitat conversion which has negative consequences to ecological composition, structure, function and processes. Uncharacteristic soil compaction, erosion and loss, sedimentation, wild ungulate grazing/browsing, and wildfire are additional threats.

*Risks:* The above threats pose the following risks with negative consequences to ecological composition, structure, function and processes. Specifically by loss of these riparian areas themselves, as-well-as affects to vegetation health (atypical composition, structure and function), soil compaction, erosion, sedimentation and loss of soil fertility, altered watershed and hydrologic functions, reduced water quality and quantity, altered fire regime, introduction and spread of invasive plants, modification of natural processes, change in ecological potentials, species extinction or reduction in population(s) and/or habitat(s), and inability to re-establish natural wildfire processes.

Changes in the structure and function of montane willow riparian forests have been noted as the primary cause of the loss of biological diversity within these systems. The causes of adverse change in the ecological character of these systems can be grouped in five broad categories:

- Changes to the water regime
- Water pollution
- Physical modification
- Exploitation of biological products
- Introduction of invasive species

**Appendix C table 30. ASNFs' risks to the montane willow riparian forest PNVT based on identified threats. Threats are categorized as either under agency management authority or outside agency management authority as well as threat type and estimated risk of high, moderate or low**

| Threat | Threat Type | Estimated Risk† | | Risk Consequence to Ecological‡ | | | |
|---|---|---|---|---|---|---|---|
| | | likelihood of occurrence | severity | compo-sition | structure | function | process |
| **Under Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | low (L) | high (H) | C | S | - | P |
| Feral equine-ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | moderate (M)-H∫ | C | S | F | P |
| Fire suppression | Modification of natural processes | H | H | C | S | F | P |
| Human-caused fire | Habitat conversion | H | H | C | S | F | P |
| Inundation (diversions, dams and impoundments)/de-watering | Habitat conversion | H | H | C | S | F | P |
| Invasive plant species | Invasive species/habitat conversion | H | M | C | S | F | P |
| Livestock grazing/browsing | Consumptive biological use/ habitat conversion | M | H | C | S | F | P |
| Off-highway vehicles (OHVs) | Non-consumptive biological use | M | H | C | - | F | P |
| Recreation activities | Non-consumptive biological use | M | M | C | - | F | P |
| Roads, highways and utility corridors | Transportation/habitat conversion | H | H | C | S | - | P |
| **Outside Agency Management Authority** | | | | | | | |
| Channelization | Habitat conversion | L | H | C | S | - | P |
| Climate change | Modification of natural processes/habitat conversion | H | H | C | S | F | P |
| Drought | Habitat conversion | M | M | C | S | F | P |
| Inundation/de-watering | Habitat conversion | M | M | C | S | - | - |
| Groundwater depletion/contamination | Habitat conversion | H | H | - | - | F | P |
| Uncharacteristic erosion | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic sedimentation | Habitat conversion | M | H | C | S | F | P |
| Uncharacteristic wildfire | Habitat conversion | M | H | C | S | F | P |
| Urban development | Habitat conversion | H | H | C | S | F | - |
| Water withdrawal | Abiotic resource use | L | H | C | S | F | - |
| Wild ungulate grazing/browsing | Consumptive biological use/ habitat conversion | H | M-H∫ | C | S | F | P |
| **Total (under/outside agency management authority)** | | | | **10/10** | **8/10** | **8/8** | **10/7** |

†Estimated Risk is divided into Likelihood of Occurrence (defined as the probability of a significant departure from reference conditions) and Severity (defined as the magnitude of the departure from reference conditions)

‡Risks are assessed as affecting changes in one or more of the following ecosystem characteristics: vegetation composition (C), vegetation structure (S); vegetation function (F) and/or ecological process (P). Function (F) is the total life activities of organisms in habitats and the effects of those activities on the non-living components of the environment. Ecological Process (P) is the dynamic biogeochemical interactions that occur among and between biotic and abiotic components of the ecosystem. Including but not limited to, transpiration; bioaccumulation; biodiversity; biogeochemical cycling; contaminant transport; ecological competition; energy cycling eutrophication; extinction and extirpation; habitat alteration; hydrologic cycling; migration; pollination, and succession, etc.

∫Given the extensive amount of low to moderatly low ecological condition herbaceous vegetation acres within this PNVT

*Reversibility:* Some threats/risks are not reversible under Forest Service authority such as: urban development, uncharacteristic erosion and sedimentation. Even though these threats/risks are not within agency authority, the forests have a responsibility to assess, address, develop and implement appropriate management responses that mitigate undesirable consequences to National Forest System Lands. On the other hand, some threats/risks are reversible such as: potential decline from uncharacteristic erosion may be partially reversible depending on scale. With OHVs – there may be irreversible conditions – soil loss, uncharacteristic succession, habitat modification/loss/fragmentation (reduces species' population and/or viability), some effects of infestations by invasive plants and areas of infestation are reversible depending on species and spatial scale, Risks from fire suppression and human-caused fires can be minimized and in many cases be reversed. Some effects of livestock grazing/browsing are reversible depending on severity of change and spatial scale.

*Opportunities:* Vegetation management that promotes structural composition that approximates HRV. Manage fire as an integral component of ecosystem sustainability; restoration of natural processes and

existing conditions that have been compromised by livestock grazing. Improved travel management and road maintenance and design; aggressive invasive plant management; and implementation of applicable BMPs.

### Ecological Need for Change in Management Activities

There is an ecological need to restore composition and structure and sustain ecological processes in this woodland community. The montane willow riparian forests PNVT on the ASNFs has the greatest road density of any riparian PNVT; nearly 4.0 linear miles of road per one square mile. Rehabilitating land that has been roaded is difficult at best. Desired changes include management activities that influence herbaceous species cover and species richness more closely associated with proper functioning conditions by:

- Maintain and/or improve hydrologic and hydraulic processes
- Maintain and/or improve geomorphic processes
- Maintain and/or improve physical and chemical characteristics
- Maintain and/or improve biological community characteristics
- Maintain and/or improving functions and dynamic equilibrium
- Re-establish dominance of the native plant community
- Limit the presence of invasive plants

# Appendix D

## Proposed Management Treatments and Acreages by Alternative

## Alternative A

**Appendix D table 1. Alternative A management treatment types, acres and percent of total PNVT treated annually, and number of years it would take to treat the entire PNVT at the annual rate for PPF, WMCF, DMCF and SFF, and all combined forested PNVTs**

| Alternative A Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | |
|---|---|---|---|---|---|
| | PPF - 602,206 acres | WMCF - 177,995 acres | DMCF - 147,885 acres | SFF - 17,667 acres | All Forested - 945,753 acres |
| | Alternative A | Alternative A | Alternative A | Alternative A | Alternative A |
| B. Free thin all sizes to target BA | 1,240 | 150 | 221 | 3 | 1,614 |
| C. Thin from below to target BA | 2,090 | 258 | 372 | 17 | 2,737 |
| D. Thin under 16-inch diameter to BA | 1,999 | 600 | 355 | 18 | 2,972 |
| E. Group select with matrix thin | 1,370 | 450 | 244 | 27 | 2,091 |
| F. Shelterwood seed cut to target BA | 420 | 20 | 74 | | 514 |
| G. Clearcut with legacy trees | | 34 | | 10 | 44 |
| H. Clearcut-Coppice | | 34 | | 17 | 51 |
| I. Plant Seedlings | 450 | 325 | 100 | 5 | 880 |
| J $R_X$ FIRE ONLY low conditions | 2,836 | 855 | 720 | 90 | 4,501 |
| K $R_X$ FIRE ONLY moderate conditions | 316 | 96 | 80 | 10 | 502 |
| L $R_X$ FIRE ONLY high conditions | | | | | |
| M. Thin under 9-inch diameter to BA | | 601 | 542 | 16 | 1,159 |
| Total Acres Treated | 10,721 | 3,423 | 2,708 | 213 | 17,065 |
| Percent Acres Treated Annually | 1.8 | 1.9 | 1.8 | 1.2 | 1.8 |
| Years to Treat Entire PNVT(s) | 56 | 52 | 55 | 83 | 55 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative A

**Appendix D table 2. Alternative A management treatment types, acres and percent of total PNVT treated annually (50 year average) as derived from VDDT modeling outputs, and number of years it would take to treat the entire PNVT at the annual rate for PPF, WMCF, DMCF and SFF, and all combined forested PNVTs**

| Alternative A Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | |
|---|---|---|---|---|---|
| | PPF - 602,206 acres | WMCF - 177,995 acres | DMCF - 147,885 acres | SFF - 17,667 acres | All Forested - 945,753 acres |
| | Alternative A | Alternative A | Alternative A | Alternative A | Alternative A |
| B. Free thin all sizes to target BA | 1,380 | 139 | 295 | 3 | 1,817 |
| C. Thin from below to target BA | 2,327 | 349 | 496 | 26 | 3,198 |
| D. Thin under 16-inch diameter to BA | 2,220 | 748 | 358 | 27 | 3,353 |
| E. Group select with matrix thin | 1,522 | 383 | 246 | 31 | 2,182 |
| F. Shelterwood seed cut to target BA | 467 | 12 | 75 | | 554 |
| G. Clearcut with legacy trees | | 19 | | 14 | 33 |
| H. Clearcut-Coppice | | 33 | | 20 | 53 |
| I. Plant Seedlings | 105 | 42 | 18 | 1 | 166 |
| J $R_X$ FIRE ONLY low conditions | 3,199 | 1,601 | 496 | 102 | 5,398 |
| K $R_X$ FIRE ONLY moderate conditions | 352 | 101 | 55 | 11 | 519 |
| L $R_X$ FIRE ONLY high conditions | | | | | |
| M. Thin under 9-inch diameter to BA | | 937 | 376 | 23 | 1,336 |
| Total Acres Treated | 11,572 | 4,365 | 2,413 | 256 | 18,606 |
| Percent Acres Treated Annually | 1.9 | 2.5 | 1.6 | 1.5 | 2.0 |
| Years to Treat Entire PNVT(s) | 52 | 41 | 61 | 69 | 51 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative B

**Appendix D table 3. Alternative B proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for PPF, WMCF, DMCF and SFF, and all forested PNVTs combined**

| Alternative B Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF - 602,206 acres | | | WMCF - 177,995 acres | | | DMCF - 147,885 acres | | | SFF - 17,667 acres | | | All Forested - 945,753 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | 2,814 | 1,605 | 396 | 94 | 54 | 14 | 110 | 65 | 19 | 3 | 3 | 0 | 3,021 | 1,725 | 429 |
| C. Thin from below to target BA | 2,042 | 1,165 | 287 | 94 | 54 | 13 | 70 | 40 | 9 | 2 | 2 | 0 | 2,208 | 1,259 | 309 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | | | | |
| E. Group select with matrix thin | 4,807 | 2,742 | 677 | 2,000 | 1,143 | 286 | 1,585 | 906 | 227 | 70 | 40 | 10 | 8,462 | 4,831 | 1,200 |
| F. Shelterwood seed cut to target BA | 1,362 | 777 | 192 | 20 | 12 | 3 | 175 | 99 | 23 | | | | 1,557 | 888 | 218 |
| G. Clearcut with legacy trees | | | | 93 | 53 | 13 | | | | 3 | 2 | 1 | 96 | 55 | 14 |
| H. Clearcut-Coppice | | | | 93 | 53 | 13 | | | | 3 | 2 | 1 | 96 | 55 | 14 |
| I. Plant Seedlings | 1,200 | 875 | 550 | 500 | 375 | 250 | 450 | 338 | 225 | 50 | 35 | 20 | 2,200 | 1,623 | 1,045 |
| J $R_X$ FIRE ONLY low conditions | 3,858 | 2,205 | 551 | 1,107 | 620 | 132 | 693 | 396 | 99 | 201 | 115 | 28 | 5,859 | 3,335 | 810 |
| K $R_X$ FIRE ONLY moderate conditions | 6,064 | 3,466 | 867 | 2,218 | 1,241 | 263 | 1,940 | 1,109 | 277 | 404 | 231 | 58 | 10,626 | 6,046 | 1,465 |
| L $R_X$ FIRE ONLY high conditions | 1,102 | 630 | 158 | | | | 277 | 159 | 40 | | | | 1,379 | 789 | 198 |
| M. Thin under 9-inch diameter to BA | | | | 931 | | 133 | 832 | 475 | 118 | 14 | | 2 | 1,777 | 1,015 | 253 |
| Total Acres Treated | 23,249 | 13,464 | 3,678 | 7,150 | 4,135 | 1,120 | 6,132 | 3,585 | 1,037 | 750 | 433 | 116 | 37,281 | 21,618 | 5,955 |
| Percent Acres Treated Annually | 3.9 | 2.2 | 0.6 | 4.0 | 2.3 | 0.6 | 4.1 | 2.4 | 0.7 | 4.2 | 2.5 | 0.7 | 3.9 | 2.3 | 0.6 |
| Years to Treat Entire PNVT(s) | 26 | 45 | 164 | 25 | 43 | 159 | 24 | 41 | 143 | 24 | 41 | 147 | 25 | 44 | 159 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative B

**Appendix D table 4. Alternative B proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for PPF, WMCF, DMCF and SFF, and all forested PNVTs combined**

| Alternative B Treatment Types♪ | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF - 602,206 acres | | | WMCF - 177,995 acres | | | DMCF - 147,885 acres | | | SFF - 17,667 acres | | | All Forested - 945,753 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | 3,674† | 2,065† | 456† | 80 | 47 | 14 | 182† | 102† | 22† | 3 | 2 | 0 | 3,939 | 2,216 | 492 |
| C. Thin from below to target BA | 2,122 | 1,216 | 310 | 126 | 72 | 17 | 99 | 56 | 12 | 4 | 2 | 0 | 2,351 | 1,346 | 339 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | | 0 | 0 | 0 |
| E. Group select with matrix thin | 6,854‡ | 3,822‡ | 791‡ | 1,608 | 903 | 198 | 1,835‡ | 1,045‡ | 254‡ | 112 | 62 | 12 | 10,409 | 5,832 | 1,255 |
| F. Shelterwood seed cut to target BA | 1,556 | 881 | 205 | 12 | 7 | 2 | 184 | 104 | 24 | | | | 1,752 | 992 | 231 |
| G. Clearcut with legacy trees | | | | 43 | 25 | 8 | | | | 4 | 3 | 1 | 47 | 28 | 9 |
| H. Clearcut-Coppice | | | | 77 | 43 | 10 | | | | 4 | 3 | 1 | 81 | 46 | 11 |
| I. Plant Seedlings | 260 | 192 | 123 | 73 | 52 | 31 | 93 | 71 | 49 | 6 | 4 | 2 | 432 | 319 | 205 |
| J $R_X$ FIRE ONLY low conditions | 9,831 | 5,613 | 1,395 | 2,074 | 1,168 | 263 | 1,993 | 1,139 | 284 | 207 | 120 | 32 | 14,105 | 8,040 | 1,974 |
| K $R_X$ FIRE ONLY moderate conditions | 1,028∫ | 588∫ | 148∫ | 2,215 | 1,243 | 271 | 664∫ | 380∫ | 95∫ | 360 | 212 | 63 | 4,267 | 2,423 | 577 |
| L $R_X$ FIRE ONLY high conditions | 202∫ | 116∫ | 30∫ | | | | 157∫ | 90∫ | 23∫ | | | | 359 | 206 | 53 |
| M. Thin under 9-inch diameter to BA | | | | 1,460 | 832 | 203 | 1,048 | 598 | 148 | 19 | 11 | 3 | 2,527 | 1,441 | 354 |
| Total Acres Treated | 25,527 | 14,493 | 3,459 | 7,767 | 4,392 | 1,016 | 6,255 | 3,583 | 911 | 718 | 417 | 116 | 40,267 | 22,885 | 5,502 |
| Percent Acres Treated Annually | 4.2 | 2.4 | 0.6 | 4.4 | 2.5 | 0.6 | 4.2 | 2.4 | 0.6 | 4.1 | 2.4 | 0.7 | 4.3 | 2.4 | 0.6 |
| Years to Treat Entire PNVT(s) | 24 | 42 | 174 | 23 | 41 | 175 | 24 | 41 | 162 | 25 | 42 | 153 | 23 | 41 | 172 |

♪ See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

†Based on specifically targeting closed canopy states F and G to maintain non-declining yield from suitable timber lands. 1982 Rule, Sec. 219.3 Definitions and terminology: Base sale schedule: A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity. Sale schedule: The quantity of timber planned for sale by time period from an area of suitable land covered by a forest plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained.

