Topic 2 – Biodiversity and Viability

Vegetation

Introduction

The following sections provide broad descriptions of the vegetation cover types, and disturbance ecology, followed by landscape vegetation patterns for the Wasatch-Cache National Forest. Because of differences from one mountain range to another, the discussion has been organized into information for each of three ecological sections (Uinta Mountains, Overthrust Mountains, and Bonneville Basin) in which the Wasatch-Cache National Forest occurs (Figure VEG-1). Table VEG-1 lists estimated acreage of each cover type (rounded to the nearest 100 acres) currently mapped on the Wasatch-Cache National Forest portions of each ecological section.

Figure VEG-1 – Location of the Wasatch-Cache National Forest within the Bonneville Basin, Overthrust Mountains, and Uinta Mountains Ecological Sections.

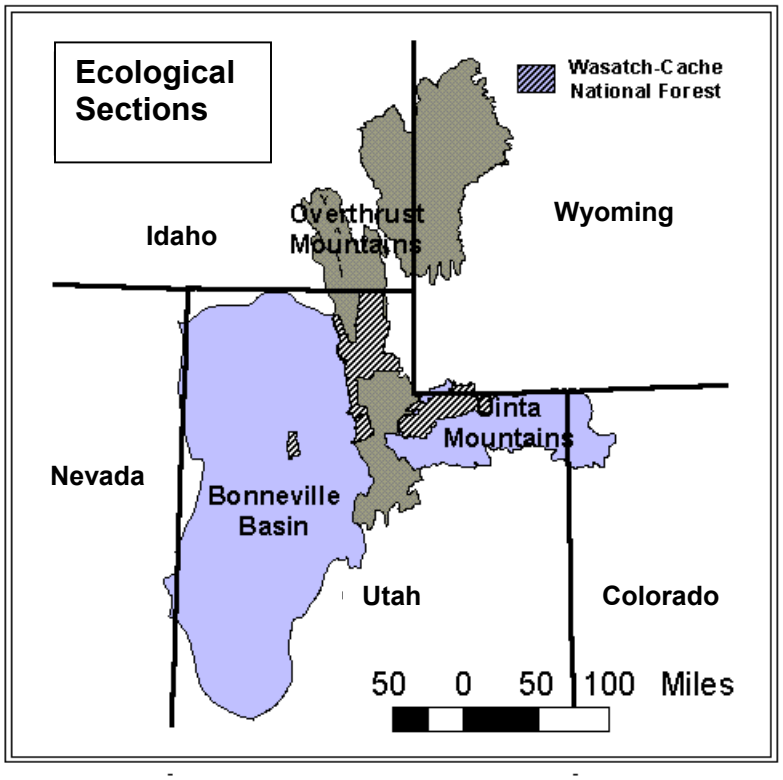


Table VEG-1. Acres of each vegetation type within the Wasatch-Cache National Forest portions of the Uinta Mountains, Overthrust Mountains, and Bonneville Basin Ecological Sections. Percentages are for each cover type within the Wasatch-Cache portion of those ecological sections and for total forest-wide area.

Cover Type	Overthrust Mountains Section	Percent within Overthrust Mountains	Uinta Mountains Section	Percent within Uinta Mts	Bonneville Basin Section (Stansbury Range Only)	Percent within Stansbury Range	Total Forest-wide	Percent of Total
Alpine	1,400	0.2	17,700	3	600	0.9	19,700	1.6
Barren[1]	21,100	3.7	79,900	13.7	500	0.7	101,500	8.3
Limber Pine	11,500	2	0	0	0	0	11,500	0.9
Spruce-Fir	24,600	4.3	127,600	21.8	1,200	1.7	153,400	12.5
Mixed Conifer	16,000	2.8	135,700	23.2	0	0	151,700	12.3
Lodgepole Pine	8,200	1.4	53,100	9.1	0	0	61,300	5
Conifer-Aspen	23,400	4.1	23,600	4	0	0	47,000	3.8
Aspen-Conifer	21,800	3.8	34,000	5.8	0	0	55,800	4.5
Aspen	74,100	12.9	27,000	4.6	1,700	2.5	102,800	8.4
Douglas-fir	70,000	12.2	8,500	1.5	9,100	13.3	87,600	7.1
Ponderosa Pine	0	0	500	0.1	0	0	500	0
Bigtooth Maple	14,600	2.5	0	0	0	0	14,600	1.2
Gambel Oak	88,700	15.4	2,100	0.4	0	0	90,800	7.4
Tall Shrub	15,700	2.7	300	0.1	6,100	8.9	22,100	1.8
Mahogany	12,800	2.2	900	0.2	100	0.1	13,800	1.1
Juniper, Pinyon-Juniper	43000	7.5	700	0.1	33,200	48.4	76,900	6.3
Sagebrush/ Grasslands	122,100	21.2	51,800	8.9	15,700	22.9	189,600	15.4
Tall Forb	3,200	0.6	0	0	0	0	3,200	0.3
Bottomland Hardwood	2,800	0.5	300	0.1	400	0.6	3,500	0.3
Wet Meadow	100	0	16,800	2.9	0	0	16,900	1.4
Willow	800	0.1	3,600	0.6	0	0	4,400	0.4
Total	575,900	100	584,100	100	68,600	100	1,228,600	100

[1] "Barren" areas in the Uinta Mountains occur in the upper cirque basins in and below the alpine. Some have scattered vegetation and could more appropriately be included in the Alpine cover type.

Vegetation patterns (both distribution of cover types and the age class diversity within these types) in the three ecological sections of the Wasatch-Cache National Forest are a function of numerous factors. Geology, soil characteristics, elevation (temperature) and precipitation are among the factors that affect the occurrence of cover types across the landscapes. Natural succession and disturbance factors, as well as human-induced disturbance such as prescribed fire, timber harvest, livestock grazing, development, and other actions can affect the extent of cover types, and often affect the age class diversity within each cover type on the landscapes. The Uinta Mountains (Uinta Mountain Section) and the Stansbury Mountains (Bonneville Basin Section) are geologically less diverse than the Wasatch Mountains, including the Bear River and Wasatch Ranges (Overthrust Mountains Section). In addition, precipitation patterns are more variable within the Wasatch Mountains because of the common "lake effect" from storms

moving across the Great Salt Lake and dropping more water, often in the form of snow, in areas primarily to the east and southeast of the lake. Both of these factors cause the Wasatch Mountains to have a much greater diversity in vegetation patterns than one finds elsewhere on the Forest.

The following descriptions show that vegetation rather than being a static covering of the land is instead an extremely dynamic patchwork with various cover types and age classes continually changing into and out of each other. This can create a rich mosaic of species (composition), age classes (structure), and distributions (pattern) of plant communities across the landscape. The result is a very complex, ever-changing three-dimensional "blanket" with different "ecological functioning" depending on the whole, as well as the parts. Ecological functioning is the value of the blanket in providing for essential life processes such as watershed protection, water and nutrient cycling, soil building, habitats for wildlife, from birds and big game to fish, insects, and even microbiotic communities. This blanket is also a major part of what we enjoy as scenery.

The last part of this section provides an assessment in summary form, of the status of vegetation types with regard to properly functioning ecosystem conditions and risks related to current status. Appendix B-1 contains a description of how vegetation modeling was conducted for forest planning.

Laws, Policy, and Direction

- **National Forest Management Act, 1976.** This law states that forest plans must "provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area."
- **Ecosystem Management** - In 1992, the Chief of the Forest Service issued a statement committing the Forest Service to the practice of ecosystem management, which is an ecological approach to managing national forests and grasslands for multiple uses.
- **36 CFR 219.27(g)** states that management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities.
- **36 CFR 219.19** requires the Forest Service to identify and prevent the destruction or adverse modification of habitat determined to be critical for threatened and endangered species. It states that fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species. Viable populations are defined as those with sufficient numbers and distribution of reproductive individuals to ensure their continued existence in the planning area.
- **36 CFR 219.19 (a)** also directs the Forest Service to select Management Indicator Species (MIS) to estimate the effect each alternative has on fish and wildlife habitat and its subsequent effect on wildlife populations, vegetation communities, and other ecological components; consult with biologists from other agencies; Consider access and dispersal problems of hunting, fishing, and other uses; and, Evaluate the effects of pest and fire management and the population trends of selected MIS.

Affected Environment

Disturbance Ecology and Ecosystem Resiliency

Hunter (1990) related a basic assumption that "the most efficient way to maintain biological diversity in a forested landscape is to have a diverse array of stands and thus a diverse array of ecosystems and their constituent species." We assume that non-forested landscapes would follow the same connection as well. Tilman (2000) found that, in general, greater diversity results in "greater productivity in plant communities, greater nutrient retention in ecosystems and greater ecosystem stability." Currently, diversity on the Wasatch-Cache National Forest is less that occurred historically. Disturbance once played a much more significant role in the diversity of age classes, patterns, and acres of different types. Natural disturbances such as fires, floods, etc. were more frequent, perhaps, but because they were, their intensity was less than is seen in ecosystems today. Forested ecosystems, such as the aspen and lodgepole types, were perpetuated through regular disturbance (fire). Fire suppression has reduced the amount of the aspen type over what occurred on the Wasatch-Cache National Forest historically by approximately 65 percent (O'Brien and Pope 1997) and the age class and fuels of the lodgepole type have been altered as well. As a result, the resiliency of these ecosystems and their function has been reduced. Mangel and others (1996) noted that the maintenance of biological diversity at the ecosystem, population, species, and genetic levels will help secure options for the future and that within the "natural boundaries of variation," resources will be conserved. Ecosystem resilience has bee reduce on the Forest because biodiversity at the ecosystem level has been reduced through a loss of diversity in age classes and the distribution of age classes within vegetation community types (patterns), as well as a significant reduction of certain types, such as aspen vegetation communities.

A variety of insects and diseases are associated including Douglas-fir beetle, Douglas-fir tussock moth, and dwarf mistletoe. A Douglas-fir beetle (*Dendroctonus pseudotsugae*) outbreak was noted in 2000 on the Wasatch-Cache National Forest (USDA Forest Service 2002c). The extent of this outbreak was not identified, but it was noted that for the Intermountain Region (Utah, Nevada, southern Idaho, and western Wyoming) mortality from Douglas-fir beetle was static between 1999 and 2000. These authors noted that mountain pine beetle (*Dendroctonus ponderosae*) nearly quadrupled between 1998 and 2000 in the Intermountain Region and that it increased in lodgepole pine stands on the Wasatch-Cache National Forest. In the Bear River Range, the scattered nature of these lodgepole stands creates a situation where risks of insects and disease are reduced so this has not been a major factor in shaping the stands, but the nearly continuous stands of lodgepole and mixed conifer (with lodgepole a major component) in the Uinta Mountains is highly susceptible.

The gypsy moth (*Lymantria dispar*) was first detected in Utah (along the Wasatch Front) in 1998 and between 1989 and 1993 nearly 72,000 acres of Federal, State and private lands were treated with *Bacillus thuringiensis* (Bt) (USDA Forest Service 2002c). In 1995 the moth was declared eradicated, but in 1997 one moth was found using pheromone traps in the same vicinity on the Wasatch-Cache National Forest, and 46 moths were captured on adjacent lands. Over 750 acres were treated in 1999 in Salt Lake County. It is expected that treatments for gypsy moth using Bt will continue indefinitely, because of continued moths being introduced to the area.