‡Based on specifically targeting closed canopy states H, I, L and M to maintain non-declining yield from suitable timber lands

∫Based on the removal of K $R_X$ fire (moderate conditions) and L $R_X$ fire (high conditions) in all states within suitable timber lands

## Alternative C

**Appendix D table 5. Alternative C proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for PPF, WMCF, DMCF and SFF, and all forested PNVTs combined**

| Alternative C Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF - 602,206 acres | | | WMCF - 177,995 acres | | | DMCF - 147,885 acres | | | SFF - 17,667 acres | | | All Forested - 945,753 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | 6,826 | 3,755 | 683 | 254 | 140 | 26 | 192 | 106 | 20 | 7 | 4 | 1 | 7,279 | 4,005 | 730 |
| C. Thin from below to target BA | 2,426 | 1,335 | 243 | 635 | 350 | 64 | 140 | 77 | 14 | 7 | 4 | 0 | 3,208 | 1,765 | 321 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | | | | |
| E. Group select with matrix thin | 10,706 | 5,889 | 1,071 | 3,423 | 1,885 | 346 | 3,961 | 2,171 | 380 | 137 | 74 | 11 | 18,227 | 10,018 | 1,808 |
| F. Shelterwood seed cut to target BA | 4,297 | 2,363 | 429 | 211 | 116 | 21 | 660 | 360 | 60 | | | | 5,168 | 2,839 | 510 |
| G. Clearcut with legacy trees | | | | 846 | 466 | 86 | | | | 13 | 7 | 1 | 859 | 473 | 87 |
| H. Clearcut-Coppice | | | | 846 | 466 | 86 | | | | 13 | 7 | 1 | 859 | 473 | 87 |
| I. Plant Seedlings | 1,400 | 1,100 | 800 | 700 | 575 | 450 | 500 | 383 | 265 | 10 | 8 | 5 | 2,610 | 2,065 | 1,520 |
| J $R_X$ FIRE ONLY low conditions | 3,565 | 1,965 | 364 | 1,044 | 575 | 105 | 660 | 363 | 66 | 297 | 164 | 31 | 5,566 | 3,066 | 566 |
| K $R_X$ FIRE ONLY moderate conditions | 5,602 | 3,087 | 571 | 2,091 | 1,150 | 208 | 1,848 | 1,017 | 185 | 596 | 329 | 62 | 10,137 | 5,582 | 1,026 |
| L $R_X$ FIRE ONLY high conditions | 1,020 | 562 | 104 | | | | 264 | 145 | 26 | | | | 1,284 | 707 | 130 |
| M. Thin under 9-inch diameter to BA | | | | 1,100 | 601 | 102 | 1,207 | 675 | 142 | 31 | 17 | 2 | 2,338 | 1,292 | 246 |
| Total Acres Treated | 35,842 | 20,054 | 4,265 | 11,150 | 6,322 | 1,494 | 9,432 | 5,295 | 1,158 | 1,111 | 616 | 114 | 57,535 | 32,283 | 7,031 |
| Percent Acres Treated Annually | 6.0 | 3.3 | 0.7 | 6.3 | 3.6 | 0.8 | 6.4 | 3.6 | 0.8 | 6.3 | 3.5 | 0.6 | 6.1 | 3.4 | 0.7 |
| Years to Treat Entire PNVT(s) | 17 | 30 | 141 | 16 | 28 | 119 | 16 | 28 | 128 | 16 | 29 | 155 | 16 | 29 | 135 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative C

**Appendix D table 6. Alternative C proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for PPF, WMCF, DMCF and SFF, and all forested PNVTs combined**

| Alternative C Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF - 602,206 acres | | | WMCF - 177,995 acres | | | DMCF - 147,885 acres | | | SFF - 17,667 acres | | | All Forested - 945,753 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | 7,150 | 3,958 | 766 | 228 | 126 | 25 | 246 | 136 | 26 | 6 | 4 | 1 | 7,630 | 4,224 | 818 |
| C. Thin from below to target BA | 2,181 | 1,219 | 256 | 902 | 494 | 85 | 193 | 106 | 19 | 13 | 7 | 0 | 3,289 | 1,826 | 360 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | | | | |
| E. Group select with matrix thin | 10,602 | 5,883 | 1,163 | 2,613 | 1,423 | 233 | 3,807 | 2,097 | 387 | 232 | 123 | 14 | 17,254 | 9,526 | 1,797 |
| F. Shelterwood seed cut to target BA | 4,823 | 2,644 | 466 | 97 | 55 | 12 | 644 | 354 | 63 | | | | 5,564 | 3,053 | 541 |
| G. Clearcut with legacy trees | | | | 304 | 177 | 50 | | | | 17 | 9 | 1 | 321 | 186 | 51 |
| H. Clearcut-Coppice | | | | 650 | 358 | 67 | | | | 16 | 9 | 1 | 666 | 367 | 68 |
| I. Plant Seedlings | 303 | 244 | 185 | 153 | 77 | 0 | 107 | 83 | 58 | 1 | 1 | 1 | 564 | 405 | 244 |
| J $R_X$ FIRE ONLY low conditions | 3,873 | 2,139 | 406 | 1,906 | 1,057 | 208 | 844 | 465 | 85 | 301 | 169 | 36 | 6,924 | 3,830 | 735 |
| K $R_X$ FIRE ONLY moderate conditions | 5,868 | 3,248 | 628 | 1,955 | 1,083 | 211 | 2,367 | 1,304 | 241 | 492 | 280 | 68 | 10,682 | 5,915 | 1,148 |
| L $R_X$ FIRE ONLY high conditions | 1,089 | 600 | 112 | | | | 628 | 344 | 60 | | | | 1,717 | 944 | 172 |
| M. Thin under 9-inch diameter to BA | | | | 1,636 | 895 | 154 | 1,586 | 890 | 193 | 42 | 23 | 3 | 3,264 | 1,808 | 350 |
| Total Acres Treated | 35,890 | 19,935 | 3,981 | 10,443 | 5,744 | 1,044 | 10,423 | 5,778 | 1,132 | 1,121 | 623 | 124 | 57,877 | 32,080 | 6,281 |
| Percent Acres Treated Annually | 6.0 | 3.3 | 0.7 | 5.9 | 3.2 | 0.6 | 7.0 | 3.9 | 0.8 | 6.3 | 3.5 | 0.7 | 6.1 | 3.4 | 0.7 |
| Years to Treat Entire PNVT(s) | 17 | 30 | 151 | 17 | 31 | 170 | 14 | 26 | 131 | 16 | 28 | 142 | 16 | 29 | 151 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative D

**Appendix D table 7. Alternative D proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for PPF, WMCF, DMCF and SFF, and all forested PNVTs combined**

| Alternative D Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF - 602,206 acres | | | WMCF - 177,995 acres | | | DMCF - 147,885 acres | | | SFF - 17,667 acres | | | All Forested - 945,753 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | 77 | 44 | 11 | | | | | | | | | | 77 | 44 | 11 |
| C. Thin from below to target BA | | | | | | | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | 8,987 | 5,168 | 1,348 | 1,973 | 987 | 0 | | | | 31 | 18 | 5 | 10,991 | 6,172 | 1,353 |
| E. Group select with matrix thin | 331 | 191 | 50 | 80 | 40 | 0 | | | | | | | 411 | 231 | 50 |
| F. Shelterwood seed cut to target BA | 55 | 32 | 8 | | | | | | | | | | 55 | 32 | 8 |
| G. Clearcut with legacy trees | | | | | | | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | | | | | | | |
| I. Plant Seedlings | 400 | 263 | 125 | | | | 200 | 150 | 100 | | | | 600 | 413 | 225 |
| J $R_X$ FIRE ONLY low conditions | 7,718 | 4,439 | 1,160 | 2,214 | 1,273 | 332 | 1,400 | 805 | 210 | 321 | 185 | 48 | 11,653 | 6,702 | 1,750 |
| K $R_X$ FIRE ONLY moderate conditions | 12,128 | 6,974 | 1,820 | 4,436 | 2,551 | 665 | 3,920 | 2,254 | 588 | 643 | 370 | 97 | 21,127 | 12,149 | 3,170 |
| L $R_X$ FIRE ONLY high conditions | 2,205 | 1,268 | 330 | | | | 339 | 211 | 83 | | | | 2,544 | 1,479 | 413 |
| M. Thin under 9-inch diameter to BA | | | | 798 | 613 | 428 | 1,207 | 784 | 360 | 5 | 3 | 1 | 2,010 | 1,400 | 789 |
| Total Acres Treated | 31,901 | 18,377 | 4,852 | 9,501 | 5,463 | 1,425 | 7,066 | 4,204 | 1,341 | 1,000 | 576 | 151 | 49,468 | 28,619 | 7,769 |
| Percent Acres Treated Annually | 5.3 | 3.1 | 0.8 | 5.3 | 3.1 | 0.8 | 4.8 | 2.8 | 0.9 | 5.7 | 3.3 | 0.9 | 5.2 | 3.0 | 0.8 |
| Years to Treat Entire PNVT(s) | 19 | 33 | 124 | 19 | 33 | 125 | 21 | 35 | 110 | 18 | 31 | 117 | 19 | 33 | 122 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative D

**Appendix D table 8. Alternative D proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for PPF, WMCF, DMCF and SFF, and all forested PNVTs combined**

| Alternative D Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF - 602,206 acres | | | WMCF - 177,995 acres | | | DMCF - 147,885 acres | | | SFF - 17,667 acres | | | All Forested - 945,753 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | 84 | 48 | 12 | | | | | | | | | | 84 | 48 | 12 |
| C. Thin from below to target BA | | | | | | | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | 10,450 | 5,970 | 1,490 | 2,929 | 1,464 | 0 | | | | 68 | 38 | 8 | 13,447 | 7,472 | 1,498 |
| E. Group select with matrix thin | 385 | 220 | 55 | 91 | 46 | 0 | | | | | | | 476 | 266 | 55 |
| F. Shelterwood seed cut to target BA | 64 | 36 | 9 | | | | | | | | | | 64 | 36 | 9 |
| G. Clearcut with legacy trees | | | | | | | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | | | | | | | |
| I. Plant Seedlings | 116 | 75 | 34 | | | | 44 | 36 | 28 | | | | 160 | 111 | 62 |
| J $R_X$ FIRE ONLY low conditions | 8,539 | 4,917 | 1,295 | 3,731 | 2,190 | 650 | 1,797 | 1,019 | 241 | 318 | 186 | 54 | 14,385 | 8,312 | 2,240 |
| K $R_X$ FIRE ONLY moderate conditions | 13,167 | 7,585 | 2,004 | 4,450 | 2,570 | 690 | 5,028 | 2,853 | 677 | 608 | 356 | 104 | 23,253 | 13,364 | 3,475 |
| L $R_X$ FIRE ONLY high conditions | 1,548 | 940 | 332 | | | | 640 | 405 | 170 | | | | 2,188 | 1,345 | 502 |
| M. Thin under 9-inch diameter to BA | | | | 12,496 | 1,005 | 714 | 1,505 | 1,106 | 706 | 7 | 4 | 1 | 14,008 | 2,115 | 1,421 |
| Total Acres Treated | 34,352 | 19,792 | 5,232 | 9,501 | 7,275 | 2,054 | 9,015 | 5,178 | 1,341 | 901 | 534 | 167 | 53,769 | 32,779 | 8,794 |
| Percent Acres Treated Annually | 5.7 | 3.3 | 0.9 | 7.0 | 4.1 | 1.2 | 6.1 | 3.7 | 1.2 | 5.1 | 3.0 | 0.9 | 5.7 | 3.5 | 0.9 |
| Years to Treat Entire PNVT(s) | 18 | 30 | 115 | 14 | 24 | 87 | 16 | 27 | 81 | 20 | 33 | 106 | 18 | 29 | 108 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative A

**Appendix D table 9. Alternative A management treatment types, acres and percent of total PNVT treated annually, and number of years it would take to treat the entire PNVT at the annual rate for MPOW and PJW, and all combined woodland PNVTs**

| Alternative A Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | |
|---|---|---|---|
| | MPOW - 394,928 acres | PJW - 222,166 acres | All Woodland - 617,094 acres |
| | Alternative A | Alternative A | Alternative A |
| B. Free thin all sizes to target BA | | 180 | 180 |
| C. Thin from below to target BA | | | |
| D. Thin under 16-inch diameter to BA | | 150 | 150 |
| E. Group select with matrix thin | | 40 | 40 |
| F. Shelterwood seed cut to target BA | | | |
| G. Clearcut with legacy trees | | 130 | 130 |
| H. Clearcut-Coppice | | | |
| I. Plant Seedlings | | | |
| J $R_X$ FIRE ONLY low conditions | | 81 | 81 |
| K $R_X$ FIRE ONLY moderate conditions | 797 | 9 | 806 |
| L $R_X$ FIRE ONLY high conditions | 266 | | 266 |
| M. Thin under 9-inch diameter to BA | | | |
| Total Acres Treated | 1,063 | 590 | 1,653 |
| Percent Acres Treated Annually | 0.3 | 0.3 | 0.3 |
| Years to Treat Entire PNVT(s) | 372 | 377 | 373 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative A

**Appendix D table 10. Alternative A management treatment types, acres and percent of total PNVT treated annually (50 year average) as derived from VDDT modeling outputs, and number of years it would take to treat the entire PNVT at the annual rate for MPOW and PJW, and all combined woodland PNVTs**

| Alternative A Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | |
|---|---|---|---|
| | MPOW - 394,928 acres | PJW - 222,166 acres | All Woodland - 617,094 acres |
| | Alternative A | Alternative A | Alternative A |
| B. Free thin all sizes to target BA | | 176 | 176 |
| C. Thin from below to target BA | | | |
| D. Thin under 16-inch diameter to BA | | 147 | 147 |
| E. Group select with matrix thin | | 38 | 38 |
| F. Shelterwood seed cut to target BA | | | |
| G. Clearcut with legacy trees | | 131 | 131 |
| H. Clearcut-Coppice | | | |
| I. Plant Seedlings | | | |
| J $R_X$ FIRE ONLY low conditions | | 81 | 81 |
| K $R_X$ FIRE ONLY moderate conditions | 791 | 18 | 809 |
| L $R_X$ FIRE ONLY high conditions | 257 | | 257 |
| M. Thin under 9-inch diameter to BA | | | |
| Total Acres Treated | 1,048 | 591 | 1,639 |
| Percent Acres Treated Annually | 0.3 | 0.3 | 0.3 |
| Years to Treat Entire PNVT(s) | 377 | 377 | 377 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative B

**Appendix D table 11. Alternative B proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for MPOW and PJW, and all woodland PNVTs combined**

| Alternative B Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MPOW - 394,928 acres | | | PJW - 222,166 acres | | | All Woodland - 617,094 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | |
| C. Thin from below to target BA | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | | | | | | |
| E. Group select with matrix thin | | | | 2,341 | 1,561 | 780 | 2,341 | 1,561 | 780 |
| F. Shelterwood seed cut to target BA | | | | | | | | | |
| G. Clearcut with legacy trees | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | |
| K $R_X$ FIRE ONLY moderate conditions | 11,143 | 7,429 | 3,714 | 1,412 | 941 | 470 | 12,555 | 8,370 | 4,184 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | |
| M. Thin under 9-inch diameter to BA | | | | | | | | | |
| Total Acres Treated | 11,143 | 7,429 | 3,714 | 3,753 | 2,502 | 1,250 | 14,896 | 9,930 | 4,964 |
| Percent Acres Treated Annually | 2.8 | 1.9 | 0.9 | 1.7 | 1.1 | 0.6 | 2.4 | 1.6 | 0.8 |
| Years to Treat Entire PNVT(s) | 35 | 53 | 106 | 59 | 89 | 178 | 41 | 62 | 124 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative B

**Appendix D table 12. Alternative B proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for MPOW and PJW, and all woodland PNVTs combined**

| Alternative B Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MPOW - 394,928 acres | | | PJW - 222,166 acres | | | All Woodland - 617,094 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | |
| C. Thin from below to target BA | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | | | | | | |
| E. Group select with matrix thin | | | | 2,149 | 1,444 | 738 | 2,149 | 1,444 | 738 |
| F. Shelterwood seed cut to target BA | | | | | | | | | |
| G. Clearcut with legacy trees | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | |
| K $R_X$ FIRE ONLY moderate conditions | 7,784 | 5,538 | 3,292 | 1,930 | 1,387 | 843 | 9,714 | 6,925 | 4,135 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | |
| M. Thin under 9-inch diameter to BA | | | | | | | | | |
| Total Acres Treated | 7,784 | 5,538 | 3,292 | 4,078 | 2,830 | 1,581 | 11,862 | 8,368 | 4,873 |
| Percent Acres Treated Annually | 2.0 | 1.4 | 0.8 | 1.8 | 1.3 | 0.7 | 1.9 | 1.4 | 0.8 |
| Years to Treat Entire PNVT(s) | 51 | 71 | 120 | 54 | 79 | 141 | 52 | 74 | 127 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative C

**Appendix D table 13. Alternative C proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for MPOW and PJW, and all woodland PNVTs combined**

| Alternative C Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MPOW - 394,928 acres | | | PJW - 222,166 acres | | | All Woodland - 617,094 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | 383 | 240 | 96 | 383 | 240 | 96 |
| C. Thin from below to target BA | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | | | | | | |
| E. Group select with matrix thin | | | | 3,830 | 2,394 | 957 | 3,830 | 2,394 | 957 |
| F. Shelterwood seed cut to target BA | | | | | | | | | |
| G. Clearcut with legacy trees | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | |
| K $R_X$ FIRE ONLY moderate conditions | 5,000 | 3,125 | 1,250 | 600 | 375 | 150 | 11,743 | 7,804 | 3,864 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | |
| M. Thin under 9-inch diameter to BA | | | | | | | | | |
| Total Acres Treated | 5,000 | 3,125 | 1,250 | 4,813 | 3,008 | 1,203 | 15,956 | 10,437 | 4,917 |
| Percent Acres Treated Annually | 1.3 | 0.8 | 0.3 | 2.2 | 1.4 | 0.5 | 2.6 | 1.7 | 0.8 |
| Years to Treat Entire PNVT(s) | 79 | 126 | 316 | 46 | 74 | 185 | 39 | 59 | 126 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative C

**Appendix D table 14. Alternative C proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for MPOW and PJW, and all woodland PNVTs combined**

| Alternative C Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MPOW - 394,928 acres | | | PJW - 222,166 acres | | | All Woodland - 617,094 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | 369 | 240 | 95 | 369 | 240 | 95 |
| C. Thin from below to target BA | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | | | | | | |
| E. Group select with matrix thin | | | | 3,436 | 2,394 | 908 | 3,436 | 2,394 | 908 |
| F. Shelterwood seed cut to target BA | | | | | | | | | |
| G. Clearcut with legacy trees | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | |
| K $R_X$ FIRE ONLY moderate conditions | 3,834 | 2,518 | 1,202 | 931 | 375 | 289 | 4,765 | 2,893 | 1,491 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | |
| M. Thin under 9-inch diameter to BA | | | | | | | | | |
| Total Acres Treated | 3,834 | 2,518 | 1,202 | 4,736 | 3,014 | 1,292 | 8,570 | 5,532 | 2,494 |
| Percent Acres Treated Annually | 1.0 | 0.6 | 0.3 | 2.1 | 1.4 | 0.6 | 1.4 | 0.9 | 0.4 |
| Years to Treat Entire PNVT(s) | 103 | 157 | 329 | 47 | 74 | 172 | 72 | 112 | 247 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative D

**Appendix D table 15. Alternative D proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for MPOW and PJW, and all woodland PNVTs combined**

| Alternative D Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MPOW - 394,928 acres | | | PJW - 222,166 acres | | | All Woodland - 617,094 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | |
| C. Thin from below to target BA | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | 3,884 | 2,266 | 647 | 3,884 | 2,266 | 647 |
| E. Group select with matrix thin | | | | 158 | 92 | 26 | 158 | 92 | 26 |
| F. Shelterwood seed cut to target BA | | | | | | | | | |
| G. Clearcut with legacy trees | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | |
| K $R_X$ FIRE ONLY moderate conditions | 22,335 | 13,029 | 3,722 | 3,443 | 2,009 | 575 | 25,778 | 15,038 | 4,297 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | |
| M. Thin under 9-inch diameter to BA | | | | | | | | | |
| Total Acres Treated | 22,335 | 13,029 | 3,722 | 7,485 | 4,367 | 1,248 | 29,820 | 17,395 | 4,970 |
| Percent Acres Treated Annually | 5.7 | 3.3 | 0.9 | 3.4 | 2.0 | 0.6 | 4.8 | 2.8 | 0.8 |
| Years to Treat Entire PNVT(s) | 18 | 30 | 106 | 30 | 51 | 178 | 21 | 35 | 124 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative D

**Appendix D table 16. Alternative D proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for MPOW and PJW, and all woodland PNVTs combined**

| Alternative D Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MPOW - 394,928 acres | | | PJW - 222,166 acres | | | All Woodland - 617,094 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | |
| C. Thin from below to target BA | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | 3,612 | 2,121 | 630 | 3,612 | 2,121 | 630 |
| E. Group select with matrix thin | | | | 135 | 80 | 24 | 135 | 80 | 24 |
| F. Shelterwood seed cut to target BA | | | | | | | | | |
| G. Clearcut with legacy trees | | | | | | | | | |
| H. Clearcut-Coppice | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | |
| K $R_X$ FIRE ONLY moderate conditions | 11,945 | 7,614 | 3,282 | 3,047 | 2,021 | 995 | 14,992 | 9,635 | 4,277 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | |
| M. Thin under 9-inch diameter to BA | | | | | | | | | |
| Total Acres Treated | 11,945 | 7,614 | 3,282 | 6,794 | 4,222 | 1,650 | 18,739 | 11,836 | 4,932 |
| Percent Acres Treated Annually | 3.0 | 1.9 | 0.8 | 3.1 | 1.9 | 0.6 | 3.0 | 1.9 | 0.8 |
| Years to Treat Entire PNVT(s) | 33 | 52 | 120 | 33 | 53 | 178 | 33 | 52 | 125 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative A

**Appendix D table 17. Alternative A management treatment types, acres and percent of total PNVT treated annually, and number of years it would take to treat the entire PNVT at the annual rate for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative A Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | |
|---|---|---|---|---|
| | GBG - 185,523 acres | SDG - 106,952 acres | All Grassland - 292,475 acres | All ASNFs - 1,855,322 acres |
| | Alternative A | Alternative A | Alternative A | Alternative A |
| B. Free thin all sizes to target BA | | | | 1,794 |
| C. Thin from below to target BA | | | | 2,737 |
| D. Thin under 16-inch diameter to BA | | | | 3,122 |
| E. Group select with matrix thin | | | | 2,131 |
| F. Shelterwood seed cut to target BA | | | | 514 |
| G. Clearcut with legacy trees | 250 | | 250 | 424 |
| H. Clearcut-Coppice | | | | 301 |
| I. Plant Seedlings | | | | 880 |
| J $R_X$ FIRE ONLY low conditions | | | | 4,582 |
| K $R_X$ FIRE ONLY moderate conditions | 41 | 27 | 68 | 1,376 |
| L $R_X$ FIRE ONLY high conditions | | | | 266 |
| M. Thin under 9-inch diameter to BA | | | | 1,159 |
| Total Acres Treated | 291 | 27 | 568 | 19,286 |
| Percent Acres Treated Annually | 0.2 | < 0.1 | 0.2 | 1.0 |
| Years to Treat Entire PNVT(s) | 638 | 3,961 | 515 | 96 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative A

**Appendix D table 18. Alternative A management treatment types, acres and percent of total PNVT treated annually (50 year average) as derived from VDDT modeling outputs, and number of years it would take to treat the entire PNVT at the annual rate for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative A Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | |
|---|---|---|---|---|
| | GBG - 185,523 acres | SDG - 106,952 acres | All Grassland - 292,475 acres | All ASNFs - 1,855,322 acres |
| | Alternative A | Alternative A | Alternative A | Alternative A |
| B. Free thin all sizes to target BA | | | | 2,169 |
| C. Thin from below to target BA | | | | 3,198 |
| D. Thin under 16-inch diameter to BA | | | | 3,647 |
| E. Group select with matrix thin | | | | 2,258 |
| F. Shelterwood seed cut to target BA | | | | 554 |
| G. Clearcut with legacy trees | 235 | | 250 | 795 |
| H. Clearcut-Coppice | | | | 53 |
| I. Plant Seedlings | | | | 166 |
| J $R_X$ FIRE ONLY low conditions | | | | 5,560 |
| K $R_X$ FIRE ONLY moderate conditions | 39 | 29 | 68 | 2,273 |
| L $R_X$ FIRE ONLY high conditions | | | | 514 |
| M. Thin under 9-inch diameter to BA | | | | 1,336 |
| Total Acres Treated | 273 | 29 | 568 | 22,770 |
| Percent Acres Treated Annually | 0.1 | < 0.1 | 0.2 | 1.2 |
| Years to Treat Entire PNVT(s) | 680 | 3,658 | 515 | 81 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative B

**Appendix D table 19. Alternative B proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative B Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GBG - 185,523 acres | | | SDG - 106,952 acres | | | All Grassland - 292,475 acres | | | All ASNFs - 1,855,322 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | | 3,021 | 1,727 | 429 |
| C. Thin from below to target BA | | | | | | | | | | 2,208 | 1,260 | 309 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | |
| E. Group select with matrix thin | | | | | | | | | | 13,144 | 7,953 | 2,760 |
| F. Shelterwood seed cut to target BA | | | | | | | | | | 1,557 | 888 | 218 |
| G. Clearcut with legacy trees | 10,269 | 7,702 | 5,135 | | | | 10,269 | 7,702 | 5,135 | 96 | 55 | 14 |
| H. Clearcut-Coppice | | | | | | | | | | 96 | 55 | 14 |
| I. Plant Seedlings | | | | | | | | | | 2,200 | 1,623 | 1,045 |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | | 5,859 | 3,335 | 810 |
| K $R_X$ FIRE ONLY moderate conditions | 10,000 | 7,500 | 5,000 | 2,000 | 1,667 | 1,333 | 12,000 | 9,167 | 6,333 | 35,736 | 22,786 | 9,833 |
| L $R_X$ FIRE ONLY high conditions | | | | 1,000 | 834 | 667 | 1,000 | 834 | 667 | 1,379 | 789 | 198 |
| M. Thin under 9-inch diameter to BA | | | | | | | | | | 1,777 | 475 | 253 |
| Total Acres Treated | 20,269 | 15,202 | 10,135 | 3,000 | 2,500 | 2,000 | 23,269 | 17,703 | 12,135 | 67,073 | 40,943 | 15,883 |
| Percent Acres Treated Annually | 10.9 | 8.2 | 5.5 | 2.8 | 2.3 | 1.9 | 8.0 | 6.1 | 4.1 | 3.6 | 2.2 | 0.9 |
| Years to Treat Entire PNVT(s) | 9 | 12 | 18 | 36 | 43 | 53 | 13 | 17 | 24 | 28 | 45 | 117 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative B

**Appendix D table 20. Alternative B proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative B Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GBG - 185,523 acres | | | SDG - 106,952 acres | | | All Grassland - 292,475 acres | | | All ASNFs - 1,855,322 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | | 3,939 | 2,216 | 492 |
| C. Thin from below to target BA | | | | | | | | | | 2,351 | 1,346 | 339 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | |
| E. Group select with matrix thin | | | | | | | | | | 12,558 | 7,276 | 1,993 |
| F. Shelterwood seed cut to target BA | | | | | | | | | | 1,752 | 992 | 231 |
| G. Clearcut with legacy trees | 2,906 | 2,687 | 2,467 | | | | 2,906 | 2,687 | 2,467 | 2,953 | 2,715 | 2,476 |
| H. Clearcut-Coppice | | | | | | | | | | 81 | 46 | 11 |
| I. Plant Seedlings | | | | | | | | | | 432 | 319 | 205 |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | | 14,105 | 8,040 | 1,974 |
| K $R_X$ FIRE ONLY moderate conditions | 2,830 | 2,616 | 2,402 | 1,577 | 1,369 | 1,162 | 4,407 | 3,985 | 3,564 | 18,388 | 13,333 | 8,276 |
| L $R_X$ FIRE ONLY high conditions | | | | 788 | 685 | 581 | 788 | 685 | 581 | 1,147 | 891 | 634 |
| M. Thin under 9-inch diameter to BA | | | | | | | | | | 2,527 | 1,441 | 354 |
| Total Acres Treated | 5,737 | 5,303 | 4,869 | 2,365 | 2,054 | 1,743 | 8,101 | 7,357 | 6,612 | 60,231 | 38,610 | 16,987 |
| Percent Acres Treated Annually | 3.1 | 2.9 | 2.6 | 2.2 | 1.9 | 1.6 | 2.8 | 2.5 | 2.3 | 3.2 | 2.1 | 0.9 |
| Years to Treat Entire PNVT(s) | 32 | 35 | 38 | 45 | 52 | 61 | 36 | 40 | 44 | 31 | 48 | 109 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative C

**Appendix D table 21. Alternative C proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative C Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GBG - 185,523 acres | | | SDG - 106,952 acres | | | All Grassland - 292,475 acres | | | All ASNFs - 1,855,322 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | | 7,662 | 4,245 | 826 |
| C. Thin from below to target BA | | | | | | | | | | 3,208 | 1,769 | 321 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | |
| E. Group select with matrix thin | | | | | | | | | | 22,057 | 12,413 | 2,765 |
| F. Shelterwood seed cut to target BA | | | | | | | | | | 5,168 | 2,839 | 510 |
| G. Clearcut with legacy trees | | 250 | | | | | | 250 | | 859 | 723 | 87 |
| H. Clearcut-Coppice | | | | | | | | | | 859 | 723 | 87 |
| I. Plant Seedlings | | | | | | | | | | 2,610 | 2,066 | 1,520 |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | | 5,566 | 3,067 | 566 |
| K $R_X$ FIRE ONLY moderate conditions | | 41 | | | 27 | | | 68 | | 15,737 | 9,151 | 2,426 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | | 1,284 | 707 | 130 |
| M. Thin under 9-inch diameter to BA | | | | | | | | | | 2,338 | 1,293 | 246 |
| Total Acres Treated | | 291 | | | 27 | | | 568 | | 67,348 | 38,996 | 9,484 |
| Percent Acres Treated Annually | | 0.2 | | | < 0.1 | | | 0.2 | | 3.6 | 2.1 | 0.5 |
| Years to Treat Entire PNVT | | 638 | | | 3,961 | | | 515 | | 28 | 48 | 196 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative C

**Appendix D table 22. Alternative C proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative C Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GBG - 185,523 acres | | | SDG - 106,952 acres | | | All Grassland - 292,475 acres | | | All ASNFs - 1,855,322 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | | 7,999 | 4,464 | 913 |
| C. Thin from below to target BA | | | | | | | | | | 3,289 | 1,826 | 360 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | | | |
| E. Group select with matrix thin | | | | | | | | | | 20,690 | 11,920 | 2,705 |
| F. Shelterwood seed cut to target BA | | | | | | | | | | 5,564 | 3,053 | 541 |
| G. Clearcut with legacy trees | | 47 | | | | | | 47 | | 321 | 233 | 51 |
| H. Clearcut-Coppice | | | | | | | | | | 666 | 367 | 68 |
| I. Plant Seedlings | | | | | | | | | | 564 | 405 | 244 |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | | 6,924 | 3,830 | 735 |
| K $R_X$ FIRE ONLY moderate conditions | | 8 | | | 29 | | | 37 | | 15,447 | 8,845 | 2,639 |
| L $R_X$ FIRE ONLY high conditions | | | | | | | | | | 1,717 | 944 | 172 |
| M. Thin under 9-inch diameter to BA | | | | | | | | | | 3,264 | 1,808 | 350 |
| Total Acres Treated | | 56 | | | 29 | | | 84 | | 66,447 | 37,697 | 8,775 |
| Percent Acres Treated Annually | | < 0.1 | | | < 0.1 | | | < 0.1 | | 3.6 | 2.0 | 0.5 |
| Years to Treat Entire PNVT | | 3,313 | | | 3,961 | | | 3,658 | | 28 | 49 | 211 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative D