Broad Scale North-South Coniferous Corridor

A description of vegetation cover in the Wasatch-Cache National Forest would be incomplete without mention of the regionally significant forestland "wildlife corridor". This north-south linkage between large landscapes is evident when viewing maps of the ecological subregions of United States (McNab and Avers. 1994). The corridor connecting forests from the northern Rocky Mountains in Canada to the southern Rocky Mountains has its narrowest part through the Wasatch-Cache National Forest in northern Utah. This linkage provides for sustaining biological diversity from the potential for exchange of genetic materials within species to the potential for migration of entire populations and communities as environmental conditions change (Primack, 1993: 339) Vegetation and ecological conditions within the National Forest are even more important when viewed in the context of other land ownerships that are increasingly being developed or managed for non-wildland purposes.

Wasatch Mountains (Wasatch, Bear River and Wellsville Ranges)

Vegetation Cover Types and Disturbance Regimes

Alpine: This vegetation group is characterized by patchy (not generally turf-forming) vegetation with thin to nonexistent soils with rocky outcrops, fell-fields and boulders. Native perennial plant cover includes short meadow forbs, sedges and grasses, some low shrubs, and lichens and bryophytes. These are sensitive to even slight disturbance because recovery is very slow within this harsh environment.

Limber Pine: These open plant communities are a minor but unique component of the Wasatch Mountains. These stands are dominated by Limber pine, which is mostly mature with some younger individuals scattered among older trees. Sites supporting this type usually have shallow, rocky soils. Canopies do not close and trees are distributed in sparse stands or widely spaced clumps of trees. In the northern Wasatch Mountains Douglas-fir is present within Limber pine stands while in the south both Douglas-fir and Engelmann spruce are intermixed. Fire regime is mixed severity with 100 to 150 year intervals between stand-replacing fires.

Engelmann Spruce-Subalpine Fir: Varying combinations of subalpine fir and Engelmann spruce with aspen as an important seral species make up this category. The spruce is long-lived (often exceeding 300 years), but susceptible to wind-throw (resulting in spruce beetle epidemics) while subalpine fir is shorter lived (100-150 years) and less disease resistant. Most stands have a multi-canopy structural condition, although much of the regeneration is subalpine fir, which is more shade tolerant. Historically, small fires (1/4 to a few acres) occurred regularly in this type either killing or weakening trees in these small areas. Large fires (a few to several hundred acres) every 200-300 years were common because of a combination of insect epidemics and fuel buildup. For the past 100 years fire suppression has allowed a buildup of fuels and higher stand densities which cause insect activity to be more extensive and intense than characteristic historically. Beetle kill is potentially very high and it has been 200-300 years in most stands since the last large fires occurred. These conditions provide potential for larger areas (several hundred to a thousand or more) to be burned at one time and the higher accumulations of large

woody debris and ladder fuels create conditions conducive to more intense fires outside the historical range.

Subalpine fir: This vegetation type occurs primarily in the Bear River Range. Stands are co-dominated by pure subalpine fir or a mixture of subalpine fir with Douglas-fir. Aspen is a major seral species, which is being replaced by subalpine fir in many areas. Subalpine fir is shorter lived (100-150 years) and less disease resistant than Engelmann spruce. Fire historically played an important role in these stands with replacement fires occurring on a 100 to 300 year cycle. Root disease is common and balsam bark beetle is at epidemic levels in the Wasatch Mountains. Currently many areas are dominated by mature to old age classes with fire suppression resulting in high stand densities and basal area along with ladder fuels, which could result in larger more intense fires than occurred historically.

Mixed Conifer: The Bear River mixed conifer communities occur at mid to high elevations in the Bear River Range east of Cache Valley and Ogden Valley. They are somewhat unique in their overstory dominance of subalpine fir, with or without Douglas-fir and lodgepole pine. Occasionally limber pine occurs as scattered individuals near the Sinks area of the Bear River Range. This type is generally at transition between the high elevation spruce-fir communities and the Douglas-fir or lodgepole pine communities at mid or lower elevations.

Lodgepole pine: Only a small amount of this cover type occurs within the Wasatch Mountains, and it does not grow in the classic large monocultures covering thousands of acres such as in Yellowstone or the Uinta Mountains. Instead, lodgepole here (primarily on the east side in the "Bear Management Area") grows in smaller non-contiguous stands along north facing slopes of ridges often intermixed with other conifers such as subalpine fir and spruce. Historically, these probably burned with stand replacing fires on a 150-300 year cycle, which in recent times have been suppressed. These areas were heavily logged in the 1880's and again since 1960. Early logging slash piles were burned causing general larger stand replacement fires over much of the area. The scattered nature of these lodgepole stands creates a situation where risks of insects and disease are reduced so this has not been a major factor in shaping the stands. However, stand structure has been altered as a result of logging with current stands grouped primarily in the over 60-70 years old class or in the under 20-30 years class.

Aspen: The aspen vegetation type may occur on sites that can be succeeded by conifers (seral aspen), or it can occur on drier sites incapable of supporting conifer communities (stable or climax aspen). On most sites, aspen is an important early seral species in the spruce-fir, mixed conifer, lodgepole, and Douglas-fir vegetation types and in the Wasatch Mountains, studies show that much of the historic seral aspen has now been replaced by spruce-fir, lodgepole pine, and Douglas-fir (O'Brien and Pope 1997). Historically, the aspen vegetation type may have covered nearly 20 percent of these mountains, but today it occupies less than 13 percent. Aspen relies on disturbance for sprouting and regeneration, which has been reduce through fire suppression actions over the past 50-100 years. These two types of aspen (seral and climax) are distinct for purposes of assessing ecological conditions and trends. **Seral aspen** historically was disturbed by fire maintaining patterns and structural diversity across the landscape. Patchy, low-intensity fires at lower elevations, and more extensive stand replacement fires at higher elevations historically regenerated aspen and kept conifers from replacing aspen stands. An estimated 75-

80 percent of the aspen is now in mid-age, mature, and old-age condition. Together, fire suppression and livestock grazing (reductions in fine fuels) have combined to result in fewer fire starts and generally smaller fires in this type. Historically the fire regime was lethal fire burning on a 20 to 100 year cycle. Aspen regeneration after fire or cutting is often susceptible to browsing by wild and domestic ungulates, which can result in unsuccessful regeneration. This is especially true if the area treated is small (such as a stand) rather than across an entire landscape (multiple stands). **Climax aspen** is much less common than seral, often at the fringe of where seral aspen communities occur and adjacent to sagebrush-dominated rangelands. Present tree ages vary from 60 to 150 years. Historically, patchy, low-intensity fire at lower elevations and more extensive stand replacement fires at higher elevations were the most important disturbance factor maintaining structural diversity of this type across the landscape. High levels of grazing in this type in the past have resulted in reduced fuels to carry fire and changed species composition and dominance (western coneflower is a good example of this).

White fir: This cover type has not been mapped on the Forest, but occurs in minor amounts along the lower, western portion of the Wasatch Mountains on steep north-facing slopes. It is not known in the Cache-Box Elder or Bear Management Areas, except for an isolated stand near Logan Canyon. Minor amounts of Douglas-fir and aspen can be present mixed with the predominant white fir. White fir is shade tolerant growing well in very dense conditions. Thus, in the absence of low-intensity fires, it increases, eventually dominating even in stands that are currently dominated by seral big-tooth maple and/or oak-maple. Because of the very dense, multi-layered canopy conditions, defoliators such as western spruce budworm and Douglas-fir tussock moth are accommodated resulting in significant tree mortality (40-90%) in many stands. Fir engraver beetle is at epidemic levels throughout the Wasatch Mountains from Ogden south. The historical fire cycle was non-lethal fires every 10-40 years on drier sites and every 30-60 years on wetter sites. Some stand replacing fires, especially where Douglas-fir was seral, kept the white fir structure at younger stages. Fires are suppressed especially given the proximity of these stands to urban populations. Lack of the frequent, low intensity fires during the last 100 years has created an accumulation of fuel, resulting in potential for fires to be more intense stand replacing fires rather than the white fir thinning fires of the past. White fir of 150+ years develops fire resistant bark similar to Douglas-fir. Currently 60-75 percent of white fir is mature and old with a trend toward mortality exceeding growth.

Interior Douglas-fir: This type is restricted to steep north-facing slopes, but is adapted to a wide variety of site, climate, and soil conditions. Historical stand structures were primarily even-aged, single canopy with fire regimes usually non-lethal on a 10 to 25 year frequency on drier sites and 30 to 50 years on cooler/wetter sites. Most stands have not burned in the last 100 years increasing ladder fuels and susceptibility to stand replacement fires. In many stands that were selectively harvested in early 1900's Douglas-fir did not regenerate and the stands are now dominated by white fir. Douglas-fir beetle is at near-epidemic levels to the south and about 55-60 percent is susceptible. Dwarf mistletoe also is present but more common to the south. Large stand-replacing fires or continued exclusion of frequent non-lethal fires result in compromising the historical balance of patterns and structures in these landscapes.

Juniper (Pinyon-Juniper): This cover type with pinyon pine occurs only on sites where precipitation exceeds 18 inches annually. Both Utah juniper and Rocky Mountain juniper forms

make up this type with Utah juniper growing on the relatively drier sites. Pinyons occur within the Mollens Hollow Research Natural Area, but are generally absent elsewhere. The juniper type currently exceeds historical distribution expanding into oak, mountain brush, and sagebrush communities. It is also much denser within a stand than historically as a result of livestock grazing of fine fuels concomitant with fire suppression and juniper's allelopathic effects. The result is lack of understory vegetation for soil protection and deteriorated watershed conditions. Historically, this type was restricted to "fire safe" sites (fire return interval greater than 10-30 years) while it was excluded from establishing on sites with fire returns of 10 to 30 years. The rooting system and year-round water use result in significant impacts to ground water and aquifer recharge. Fire regimes have changed because of lack of fine fuels but large fires can occur as wind-driven crown fires. The change from low-intensity surface fires to snag-replacing crown fires demonstrates a radical change in fire regime. In other areas, an increase of exotic annuals such as cheatgrass has enabled fires to burn more frequently than historically, and native herbaceous understories are replaced by weedy species such as cheatgrass, thistle, and knapweeds.

Mountain Mahogany: This cover type occurs with two different species: - curl-leaf and birch leaf mountain mahogany. Birch leaf mountain mahogany is deciduous and sprouts following fire or browsing while curl leaf mahogany is evergreen, tree-like and reproduces only by seed. Wildlife and livestock browse both and where use is heavy, reduced soil cover results in some decline in watershed condition. Birch leaf mahogany on southerly aspects where wild ungulate winter use is heavy may be lost.

Gambel Oak: This cover type occupies more than 15 percent of the Wasatch-Cache National Forest portion of the Overthrust Mountains Ecological Section. It occurs on foothills, along the Wasatch Front, but is absent, except for one isolated stand near Logan Canyon, from the Cache Valley area. Oak is a prolific sprouter that occurs in tree form on better sites and in a medium to tall shrub form elsewhere. The massive root system holds soils well for watershed protection and until overstories become dense, stands may support abundant understory grasses and forbs. Fire intervals were historically 20 to 50 years and years of fire suppression have resulted in somewhat greater than historical patch size and large areas of old decadent stands. Fall canker worm activity has increased because of reduced fire intervals causing top and branch mortality. However, recovery of oak communities is often rapid following disturbance. Decadent stands, when intermixed as they commonly are, with housing and other development, pose a risk to public safety from fire. Fire suppression in this type has resulted in a decrease in diversity of structure and pattern and increased fuels creating a much greater risk for more intense fires than occurred historically.

Bigtooth Maple: This cover type is found in the foothills where it is the ecological equivalent of Gambel oak and in some areas is capable of succeeding oak on more moist cooler sites. Maple often supports a sparse understory of grasses and forbs but has heavy leaf litter. It is capable of sprouting following fire. Fire suppression has resulted in longer than historical intervals with increasing age class, decreasing diversity in structure and pattern, and with maple replacing or co-dominant with oak in some areas.

Mountain Brush Complex: Chokecherry, serviceberry, gooseberries, mountain maple, mountain snowberry, and elderberry make up this cover type. These include species that resprout after fire and are intermingled with sagebrush at mid and conifer/aspen at higher elevations. Insect, disease, and fire intervals were historically in 20 to 40 year cycles. Suppression has allowed some pinyon-juniper and sagebrush to replace these communities and for encroachment of species such as Douglas–fir. Historic browsing primarily by wild ungulates has reduced the extent and crown cover of some mountain brush communities.

Tall Forb: This cover type is considered the "flower garden" of the mountains. Historically, tall forb communities were common throughout the mountains above 8,000 feet where precipitation exceeds 35 inches annually. More than half of these highly productive tall forb communities were lost years ago due to excessive livestock grazing with concurrent significant soil loss. Many sites are presently dominated by tarweed, knotweed, mulesear, and western coneflower. Site restoration is difficult or impossible because of soil losses. Except in the canyons of the Wasatch front, grazing continues to occur on many of the sites currently or historically supporting tall forb communities.

Sagebrush/Grasslands: These types are found throughout the Wasatch Mountains, covering more than 20 percent of the Wasatch-Cache National Forest portion of this area. While there are seven known species of sagebrush in the area, mountain big sagebrush makes up an estimated 60-70 percent and spiked big sagebrush makes up an estimated 20-30 percent across the landscape. **Mountain big sagebrush** occurs at elevations from 5,500 to 10,000 feet across a wide variety of landtypes. Fires historically occurred at about 20-40 year return cycles being lethal to individual sagebrush plants and favoring understory grasses and forbs. Fire in these landscapes typically burned in mosaic patterns leaving patches of several age and canopy classes. Currently many sagebrush communities are dominated by stands with greater than 15% sagebrush canopy cover due to a combination of fire suppression and livestock grazing. Forage utilization standards and monitoring are intended to increase grass and forb cover in these communities. At lower elevations, especially in foothills adjacent to urban areas, invasion of sagebrush by cheatgrass and various noxious weeds and annuals is common. **Spiked big sagebrush** generally occurs at elevations above 8,000 feet and is relatively productive having a greater diversity of wildflowers than mountain big sagebrush. Historical fire return intervals were 20-40 year cycles in mosaic patterns with spiked big sagebrush capable of sprouting after fire.

Riparian: These streamside communities occupy a relatively small proportion of the landscape, however, they are highly productive, and heavily used and valued by both people and animals. These communities are very diverse and range from tree-dominated (cottonwood, box elder, etc.) to shrub dominated (willow, dogwood, alder, birch, etc.) to herbaceous (wildflowers, grasses, sedges, rushes).

They are indicators of watershed conditions and play an important role in maintaining stream channels in a state of "dynamic equilibrium" where channel changes are at a rate consistent with sustaining hydrologic functions over time. Some riparian areas have disappeared because of overuse and changes caused by humans and domesticated livestock while others have been severely impacted. Water diversion, roads, timber harvest, grazing, and trampling including that

from recreation have been major causes of negative impacts such as lowering of water tables, erosion of stream channels, exotic plant encroachment, removal of beaver populations, increased water temperatures, concentrated runoff and increased sediment, and changes in vegetation density and composition, in riparian ecosystems. Also large areas of riparian and wetland ecosystems have been replaced by aquatic environments as a result of lakes and reservoirs behind human-built dams. Changes in historic flow regimes have reduced numbers and /or health of cottonwood trees in many areas. Changes in fire frequency have resulted in succession to conifers shading out deciduous species such as willow and aspen, which can cause reduced flows. Aquatic habitats are intertwined with riparian and upland vegetation conditions and can be negatively impacted as a result of increased erosion and sediment deposited in stream channels. This reduces exposed gravels for native fish spawning, broadens stream channels, creates shallow waters, reduces abundance and quality of pools, and increases water temperatures. Where streams have been down cut and water tables have dropped, riparian communities have been replaced by non-riparian species such as mountain big sagebrush, silver sagebrush, and Kentucky bluegrass. Streamside vegetation, food sources, and cover are also reduced as stream dynamics change and the effect is a net loss of aquatic and riparian species diversity.

Inventories were conducted on some high-priority stream channels on the Forest in 1992 and 1993. Approximately 29 percent of the nearly 119 inventoried miles were sampled in this ecological section. Of these inventoried miles of riparian area 42 percent were at PNC (potential natural communities), 47 percent were late seral, 4 percent were mid seral, 6 percent early seral and the remaining 1 percent in very early seral ecological condition. Because not attempt was made to inventory all miles of riparian these percentages do not necessarily represent the overall conditions in this ecological section.

Rare Communities: A few rare or unique plant communities occur in this portion of the forest. These include the single needle pinyon (*Pinus monophylla*) communities in Mollens Hollow RNA southeast of the Cache Valley, which are not globally rare, but are very rare in this ecological section. Also near Right Hand Fork, Logan River, on the Bear River Range, are references to disjunct occurrences of Gambel oak and white fir. These species, while abundant elsewhere in the Wasatch Mountains, are not known from this portion. East of Salt Lake Valley, there are unique side-slope thinleaf alder (*Alnus incana*) communities in Little Cottonwood Canyon. While thinleaf alder is not uncommon on the forest, it typically occurs along streams and rivers and does not occur elsewhere on the forest as these large, sideslope seep communities. In Big Cottonwood Canyon are some ponderosa pine (*Pinus ponderosa*) communities that are likely related to plantations in the early 20th century, but that are reproducing and maintaining themselves. These occur in and west of Mill D North Canyon.

Vegetation Patterns

The Wasatch Mountains occur within the Overthrust Mountains Section (Figure VEG-1), which is a part of the Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest – Alpine Meadow Province (McNab and Avers 1994). These mountains extend from just east of Nephi on the south to southern Idaho where the Bear River turns the bend south toward the Great Salt Lake (Cronquist and others 1972). In the Wasatch-Cache National Forest, the Wasatch

Mountains includes the Bear River Range and Wellsville Mountains on the northern portion (separated by the Cache Valley) and the Wasatch Range in the south-central portion of the Forest. These ranges represent a transition from the Great Basin to the Rocky Mountains.

On the west-facing slopes, juniper occurs from the Bear River Range west to the Wellsville Mountains and scattered along rocky ridges in the Wasatch Range. Juniper is also becoming more and more a part of the bigtooth maple communities between Wellsville and Brigham City.

Sagebrush (primarily with mature and old overstories) occurs from the lowest to subalpine elevations all along the Wasatch Mountains. Subalpine big sagebrush, mountain big sagebrush, and low sagebrush are non-sprouting species following fire. Spiked big sagebrush and silver sagebrush both sprout following fire. Mountain big sagebrush is probably the most common variety on the Forest, occurring from 4,500 ft. to over 9,000 ft. elevation on deep, well-drained soil. Spiked big sagebrush is also very common in the Wasatch Mountains occurring above 6,800 ft. in elevation and on deep, productive soils. Subalpine big sagebrush occurs in the Bear River Range near Franklin Basin and generally occurs on shallower, more rocky and less productive soils than spiked big sagebrush. Low sagebrush occurs on rockier, well-drained sites that typically have very low forage production. Silver sagebrush occurs in the North Sinks region of the Bear River Range and is not known to occur in large stands anywhere in the Wasatch Mountains. It typically occupies very moist, almost riparian sites. Sagebrush communities form relatively large stands, often included in aspen, conifer, and mountain brush mosaics on the landscapes.

Tall Forbs historically occurred in the Bear River Range as well as the Wasatch Range, but have experienced perhaps the greatest impacts of any vegetation community from historic livestock grazing. Few, if any of these communities in the Bear River Range occur with the diversity of species that they once had. Willard Basin and Ben Lomond Peak between North Ogden and Brigham City, and Albion Basin in Little Cottonwood Canyon still have relatively large expanses of this type in more-or-less natural condition. In parts of the Bear River Range, this type has been converted to a tarweed-dominated type or has significantly fewer desirable species.

Bigtooth maple forms a rim along the relatively low-elevation, eastern slopes of the Wellsville Mountains in Cache Valley. Maple communities also occur in the draws, often succeeding the Gambel oak communities described below. In the Cache Valley, these maple communities are similar in habitat to Gambel oak communities that do not occur on this portion of the forest, and that may be absent here because of colder temperatures held in the valley because of winter inversions. Rocky Mountain juniper is slowly increasing it occurrence in the male cover type in some areas, but not expected to replace maple in most areas.

Mature to old communities of Gambel oak are abundant on the west and south-facing foothills of the Wasatch Mountains from Brigham City south to the Uinta National Forest, but only occur as a dominant overstory species as far north as Brigham City (south and east of Hwy 89). Maple communities tend to replace the oak, primarily in moister draws. The northern-most known occurrence of Gambel oak on the Forest is in Right Hand Fork Canyon south of Logan Canyon.

Douglas-fir usually occurs in mature to old forms at lower forested elevations from the northern to southern borders of the Wasatch-Cache National Forest. They occur primarily on the western portions of the Wasatch Mountains. Douglas-fir may be succeeded by white fir in the southern portion of the Wasatch Range north to, but not including, the Cache Valley. Very little White fir occurs north of this area, although a few individuals have been reported in Right Hand Fork Canyon south of Logan Canyon. White fir has increased its distribution in some areas because it has succeeded Douglas-fir. Several stands along the Wasatch front have, however, been killed by western spruce budworm, Douglas-fir tussock moth, and the fir engraver beetle, which as noted above is at epidemic levels throughout the Wasatch Mountains from Ogden south.

Lodgepole pine occurs as narrow bands on north-facing slopes on the east side of the Bear River Range. Timber harvest has occurred in some of these stands, which adds some diversity to the age classes within these stands. In some portions of these communities aspen is a co-dominant and the same age as the lodgepole. Both species quickly reestablish themselves following disturbances such as timber harvest and fire. A few populations occur in Big Cottonwood Canyon and may have been planted here in the early 20th Century.

Aspen occurs in conjunction with the lodgepole pine, mixed conifer, and occasionally Douglas-fir and spruce-fir communities. In these areas aspen is an early seral component that has been largely replaced by the later-seral conifers. Climax aspen occurs in the Monte Cristo portion of the Forest east of Ogden Valley and in Big and Little Cottonwood Canyons east of Salt Lake City. It is considered to be climax in these areas because a conifer component is largely missing, which may be the result of either different site conditions or more likely because of the lack of a conifer seed source.