**Appendix D table 23. Alternative D proposed management treatment types, acres and percent of total PNVT treated annually, and years it would take to treat the entire PNVT at the annual rate proposed for forested PNVTs; proposed high, average and low acre treatment objectives are presented for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative D Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GBG - 185,523 acres | | | SDG - 106,952 acres | | | All Grassland - 292,475 acres | | | All ASNFs - 1,855,322 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | | 77 | 44 | 11 |
| C. Thin from below to target BA | | | | | | | | | | | | |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | 14,875 | 3,271 | 2,000 |
| E. Group select with matrix thin | | | | | | | | | | 569 | 323 | 76 |
| F. Shelterwood seed cut to target BA | | | | | | | | | | 55 | 32 | 8 |
| G. Clearcut with legacy trees | 6,161 | 4,621 | 3,081 | | | | 6,161 | 4,621 | 3,081 | 6,161 | 4,621 | 3,081 |
| H. Clearcut-Coppice | | | | | | | | | | | | |
| I. Plant Seedlings | | | | | | | | | | 600 | 413 | 225 |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | | 11,653 | 6,702 | 1,750 |
| K $R_X$ FIRE ONLY moderate conditions | 14,000 | 10,500 | 7,000 | 2,000 | 1,667 | 1,333 | 16,000 | 12,167 | 8,333 | 62,905 | 39,354 | 15,800 |
| L $R_X$ FIRE ONLY high conditions | | | | 1,000 | 834 | 667 | 1,000 | 834 | 667 | 3,544 | 2,313 | 1,080 |
| M. Thin under 9-inch diameter to BA | | | | | | | | | | 2,010 | 1,400 | 789 |
| Total Acres Treated | 20,161 | 15,121 | 10,081 | 3,000 | 2,500 | 2,000 | 23,161 | 17,621 | 12,081 | 102,449 | 58,473 | 24,820 |
| Percent Acres Treated Annually | 10.9 | 8.2 | 5.4 | 2.8 | 2.3 | 1.9 | 7.9 | 6.0 | 4.1 | 5.5 | 3.2 | 1.3 |
| Years to Treat Entire PNVT(s) | 9 | 12 | 18 | 36 | 43 | 53 | 13 | 17 | 24 | 18 | 32 | 75 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

## Alternative D

**Appendix D table 24. Alternative D proposed management treatment types, acres and percent treated annually (50 year average) as derived from VDDT modeling outputs, and years it would take to treat the entire PNVT at the annual rate for forested PNVTs; proposed high, average and low acre treatment objectives are presented for GBG and SDG, and all modeled grasslands PNVTs combined, and all modeled ASNFs PNVTs combined**

| Alternative D Treatment Types† | Proposed Annual PNVT Acres Treated by Treatment Type Based on VDDT Model Outputs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GBG - 185,523 acres | | | SDG - 106,952 acres | | | All Grassland - 292,475 acres | | | All ASNFs - 1,855,322 acres | | |
| | High | Average | Low | High | Average | Low | High | Average | Low | High | Average | Low |
| B. Free thin all sizes to target BA | | | | | | | | | | 84 | 48 | 12 |
| C. Thin from below to target BA | | | | | | | | | | 0 | 0 | 0 |
| D. Thin under 16-inch diameter to BA | | | | | | | | | | 17,059 | 9,593 | 2,128 |
| E. Group select with matrix thin | | | | | | | | | | 611 | 346 | 79 |
| F. Shelterwood seed cut to target BA | | | | | | | | | | 64 | 36 | 9 |
| G. Clearcut with legacy trees | 1,935 | 1,729 | 1,522 | | | | 1,935 | 1,729 | 1,522 | 1,935 | 1,729 | 1,522 |
| H. Clearcut-Coppice | | | | | | | | | | 0 | 0 | 0 |
| I. Plant Seedlings | | | | | | | | | | 160 | 111 | 62 |
| J $R_X$ FIRE ONLY low conditions | | | | | | | | | | 14,385 | 8,312 | 2,240 |
| K $R_X$ FIRE ONLY moderate conditions | 4,398 | 3,927 | 3,457 | 1,577 | 1,370 | 1,162 | 5,975 | 5,297 | 4,619 | 44,220 | 28,296 | 12,371 |
| L $R_X$ FIRE ONLY high conditions | | | | 788 | 685 | 581 | 788 | 685 | 581 | 2,976 | 2,030 | 1,083 |
| M. Thin under 9-inch diameter to BA | | | | | | | | | | 14,008 | 2,115 | 1,421 |
| Total Acres Treated | 6,333 | 5,656 | 4,979 | 2,365 | 2,054 | 1,743 | 8,698 | 7,711 | 6,722 | 81,206 | 52,325 | 20,448 |
| Percent Acres Treated Annually | 3.4 | 3.0 | 2.7 | 2.2 | 2.3 | 1.9 | 3.0 | 2.6 | 2.3 | 4.4 | 2.8 | 1.1 |
| Years to Treat Entire PNVT(s) | 29 | 33 | 37 | 45 | 43 | 52 | 34 | 38 | 44 | 23 | 35 | 91 |

†See the Silviculturalist and Fire Specialists' reports for a description of their respective treatment types

# Appendix E

## Tabular Summations of the 15-Year Planning Period and 50-Year Modeling Period Comparisons of the Environmental Consequences to the Vegetation Indicators Between the Proposed High, Average, and Low Acre Treatment Objectives for Alternatives B, C, and D, and Alternative A

## 15-Year Planning Period Proposed High Acre Treatment Objectives

**Appendix E table 1. Tabular summation† of the 15-year planning period comparisons of the environmental consequences to the vegetation indicators between the proposed high acre treatment objectives for alternatives B, C, and D, and alternative A**

| Alternative Comparison Variables | Alternative A (Current) | | Alternative B (Preferred) | | Alternative C | | Alternative D | | Alternative Ranking (from greatest to least) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indicator - Vegetation Movement Toward DC and HRV** | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| Ponderosa pine forest PNVT | 1 | 1 | 2 | 3 | 4 | 4 | 3 | 2 | C, D, B, A | C, B, D, A |
| Wet mixed conifer forest PNVT | 4 | 3 | 2 | 4 | 1 | 1 | 3 | 2 | A, D, B, C | B, A, D, C |
| Dry mixed conifer forest PNVT | 1 | 1 | 3 | 3 | 4 | 4 | 2 | 2 | C, B, D, A | C, B, D, A |
| Spruce-fir forest PNVT | 2 | 2 | 3 | 3 | 4 | 3 | 3 | 4 | C, B/D, A | D, B/C, A |
| All Forest PNVTs | 2 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | C, B, A, D | C, A/B, D |
| Madrean pine-oak woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Piñon-juniper woodland PNVT | 2 | 2 | 3 | 3 | 4 | 4 | 3 | 3 | C, B/D, A | C, B/D, A |
| All Woodland PNVTs | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Great Basin grassland PNVT | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, A/C | D, B, A/C |
| Semi-desert grassland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane/subalpine grasslands PNVT | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | B/C/D, A | B/C/D, A |
| All Grassland PNVTs | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, A/C | D, B, A/C |
| All Modeled PNVTs | 3 | 2 | 2 | 4 | 4 | 3 | 1 | 4 | C, A, B, D | A, C, B, D |
| Interior chaparral PNVT | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | A/B/C/D | A/B/C/D |
| Wetland/cienega riparian areas PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Mixed broadleaf deciduous riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Cottonwood-willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Riparian Areas/Forest PNVTS | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Overall Indicator Ranking - Vegetation Movement Toward DC and HRV | 46/2.42 | 45/2.37 | 62/3.26 | **67/3.53** | 59/3.11 | 57/3.00 | **64/3.37** | **67/3.53** | D, B, C, A | B/D, C, A |
| **Indicator - Acres of Old/Large Trees** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 3 | | 2 | | 1 | | 4 | | D, A, B, C | |
| Wet mixed conifer forest PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Dry mixed conifer forest PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Spruce-fir forest PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Madrean pine-oak woodland PNVT | 2 | | 3 | | 1 | | 4 | | D, B, A, C | |
| Piñon-juniper woodland PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Overall Indicator Ranking - Acres of Old/Large Trees | 9/1.50 | | 13/2.17 | | 14/2.33 | | **24/4.00** | | D, C, B, A | |
| **Indicator - Number of Large Snags ( ≥ 18”) per Acre** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 3 | | 4 | | 4 | | 2 | | B/C, A, D | |
| Wet mixed conifer forest PNVT | 4 | | 3 | | 2 | | 1 | | A, B, C, D | |
| Dry mixed conifer forest PNVT | 4 | | 1 | | 2 | | 3 | | A, D, C, B | |
| Spruce-fir forest PNVT | 4 | | 3 | | 2 | | 1 | | A, B, C, D | |
| Madrean pine-oak woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Piñon-juniper woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Overall Indicator Ranking - Number of Snags per Acre | **23/3.83** | | 19/3.17 | | 18/3.00 | | 15/2.50 | | A, B, C, D | |

**Appendix E table 1. Continued**

| Alternative Comparison Variables | Alternative A (Current) | Alternative B (Preferred) | Alternative C | Alternative D | Alternative Ranking (from greatest to least) |
|---|---|---|---|---|---|
| **Indicator - Tons of Coarse Woody Debris per Acre** | | | | | |
| Ponderosa pine forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Wet mixed conifer forest PNVT | 3 | 3 | 4 | 2 | C, A/B, D |
| Dry mixed conifer forest PNVT | 2 | 4 | 3 | 1 | B, C, A, D |
| Spruce-fir forest PNVT | 3 | 2 | 1 | 4 | D, A, B, C |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 4 | 4 | 4 | 4 | A/B/C/D |
| Overall Indicator Ranking - Tons of Coarse Woody Debris per Acre | 15/2.50 | **19/3.17** | 18/3.00 | 16/2.67 | B, C, D, A |
| **Indicator - Enhancement/Maintenance of Aspen** | | | | | |
| Enhancement/maintenance of aspen | **4.00** | **4.00** | **4.00** | **4.00** | A/B/C/D |
| **Indicator - Vegetation Overstory Canopy Cover/Herbaceous Understory Vegetation Relationship** | | | | | |
| Ponderosa pine forest PNVT | 1 | 3 | 4 | 2 | C, B, D, A |
| Dry mixed conifer forest PNVT | 1 | 3 | 4 | 2 | C, B, D, A |
| Naturally Open Canopy Forest PNVTs | 1 | 3 | 4 | 2 | C, B, D, A |
| Wet mixed conifer forest PNVT | 2 | 4 | 3 | 4 | B/D, C, A |
| Spruce-fir forest PNVT | 1 | 4 | 2 | 3 | B, D, C, A |
| Naturally Closed Canopy Forest PNVTs | 2 | 4 | 3 | 4 | B/D, C, A |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Woodland PNVTs | 1 | 3 | 2 | 4 | D, B, C, A |
| Great Basin grassland PNVT | 2 | 4 | 1 | 3 | B, D, A, C |
| Semi-desert grassland PNVT | 3 | 4 | 2 | 4 | B/D, A, C |
| Grassland PNVTs | 2 | 4 | 2 | 3 | B, D, A/C |
| Overall Indicator Ranking - Vegetation Overstory Canopy Cover/ Herbaceous Understory Vegetation Relationship | 18/1.50 | **42/3.50** | 31/2.58 | 39/3.25 | B, D, C, A |
| **Overall Alternative Comparison Ranking for all indicators** | | | | | |
| Total Score/Average Score | 160/2.32 | 226/3.28 | 201/2.91 | **229/3.32** | D, B, C, A |

†Based on the results of analyses, each alternative was assigned a numerical value (1, 2, 3, or 4) depending on its overall movement toward desired conditions when compared to the other alternatives for each assessed indicator; one point was assigned for the least movement and four points were assigned for the greatest movement. Values were summed and an average determined. Each alternative was then ranked against each other alternative; results of that ranking are displayed in the column(s) on the left. Comparisons Example 1): C, B, A, D would be interpreted to mean that alternative C is better than alternatives B, A, and D; alternative B is poorer than alternative C but better than alternatives A and D; alternative A is poorer than alternatives C and B but better than alternative D; and alternative D is poorer than alternatives C, B and A. Comparisons Example 2): A, B/D, C would be interpreted to mean that alternative A is better than alternatives B, D and C; alternative B is poorer than alternative A but is equal to alternative D but is better than alternative C; alternative D is poorer than alternative A but is equal to alternative B but is better than alternative C; and alternative C is poorer than alternatives A, B and D.

Overall, by the end of the 15-year planning period, when comparing the proposed high acre treatment objectives, alternative D provides the greatest composite movement towards all desired conditions; followed by alternatives B, C, and A, from greatest to least, respectively.

## 50-Year Modeling Period Proposed High Acre Treatment Objectives

**Appendix E table 2. Tabular summation† of the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed high acre treatment objectives for alternatives B, C, and D, and alternative A**

| Alternative Comparison Variables | Alternative A (Current) | | Alternative B (Preferred) | | Alternative C | | Alternative D | | Alternative Ranking (from greatest to least) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indicator - Vegetation Movement Toward DC and HRV** | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| Ponderosa pine forest PNVT | 2 | 1 | 4 | 3 | 3 | 2 | 2 | 4 | B, C, A/D | D, B, C, A |
| Wet mixed conifer forest PNVT | 4 | 4 | 2 | 3 | 1 | 2 | 3 | 3 | A, D, B, C | A, B/D, C |
| Dry mixed conifer forest PNVT | 1 | 2 | 4 | 4 | 3 | 3 | 2 | 3 | B, C, D, A | B, C, D, A |
| Spruce-fir forest PNVT | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 3 | C/D, B, A | C, B/D, A |
| All Forest PNVTs | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 4 | A, B, C, D | D, A, B/C |
| Madrean pine-oak woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| All Woodland PNVTs | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Great Basin grassland PNVT | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, A/C | D, B, A/C |
| Semi-desert grassland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane/subalpine grasslands PNVT | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | B/C/D, A | B/C/D, A |
| All Grassland PNVTs | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, A/C | D, B, A/C |
| All Modeled PNVTs | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | B, D, C, A |
| Interior chaparral PNVT | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | A/B/C/D | A/B/C/D |
| Wetland/cienega riparian areas PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Mixed broadleaf deciduous riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Cottonwood-willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Riparian Areas/Forest PNVTS | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Overall Indicator Ranking - Vegetation Movement Toward DC and HRV | 46/2.42 | 45/2.37 | 66/3.47 | 65/3.42 | 51/2.68 | 51/2.68 | **68/3.58** | **73/3.84** | D, B, C, A | D, B, C, A |
| **Indicator - Acres of Old/Large Trees** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 3 | | 2 | | 1 | | 4 | | D, A, B, C | |
| Wet mixed conifer forest PNVT | 1 | | 3 | | 2 | | 4 | | D, B, C, A | |
| Dry mixed conifer forest PNVT | 1 | | 4 | | 2 | | 3 | | B, D, C, A | |
| Spruce-fir forest PNVT | 1 | | 2 | | 4 | | 3 | | C, D, B, A | |
| Madrean pine-oak woodland PNVT | 4 | | 3 | | 1 | | 2 | | A, B, D, C | |
| Piñon-juniper woodland PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Overall Indicator Ranking - Acres of Old/Large Trees | 11/1.83 | | 16/2.67 | | 13/2.17 | | **20/3.33** | | D, B, C, A | |
| **Indicator - Number of Large Snags ( > 18”) per Acre** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 2 | | 3 | | 4 | | 1 | | C, B, A, D | |
| Wet mixed conifer forest PNVT | 4 | | 2 | | 3 | | 1 | | A, C, B, D | |
| Dry mixed conifer forest PNVT | 4 | | 1 | | 2 | | 3 | | A, D, C, B | |
| Spruce-fir forest PNVT | 3 | | 4 | | 4 | | 4 | | B/C/D, A | |
| Madrean pine-oak woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Piñon-juniper woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Overall Indicator Ranking - Number of Snags per Acre | **21/3.50** | | 18/3.00 | | **21/3.50** | | 17/2.83 | | A/C, B, D | |