Spruce-fir occurs at highest portions of the Wellsville Mountains, Bear River Range and in the Wasatch Range east of Salt Lake City. This cover type also occurs as scattered communities in the areas in-between. This type is generally dominated by Engelmann spruce with subalpine fir a minor to dominant component and some scattered Douglas-fir at the lower range of this type.

Limber pine occurs at high elevations in the Wasatch Mountains on sites that are typically well drained and unable to support Engelmann spruce or subalpine fir. Understories are usually sparse, often with Oregon grape and kings fescue common components of the herbaceous layer.

Noxious Weeds

Appendix H1 lists the Utah and Wyoming Noxious Weeds and describes in more detail the occurrence of these species on the forest. This ecological section has a great variety and concentration of noxious weeds. The most common noxious weed in this area is dyers woad (*Isatis tinctora*). While most abundant along roadsides and travel ways, it extends away from these areas onto adjacent foothills and slopes. It occurs at nearly all elevations in the Bear River and Wasatch Ranges. Estimated population sizes range from less than 0.1 acre to over 650 acres. Leafy spurge has been found in both the Bear River and Wellsville Mountains and has been noted elsewhere on the forest as well. It occurs in the Mount Naomi and Wellsville Wilderness Areas. Musk thistle (*Carduus nutans*) has been found in the Bear River Range. Canada thistle (*Cirsium arvense*) occurs primarily along streams throughout the area, while hemlock has been

noted in only a few locations in this portion of the forest. Dalmatian toadflax (*Linaria dalmatica*) has been noted in the Bear River Range and is abundant along the foothills of the Wasatch Range. Russian knapweed and spotted knapweed (*Centaurea repens* and *C. maculosa*) are located in only a few areas in the Bear River Range and the Wasatch Range, but are considered to be the highest priority for treatment because of their expansive nature in other places they occur. Medusahead (*Taeniatherum caput-medusae*) and whitetop (*Cardaria draba*) have been found in the Bear River Range and whitetop has also been noted in the Wasatch Range as well. In addition to these noxious weeds, other undesirable plants, such as houndstongue (*Cynoglossum offionale*) and black henbane (*Hyoscyamus niger*), are also present in the Bear River Range. Other noxious weeds, such as field bindweed (*Convolvulus arvensis*), perennial pepperweed (*Lepidium latifolium*), purple loosestrife (*Lythrum salicaria*), diffuse and squarrose knapweeds (*Centaurea diffusa* and *C. virgata*), yellow starthistle (*Centaurea solstitialis*) and quackgrass (*Elymus repens*) may also be present throughout this portion of the Forest, but have not been noted by personnel on the Forest.

Bonneville Basin (Stansbury Mountains)

Vegetation Cover Types and Disturbance Regimes

Alpine: Vegetation here at elevations above tree line (greater than 9,000 feet) is patchy with thin soils. Even slight disturbance is significant because of slow recovery in this harsh environment. Past human recreation traffic and some grazing are the only disturbance to vegetation in the alpine area and the effects have been negligible based on limited historic information.

Limber Pine and Bristlecone Pine: These cover very small acreage in this mountain range. It is primarily composed of limber pine but with some bristlecone present on limestone substrates. Given the location in steep high elevation inaccessible areas, this type appears to be protected from any human caused impacts. The area gets frequent lightening strikes but fuel loading is sparse and fires usually do not carry.

Aspen: These communities occupy mid-elevations in canyon bottoms, near springs, and on moist cool side slopes. It is interspersed with Douglas-fir at higher elevations and tree ages vary from 60 to 150 years. Patchy, low-intensity fires at higher elevations and more extensive fires at low elevations historically regenerated aspen and kept age classes in balance. Fire suppression has resulted in some of this type being replaced by coniferous forest and cattle grazing and recreation can impact stands especially where cattle or people congregate.

White fir: This cover type occupies relatively minor acreage in drainages at low to mid elevations. It regenerates in shade of cottonwoods and aspen and is very sensitive to frequent low intensity fires. In the absence of fire, white fir has increased in numbers and density.

Douglas-fir: This cover type occupies a moderate amount of acreage in pockets on north-facing slopes. Historical stand structures were primarily even-aged, single-canopy stands. A variety of insects and diseases are associated including Douglas-fir beetle, Douglas-fir tussock moth, and dwarf mistletoe. Fire regimes were usually non-lethal at frequencies of 10 to 30 years on dry

sites, and 30 to 50 years on cooler/wetter sites with lethal fires very rare. Most stands have not burned in the past 100 years, have few seedling or sapling stands and are not actively regenerating. Fires suppression appears to have allowed Douglas-fir to overtake some aspen. Fuels have continued to build and potential for large lethal fires has increased. Older dense stands of Douglas-fir are also susceptible to Douglas-fir beetle.

Juniper (Pinyon-Juniper): This cover type is the most common vegetation type in the Wasatch-Cache National Forest portion of the Bonneville Basin. Juniper dominate most sites, while pinyon pine are scattered within some communities. Both Utah and Rocky Mountain juniper occur with Utah juniper on relatively drier sites increasing in density due to grazing and fire suppression and replacing sagebrush and in some instances mountain brush. Rocky Mountain juniper, on more moist sties, has not expanded as much as Utah juniper. Pinyon-juniper currently exceeds its historical distribution and density by as much as 60 percent. These pinyon-juniper communities occur on sites that were historically maintained in a sagebrush state through natural fires that occurred every 20-40 years. Currently, wind-driven crown fires can burn thousands of acres at a time, which is a radical change from the low-intensity surface fires every 10 to 30 years that were part of the historical fire regime. Historic grazing significantly reduced fine fuels and also accelerated loss of topsoils with resulting decrease in production of herbaceous vegetation in the undergrowth. Some stands have been chained and seeded to crested wheatgrass. An increase in pinyon-juniper is thought to have had a dramatic impact on local aquifers because of the transpiration use year-round.

Mountain Mahogany: This cover type is not common to this mountain range. Most is curlleaf mountain mahogany with birchleaf as a very limited component of the mountain brush type. Curlleaf mountain mahogany is evergreen, has a tree-like form, and has a number of disease pathogens. It is a weak resprouter following fire and reproduces mostly from seed. This type has been heavily browsed and is primarily in an old structural condition. It is being lost on dry southerly slopes where livestock and large ungulates overgraze reducing groundcover and degrading watershed conditions.

Mountain Brush Complex: This complex of species is relatively common and includes chokecherry, serviceberry, gooseberries, birchleaf mountain mahogany, mountain snowberry, and elderberry some of which sprout after fire. This complex occurs on slightly moister areas than sagebrush with annual precipitation of 15 to 25 inches. It occurs in mosaics with sagebrush and conifer/aspen or aspen providing a highly diverse landscape cover. Fires suppression has resulted in mature to old age classes of dominant shrubs, which is uncharacteristic of a type that historically burned every 20-40 years.

Tall Forb: While the tall forb vegetation cover type has not been mapped in the Stansbury Mountains, forb-dominated plant communities occur here. They are similar to forb communities that occupy drier, often rocky sites in the Wasatch Mountains with species such as bee balm (*Mondardella odorotissima*), spike fescue (*Leucopoa kingii*), scarlet gilia (*Gilia aggregata*), rock goldenrod (*Petradoria pumila*), and various species of beardtongue (*Penstemon* spp.) present. As vegetation mapping procedures improve, this type will possibly make up about 1 percent or more of the Wasatch-Cache National Forest portion of this mountain range.

Sagebrush/Grasslands: Sagebrush and grasslands are common at elevations of 5,500 to 10,000 feet, with mountain big sagebrush composing an estimated 80-90 percent of the landscape and other sagebrush species being minor. Fire regime historically had a return interval of 20-40 years with fires lethal to individual sagebrush plants and favoring understory grasses and forbs. Historic fire patterns created a mosaic of several age and canopy classes within any given landscape. Many acres of mountain big sagebrush have been treated and replanted to crested wheatgrass on the lower eastern portion of the Stansbury Mountains and it continues to be a major component among a few native species. Where treatments have not occurred, sagebrush stands are dominated by mature shrubs with greater than 15 percent canopy cover and ground cover less than 85 percent of potential (which does not provide adequate soil protection). Many acres of mountain big sagebrush have been replaced by pinyon-juniper because of removal of fire and reduction of fine fuels in the understory. Soil stability and productivity may be seriously affected from a loss in understory vegetation and surface erosion may increase. Fires that have occurred recently on the Stansbury Mountains have resulted in a decrease in juniper and an associated increase in early seral Sagebrush/Grassland communities. Without aggressive reseeding of perennial grasses and forbs following fire, cheatgrass has and will continue to dominate many drier landscapes.

Riparian: These communities are a small amount of the land base, but are highly productive and heavily used by people and animals. A Few live water streams and many seeps characterize the area and springs scattered over the landscape. Many water sources become subterranean with most of the larger stream systems becoming dry near the Forest boundary because of water diversions for downstream users. Recreation use is often very high wherever there is live water adjacent to accessible roads with consequent soil compaction and loss of streamside vegetation. Some aquatic habitat improvements (gabions, log structures) have been installed to improve habitat for species including Bonneville and Colorado River cutthroat, rainbow and brown trout. Significant negative effects from a variety of uses include lowering of water tables, erosion of stream channels, exotic plant encroachment, removal of beaver populations, increased water temperatures, concentrated runoff and increased sediment from road construction, and changes in vegetation density and composition. White fir has replaced some of the cottonwood stands shading out deciduous willows. *Cytospora* and scale insects have adversely affected viability of cottonwood and willow in some areas. Interruption of historic disturbance patterns and several decades of reduced flows have led to a decrease in numbers of cottonwood trees. Other changes resulting from fire suppression include white fir, Douglas-fir, pinyon-juniper and sagebrush increases with water use year round reducing the amount of water available for stream flows. Aquatic habitats are intertwined with riparian and upland vegetation conditions and can be negatively impacted as a result of increased erosion and sediment deposited in stream channels. This reduces exposed gravels for native fish spawning, broadens stream channels, creates shallow waters, reduces abundance and quality of pools, and increases water temperatures. Streamside vegetation, food sources, and cover are also reduced as stream dynamics change and the effect is a net loss of aquatic and riparian species diversity.

Inventories were conducted on some high-priority stream channels on the Forest in 1992 and 1993. Approximately 3 percent of the nearly 119 inventoried miles were sampled in this ecological section (the Stansbury Mountains have a relatively low percent of the forest's total riparian areas). Of these inventoried miles of riparian area 15 percent were at PNC (potential

natural communities), 58 percent were late seral, 14 percent were mid seral, 10 percent early seral and the remaining 3 percent in very early seral ecological condition. As previously noted, because not attempt was made to inventory all miles of riparian these percentages do not necessarily represent the overall conditions in this ecological section.

Rare Communities: As noted above, there are some bristlecone pine (*Pinus longaeva*) communities in the Stansbury Mountains that do not occur elsewhere on the forest and that are generally uncommon throughout their range. These bristlecone have been described as infrequent, but "locally dominant on limestone slopes at moderately high elevations" (Taye 1983).

Vegetation Patterns

The Stansbury Mountains are part of the Bonneville Basin Section, which occurs within the Basin, and Range physiographic province as described by McNab and Avers (1994). The relatively low precipitation in this Section (up to 18 inches on the mountains) affects the plant communities that occur. Salt desert communities, while generally not present in the Wasatch-Cache are common at elevations below the forest boundary on the west side of this mountain range. The lower foothills on the western portion of the Stansbury Mountains are dominated by juniper, which has invaded many sagebrush communities that once dominated these sites prior to fire suppression. Fire historically played a large role in controlling the expanse of juniper on these lower sites. Juniper is a more natural component on rockier sites above and within these foothills, because fire had a more difficult time burning with the naturally lower fuels.

Sagebrush communities, while not as expansive as they were historically, generally occur from low to upper elevations. On the east side of the Stansbury Mountains, crested wheatgrass was seeded on many acres during the 1960's. Because of the long-lived and competitive nature of crested wheatgrass, this species is still the dominant species on many of these areas although some natives, such as bluebunch wheatgrass, are beginning to reestablish.

While aspen communities are not as big a component as is found elsewhere on the Forest, they are still an important part of mid-elevations in the Stansbury Mountains. In many areas aspen is being replaced by Douglas-fir and occasionally by some white fir in riparian areas.

Douglas-fir communities are common mid-elevation communities within the conifer belt of the Stansbury Mountains. At the upper reaches of Douglas-fir dominance there is a transition into spruce-fir communities. White fir is invading riparian communities along South Willow and North Willow channels and is becoming a minor component in Douglas-fir stands.

The Engelmann spruce and subalpine fir (Spruce-fir) communities, while not covering large acres within the Stansbury Mountains, are present at elevations above the Douglas-fir as well as on cooler, moister sites within the Douglas-fir belt. At the highest elevations below timberline in the range, these communities often form a mosaic with the limber pine-bristlecone pine communities.

Both limber and bristlecone pines occur at the upper forest zone, just below timberline in the Stansbury Mountains.

Alpine and subalpine forbs occur at higher elevations in the Stansbury Mountains. Deseret Peak, at just over 11,000 feet elevation, offers what little alpine habitat there is in the Stansbury Mountains. These sites are generally rocky rather than sod forming with scattered vegetation.

Noxious Weeds

Appendix H1 lists the Utah and Wyoming Noxious Weeds and describes in more detail the occurrence of these species on the forest. Whitetop has been noted along many drainages in the Stansbury Mountains including, but not limited to North Willow, South Willow, Big Hollow, Barlow, Spring Creek, Round, Big Granite, Monument, and Chokecherry Canyons. Other species are likely to occur, but have not been inventoried.

Uinta Mountains

Vegetation Cover Types and Disturbance Regimes

Alpine*:* Distribution of alpine plant communities is tied to rock type, landform, and depth and duration of snow cover. Lewis (1970) described the Curly Sedge/Cushion Plan, Alpine Avens-Sedge and Sedge-Alpine Avens, Sedge-Grass, Wet Meadow and Bog, Dry Meadow, and Alpine Shrub communities. We have not mapped the alpine communities to this level of accuracy. Areas of semi-barrens vary from year to year depending on the persistence of snow cover and in "good" years are covered with sparse vegetation. Talus creep and cliff faces support other plant communities and the Red Pine Shale formation supports the sensitive plant species, alpine poppy. Limestone substrates support different plant composition than the common quartzite. Except for the sheep driveway, at localized salting and bedding grounds, and where high recreation use is concentrated (Naturalist Basin), alpine plant communities appear to be much as they might have been prior to European settlement. However in these use areas, ground cover is significantly lower than potential, and erosion has occurred resulting in watershed concerns.

High Elevation Engelmann Spruce: These communities occur from above 10,400 feet elevation and extend down to about 10,000 feet. Spruce trees are 300-400 years and older with little or no replacement by subalpine fir. Typical fire regime is small infrequent fires with long intervals (300 years or more) between disturbance and maturation of forests. Uneven age and old stands dominate. Very little of these forests have been harvested and they show comparatively little mortality from insects with frequency of insect epidemics much lower than for lower elevations. At the highest elevation, these communities are represented by stunted krummholz conditions because of the severe environmental conditions that occur.

Spruce-Fir: As noted in Table VEG-1, this type covers over 20 percent of the Wasatch-Cache National Forest portion of the Uinta Mountains. Spruce-fir occurs in the western portions of the Uintas between elevations of 8,000 and 10,000 feet. These communities often occur as relatively small group stands rather than the large continuous forest more typical of mixed conifer. Engelmann spruce is long-lived (250 to >300 years), on cool moist sites and has shallow roots

(susceptible to windthrow); and most stands are in multi-canopy structural condition. Subalpine fir is similar in ecology but shorter-lived (100-150 years). Blue spruce is a very minor component with aspen, lodgepole pine, and a few Douglas-fir associated in mixed or seral stands. Harvest of spruce-fir stands was common both prior to and after World War II. The majority of the type is mid-aged and mature to old with many stands uneven-aged and/or multi-storied. Areas harvested are covered with sapling and seedlings with composition weighted toward subalpine fir. There is a dynamic cycle between spruce and subalpine fir dominance depending on stand conditions and insect activities with subalpine fir co-dominating during the first century and then declining while the stand becomes dominated by Engelmann n spruce. Historic fire regimes were mixed with small fires burning individual trees to a few acres on a relatively frequent basis within most stands. These lethal small fires served to create uneven-aged stands. Less frequent stand-replacing fires occurred on a 200 to 400 year cycle creating an earlier seral stage with more even-aged stands. There is increasing risk from fire and insects because of the increasingly mature component of stands as a result of fire suppression.

Mixed Conifer-Uinta Mountains: This type occurs between 9,000 and 10,500 ft. elevation. A conspicuous difference between this type in the Uinta Mountains and many other areas is the strong presence of mature and old lodgepole pine intermixed with Engelmann spruce with rather low presence of subalpine fir. Lodgepole pine often clearly dominates stands, reflecting its more-rapid establishment following disturbance. In places subalpine fir shows a strong presence in shrubby form by layering, however it appears that the vast area of quartzite materials of the Uinta Mountain Group present substrates on which subalpine fir fails to express dominance. As noted in Table VEG-1, this type covers nearly 25 percent of the Wasatch-Cache National Forest portion of the Uinta Mountains. Areas of this type outside Wilderness have been harvested and a mountain pine beetle epidemic swept the eastern but not western Uinta Mountains. Historic fire regimes were lethal fires on a 100-300 year cycle. Following fire, lodgepole pine tends to dominate stands for a period while spruce a shade-tolerant species, eventually again becomes a significant component. Without fire or other disturbance, the lodgepole pine component will be greatly reduced.

Lodgepole Pine: In the Uinta Mountains lodgepole pine occupies large areas in unbroken stands. Historical fire regimes included large stand replacing fires at intervals of 100-200 years followed by rapid regeneration of trees with a resulting relatively few age classes across the landscape. Mountain pine beetle is also a contributor to regeneration creating conditions suitable for large fires. Dwarf mistletoe is an active agent throughout theses ecosystems with highly variable levels of infestation. Clear cutting has been widespread as well as tie-hacking in the Blacks Fork and Bear River drainages. Tie hacking was a process of tree harvest and placement of trees in waterways where streams backed up large amounts of water, then blasted to allow the trees to flow downstream off the forest for cutting into railroad ties. This practice affected both thousands of acres of upland (clear-cut) and riparian ecosystems with effects evident even today. Early harvests was done in blocks of 300-500 acres or more with later harvest limited to 40 acre blocks considering elk hiding cover. Gently sloping areas have mostly been harvested with long persistent lodgepole remaining on steeper or rockier areas. Mountain pine beetle heavily impacted lodgepole pine in the Uinta Mountains in the early 1980's. For several years, many thousands of acres of lodgepole were treated to minimize impacts from the beetle, but these treatments were, for the most part, unsuccessful in the long term. The largest number of acres

affected by the beetle occurred on the Ashley National Forest in the eastern portion of the Uinta Mountains.

Aspen: Three distinct categories of this type have been identified. **Conifers** eventually replace **Seral Aspen** in the absence of disturbance. **Seral Aspen-Lodgepole** is composed of co-dominate aspen and lodgepole with both regenerating after fire. **Climax Aspen** is usually at lower elevations and/or drier sites where conifer encroachment remains low with or without fire or other disturbance. On the north slope of the Uinta Mountains there has been a large loss of **Seral Aspen** to mixed conifer and spruce-fir as a result of fire suppression. Conifers make up more than 35% in most existing aspen stands except in the eastern Uintas where mountain pine beetle in the 1980s and harvest in the past 50 years has regenerated seral aspen. 70-80% of aspen stands are mature or old age classes with a resulting loss of structural diversity. Expanding elk herds also pose a risk to regenerating seral aspen. The historical fire regime was for lethal fires at intervals needed to keep aspen abundant and vigorous. **Seral Aspen-Lodgepole** is the largest aspen cover type with most stands in the mature to old age classes as a result of successful fire suppression. Stands are becoming dominated by lodgepole pine without lethal fire return intervals within the historic range but where pine bark beetle has killed lodgepole stands have been rejuvenated. **Climax Aspen is** typically adjacent to sagebrush/grasslands on lower elevation sites that cannot support conifers. Some clones have great ability to regenerate under mature stems while others do not. Most of these stands are in the mature and old age classes affecting structural diversity but clone-by-clone evaluation is necessary to determine proper functioning condition. Expanding elk herds pose a risk, which has become significant in some areas.

Interior Douglas-fir: This community is confined to a limestone belt with much in the eastern Uinta Mountains in mid to old age classes. Historic fire regimes were non-lethal and mixed severity on a 10-25 year cycle on drier sites and 30-50 years on wetter sites. Lack of non-lethal ground fires has allowed for an increase in the shade tolerant true firs and a build up of dead and down ladder fuels. In some areas this type is being replaced by White fir. Insect activities do not currently exceed endemic levels but conditions are such that most stands rate out at “high” risk because of stand densities and age. Clear cutting in this type has resulted in slow tree regeneration and created grass/forb openings. Douglas-fir is moving into sagebrush, mahogany, and mountain brush communities in the absence of fire. The lack of fires during the last century increases the likelihood that fires will be stand replacing and may result in greater watershed damage than historic fires.

Juniper (Pinyon-Juniper): This is a minor cover type occupying less than 1000 acres in the western portion of this area. No pinyons are known to occur in this portion of the Uinta Mountains Ecological Section. Historical fire return intervals were 50-200 years. Without fire, juniper crown closure results in a significantly reduced understory exposing soils to erosion because of lack of ground cover. Old stands with risk to watershed conditions are within the historic range of variability. Risk of cheatgrass invasion exists especially where fires are not followed with the seeding of vigorous perennial species that have high ability to compete with it.

Mountain Mahogany: Both Birchleaf Mahogany and Curlleaf Mahogany occur in the Uinta Mountains. **Curl-leaf Mountain Mahogany** is a poor sprouter, readily killed by fire. It has winter persistent leaves and is highly hedged by wildlife, including mule deer, elk, and moose.

Stands in this area are relatively small (100 to 200 acres) and show that concentrated elk and moose utilization are resulting in declining conditions (vigor, density, and reproduction). Fire regimes were historically mixed severity/lethal on a 50 to 70 year cycle. **Birchleaf Mountain Mahogany** sprouts after fire and is found from about 6,000 to 9,000 feet elevation with lower areas seral to pinyon-juniper and higher areas seral to Douglas-Fir. Curl-leaf mahogany stands in the Kamas Ranger District are not regenerating, possibly because of lack of seed set and/or germination. Stands are old with tall, highlined structure and cheatgrass has invaded.