**Appendix E table 2. Continued**

| Alternative Comparison Variables | Alternative A (Current) | Alternative B (Preferred) | Alternative C | Alternative D | Alternative Ranking (from greatest to least) |
|---|---|---|---|---|---|
| **Indicator - Tons of Coarse Woody Debris per Acre** | | | | | |
| Ponderosa pine forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Wet mixed conifer forest PNVT | 3 | 2 | 4 | 1 | C, A, B, D |
| Dry mixed conifer forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Spruce-fir forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 2 | 4 | 3 | 4 | B/D, C, A |
| Overall Indicator Ranking - Tons of Coarse Woody Debris per Acre | 14/2.33 | 18/3.03 | **19/3.17** | 12/2.00 | C, B, A, D |
| **Indicator - Enhancement/Maintenance of Aspen** | | | | | |
| Enhancement/maintenance of aspen | **4.00** | **4.00** | 3.00 | 2.00 | A/B, C, D |
| **Indicator - Vegetation Overstory Canopy Cover/Herbaceous Understory Vegetation Relationship** | | | | | |
| Ponderosa pine forest PNVT | 1 | 3 | 4 | 2 | C, B, D, A |
| Dry mixed conifer forest PNVT | 2 | 4 | 4 | 3 | B/C, D, A |
| Naturally Open Canopy Forest PNVTs | 1 | 2 | 4 | 3 | C, D, B, A |
| Wet mixed conifer forest PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Spruce-fir forest PNVT | 1 | 4 | 3 | 2 | B, C, D, A |
| Naturally Closed Canopy Forest PNVTs | 2 | 4 | 1 | 3 | B, D, A, C |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Woodland PNVTs | 3 | 2 | 1 | 4 | D, A, B, C |
| Great Basin grassland PNVT | 2 | 3 | 1 | 4 | D, B, A, C |
| Semi-desert grassland PNVT | 3 | 4 | 2 | 4 | B/D, A, C |
| Grassland PNVTs | 2 | 3 | 2 | 4 | D, B, A/C |
| Overall Indicator Ranking - Vegetation Overstory Canopy Cover/ Herbaceous Understory Vegetation Relationship | 20/1.67 | 38/3.17 | 28/2.33 | **41/3.42** | D, B, C, A |
| **Overall Alternative Comparison Ranking for all indicators** | | | | | |
| Total Score/Average Score | 161/2.33 | 225/3.26 | 186/2.70 | **233/3.38** | D, B, C, A |

†Based on the results of analyses, each alternative was assigned a numerical value (1, 2, 3, or 4) depending on its overall movement toward desired conditions when compared to the other alternatives for each assessed indicator; one point was assigned for the least movement and four points were assigned for the greatest movement. Values were summed and an average determined. Each alternative was then ranked against each other alternative; results of that ranking are displayed in the column(s) on the left. Comparisons Example 1): C, B, A, D would be interpreted to mean that alternative C is better than alternatives B, A, and D; alternative B is poorer than alternative C but better than alternatives A and D; alternative A is poorer than alternatives C and B but better than alternative D; and alternative D is poorer than alternatives C, B and A. Comparisons Example 2): A, B/D, C would be interpreted to mean that alternative A is better than alternatives B, D and C; alternative B is poorer than alternative A but is equal to alternative D but is better than alternative C; alternative D is poorer than alternative A but is equal to alternative B but is better than alternative C; and alternative C is poorer than alternatives A, B and D.

Overall, at the end of the 50-year planning period, when comparing the proposed high acre treatment objectives, alternative D provides the greatest composite movement towards all desired conditions; followed by alternatives B, C, and A, from greatest to least, respectively.

## 15-Year Planning Period Proposed Average Acre Treatment Objectives

**Appendix E table 3. Tabular summation† of the 15-year planning period comparison of the environmental consequences to the vegetation indicators between the proposed average acre treatment objectives for alternatives B, C, and D, and alternative A**

| Alternative Comparison Variables | Alternative A (Current) | | Alternative B (Preferred) | | Alternative C | | Alternative D | | Alternative Ranking (from greatest to least) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indicator - Vegetation Movement Toward DC and HRV** | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| Ponderosa pine forest PNVT | 2 | 2 | 3 | 3 | 4 | 4 | 1 | 1 | C, B, A, D | C, B, A, D |
| Wet mixed conifer forest PNVT | 4 | 4 | 2 | 4 | 1 | 2 | 3 | 3 | A, D, B, C | A/B, D, C |
| Dry mixed conifer forest PNVT | 2 | 2 | 3 | 3 | 4 | 4 | 1 | 1 | C, B, A, D | C, B, A, D |
| Spruce-fir forest PNVT | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | C/D, B, A | B/C/D, A |
| All Forest PNVTs | 2 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | C, B, A, D | C, A/B, D |
| Madrean pine-oak woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Piñon-juniper woodland PNVT | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | C/D, B, A | C/D, B, A |
| All Woodland PNVTs | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Great Basin grassland PNVT | 2 | 2 | 4 | 4 | 2 | 2 | 3 | 3 | B, D, A/C | B, D, A/C |
| Semi-desert grassland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane/subalpine grasslands PNVT | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | B/C/D, A | B/C/D, A |
| All Grassland PNVTs | 2 | 2 | 4 | 4 | 2 | 2 | 3 | 3 | B, D, A/C | B, D, A/C |
| All Modeled PNVTs | 1 | 2 | 3 | 4 | 2 | 3 | 4 | 4 | D, B, C, A | B/D, C, A |
| Interior chaparral PNVT | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | A/B/C/D | A/B/C/D |
| Wetland/cienega riparian areas PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Mixed broadleaf deciduous riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Cottonwood-willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Riparian Areas/Forest PNVTS | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Overall Indicator Ranking - Vegetation Movement Toward DC and HRV | 46/2.42 | 49/2.58 | **66/3.47** | **70/3.68** | 57/3.00 | 59/3.11 | 64/3.37 | 65/3.42 | B, D, C, A | B, D, C, A |
| **Indicator - Acres of Old/Large Trees** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 3 | | 2 | | 1 | | 4 | | D, A, B, C | |
| Wet mixed conifer forest PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Dry mixed conifer forest PNVT | 1 | | 4 | | 3 | | 2 | | B, C, D, A | |
| Spruce-fir forest PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Madrean pine-oak woodland PNVT | 1 | | 3 | | 2 | | 4 | | D, B, C, A | |
| Piñon-juniper woodland PNVT | 2 | | 1 | | 3 | | 4 | | D, C, A, B | |
| Overall Indicator Ranking - Acres of Old/Large Trees | 9/1.50 | | 14/2.33 | | 15/2.50 | | **22/3.67** | | D, C, B, A | |
| **Indicator - Number of Large Snags (> 18") per Acre** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 2 | | 4 | | 3 | | 1 | | B, C, A, D | |
| Wet mixed conifer forest PNVT | 4 | | 3 | | 2 | | 1 | | A, B, C, D | |
| Dry mixed conifer forest PNVT | 3 | | 2 | | 3 | | 4 | | D, A/C, B | |
| Spruce-fir forest PNVT | 4 | | 3 | | 2 | | 1 | | A, B, C, D | |
| Madrean pine-oak woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Piñon-juniper woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Overall Indicator Ranking - Number of Snags per Acre | **21/3.50** | | 20/3.33 | | 18/3.00 | | 15/2.50 | | A, B, C, D | |

**Appendix E table 3. Continued**

| Alternative Comparison Variables | Alternative A (Current) | Alternative B (Preferred) | Alternative C | Alternative D | Alternative Ranking (from greatest to least) |
|---|---|---|---|---|---|
| **Indicator - Tons of Coarse Woody Debris per Acre** | | | | | |
| Ponderosa pine forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Wet mixed conifer forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Dry mixed conifer forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Spruce-fir forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 4 | 4 | 4 | 4 | A/B/C/D |
| Overall Indicator Ranking - Tons of Coarse Woody Debris per Acre | 15/2.50 | 19/3.17 | **20/3.33** | 12/2.00 | C, B, A, D |
| **Indicator - Enhancement/Maintenance of Aspen** | | | | | |
| Enhancement/maintenance of aspen | **4.00** | **4.00** | **4.00** | **4.00** | A/B/C/D |
| **Indicator - Vegetation Overstory Canopy Cover/Herbaceous Understory Vegetation Relationship** | | | | | |
| Ponderosa pine forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Dry mixed conifer forest PNVT | 2 | 3 | 4 | 4 | C/D, B, A |
| Naturally Open Canopy Forest PNVTs | 2 | 3 | 4 | 1 | C, B, A, D |
| Wet mixed conifer forest PNVT | 4 | 4 | 3 | 4 | A/B/D, C |
| Spruce-fir forest PNVT | 4 | 4 | 2 | 3 | A/B, D, C |
| Naturally Closed Canopy Forest PNVTs | 4 | 4 | 3 | 4 | A/B/D, C |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Woodland PNVTs | 1 | 3 | 2 | 4 | D, B, C, A |
| Great Basin grassland PNVT | 2 | 4 | 2 | 3 | B, D, A/C |
| Semi-desert grassland PNVT | 3 | 4 | 3 | 4 | B/D, A/C |
| Grassland PNVTs | 2 | 4 | 2 | 3 | B, D, A/C |
| Overall Indicator Ranking - Vegetation Overstory Canopy Cover/ Herbaceous Understory Vegetation Relationship | 28/2.33 | **42/3.50** | 33/2.75 | 39/3.25 | B, D, C, A |
| **Overall Alternative Comparison Ranking for all indicators** | | | | | |
| Total Score/Average Score | 172/2.49 | **235/3.41** | 206/3.99 | 221/3.20 | B, D, C, A |

†Based on the results of analyses, each alternative was assigned a numerical value (1, 2, 3, or 4) depending on its overall movement toward desired conditions when compared to the other alternatives for each assessed indicator; one point was assigned for the least movement and four points were assigned for the greatest movement. Values were summed and an average determined. Each alternative was then ranked against each other alternative; results of that ranking are displayed in the column(s) on the left. Comparisons Example 1): C, B, A, D would be interpreted to mean that alternative C is better than alternatives B, A, and D; alternative B is poorer than alternative C but better than alternatives A and D; alternative A is poorer than alternatives C and B but better than alternative D; and alternative D is poorer than alternatives C, B and A. Comparisons Example 2): A, B/D, C would be interpreted to mean that alternative A is better than alternatives B, D and C; alternative B is poorer than alternative A but is equal to alternative D but is better than alternative C; alternative D is poorer than alternative A but is equal to alternative B but is better than alternative C; and alternative C is poorer than alternatives A, B and D.

Overall, by the end of the 15-year planning period, when comparing the proposed average acre treatment objectives, alternative B provides the greatest composite movement towards all desired conditions; followed by alternatives D, C, and A, from greatest to least, respectively.

## 50-Year Modeling Period Proposed Average Acre Treatment Objectives

**Appendix E table 4. Tabular summation† of the 50-year modeling period comparisons of the environmental consequences to the vegetation indicators between the proposed average acre treatment objectives for alternatives B, C, and D, and alternative A**

| Alternative Comparison Variables | Alternative A (Current) | | Alternative B (Preferred) | | Alternative C | | Alternative D | | Alternative Ranking (from greatest to least) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indicator - Vegetation Movement Toward DC and HRV** | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| Ponderosa pine forest PNVT | 4 | 3 | 4 | 2 | 4 | 2 | 3 | 4 | A/B/C, D | D, A, B/C |
| Wet mixed conifer forest PNVT | 4 | 4 | 2 | 3 | 1 | 2 | 3 | 3 | A, D, B, C | A, B/D, C |
| Dry mixed conifer forest PNVT | 4 | 3 | 3 | 4 | 3 | 3 | 2 | 2 | A, B, C, D | B, A/C, D |
| Spruce-fir forest PNVT | 2 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | D, B/C, A | B/C/D, A |
| All Forest PNVTs | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 4 | A, B, C, D | D, A, B/C |
| Madrean pine-oak woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| All Woodland PNVTs | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| Great Basin grassland PNVT | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, A/C | D, B, A/C |
| Semi-desert grassland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane/subalpine grasslands PNVT | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | B/C/D, A | B/C/D, A |
| All Grassland PNVTs | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, A/C | D, B, A/C |
| All Modeled PNVTs | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | B, D, C, A |
| Interior chaparral PNVT | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | A/B/C/D | A/B/C/D |
| Wetland/cienega riparian areas PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Mixed broadleaf deciduous riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Cottonwood-willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Riparian Areas/Forest PNVTS | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Overall Indicator Ranking - Vegetation Movement Toward DC and HRV | 51/2.68 | 49/2.58 | 65/3.42 | 65/3.42 | 51/2.68 | 51/2.68 | **69/3.63** | **73/3.84** | D, B, A/C | D, B, C, A |
| **Indicator - Acres of Old/Large Trees** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 3 | | 2 | | 1 | | 4 | | D, A, B, C | |
| Wet mixed conifer forest PNVT | 2 | | 3 | | 1 | | 4 | | D, B, A, C | |
| Dry mixed conifer forest PNVT | 1 | | 4 | | 2 | | 3 | | B, D, C, A | |
| Spruce-fir forest PNVT | 1 | | 3 | | 2 | | 4 | | D, C, B, A | |
| Madrean pine-oak woodland PNVT | 4 | | 3 | | 1 | | 2 | | A, B, D, C | |
| Piñon-juniper woodland PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Overall Indicator Ranking - Acres of Old/Large Trees | 12/2.00 | | 17/2.83 | | 10/1.67 | | **21/3.50** | | D, B, A, C | |
| **Indicator - Number of Large Snags ( > 18”) per Acre** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 2 | | 3 | | 4 | | 1 | | C, B, A, D | |
| Wet mixed conifer forest PNVT | 3 | | 3 | | 4 | | 2 | | C, A/B, D | |
| Dry mixed conifer forest PNVT | 3 | | 2 | | 3 | | 4 | | D, A/C, B | |
| Spruce-fir forest PNVT | 4 | | 3 | | 2 | | 1 | | A, B, C, D | |
| Madrean pine-oak woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Piñon-juniper woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Overall Indicator Ranking - Number of Snags per Acre | 20/3.33 | | 19/3.17 | | **21/3.50** | | 16/2.67 | | A, C, B, D | |

**Appendix E table 4. Continued**

| Alternative Comparison Variables | Alternative A (Current) | Alternative B (Preferred) | Alternative C | Alternative D | Alternative Ranking (from greatest to least) |
|---|---|---|---|---|---|
| **Indicator - Tons of Coarse Woody Debris per Acre** | | | | | |
| Ponderosa pine forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Wet mixed conifer forest PNVT | 2 | 3 | 4 | 1 | C, B, A, D |
| Dry mixed conifer forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Spruce-fir forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 2 | 3 | 4 | D, C, B, A |
| Overall Indicator Ranking - Tons of Coarse Woody Debris per Acre | 14/2.33 | **17/2.83** | **17/2.83** | 12/2.00 | B/C, A, D |
| **Indicator - Enhancement/Maintenance of Aspen** | | | | | |
| Enhancement/maintenance of aspen | **4.00** | **4.00** | 3.00 | 2.00 | A/B, C, D |
| **Indicator - Vegetation Overstory Canopy Cover/Herbaceous Understory Vegetation Relationship** | | | | | |
| Ponderosa pine forest PNVT | 1 | 2 | 4 | 3 | C, D, B, A |
| Dry mixed conifer forest PNVT | 2 | 3 | 2 | 4 | D, B, A/C |
| Naturally Open Canopy Forest PNVTs | 2 | 3 | 3 | 4 | D, B/C, A |
| Wet mixed conifer forest PNVT | 3 | 4 | 2 | 3 | B, A/D, C |
| Spruce-fir forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Naturally Closed Canopy Forest PNVTs | 3 | 4 | 2 | 3 | B, A/D, C |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Woodland PNVTs | 3 | 2 | 1 | 4 | D, A, B, C |
| Great Basin grassland PNVT | 2 | 3 | 2 | 4 | D, B, A/C |
| Semi-desert grassland PNVT | 3 | 4 | 3 | 4 | B/D, A/C |
| Grassland PNVTs | 2 | 3 | 2 | 4 | D, B, A/C |
| Overall Indicator Ranking - Vegetation Overstory Canopy Cover/ Herbaceous Understory Vegetation Relationship | 27/2.25 | 37/3.08 | 27/2.25 | **42/3.50** | D, B, A/C |
| **Overall Alternative Comparison Ranking for all indicators** | | | | | |
| Total Score/Average Score | 177/2.57 | 224/3.25 | 180/2.61 | **235/3.41** | D, B, C, A |

†Based on the results of analyses, each alternative was assigned a numerical value (1, 2, 3, or 4) depending on its overall movement toward desired conditions when compared to the other alternatives for each assessed indicator; one point was assigned for the least movement and four points were assigned for the greatest movement. Values were summed and an average determined. Each alternative was then ranked against each other alternative; results of that ranking are displayed in the column(s) on the left. Comparisons Example 1): C, B, A, D would be interpreted to mean that alternative C is better than alternatives B, A, and D; alternative B is poorer than alternative C but better than alternatives A and D; alternative A is poorer than alternatives C and B but better than alternative D; and alternative D is poorer than alternatives C, B and A. Comparisons Example 2): A, B/D, C would be interpreted to mean that alternative A is better than alternatives B, D and C; alternative B is poorer than alternative A but is equal to alternative D but is better than alternative C; alternative D is poorer than alternative A but is equal to alternative B but is better than alternative C; and alternative C is poorer than alternatives A, B and D.