Gambel Oak: This community is present along the western end of the Uinta Mountains. Gambel oak is a prolific sprouter with Bigtooth maple a common component on more moist sites. Oak expanded somewhat into areas of sagebrush/grass. Historic fire regimes were mixed severity with crown fires every 20 to 50 years. Fire suppression has resulted in reduced understory species and cheatgrass is common in lower elevation stands adjacent to agricultural lands. A variety of insects are common to the oak type; however, none of the native insect species has posed a serious threat to the oak to date. Residential encroachment is occurring in this type in many foothill areas and there is increased potential fire intensities because of fuel build up.

Tall Forb: Tall forb communities occur only on the western portion of the Uinta Mountains on limestone-derived soils. It is estimated that about 50 percent of the sites once occupied by tall forbs are no longer present because of loss of productive topsoil resulting from historic impacts of heavy livestock grazing. On sites where potential remains, plant composition has changed significantly and currently many of these sites have high gopher populations, which prevents development of perennial forb cover. Invasion of tarweed, mulesear, and other weedy species are common. Risks to the type include uncontrolled livestock grazing, continued loss of topsoil, and invasion of annual weedy species (tarweed and knotweeds) and noxious weeds.

Sagebrush/Grasslands: Of eight known taxa of sagebrush in the area, mountain big sagebrush is the most common. The fire regime historically was on about a 20-40 year return interval, with sagebrush having the ability to return to pre-fire cover within 20 years. The majority of sagebrush is currently in older age-classes with higher canopy cover and reduced grass-forb cover. Spiked sagebrush, while less common, occurs on more moist sites. Silver sagebrush occurs adjacent to many streams on the north slope, but is not common on the western portion of the Uinta Mountains. Silver sagebrush and spiked sagebrush both have the ability to sprout following fire and, therefore, these communities return to pre-burn canopy cover more quickly.

Riparian: Inventories were conducted on some high-priority stream channels on the Forest in 1992 and 1993. Approximately 68 percent of the nearly 119 inventoried miles were sampled in this ecological section. Of these inventoried miles of riparian area 42 percent were at potential natural community status (PNC), 47 percent were late seral, 4 percent were mid seral, 6 percent early seral and the remaining 1 percent in very early seral ecological condition. As previously noted, because no attempt was made to inventory all miles of riparian these percentages do not necessarily represent the overall conditions in this ecological section. In the Uinta Mountain Section, the PFC assessment (USDA Forest Service 1998c) divided these areas into **Stream Canyon Riparian Complexes** and **Subalpine Meadow Complexes, which** are described in more detail below.

Stream Canyon Riparian Complexes: These complexes occur at all elevations with a great diversity of communities associated and structural diversity that exceeds all other cover types. Both deciduous and evergreen trees (aspen, narrowleaf cottonwood, box elder, and rarely bigtooth maple; limber pine, lodgepole pine, Douglas-fir, blue spruce, Engelmann spruce, and subalpine fir) occur along with tall shrubs and low trees (thinleaf alder, western birch, Bebbs willow, Scouler willow, caudate willow) and shorter shrubs (Booths willow, Drummonds willow, Geyers willow, red-osier dogwood, and woods rose) in addition to an herbaceous layer of grasses, sedges, and forbs. Because these generally narrow communities are often adjacent to moderate to steep gradient streams well armored by rock and adjacent to conifer communities, they are typically protected from large amounts of domestic or wild grazers. Timber harvest has been minor and structural diversity is high. Fuel loading is extreme in some places but in general these communities can be expected to recover rapidly from fire, which historically was on a 100-200 year cycle.

Subalpine Meadow Complexes: These plant communities vary with geomorphology and both wet and dry conditions. Wet meadow complexes are dominated by plainleaf willow, water sedge, mud sedge, few-flowered spikerush, deerhair bullrush, marsh marigold, elephants head, and other wetland species intergrading into tufted hairgrass communities transitioning into dry meadow complexes dominated by timber oatgrass or sheep fescue. Wolfs willow is common where the water table is at or near the surface for much of the growing season. Red Pine Shale occurrence is accompanied by barrens and semi barrens with inherent infertility and varying degrees of resistance to erosion. Cattle allotments are common at lower elevations and some of these meadow complexes have been without livestock grazing for many years. Impacts from years of livestock grazing to some of these broad meadow complexes are apparent with ecological status ranging from very early seral to potential natural. Recreation stock use is common in these areas while hiking and camping are largely confined to trails running through meadows and in the vicinity of lakes. Beaver are common where willows and aspen are available for dam construction. Their activities store water and raise the water table expanding riparian areas and trapping stream sediments. Ponds provide habitat for fish, birds, and aquatic furbearers. Dry meadow complexes are more sensitive than wet to sheep grazing because they receive more use. Where livestock have been removed or numbers reduced from those of the early part of the century, composition and ground cover can return to proper functioning.

Rare Communities: Ponderosa Pine communities are present and only in a small amount (about 500 acres) on the Kamas Ranger District. This is the westernmost extent of ponderosa pine in northern Utah, with the exception of a few scattered individuals and small groups in the Wasatch Mountains. Historic non-lethal ground fires with a return interval of 5 to 25 years would have cleared the ground of some of the duff layer and provided favorable seedbeds for ponderosa pine regeneration. Successive fires would have favored continued growth of established ponderosa pine saplings. Planting of ponderosa pine as well as clearing of invading juniper aimed at perpetuating the Ponderosa pine has been completed. In addition, there are some unique spruce communities with water birch as a component on the lower meadows typically north of the forest, but also occurring in a few locations on the eastern portion of Evanston Ranger District/western portion of the Mountain View Ranger District. Some white fir, which is

identified as a Wyoming State rare species (S1), has been noted on the northern portions of the Uinta Mountains. Its presence on the Forest has not been identified to date, but if present would be important to protect.

Vegetation Patterns

The Uinta Mountains are an ecological section, which, like the Overthrust Mountains Ecological Section, are within the Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest – Alpine Meadow Province (McNab and Avers 1994). The Uinta Mountains are primarily in northeastern Utah with a small portion occurring in southwestern Wyoming and western Colorado. The patterns of vegetation across the Uinta Mountains are fairly uniform from east to west, although landscape patterns west of Stillwater are more similar to the Wasatch Mountains. In addition, there are limestone uplifts within the northern portion of the Uinta Mountains that run east-west with north-facing slopes typically dominated by Douglas-fir and south-facing slopes often dominated by sagebrush.

In general, going from north to south (lower elevation to higher elevation) on the North Slope of the Uinta Mountains the plant communities include open sagebrush flats, aspen, lodgepole, Uinta Mountain mixed conifer (a mixture of lodgepole pine, Engelmann spruce and subalpine fir), spruce-fir forests, high elevation Engelmann spruce, including krummholz, semi-circular rocky cirque basins, and alpine tundra. Interspersed at higher elevations throughout this portion of the North Slope are a profusion of lakes, streams and wetlands.

While present throughout the Uinta Mountains, sagebrush communities are most evident in the western Uinta Mountains near Whitney Reservoir, on the western face of the range east of Kamas and Oakley, and on the far eastern portion of the Forest adjacent to birchleaf mountain mahogany, aspen and lodgepole communities. Nearly all sagebrush stands are mature with canopy cover over 15 percent. Some stands on the south faces of limestone ridges have been treated within the past 10-15 years and have a more open canopy. Silver sagebrush is a common component adjacent to riparian ecosystems and is sometimes a part of riparian ecosystems.

Tall Forb communities historically occurred in the western portion of the Uinta Mountains (Hoyts Peak and Whitney areas), but have experienced impacts from historic livestock grazing. In parts of the Hoyts Peak area, this type has been converted to a tarweed-dominated type and has experienced significant soil loss as well. This loss of topsoil has made the natural recovery of these sites very difficult.

Birchleaf mountain mahogany occurs in the vicinity of Widdop Mountain on the eastern portion of the forest on the North Slope. Birchleaf mountain mahogany communities are managed so that use of browse is at a level that not only provides for the continued maintenance of existing vegetation, but also provides for the continued reproduction and replacement of decadent and dead individuals within the stands.

Aspen stands on the northern most fringes of the Uinta Mountains are climax in nature, not being replaced over time by conifers in the overstory. These typically have common juniper (a shrub form of juniper) in the understory. They occur on the drier fringe of the forest ecosystems.

Somewhat higher in elevation pure lodgepole pine communities occur. In many cases aspen is a component and a seral co-dominant.

Lodgepole pine occurs on the lower portion of the conifer forest zone in the Uinta Mountains. At these lower elevations, lodgepole pine is generally not seral to spruce and fir. It may be associated with aspen, and where it is they often co-dominate before and after fire, but with continued fire suppression, these stands will eventually become dominated by lodgepole alone.

The role of fire in the lodgepole pine, mixed conifer and aspen ecosystems has been replaced to some extent by timber harvest over the last 100 years. Extensive tie hacking in the late 1800's/early 1900's produced uneven-age stands and affected watershed and wetland functions. Logs cut for railroad ties were placed in several streams on the north slope of the Uinta Mountains. Large dams were formed with these logs, and then blasted so the logs would flow northward off the forest. This practice affected the riparian areas to an extent that is still unknown.

Above the band of pure aspen, lodgepole pine and aspen regenerated concurrently following fires with mixed regimes (some stand replacing and some ground fires). Most of the pure lodgepole pine type appears to have regenerated following large, stand replacing fires. Some of the lodgepole pine stands on drier sites appear to have experienced cycles of surface or mixed severity fires that allowed them to develop an uneven-aged structure.

Douglas-fir communities are restricted to limestone outcrops at mid to upper elevations in a band across the north slope of the Uinta Mountains. Most of these stands are mature to old in age class.

A majority of the forested stands on the north slope of the Uinta Mountains are what have been described as the Uinta Mountain mixed conifer communities, dominated by a mixture of lodgepole pine, Engelmann spruce, and subalpine fir. There is no clear succession to spruce-fir dominance as is evidenced by the presence of mature trees (150 years or older) of each of these overstory dominants. Aspen, as previously noted, occurs from the northern fringes of the forested portion of the Uinta Mountains. In addition, it occurs up to the spruce-fir zone but is primarily a major component in the lodgepole and Uinta mixed conifer zones. These forests are dependent on disturbance to maintain a properly functioning condition.

At even higher elevations, spruce-fir communities occur. These differ from the mixed conifer communities at lower elevations in their lack of lodgepole pine. Disturbance regimes historically included smaller, more localized fires. Pure Engelmann spruce communities occur at the upper tree line and often grade into krummholz growth forms at the uppermost elevations, where it occurs.

Upper elevation forested stands (both spruce-fir and Engelmann spruce) appear to have a relatively infrequent fire history that is probably due in part to the wetter conditions during the fire season. These upper elevation stands are frequently in smaller patch sizes with changes in species composition dependent on how large and intense the fires were and how long succession from seral lodgepole pine to subalpine fir and Engelmann spruce has been progressing.

Rock talus (barren) sites are an important part of the upper landscape, but tend to form the cirque basin walls below the alpine communities, which are the uppermost vegetation zone in the Uinta Mountains. These differ from those on other ecological sections of the Forest because of the abundance of vegetation cover, which results from more soil and relatively fewer rocky outcrop sites.

Noxious Weeds

Appendix H1 lists the Utah and Wyoming Noxious Weeds and describes in more detail the occurrence of these species on the forest. Dyers woad is beginning to expand into this management area from adjacent Utah. While it has only been noted at one location along Beaver Creek east of Kamas, it is on several sites south of Evanston. White top has been noted in some of these areas as well. Canada and musk thistle are common throughout this area, spotted knapweed has been found near the forest boundary south of Mountain View.

General Effects

The ecosystem management principle of sustainability implies our ability to define and measure the status of ecosystems now, as compared to their historic range of variability. The concept of "historic range" recognizes that ecosystems are dynamic in nature and that disturbance and change is a common component. Areas that are within their historic range of variability are said to be in "properly functioning condition" (PFC).

Properly Functioning Conditions Assessment Summary

An assessment of PFC of vegetation cover types in National Forests in northern Utah (Ashley, Uinta and Wasatch-Cache National Forests) was completed in 1998 (USDA Forest Service 1998). Historic reference conditions for this area, including the Wasatch-Cache National Forest, were based on fire history studies, historical records, and documentation of historic uses of these lands both prior to and after the establishment of the National Forest System. Consistent with the ecosystem management principle of humans as ecosystem components, we include Native American actions (such as setting fires) prior to the settlement of Europeans, in the picture of historic reference conditions. These ecosystems did evolve in a sustainable manner with humans as integral parts. Table VEG-2 shows both the desired an existing age class diversity for vegetation cover types on the Wasatch-Cache National Forest portions of the Bonneville Basin, Overthrust Mountains, and Uinta Mountains Ecological Sections.

Ecological conditions were assessed by looking at four distinct aspects or ecosystem features: 1) Composition- the species list; 2) Structure- the layers and ages of species; 3) Patterns- the patchwork of species and ages across the landscape; and 4) Functions- processes and how they occur and interact on the land.

The PFC Assessment completed for the northern Utah national forests (Ashley, Uinta, and Wasatch-Cache National Forests) focused primarily on changes in patterns over the landscape (e.g. aspen cover types being replaced by various conifer cover types or sagebrush/grasslands being replaced by pinyon-juniper through the control of fires over the past 50 to 100 years) with

some focus on changes that have occurred in age class diversity (structure) and species composition primarily in forested ecosystems. From these changes we infer changes in the way these ecosystems function.

Table VEG-2. Existing and desired age class diversity for vegetation cover types occurring in the Wasatch-Cache National Forest portions of the Bonneville Basin (BB), Uinta Mountain (UM), and Overthrust Mountain (OM) Ecological Sections.

Cover Type	Desired Age Class Diversity	Existing Age Class Diversity
Limber Pine, Bristlecone Pine	Grass/Forb, seedlings - saplings = 10 - 20% Young, Mid Aged &Mature forests = 30 - 50% Old Forests = 20 - 40%	BB - Most stands are in the mature stages (>80 years old) with little young or very old stands. UM-Not Present OM - All Mature to Old
Engelmann Spruce – Subalpine Fir	Grass/Forb = 5-15% Seedling/Sapling = 5-15 % Young Forest about = 10-30% Mid Aged Forest about = 10-30% Mature Forest about = 10-30% Old Forest about = 10-30%	BB - Minor component OM - more than 40% of the type in mature or old age classes UM - Grass/Forb = 0 Seedling/Sapling = 0 Immature = 7% Mature =6% Old = 87% OM - Grass/Forb = 0% Seedling/Sapling = 0% Immature = 1% Mature = 2% Old = 97%
Aspen	Grass/Forb - Seedling/Sapling = 20 - 40 % Immature = 20 - 40% Mature = 20 - 40%	BB – Grass/Forb - Seedling/Sapling = <1% Immature = 10% Mature = 90% UM – Grass/Forb - Seedling/Sapling = 31% Immature = 2% Mature = 67% OM – Grass/Forb - Seedling/Sapling = <1% Immature = 1% Mature = 99%
Mixed Conifer – Lodgepole Pine	Grass/Forb = 5-15% Seedling/Sapling = 5-15 % Young Forest about = 10-30% Mid Aged Forest about = 10-30% Mature Forest about = 10-30% Old Forest about = 10-30%	BB – Not present UM – Grass/Forb = 1% Seedling/Sapling = 7% Immature = 10% Mature = 80% Old = 2%

Cover Type	Desired Age Class Diversity	Existing Age Class Diversity
		OM – Grass/Forb = 2% Seedling/Sapling = 1% Immature = 3% Mature = 94% Old = <1%
Interior Douglas-fir	Grass/Forb = 5-15% Seedling/Sapling = 5-15 % Young Forest about = 10-30% Mid Aged Forest about = 10-30% Mature Forest about = 10-30% Old Forest about = 10-30%	BB – Nearly all stands are in mature and old age classes. UM – Grass/Forb = 0% Seedling/Sapling = 0% Immature = 11% Mature = 89% Old = <1% OM – Grass/Forb = 0% Seedling/Sapling = 0% Immature = <1% Mature = 99% Old = <1%
Pinyon-Juniper	Grass/Forb = 5-15% Seedling/Sapling = 5-15 % Young Forest about = 10-30% Mid Aged Forest about = 10-30% Mature Forest about = 10-30% Old Forest about = 10-30%	BB - Most juniper stands are mature or old. UM - Currently more than 40% is mature and old (insignificant on the W-C portion of the Uinta Mountains) OM - More than 40% of the stands are in mature and old age classes.
Gambel Oak	Seedling/Sapling about 30-60% Immature 20-40% Mature 20-40%	BB – Not present UM – Component confined to a small portion of the Western Uinta Mountains Management Area. OM – Seedling/Sapling = 7% Immature = 18% Mature = 75%
Sagebrush (Big)/Grassland	<5% crown cover = 10-30% 5-15% crown cover = 30-50% >15% crown cover = 30-50%	BB - Many stands are skewed toward greater crown cover closure. UM - Overall a balanced range of structural stages. OM - Mountain big sagebrush skewed toward greater crown cover closure.

The primary impacts to ecosystems in northern Utah National Forests that have caused ecosystems to no longer be within their range of historic variation are the exclusion of fire through suppression, historically high livestock grazing levels, and the damming and diversion of water. In addition, impacts to riparian ecosystems have resulted from livestock grazing as well as from road construction and from heavy recreation use. Fire exclusion has resulted in a reduction in age class diversity of most shrub- and tree-dominated cover types. Probably most significant is the greater than 60 percent reduction in acres of aspen communities on the Wasatch-Cache National Forest. Heavy livestock grazing resulted in a loss of protective ground cover, which had severe impacts to watershed conditions through soil erosion and impacts to the riparian ecosystems. In addition, livestock grazing resulted in a large change in plant composition allowing for the invasion of non-native species and/or an increase in less palatable native species. The damming and diversion of streams has had a large impact on the stream environment. Dams have created barriers to the movement of fish while diversions have resulted in the complete loss of water from some streams and abnormally high, sustained flows in others.

A summary of the PFC assessment for the National Forest of northern Utah (Table VEG-3) shows some obvious areas where conditions across landscapes are no longer properly functioning based on current vegetation conditions. Those areas with a high deviation from historic range of variability are considered to be non-functioning or poorly functioning while those with a moderate deviation from their historic variability may still be functioning, but at risk. Some of the most notable communities at risk are the seral aspen (over 65 percent of the seral aspen communities on the Wasatch-Cache National Forest have been, or are rapidly being, replaced by conifer tree-dominated communities), seral aspen-lodgepole, Engelmann spruce, interior Douglas-fir, tall forb, riparian, and aquatic ecosystems. The oakbrush communities, while noted as having a low to moderate deviation from historic conditions, have been protected, to the degree possible, from fire. Because this has resulted in a build up of fine fuels, and because more and more homes are being built up to the edge of the oakbrush communities (comprising many of the acres now referred to as Wildland Urban Interface or WUI), there is an ever-increasing threat to property and safety from even larger wildfires in the future. In addition, sagebrush communities were noted as having moderate to high variation from historic conditions (Table VEG-3). These are different that those identified in PFC evaluation for National Forests in northern Utah (USDA Forest Service 1998c). In that document evaluations did not account for the predominantly old age classes of spiked and mountain big sagebrush stands with typically dense (>15 percent) sagebrush canopies. The moderate to high ranking in the Bonneville Basin Section in Table VEG-3 is based primarily on juniper invasion of sagebrush communities, but also includes the low age-class diversity in sagebrush throughout its distribution.

Table VEG-3. Deviation (Low, Moderate, High) from Historic Range of Variation for the Bonneville Basin, Uinta Mountains and Wasatch Mountains of Northern Utah and for the Caribou National Forest.

Subject Area (Cover Type)	Wasatch Mountains	Bonneville Basin	Uinta Mountains	Caribou National Forest
Alpine	Low-Mod	Low	Low	*
Limber Pine/Bristlecone Pine	Low	Low	*	Low
Engelmann Spruce-Subalpine Fir				High
-High Elevation Spruce	*	*	Low	
-Spruce-Fir	Mod-High	**	Low-Mod	
-Subalpine fir	Moderate	*	*	
-Mixed Conifer	*Moderate*	*	Low-Mod	
Aspen				High
-Seral Aspen	High	High	High	
-Seral Aspen-Lodgepole	*	**	Mod-High	
-Climax Aspen	Low	**	Low-Mod	
Lodgepole Pine	Low-Mod	*	Low	Low
White Fir	Mod-High	Low	**	*
Interior Douglas-fir	Mod-High	Mod-High	Mod-High	Moderate
Pinyon-Juniper	Mod-High	High	Low-Mod (High)	High
Mountain Mahogany				Moderate
-Curlleaf	Low-Mod	Low-Mod	Low-Mod	
-Birchleaf (Alderleaf)	Low-Mod	Low-Mod	Mod-High	
Gambel Oak	Low-Mod *(High)*	Low-Mod	Low-Mod	*
Maple	Low-Mod	*	**	High
Mountain Brush	Low	Low	Low	Low
Tall Forb	High	Mod-High	Mod-High	High
Sagebrush Grasslands				Moderate
-Mountain Big Sagebrush	*Mod-High*	*Mod-High*	Low	
-Spiked Big Sagebrush	*Mod-High* *	**	**	
-Wyoming Big Sagebrush		**	**	
Riparian	High	High		High
-Stream Canyon			Low	
-Subalpine Meadow			Mod-High	
Aquatic	Mod-High	High	Mod-High	

* Subject Area not present in assessment area.
** Subject Area not evaluated in this assessment due to lack of substantial distribution in the assessment area.

Environmental Consequences

Vegetation Cover Types and Properly Functioning Condition

Forest-wide, the following vegetation cover types are considered to be the furthest away from properly functioning conditions (PFC):

- Aspen (distribution and age class diversity);
- Douglas-fir (age class diversity);
- Oak (age class diversity);
- Pinyon-juniper (distribution and age class diversity);
- Sagebrush (age class diversity);
- Tall forb (distribution and composition); and
- Riparian (age class diversity and composition).

Table VEG-4a compares the current structural composition to the desired composition for the various forest types.

Table VEG-4a. Existing and desired conditions of various cover types by Ecological Section.