Overall, at the end of the 50-year modeling period, when comparing the proposed average acre treatment objectives, alternative D provides the greatest composite movement towards all desired conditions; followed by alternatives B, C, and A, from greatest to least, respectively.

## 15-Year Planning Period Proposed Low Acre Treatment Objectives

**Appendix E table 5. Tabular summation† of the 15-year planning period comparisons of the environmental consequences to the vegetation indicators between the proposed low acre treatment objectives for alternatives B, C, and D, and alternative A**

| Alternative Comparison Variables | Alternative A (Current) | | Alternative B (Preferred) | | Alternative C | | Alternative D | | Alternative Ranking (from greatest to least) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indicator - Vegetation Movement Toward DC and HRV** | **DC** | **HRV** | **DC** | **HRV** | **DC** | **HRV** | **DC** | **HRV** | **DC** | **HRV** |
| Ponderosa pine forest PNVT | 4 | 4 | 3 | 2 | 3 | 3 | 1 | 1 | A, B/C, D | A, C, B, D |
| Wet mixed conifer forest PNVT | 4 | 4 | 3 | 3 | 2 | 3 | 3 | 4 | A, B/D, C | A/D, B/C |
| Dry mixed conifer forest PNVT | 4 | 4 | 2 | 2 | 3 | 1 | 3 | 3 | A, C/D, B | A, D, B, C |
| Spruce-fir forest PNVT | 3 | 2 | 3 | 4 | 4 | 3 | 4 | 4 | C/D, A, B | B/D, C, A |
| All Forest PNVTs | 2 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | C, B, A, D | C, A/B, D |
| Madrean pine-oak woodland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Piñon-juniper woodland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Woodland PNVTs | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Great Basin grassland PNVT | 2 | 2 | 4 | 4 | 2 | 2 | 3 | 3 | B, D, A/C | B, D, A/C |
| Semi-desert grassland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane/subalpine grasslands PNVT | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | B/C/D, A | B/C/D, A |
| All Grassland PNVTs | 2 | 2 | 4 | 4 | 2 | 2 | 3 | 3 | B, D, A/C | B, D, A/C |
| All Modeled PNVTs | 1 | 2 | 4 | 4 | 2 | 3 | 3 | 4 | B, D, C, A | B/D, C, A |
| Interior chaparral PNVT | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | A/B/C/D | A/B/C/D |
| Wetland/cienega riparian areas PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Mixed broadleaf deciduous riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Cottonwood-willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Riparian Areas/Forest PNVTS | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Overall Indicator Ranking - Vegetation Movement Toward DC and HRV | 56/2.95 | 57/3.05 | **70/3.68** | **70/3.68** | 57/3.00 | 56/2.95 | 65/3.42 | 68/3.58 | B, D, C, A | B, D, A, C |
| **Indicator - Acres of Old/Large Trees** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 4 | | 1 | | 2 | | 3 | | A, D, C, B | |
| Wet mixed conifer forest PNVT | 4 | | 1 | | 3 | | 2 | | A, C, D, B | |
| Dry mixed conifer forest PNVT | 4 | | 3 | | 2 | | 1 | | A, B, C, D | |
| Spruce-fir forest PNVT | 4 | | 2 | | 1 | | 3 | | A, D, B, C | |
| Madrean pine-oak woodland PNVT | 3 | | 1 | | 2 | | 4 | | D, B, C, A | |
| Piñon-juniper woodland PNVT | 3 | | 1 | | 3 | | 4 | | D, A, C, B | |
| Overall Indicator Ranking - Acres of Old/Large Trees | **22/3.67** | | 9/1.50 | | 13/2.17 | | 17/2.83 | | A, D, C, B | |
| **Indicator - Number of Large Snags (> 18”) per Acre** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 2 | | 4 | | 4 | | 3 | | B/C, D, A | |
| Wet mixed conifer forest PNVT | 3 | | 4 | | 4 | | 2 | | B/C, A, D | |
| Dry mixed conifer forest PNVT | 1 | | 2 | | 3 | | 4 | | D, C, B, A | |
| Spruce-fir forest PNVT | 2 | | 4 | | 3 | | 2 | | B, C, A/D | |
| Madrean pine-oak woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Piñon-juniper woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Overall Indicator Ranking - Number of Snags per Acre | 16/2.67 | | **22/3.67** | | **22/3.67** | | 19/3.17 | | B/C, D, A | |

**Appendix E table 5. Continued**

| Alternative Comparison Variables | Alternative A (Current) | Alternative B (Preferred) | Alternative C | Alternative D | Alternative Ranking (from greatest to least) |
|---|---|---|---|---|---|
| **Indicator - Tons of Coarse Woody Debris per Acre** | | | | | |
| Ponderosa pine forest PNVT | 2 | 4 | 3 | 1 | B, C, A, D |
| Wet mixed conifer forest PNVT | 1 | 3 | 4 | 2 | C, B, D, A |
| Dry mixed conifer forest PNVT | 4 | 3 | 2 | 2 | A, B, C/D |
| Spruce-fir forest PNVT | 1 | 3 | 4 | 2 | C, B, D, A |
| Madrean pine-oak woodland PNVT | 2 | 3 | 2 | 4 | D, B, A/C |
| Piñon-juniper woodland PNVT | 4 | 4 | 4 | 4 | A/B/C/D |
| Overall Indicator Ranking - Tons of Coarse Woody Debris per Acre | 14/2.33 | **20/3.33** | 19/3.17 | 15/2.50 | B, C, D, A |
| **Indicator - Enhancement/Maintenance of Aspen** | | | | | |
| Enhancement/maintenance of aspen | **4.00** | **4.00** | **4.00** | **4.00** | A/B/C/D |
| **Indicator - Vegetation Overstory Canopy Cover/Herbaceous Understory Vegetation Relationship** | | | | | |
| Ponderosa pine forest PNVT | 4 | 3 | 3 | 2 | A, B/C, D |
| Dry mixed conifer forest PNVT | 4 | 3 | 2 | 2 | A, B, C/D |
| Naturally Open Canopy Forest PNVTs | 2 | 4 | 4 | 3 | B/C, D, A |
| Wet mixed conifer forest PNVT | 2 | 4 | 3 | 4 | B/D, C, A |
| Spruce-fir forest PNVT | 3 | 4 | 4 | 4 | B/C/D, A |
| Naturally Closed Canopy Forest PNVTs | 2 | 4 | 3 | 4 | B/D, C, A |
| Madrean pine-oak woodland PNVT | 3 | 4 | 2 | 4 | B/D, A, C |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Woodland PNVTs | 2 | 4 | 3 | 4 | B/D, C, A |
| Great Basin grassland PNVT | 2 | 4 | 1 | 3 | B, D, A, C |
| Semi-desert grassland PNVT | 1 | 4 | 2 | 3 | B, D, C, A |
| Grassland PNVTs | 2 | 4 | 2 | 3 | B, D, A/C |
| Overall Indicator Ranking - Vegetation Overstory Canopy Cover/ Herbaceous Understory Vegetation Relationship | 28/2.33 | **45/3.75** | 31/2.58 | 40/3.33 | B, D, C, A |
| **Overall Alternative Comparison Ranking for all indicators** | | | | | |
| Total Score/Average Score | 197/2.86 | **240/3.48** | 202/2.93 | 228/3.30 | B, D, C, A |

†Based on the results of analyses, each alternative was assigned a numerical value (1, 2, 3, or 4) depending on its overall movement toward desired conditions when compared to the other alternatives for each assessed indicator; one point was assigned for the least movement and four points were assigned for the greatest movement. Values were summed and an average determined. Each alternative was then ranked against each other alternative; results of that ranking are displayed in the column(s) on the left. Comparisons Example 1): C, B, A, D would be interpreted to mean that alternative C is better than alternatives B, A, and D; alternative B is poorer than alternative C but better than alternatives A and D; alternative A is poorer than alternatives C and B but better than alternative D; and alternative D is poorer than alternatives C, B and A. Comparisons Example 2): A, B/D, C would be interpreted to mean that alternative A is better than alternatives B, D and C; alternative B is poorer than alternative A but is equal to alternative D but is better than alternative C; alternative D is poorer than alternative A but is equal to alternative B but is better than alternative C; and alternative C is poorer than alternatives A, B and D.

Overall, by the end of the 15-year planning period, when comparing the proposed low acre treatment objectives, alternative B provides the greatest composite movement towards all desired conditions; followed by alternatives D, C, and A, from greatest to least, respectively.

## 50-Year Modeling Period Proposed Low Acre Treatment Objectives

**Appendix E table 6. Tabular summation† of the 50-year modeling period comparisons‡ of the environmental consequences to the vegetation indicators between the proposed low acre treatment objectives for alternatives B, C, and D, and alternative A**

| Alternative Comparison Variables | Alternative A (Current) | | Alternative B (Preferred) | | Alternative C | | Alternative D | | Alternative Ranking (from greatest to least) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Indicator - Vegetation Movement Toward DC and HRV** | **DC** | **HRV** | **DC** | **HRV** | **DC** | **HRV** | **DC** | **HRV** | **DC** | **HRV** |
| Ponderosa pine forest PNVT | 4 | 4 | 1 | 1 | 3 | 3 | 2 | 3 | A, C, D, B | A, C/D, B |
| Wet mixed conifer forest PNVT | 4 | 4 | 2 | 2 | 1 | 2 | 3 | 3 | A, D, B, C | A, D, B/C |
| Dry mixed conifer forest PNVT | 4 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | A, B, C, D | A, B, C, D |
| Spruce-fir forest PNVT | 3 | 3 | 3 | 4 | 2 | 4 | 4 | 3 | D, A/B, C | B/C, A/D |
| All Forest PNVTs | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 4 | A, B, C, D | D, A, B/C |
| Madrean pine-oak woodland PNVT | 2 | 2 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, C, A | B/D, C, A |
| Piñon-juniper woodland PNVT | 1 | 1 | 3 | 3 | 2 | 2 | 4 | 4 | D, B, C, A | D, B, C, A |
| All Woodland PNVTs | 1 | 2 | 3 | 4 | 2 | 3 | 4 | 4 | D, B, C, A | B/D, C, A |
| Great Basin grassland PNVT | 2 | 2 | 4 | 4 | 2 | 2 | 3 | 3 | B, D, A/C | B, D, A/C |
| Semi-desert grassland PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane/subalpine grasslands PNVT | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | B/C/D, A | B/C/D, A |
| All Grassland PNVTs | 2 | 2 | 4 | 4 | 2 | 2 | 3 | 3 | B, D, A/C | B, D, A/C |
| All Modeled PNVTs | 2 | 2 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, C, A | B/D, C, A |
| Interior chaparral PNVT | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | A/B/C/D | A/B/C/D |
| Wetland/cienega riparian areas PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Mixed broadleaf deciduous riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Montane willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Cottonwood-willow riparian forest PNVT | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| All Riparian Areas/Forest PNVTS | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | B/D, A/C | B/D, A/C |
| Overall Indicator Ranking - Vegetation Movement Toward DC and HRV | 54/2.84 | 54/2.84 | **66/3.47** | 67/3.53 | 50/2.63 | 54/2.84 | 65/3.42 | **68/3.58** | B, D, A, C | D, B, A/C |
| **Indicator - Acres of Old/Large Trees** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 4 | | 1 | | 2 | | 3 | | A, D, C, B | |
| Wet mixed conifer forest PNVT | 4 | | 2 | | 1 | | 3 | | A, D, B, C | |
| Dry mixed conifer forest PNVT | 3 | | 4 | | 2 | | 1 | | B, A, C, D | |
| Spruce-fir forest PNVT | 2 | | 1 | | 3 | | 4 | | D, C, A, B | |
| Madrean pine-oak woodland PNVT | 1 | | 2 | | 4 | | 3 | | C, D, B, A | |
| Piñon-juniper woodland PNVT | 2 | | 3 | | 1 | | 4 | | D, B, A, C | |
| Overall Indicator Ranking - Acres of Old/Large Trees | 16/2.67 | | 13/2.17 | | 13/2.17 | | **18/3.00** | | D, A, B/C | |
| **Indicator - Number of Snags (> 18”) per Acre** | | | | | | | | | | |
| Ponderosa pine forest PNVT | 1 | | 4 | | 3 | | 2 | | B, C, D, A | |
| Wet mixed conifer forest PNVT | 2 | | 4 | | 4 | | 3 | | B/C, D, A | |
| Dry mixed conifer forest PNVT | 2 | | 1 | | 3 | | 4 | | D, C, A, B | |
| Spruce-fir forest PNVT | 4 | | 4 | | 3 | | 2 | | A/B, C, D | |
| Madrean pine-oak woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Piñon-juniper woodland PNVT | 4 | | 4 | | 4 | | 4 | | A/B/C/D | |
| Overall Indicator Ranking - Number of Snags per Acre | 17/2.83 | | **21/3.50** | | **21/3.50** | | 19/3.17 | | B/C, D, A | |

**Appendix E table 6. Continued**

| Alternative Comparison Variables | Alternative A (Current) | Alternative B (Preferred) | Alternative C | Alternative D | Alternative Ranking (from greatest to least) |
|---|---|---|---|---|---|
| **Indicator - Tons of Coarse Woody Debris per Acre** | | | | | |
| Ponderosa pine forest PNVT | 3 | 4 | 4 | 2 | B/C, A, D |
| Wet mixed conifer forest PNVT | 1 | 3 | 4 | 2 | C, B, D, A |
| Dry mixed conifer forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Spruce-fir forest PNVT | 3 | 4 | 3 | 2 | B, A/C, D |
| Madrean pine-oak woodland PNVT | 2 | 4 | 3 | 4 | B/D, C, A |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Overall Indicator Ranking - Tons of Coarse Woody Debris per Acre | 14/2.33 | **21/3.50** | 18/3.00 | 15/2.50 | B, C, D, A |
| **Indicator - Enhancement/Maintenance of Aspen** | | | | | |
| Enhancement/maintenance of aspen | **4.00** | **4.00** | **4.00** | **4.00** | A/B/C/D |
| **Indicator - Vegetation Overstory Canopy Cover/Herbaceous Understory Vegetation Relationship** | | | | | |
| Ponderosa pine forest PNVT | 4 | 2 | 3 | 1 | A, C, B, D |
| Dry mixed conifer forest PNVT | 4 | 3 | 2 | 1 | A, B, C, D |
| Naturally Open Canopy Forest PNVTs | 4 | 3 | 3 | 2 | A, B/C, D |
| Wet mixed conifer forest PNVT | 2 | 4 | 3 | 4 | B/D, C, A |
| Spruce-fir forest PNVT | 2 | 4 | 4 | 3 | B/C, D, A |
| Naturally Closed Canopy Forest PNVTs | 3 | 4 | 4 | 4 | B/C/D, A |
| Madrean pine-oak woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Piñon-juniper woodland PNVT | 1 | 3 | 2 | 4 | D, B, C, A |
| Woodland PNVTs | 3 | 2 | 1 | 4 | D, A, B, C |
| Great Basin grassland PNVT | 2 | 4 | 1 | 3 | B, D, A, C |
| Semi-desert grassland PNVT | 3 | 4 | 2 | 4 | B/D, A, C |
| Grassland PNVTs | 2 | 4 | 2 | 3 | B, D, A/C |
| Overall Indicator Ranking - Vegetation Overstory Canopy Cover/ Herbaceous Understory Vegetation Relationship | 31/2.58 | **40/3.33** | 29/2.42 | 37/3.08 | B, D, A, C |
| **Overall Alternative Comparison Ranking for all indicators** | | | | | |
| Total Score/Average Score | 190/2.75 | **232/3.36** | 188/2.72 | 224/3.25 | B, D, A, C |

†Based on the results of analyses, each alternative was assigned a numerical value (1, 2, 3, or 4) depending on its overall movement toward desired conditions when compared to the other alternatives for each assessed indicator; one point was assigned for the least movement and four points were assigned for the greatest movement. Values were summed and an average determined. Each alternative was then ranked against each other alternative; results of that ranking are displayed in the column(s) on the left.

‡Comparisons Example 1): C, B, A, D would be interpreted to mean that alternative C is better than alternatives B, A, and D; alternative B is poorer than alternative C but better than alternatives A and D; alternative A is poorer than alternatives C and B but better than alternative D; and alternative D is poorer than alternatives C, B and A. Comparisons Example 2): A, B/D, C would be interpreted to mean that alternative A is better than alternatives B, D and C; alternative B is poorer than alternative A but is equal to alternative D but is better than alternative C; alternative D is poorer than alternative A but is equal to alternative B but is better than alternative C; and alternative C is poorer than alternatives A, B and D.

Overall, at the end of the 50-year modeling period, when comparing the proposed low acre treatment objectives, alternative B provides the greatest composite movement towards all desired conditions; followed by alternatives D, A, and C, from greatest to least, respectively.

# Appendix F

## Comparisons of the Departures from DC and HRV by Alternative Proposed High and Low Acre Treatment Objectives and Alternative A, by the end of the 15-Year Planning Period and the 50-Year Modeling Period

## 15-Year Planning Period Proposed High Acre Treatment Objectives

**Appendix F table 1. Comparisons of the departures from DC and HRV at the end of the 15-year planning period, by alternative proposed high acre treatment objectives and alternative A (the lower the departure† value the closer to DC and HRV)**

| Alternative | Forested PNVT Group | | | | | | | | | | Woodland PNVT Group | | | | | | Grassland PNVT Group | | | | | | All Modeled PNVTs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF | | WMCF | | DMCF | | SFF | | all modeled forest | | MPOW | | PJW | | all modeled woodland | | GBG | | SDG | | all modeled grassland | | | |
| | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| *Current Condition* | *77$^{H}$* | *94$^{S}$* | *54$^{M}$* | *61$^{H}$* | *67$^{H}$* | *77$^{H}$* | *59$^{M}$* | *62$^{H}$* | *71$^{H}$* | *85$^{S}$* | *61$^{H}$* | *72$^{H}$* | *28$^{L}$* | *28$^{L}$* | *49$^{M}$* | *56$^{M}$* | *67$^{H}$* | *67$^{H}$* | *79$^{H}$* | *79$^{H}$* | *71$^{H}$* | *71$^{H}$* | *64$^{H}$* | *73$^{H}$* |
| A | 65$^{H}$ | 84$^{S}$ | **49$^{M}$** | 46$^{M}$ | 57$^{M}$ | 54$^{M}$ | 68$^{H}$ | 58$^{M}$ | 61$^{H}$ | 71$^{H}$ | 59$^{M}$ | 70$^{H}$ | 21$^{L}$ | 21$^{L}$ | 45$^{M}$ | 52$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 57$^{M}$ | 65$^{H}$ |
| B | 58$^{M}$ | 80$^{H}$ | 52$^{M}$ | **44$^{M}$** | 53$^{M}$ | 48$^{M}$ | 64$^{H}$ | 54$^{M}$ | 56$^{M}$ | 68$^{H}$ | 41$^{M}$ | 52$^{M}$ | 19$^{N}$ | 19$^{N}$ | 33$^{L}$ | 40$^{L}$ | 9$^{N}$ | 9$^{N}$ | **66$^{H}$** | **66$^{H}$** | 30$^{L}$ | 30$^{L}$ | 44$^{M}$ | 52$^{M}$ |
| C | **52$^{M}$** | **75$^{H}$** | 56$^{M}$ | 51$^{M}$ | **49$^{M}$** | **44$^{M}$** | **63$^{H}$** | 54$^{M}$ | **52$^{M}$** | **65$^{H}$** | 50$^{M}$ | 61$^{H}$ | **18$^{N}$** | **18$^{N}$** | 38$^{L}$ | 45$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 51$^{M}$ | 60$^{H}$ |
| D | 61$^{H}$ | 82$^{S}$ | 50$^{M}$ | 47$^{M}$ | 56$^{M}$ | 52$^{M}$ | 64$^{H}$ | **53$^{M}$** | 58$^{M}$ | 70$^{H}$ | **28$^{L}$** | **38$^{L}$** | 19$^{N}$ | 19$^{N}$ | **25$^{L}$** | **31$^{L}$** | **8$^{N}$** | **8$^{N}$** | **66$^{H}$** | **66$^{H}$** | **29$^{L}$** | **29$^{L}$** | **43$^{M}$** | **51$^{M}$** |

†Departure Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

## 50-year Modeling Period Proposed High Acre Treatment Objectives

**Appendix F table 2. Comparisons of the departures from DC and HRV at the end of the 50-year modeling period, by alternative proposed high acre treatment objectives and alternative A (the lower the departure† value the closer to DC and HRV)**

| Alternative | Forested PNVT Group | | | | | | | | | | Woodland PNVT Group | | | | | | Grassland PNVT Group | | | | | | All Modeled PNVTs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF | | WMCF | | DMCF | | SFF | | all modeled forest | | MPOW | | PJW | | all modeled woodland | | GBG | | SDG | | all modeled grassland | | | |
| | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| *Current Condition* | *77$^{H}$* | *94$^{S}$* | *54$^{M}$* | *61$^{H}$* | *67$^{H}$* | *77$^{H}$* | *59$^{M}$* | *62$^{H}$* | *71$^{H}$* | *85$^{S}$* | *61$^{H}$* | *72$^{H}$* | *28$^{L}$* | *28$^{L}$* | *49$^{M}$* | *56$^{M}$* | *67$^{H}$* | *67$^{H}$* | *79$^{H}$* | *79$^{H}$* | *71$^{H}$* | *71$^{H}$* | *64$^{H}$* | *73$^{H}$* |
| A | 65$^{H}$ | 84$^{S}$ | **49$^{M}$** | 46$^{M}$ | 57$^{M}$ | 54$^{M}$ | 68$^{H}$ | 58$^{M}$ | 61$^{H}$ | 71$^{H}$ | 59$^{M}$ | 70$^{H}$ | 21$^{L}$ | 21$^{L}$ | 45$^{M}$ | 52$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 57$^{M}$ | 65$^{H}$ |
| B | **46$^{M}$** | 69$^{H}$ | 51$^{M}$ | **45$^{M}$** | **43$^{M}$** | **39$^{L}$** | 61$^{H}$ | 53$^{M}$ | **49$^{M}$** | 60$^{M}$ | 30$^{L}$ | 40$^{L}$ | 15$^{N}$ | 15$^{N}$ | 25$^{L}$ | 31$^{L}$ | 22$^{L}$ | 22$^{L}$ | **52$^{M}$** | **52$^{M}$** | 33$^{L}$ | 33$^{L}$ | 38$^{M}$ | 46$^{M}$ |
| C | 48$^{M}$ | 70$^{H}$ | 59$^{M}$ | 51$^{M}$ | 44$^{M}$ | 40$^{L}$ | **60$^{M}$** | **52$^{M}$** | 50$^{M}$ | 62$^{H}$ | 40$^{L}$ | 51$^{M}$ | 25$^{L}$ | 25$^{L}$ | 35$^{L}$ | 41$^{M}$ | 68$^{H}$ | 68$^{H}$ | 94$^{S}$ | 94$^{S}$ | 78$^{H}$ | 78$^{H}$ | 49$^{M}$ | 57$^{M}$ |
| D | 54$^{M}$ | **55$^{M}$** | **49$^{M}$** | **45$^{M}$** | 45$^{M}$ | 44$^{M}$ | **60$^{M}$** | 53$^{M}$ | 52$^{M}$ | **51$^{M}$** | **19$^{N}$** | **29$^{L}$** | **10$^{N}$** | **10$^{N}$** | **16$^{N}$** | **22$^{L}$** | **16$^{N}$** | **16$^{N}$** | **52$^{M}$** | **52$^{M}$** | **29$^{L}$** | **29$^{L}$** | **36$^{L}$** | **38$^{M}$** |

†Departure Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

## 15-Year Planning Period Proposed Low Acre Treatment Objectives

**Appendix F table 3. Comparisons of the departures from DC and HRV at the end of the 15-year planning period, by alternative proposed low acre treatment objectives and alternative A (the lower the departure† value the closer to DC and HRV)**

| Alternative | Forested PNVT Group | | | | | | | | | | Woodland PNVT Group | | | | | | Grassland PNVT Group | | | | | | All Modeled PNVTs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF | | WMCF | | DMCF | | SFF | | all modeled forest | | MPOW | | PJW | | all modeled woodland | | GBG | | SDG | | all modeled grassland | | | |
| | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| *Current Condition* | *77$^{H}$* | *94$^{S}$* | *54$^{M}$* | *61$^{H}$* | *67$^{H}$* | *77$^{H}$* | *59$^{M}$* | *62$^{H}$* | *71$^{H}$* | *85$^{S}$* | *61$^{H}$* | *72$^{H}$* | *28$^{L}$* | *28$^{L}$* | *49$^{M}$* | *56$^{M}$* | *67$^{H}$* | *67$^{H}$* | *79$^{H}$* | *79$^{H}$* | *71$^{H}$* | *71$^{H}$* | *64$^{H}$* | *73$^{H}$* |
| A | **65$^{H}$** | **84$^{S}$** | **49$^{M}$** | **46$^{M}$** | **57$^{M}$** | **54$^{M}$** | 68$^{H}$ | 58$^{M}$ | **61$^{H}$** | **71$^{H}$** | 59$^{M}$ | 70$^{H}$ | 21$^{L}$ | 21$^{L}$ | 45$^{M}$ | 52$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 57$^{M}$ | 65$^{H}$ |
| B | 69$^{H}$ | 87$^{S}$ | 54$^{M}$ | 47$^{M}$ | 60$^{M}$ | 57$^{M}$ | 68$^{H}$ | **56$^{M}$** | 64$^{H}$ | 74$^{H}$ | **54$^{M}$** | **65$^{H}$** | **20$^{N}$** | **20$^{N}$** | **42$^{M}$** | **49$^{M}$** | **24$^{L}$** | **24$^{L}$** | **70$^{H}$** | **70$^{H}$** | **41$^{M}$** | **41$^{L}$** | **53$^{M}$** | **61$^{H}$** |
| C | 69$^{M}$ | 86$^{S}$ | 55$^{M}$ | 47$^{M}$ | 59$^{M}$ | 58$^{M}$ | **67$^{H}$** | 57$^{M}$ | 64$^{H}$ | 74$^{H}$ | 59$^{M}$ | 70$^{H}$ | 21$^{L}$ | 21$^{L}$ | 45$^{M}$ | 52$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 59$^{M}$ | 66$^{H}$ |
| D | 70$^{H}$ | 87$^{S}$ | 54$^{M}$ | **46$^{M}$** | 62$^{H}$ | 59$^{M}$ | **67$^{H}$** | **56$^{M}$** | 66$^{H}$ | 74$^{H}$ | **54$^{M}$** | **65$^{H}$** | **20$^{N}$** | **20$^{N}$** | **42$^{M}$** | **49$^{M}$** | 29$^{L}$ | 29$^{L}$ | **70$^{H}$** | **70$^{H}$** | 44$^{M}$ | 44$^{L}$ | 54$^{M}$ | **61$^{H}$** |

†Departure Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

## 50-Year Modeling Period Proposed Low Acre Treatment Objectives

**Appendix F table 4. Comparisons of the departures from DC and HRV at the end of the 50-year modeling period, by alternative proposed low acre treatment objectives and alternative A (the lower the departure† value the closer to DC and HRV)**

| Alternative | Forested PNVT Group | | | | | | | | | | Woodland PNVT Group | | | | | | Grassland PNVT Group | | | | | | All Modeled PNVTs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PPF | | WMCF | | DMCF | | SFF | | all modeled forest | | MPOW | | PJW | | all modeled woodland | | GBG | | SDG | | all modeled grassland | | | |
| | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV | DC | HRV |
| *Current Condition* | *77$^{H}$* | *94$^{S}$* | *54$^{M}$* | *61$^{H}$* | *67$^{H}$* | *77$^{H}$* | *59$^{M}$* | *62$^{H}$* | *71$^{H}$* | *85$^{S}$* | *61$^{H}$* | *72$^{H}$* | *28$^{L}$* | *28$^{L}$* | *49$^{M}$* | *56$^{M}$* | *67$^{H}$* | *67$^{H}$* | *79$^{H}$* | *79$^{H}$* | *71$^{H}$* | *71$^{H}$* | *64$^{H}$* | *73$^{H}$* |
| A | 65$^{H}$ | 84$^{S}$ | **49$^{M}$** | 46$^{M}$ | 57$^{M}$ | 54$^{M}$ | 68$^{H}$ | 58$^{M}$ | 61$^{H}$ | 71$^{H}$ | 59$^{M}$ | 70$^{H}$ | **21$^{L}$** | **21$^{L}$** | 45$^{M}$ | 52$^{M}$ | 63$^{H}$ | 63$^{H}$ | 84$^{S}$ | 84$^{S}$ | 71$^{H}$ | 71$^{H}$ | 57$^{M}$ | 65$^{H}$ |
| B | 62$^{H}$ | 80$^{H}$ | 54$^{M}$ | 45$^{M}$ | **51$^{M}$** | **50$^{M}$** | 65$^{H}$ | **53$^{M}$** | 58$^{M}$ | **67$^{H}$** | **45$^{M}$** | **56$^{M}$** | 30$^{L}$ | 30$^{L}$ | 40$^{L}$ | **46$^{M}$** | **19$^{N}$** | **19$^{N}$** | **63$^{H}$** | **63$^{H}$** | **35$^{L}$** | **35$^{L}$** | **48$^{M}$** | **55$^{M}$** |
| C | **59$^{M}$** | **77$^{H}$** | 55$^{M}$ | 45$^{M}$ | 52$^{M}$ | 53$^{M}$ | 65$^{H}$ | **53$^{M}$** | **57$^{M}$** | **67$^{H}$** | 53$^{M}$ | 64$^{H}$ | 36$^{L}$ | 36$^{L}$ | 47$^{M}$ | 54$^{M}$ | 68$^{H}$ | 68$^{H}$ | 94$^{S}$ | 94$^{S}$ | 78$^{H}$ | 78$^{H}$ | 57$^{M}$ | 64$^{H}$ |
| D | 60$^{M}$ | **77$^{H}$** | 53$^{M}$ | **44$^{M}$** | 54$^{M}$ | 55$^{M}$ | **64$^{H}$** | 54$^{M}$ | 58$^{M}$ | **67$^{H}$** | **45$^{M}$** | **56$^{M}$** | 28$^{L}$ | 28$^{L}$ | **39$^{L}$** | **46$^{M}$** | 20$^{N}$ | 20$^{N}$ | **63$^{H}$** | **63$^{H}$** | 36$^{L}$ | 36$^{L}$ | **48$^{M}$** | **55$^{M}$** |

†Departure Ratings: (0-20% = no departure$^{N}$); (21-40% = low departure$^{L}$); (41-60% = moderate departure$^{M}$); (61-80% = high departure$^{H}$); and (81-100% = severe departure$^{S}$)

# Appendix G

## Comparisons, Based on the Proposed Acre Treatment Objectives for Alternatives B, C and D, and Alternative A, by the end of the 15-Year Planning Period and the 50-Year Modeling Period, of the Percentage and Acreage Changes in Closed Woody Canopy Cover

## 15-Year Planning Period and the 50-Year Modeling Period Proposed High Acre Treatment Objectives

**Appendix G table 1. Comparisons, based on the proposed high acre treatment objectives for alternatives B, C and D, and alternative A, by the end of the 15-year planning period and the 50-year modeling period, of the percentage and acreage changes in closed woody canopy cover† within the historically open forest (PPF and DMCF), and the historically closed forest (WMCF and SFF) PNVTs**

| Years | Alternative Percents and Acres Display the Amount of Change within Each PNVT that has Closed Woody Canopy Cover Greater than 30 Percent (arrows indicate direction of change in woody canopy cover; ↑ up, or ↓ down) | | | |
|---|---|---|---|---|
| | alternative A | alternative B high | alternative C high | alternative D high |
| **Ponderosa pine forest PNVT current conditions: 602,206 acres of which 68% or 410,912 acres with woody canopy cover > 30%** | | | | |
| 15 | 10%↓ (370,119 acres) | 21%↓ (324,218 acres) | **38%↓ (254,139 acres)** | 14%↓ (351,946 acres) |
| 50 | 16%↓ (343,281 acres) | 29%↓ (291,511 acres) | **40%↓ (245,091 acres)** | 37%↓ (258,284 acres) |
| **Dry mixed conifer forest PNVT current conditions: 147,885 acres of which 61% or 90,210 acres with woody canopy cover > 30%** | | | | |
| 15 | 23%↑ (110,914 acres) | 11%↑ (100,562 acres) | **7%↑ (96,125 acres)** | 18%↑ (106,477 acres) |
| 50 | 21%↑ (109,435 acres) | **10%↑ (99,083 acres)** | **10%↑ (99,083 acres)** | 16%↑ (104,998 acres) |
| **Open canopy forest types (PPF+DMCF): 750,091 acres of which 67% or 501,122 acres with woody canopy cover > 30%** | | | | |
| 15 | 4%↓ (481,033 acres) | 15%↓ (424,779 acres) | **30%↓ (350,264 acres)** | 9%↓ (458,423 acres) |
| 50 | 10%↓ (452,716 acres) | 22%↓ (390,594 acres) | **31%↓ (344,174 acres)** | 28%↓ (363,282 acres) |
| **Wet mixed conifer forest PNVT current conditions: 177,995 acres of which 61% or 101,457 acres with woody canopy cover > 30%** | | | | |
| 15 | **12%↑ (113,917 acres)** | 11%↑ (112,137 acres) | 2%↓ (99,677 acres) | 11%↑ (112,137 acres) |
| 50 | **18%↑ (119,257 acres)** | **18%↑ (119,257 acres)** | 9%↑ (110,357 acres) | 16%↑ (117,477 acres) |
| **Spruce-fir forest PNVT current conditions: 17,667 acres of which 61% or 10,777 acres with woody canopy cover > 30%** | | | | |
| 15 | **11%↑ (12,014 acres)** | 8%↑ (11,660 acres) | 5%↑ (11,307 acres) | 7%↑ (11,484 acres) |
| 50 | **2%↑ (10,954 acres)** | 10%↓ (9,717 acres) | 11%↓ (9,540 acres) | 15%↓ (9,187 acres) |
| **Closed canopy forest types (WMCF+SFF): 195,662 acres of which 57% or 112,234 acres with woody canopy cover > 30%** | | | | |
| 15 | **12%↑ (125,930 acres)** | 10%↑ (123,797 acres) | 1%↓ (110,984 acres) | 10%↑ (123,620 acres) |
| 50 | **16%↑ (130,210 acres)** | 15%↑ 128,974 acres) | 7%↑ (119,897 acres) | 15%↑ (126,664 acres) |

†Woody canopy closure classes are: 0 to < 10% is defined as very open canopy; 10 to ≤ 30% is defined as open canopy; and > 30% is defined as closed canopy. Under HRV and for DC ponderosa pine and dry mixed conifer forests should exhibit open canopies (10 to ≤ 30% woody canopy cover). Therefore, the lower the amounts of closed woody canopy cover, the closer these two PNVTs are to their HRV and forest plan DCs. Under HRV and for DC wet mixed conifer and spruce-fir forests should exhibit closed canopies (> 30% woody canopy cover). Therefore, the higher the amount of closed woody canopy cover, the closer these two PNVTs are to their HRV and forest plan DCs

## 15-Year Planning Period and the 50-Year Modeling Period Proposed Low Acre Treatment Objectives

**Appendix G table 2. Comparisons, based on the proposed low acre treatment objectives for alternatives B, C and D, and alternative A, by the end of the 15-year planning period and the 50-year modeling period, of the percentage and acreage changes in closed woody canopy cover† within the historically open forest (PPF and DMCF), and the historically closed forest (WMCF and SFF) PNVTs**

| Years | Alternative Percents and Acres Display the Amount of Change within Each PNVT that has Closed Woody Canopy Cover Greater than 30 Percent (arrows indicate direction of change in woody canopy cover; ↑ up, ↓ down, or ↔ no change) | | | |
|---|---|---|---|---|
| | alternative A | alternative B low | alternative C low | alternative D low |
| **Ponderosa pine forest PNVT current conditions: 602,206 acres of which 68% or 410,912 acres with woody canopy cover > 30%** | | | | |
| 15 | **10%↓ (370,119 acres)** | 4%↓ (394,673 acres) | 4%↓ (395,392 acres) | 2%↓ (404,593 acres) |
| 50 | **16%↓ (343,281 acres)** | 6%↓ (385,752 acres) | 8%↓ (379,968 acres) | 5%↓ (389,767 acres) |
| **Dry mixed conifer forest PNVT current conditions: 147,885 acres of which 61% or 90,210 acres with woody canopy cover > 30%** | | | | |
| 15 | **23%↑ (110,914 acres)** | 28%↑ (115,350 acres) | 31%↑ (118,308 acres) | 31%↑ (118,308 acres) |
| 50 | **21%↑ (109,435 acres)** | 31%↑ (118,308 acres) | 34%↑ (121,266 acres) | 36%↑ (122,745 acres) |
| **Open canopy forest types (PPF+DMCF): 750,091 acres of which 67% or 501,122 acres with woody canopy cover > 30%** | | | | |
| 15 | **4%↓ (481,033 acres)** | 2%↑ (510,023 acres) | 3%↑ (513,700 acres) | 4%↑ (522,901 acres) |
| 50 | **10%↓ (452,716 acres)** | 1%↑ (504,060 acres) | 0%↔ (501,234 acres) | 2%↑ (512,512 acres) |
| **Wet mixed conifer forest PNVT current conditions: 177,995 acres of which 61% or 101,457 acres with woody canopy cover > 30%** | | | | |
| 15 | 12%↑ (113,917 acres) | **14%↑ (115,697 acres)** | 12%↑ (113,917 acres) | **14%↑ (115,697 acres)** |
| 50 | 18%↑ (119,257 acres) | **21%↑ (122,817 acres)** | 19%↑ (121,037 acres) | **21%↑ (122,817 acres)** |
| **Spruce-fir forest PNVT current conditions: 17,667 acres of which 61% or 10,777 acres with woody canopy cover > 30%** | | | | |
| 15 | 11%↑ (12,014 acres) | **13%↑ (12,190 acres)** | **13%↑ (12,190 acres)** | **13%↑ (12,190 acres)** |
| 50 | 2%↑ (10,954 acres) | **3%↑ (11,130 acres)** | **3%↑ (11,130 acres)** | 0%↔ (10,777 acres) |
| **Closed canopy forest types (WMCF+SFF): 195,662 acres of which 57% or 112,234 acres with woody canopy cover > 30%** | | | | |
| 15 | 12%↑ (125,930 acres) | **14%↑ (127,887 acres)** | 12%↑ (126,107 acres) | **14%↑ (127,887 acres)** |
| 50 | 16%↑ (130,210 acres) | **19%↑ (133,947 acres)** | 18%↑ (132,167 acres) | **19%↑ (133,593 acres)** |

†Woody canopy closure classes are: 0 to < 10% is defined as very open canopy; 10 to ≤ 30% is defined as open canopy; and > 30% is defined as closed canopy. Under HRV and for DC ponderosa pine and dry mixed conifer forests should exhibit open canopies (10 to ≤ 30% woody canopy cover). Therefore, the lower the amounts of closed woody canopy cover, the closer these two PNVTs are to their HRV and forest plan DCs. Under HRV and for DC wet mixed conifer and spruce-fir forests should exhibit closed canopies (> 30% woody canopy cover). Therefore, the higher the amount of closed woody canopy cover, the closer these two PNVTs are to their HRV and forest plan DCs

## 15-Year Planning Period and the 50-Year Modeling Period Proposed High Acre Treatment Objectives

**Appendix G table 3. Comparisons, based on the proposed high acre treatment objectives for alternatives B, C and D, and alternative A, by the end of the 15-year planning period and the 50-year modeling period, of the percentage and acreage changes in closed woody canopy cover† within the historically open woodland (MPOW and PJW), and grassland (GBG and SDG) PNVTs**

| Years | Alternative Percents and Acres Display the Amount of Change within Each PNVT that has Closed Woody Canopy Cover Greater than 30 Percent in Woodland and Greater than 10 Percent in Grassland (arrows indicate direction of change in woody canopy cover; ↑ up, ↓ down, or ↔ no change) | | | |
|---|---|---|---|---|
| | alternative A | alternative B high | alternative C high | alternative D high |
| **Madrean pine-oak woodland PNVT current conditions: 394,927 acres of which 78% or 308,043 acres with woody canopy cover > 30%** | | | | |
| 15 | 3%↓ (300,145 acres) | 24%↓ 233,007 acres) | 17%↓ (256,703 acres) | **44%↓ (173,768 acres)** |
| 50 | 6%↓ (288,297 acres) | 45%↓ (169,819 acres) | 38%↓ (189,565 acres) | **63%↓ (114,529 acres)** |
| **Piñon-juniper woodland PNVT current conditions: 222,166 acres of which 22% or 48,877 acres with woody canopy cover > 30%** | | | | |
| 15 | 82%↑ (88,866 acres) | 36%↑ (66,650 acres) | 45%↑ (71,093 acres) | **0%↔ (48,877 acres)** |
| 50 | 191%↑ (142,186 acres) | 82%↑ (88,866 acres) | 118%↑ (106,640 acres) | **5%↑ (51,098 acres)** |
| **Woodland total current conditions (MPOW+PJW): 617,093 acres of which 58% or 356,920 acres with woody canopy cover > 30%** | | | | |
| 15 | 9%↑ (389,011 acres) | 16%↓ (299,657 acres) | 8%↑ (327,796 acres) | **38%↓ (222,644 acres)** |
| 50 | 21%↑ (430,483 acres) | 28%↓ (258,685 acres) | 17%↓ (296,205 acres) | **54%↓ (165,627 acres)** |
| **Great Basin grassland current conditions: 185,523 acres of which 89% or 165,190 acres with woody canopy cover > 10%** | | | | |
| 15 | 5%↓ (157,757 acres) | **75%↓ (40,815 acres)** | 7%↓ (153,984 acres) | 70%↓ (50,091 acres) |
| 50 | 2%↓ (162,647 acres) | 55%↓ (74,209 acres) | 8%↓ (152,129 acres) | **61%↓ (64,933 acres)** |
| **Semi-desert grassland current conditions: 106,952 acres of which 79% or 84,492 acres with woody canopy cover > 10%** | | | | |
| 15 | 6%↑ (89,840 acres) | **19%↓ (68,449 acres)** | 4%↑ (87,701 acres) | **19%↓ (68,449 acres)** |
| 50 | 19%↑ (100,535 acres) | **37%↓ (53,476 acres)** | 16%↑ (98,396 acres) | **37%↓ (53,476 acres)** |
| **Grassland total current conditions (GBG+SDG): 292,475 acres of which 85% or 249,682 acres with woody canopy cover > 10%** | | | | |
| 15 | 1%↓ (246,597 acres) | **56%↓ (109,264 acres)** | 3%↓ (241,685 acres) | 53%↓ (118,540 acres) |
| 50 | 5%↑ (263,182 acres) | 49%↓ (127,685 acres) | 0%↔ (250,525 acres) | **53%↓ (118,409 acres)** |

† Woody canopy closure classes are: 0 to < 10% is defined as very open canopy; 10 to ≤ 30% is defined as open canopy; and > 30% is defined as closed canopy. Under HRV and for DC Madrean pine-oak and piñon-juniper woodlands should exhibit open canopies (10 to ≤ 30% woody canopy cover). Under HRV and for DC Great Basin and semi-desert grasslands should exhibit very open canopies (0 to ≤ 10% woody canopy cover); grasslands, by definition, should not be dominated by woody species canopy cover. Therefore, the lower the amounts of closed woody canopy cover, the closer these four PNVTs are to their HRV and forest plan DCs

## 15-Year Planning Period and the 50-Year Modeling Period Proposed Low Acre Treatment Objectives

**Appendix G table 4. Comparisons, based on the proposed low acre treatment objectives for alternatives B, C and D, and alternative A, by the end of the 15-year planning period and the 50-year modeling period, of the percentage and acreage changes in closed woody canopy cover† within the historically open woodland (MPOW and PJW), and grassland (GBG and SDG) PNVTs**

| Years | Alternative Percents and Acres Display the Amount of Change within Each PNVT that has Closed Woody Canopy Cover Greater than 30 Percent in Woodland and Greater than 10 Percent in Grassland (arrows indicate direction of change in woody canopy cover; ↑ up, ↓ down, or ↔ no change) | | | |
|---|---|---|---|---|
| | alternative A | alternative B low | alternative C low | alternative D low |
| **Madrean pine-oak woodland PNVT current conditions: 394,927 acres of which 78% or 308,043 acres with woody canopy cover > 30%** | | | | |
| 15 | 3%↓ (300,145 acres) | **6%↓ 288,297 acres)** | 0%↓ (308,043 acres) | **6%↓ (288,297 acres)** |
| 50 | 6%↓ (288,297 acres) | 21%↓ (244,855acres) | 10%↓ (276,449 acres) | **22%↓ (240,905 acres)** |
| **Piñon-juniper woodland PNVT current conditions: 222,166 acres of which 22% or 48,877 acres with woody canopy cover > 30%** | | | | |
| 15 | 82%↑ (88,866 acres) | 68%↑ 82,201 acres) | 77%↑ (86,645 acres) | **64%↑ (79,980 acres)** |
| 50 | 191%↑ (142,186 acres) | 150%↑ (122,191 acres) | 173%↑ (133,300 acres) | **136%↑ (115,526 acres)** |
| **Woodland total current conditions (MPOW+PJW): 617,093 acres of which 58% or 356,920 acres with woody canopy cover > 30%** | | | | |
| 15 | 9%↑ (389,011 acres) | 4%↑ (370,498 acres) | 11%↑ (394,688 acres) | **3%↑ (368,276 acres)** |
| 50 | 21%↑ (430,483 acres) | 3%↑ (367,046 acres) | 15%↑ (409,749 acres) | **0%↔ (356,432 acres)** |
| **Great Basin grassland current conditions: 185,523 acres of which 89% or 165,190 acres with woody canopy cover > 10%** | | | | |
| 15 | 5%↓ (157,757 acres) | 51%↓ (81,630 acres) | 7%↓ (153,984 acres) | **45%↓ (90,906 acres)** |
| 50 | 2%↓ (162,647 acres) | **56%↓ (72,354 acres)** | 8%↓ (152,129 acres) | 55%↓ (74,209 acres) |
| **Semi-desert grassland current conditions: 106,952 acres of which 79% or 84,492 acres with woody canopy cover > 10%** | | | | |
| 15 | 6%↑ (89,840 acres) | **14%↓ (72,727 acres)** | 4%↑ (87,701 acres) | **14%↓ (72,727 acres)** |
| 50 | 19%↑ (100,535 acres) | **23%↓ (65,241 acres)** | 16%↑ (98,396 acres) | **23%↓ (65,241 acres)** |
| **Grassland total current conditions (GBG+SDG): 292,475 acres of which 85% or 249,682 acres with woody canopy cover > 10%** | | | | |
| 15 | 1%↓ (246,597 acres) | **38%↓ (154,357 acres)** | 3%↓ (241,685 acres) | 34%↓ (163,634 acres) |
| 50 | 5%↑ (263,182 acres) | **45%↓ (137,595 acres)** | 0%↔ (250,525 acres) | 44%↓ (139,450 acres) |

† Woody canopy closure classes are: 0 to < 10% is defined as very open canopy; 10 to ≤ 30% is defined as open canopy; and > 30% is defined as closed canopy. Under HRV and for DC Madrean pine-oak and piñon-juniper woodlands should exhibit open canopies (10 to ≤ 30% woody canopy cover). Under HRV and for DC Great Basin and semi-desert grasslands should exhibit very open canopies (0 to ≤ 10% woody canopy cover); grasslands, by definition, should not be dominated by woody species canopy cover. Therefore, the lower the amounts of closed woody canopy cover, the closer these four PNVTs are to their HRV and forest plan DCs