Cover Type	Desired Age Classes at PFC (Percent)	Existing Age Classes (Percent)	
		Overthrust Mountains	Uinta Mountains
Oak	SS – 30-50% IMM – 20-40% MAT – 20-40%	SS – 7% IMM – 18% MAT – 75%	SS – 7% IMM – 18% MAT – 75%
Aspen	GF, SS – 20-40% IMM – 20-40% MAT – 20-40%	GF, SS – 0% IMM – 1% MAT – 99%	GF, SS – 7% IMM – 1% MAT – 92%
Douglas-fir	GF – 5-15% SS – 5-15% IMM – 10-30% MAT – 10-30% OLD – 10-30%	GF – 0% SS – 0% IMM – 1% MAT – 99% OLD – 0%	GF – 0% SS – 0% IMM – 11% MAT – 89% OLD – 0%
Mixed Conifer Lodgepole	GF – 5-15% SS – 5-15% IMM – 10-30% MAT – 10-30% OLD – 10-30%	GF – 2% SS – 1% IMM – 3% MAT – 94% OLD – 0%	GF – 1% SS – 7% IMM – 10% MAT – 80% OLD – 2%
Spruce-Fir	GF – 5-15% SS – 5-15% IMM – 10-30% MAT – 10-30% OLD – 10-30%	GF – 0% SS – 0% IMM – 1% MAT – 1% OLD – 98%	GF – 0% SS – 0% IMM – 7% MAT – 6% OLD – 87%

Table VEG-4b compares the current structural composition to the desired composition for the sagebrush cover type Forest wide. Currently an estimated 5 percent of the sagebrush communities across the forest have low (<5%) crown cover, about 25 percent of the sagebrush communities have moderate (5-15 %) crown cover, and about 70 percent have high (>15%) crown cover. The desired conditions are to have about 5-15 percent of the sagebrush

communities across the forest with low (<5 %) crown cover, about 30-50 percent of the sagebrush communities with moderate (5-15 %) crown cover, and about 30-50 percent have high (>15%) crown cover.

Table VEG-4b. Existing and desired conditions of the sagebrush vegetation cover type across the Wasatch-Cache National Forest.

Cover Type	Existing Canopy Cover Classes (Percent)	Desired Age Classes at PFC (Percent)
sagebrush	low – 4% moderate – 21% high – 58%	low – 5-15% moderate – 30-50% high – 30-50%

These cover types are the primary focus of comparisons between alternatives when addressing PFC. Acres in existing wilderness and recommended wilderness, as well as those areas managed as undeveloped, affect the ways vegetation can be managed. Because mechanical treatment cannot be used in these areas, fire is the only tool available to modify existing condition.

Table VEG-5 lists various activities (prescribed fire, timber harvest, fuels treatment, and road construction) and their acres by alternative. This table is provided to show the potential impacts to vegetation age-class and patterns over the forest. The focus on treatments will be primarily on fire condition class 3 with some treatments likely to occur in Condition Class 2 as well. Condition Class 3 is defined as having significantly altered disturbance regimes, while Condition Class 2 is defined as having clearly evident, moderate modifications to disturbance regimes. These conditions classes are defined in more detail in Chapter 3, Topic 10 – Fire Management. Table FM-3 within the Topic 10 discussion describes the Fire Regimes and Condition Classes for the various cover types listed in Table VEG-5.

Evaluating the Movement Towards Properly Functioning Condition

Conifer, Oak and Aspen Cover Types

The Vegetation Dynamics Development Tool (VDDT) was used to model plant succession for conifer, aspen, and oak vegetation types for each alternative, which are characterized by different amounts of acres treated. This was used to estimate how each alternative moved the various vegetation types toward PFC in a 100-year period. VDDT is described in more detail in FEIS, Appendix B-1.

Table VEG-5 Comparison of treatments (prescribed fire, harvest, and mechanical fuels treatment) for each alternative over a 10-year period on the Wasatch-Cache National Forest.

Treatment	Vegetation Type	Alternatives							
		Total Acres	1	2	3	4	5	6	7
PRESCRIBED FIRE									
Prescribed Fire	Aspen & Aspen/Conifer	205,600	0	80,000	32,000	7,200	7,200	32,000	32,000
	Douglas-fir	87,500	0	4,000	2,000	0	0	2,000	2,000
	Sagebrush and Pinyon-Juniper	266,500	0	40,000	20,000	10,000	10,000	20,000	30,000
	Oak	90,800	0	40,000	20,000	8,000	20,000	20,000	8,000
Total Acres Treated by Prescribed Fire		650,400	0	164,000	74,000	25,200	37,200	74,000	72,000
HARVEST AND MECHANICAL TREATMENT									
Timber Harvest	Aspen and Conifer Harvest	556,600	0	6,500	7,500	12,500	15,500	5,000	8,500
Mech. Treatment	Oak (fuels treatment)	90,800	0	16,000	8,000	0	8,000	8,000	20,000
TOTAL ACRES TREATED									
Total Acres Treated (Harvest, Prescribed Fire, & Mechanical)			0	186,500	89,500	37,700	60,700	87,000	100,500
PERCENTATGE OF THE ACRES TREATED BY FIRE, HARVEST, AND MECHANICAL METHODS									
Of the Acres Treated, Percent Treated by Prescribed Fire			0%	88%	83%	67%	61%	85%	72%
Of the Acres Treated, Percent Treated by Timber Harvest			0%	3%	8%	33%	26%	6%	8%
Of the Acres Treated, Percent Mechanically Treated			0%	9%	9%	0%	13%	9%	20%

The VDDT model projects vegetation response to disturbance, as well as succession in the absence of disturbance, based on probability of occurrence. The disturbances may or may not actually occur as modeled, so the results are chiefly useful in comparing the overall results of an alternative, rather than identifying specific decades in which certain activities or disturbances occur. Management disturbances such as harvest or prescribed fire are dependent upon funding levels, which are not predictable over such long time periods. Natural disturbances such as insects and fires are more likely under certain stand conditions than under others, and the probability of occurrence will increase as more area develops those favorable conditions. But while the probability of their occurring may increase, the decade in which they occur is not predictable. The results of the model are useful because they reflect vegetation responses to the varying management emphases between the different alternatives. However, they should not be considered accurate predictors of stand development at a particular moment in time. In terms of development of PFC, the model indicates the likelihood that a given set of management practices

will lead toward PFC over the time period, but not that a particular vegetation type will meet PFC in a specific decade.

The VDDT model indicated that spruce-fir stands could be brought into PFC within 10 decades in all alternatives. However, the achievement of PFC is dependent upon significant acreages of spruce-fir being burned with prescribed and wildland fires. In the model, when mature forests receive a high intensity burn, the affected acres are moved into the grass/forb stage, where they remain for a relatively short period of time (usually 10 years) while regeneration is established. At the end of the time period, the acres move along the successional pathway to the seedling/sapling stage. This scenario is appropriate for most of the types modeled, but not for spruce-fir. Spruce stands are expected to quickly regenerate after fire when the fire is low intensity and leaves a scattered overstory to provide a seed source and protection for seedling establishment. However, a large stand-replacing fire (hundreds to thousands of acres) will create conditions which make spruce and fir regeneration very difficult. These species tend to occur at high elevations, and require substantial protection for seedling survival. They will not readily regenerate in large openings at high elevations, conditions that are created by large fires. In this situation, regeneration may take up to 50 years (not 10 years as described in the model) to become established and move into the seedling/sapling stage. So while the model is correct in showing the reduction of the mature and old stages resulting from large fires it underestimates the length of time to regenerate and develop the seedling/sapling stages. Therefore, the actual time to reach PFC may be several decades longer than predicted by the model.

The VDDT model also showed that the maximum acres of failed fire suppression per decade could vary significantly by alternative (Table VEG-6) based on treatments and subsequent successional pathways and changes in fire hazards. The amount of acres treated through timber harvest, mechanical oak treatment, and primarily prescribed fire including wildland fire use, either encourage or reduce fuel buildup and consequently change fire regimes and/or fire condition classes (Tables FM-1 and FM-2, Topic 10 – Fire Management). Because the values in Table VEG-6 were derived from a stochastic model, they can only be used to predict broad differences in failed fire suppression between alternatives, not actual impacts.

Table VEG-6. Results from the VDDT Model that show maximum acres of different vegetation types that are likely to burn in one decade forest-wide within the next 10 decades through failed fire suppression (rounded to the nearest 100 acres).

Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Aspen	5,100	3,100	4,200	4,400	4,000	4,100	4,200
All Conifer	79,000	22,500	23,400	11,600	13,600	27,000	27,000
Oak	3,300	6,000	1,900	5,600	3,500	3,000	4,100
Total	87,400	31,600	29,500	21,600	21,100	34,100	35,300

Sagebrush Cover Types

Outside of the VDDT model, an assessment of the succession of sagebrush, forest wide, was conducted given the forest wide conditions and acres treated per decade by alternative over the next 100 years. This assessment, which is not as complex in nature as VDDT, is more fully described in Appendix B-1.

These models included an increase in total acres of sagebrush as a result of conversion of juniper to sagebrush. Because of fire suppression, juniper has increased anywhere from 25 to 50 percent in its distribution on sites that were historically dominated by sagebrush. This sagebrush modeling shows that Alternatives 2 and 7 reach PFC within the 100 year modeling period. It would take more than 10 decades for any other alternative to achieve these conditions in the sagebrush communities.

General Alternative Comparisons

Alternative 1 has the least impact to existing successional pathways, but could vary the most from the historically natural successional pathways. This alternative has no timber harvest, prescribed fire, or mechanical treatment of vegetation. The only mechanism for plant succession would be failed fire suppression and continued succession along existing pathways. Because of historic fire suppression and subsequent fuels build-up, there will likely be new, uncharacteristically large insect and disease outbreaks resulting in a buildup of fuels in all the woody communities and as a result, uncharacteristically large and/or severe fires are the most likely to occur. As shown in Table VEG-6, Alternative 1 is likely to result in approximately 2 to 3 times more acres burned through failed fire suppression than any of the other alternatives, resulting in a greater potential for uncharacteristically large and intense fires. Under this alternative, the Uinta Mountains mixed conifer/lodgepole pine type is the only forest type to approximate PFC within 10 decades. The spruce-fir type is shown to reach PFC within decades, but that assumes burning extensive acreages. As noted above, however, the assumptions in the VDDT model were not accurate and it is not likely to reach these conditions within 10 decades. In addition, because of existing conditions resulting from historic livestock grazing impacts and lack of *active* restoration management in this alternative, some rangelands will take longer to recover than they would under Alternatives 2, 3, 6 and 7. Like Alternatives 2 and 6, no road construction or reconstruction would be allowed on over 600,000 acres. Of these acres, this alternative has recommended the largest amount (359,686 acres) as wilderness (MPC 1.5) in addition to the 309,079 acres of wilderness already occurring on the Forest. This limits the management tool to wildland fire use in moving plant communities toward PFC. Given the number of variables involved, movement toward PFC in all the above-listed cover types would be among the least predictable of all alternatives.

- Emphasis would be placed on allowing natural processes to move all vegetation types, without interference, toward PFC.

- Fires would be allowed to burn, where possible, as long as they avoid conflicts with human health and safety and property damage.

- Uinta Mountain mixed conifer/lodgepole type reaches PFC.

Alternative 2 proposes to treat the most total acres (Table VEG-4) including sagebrush, aspen, conifer, conifer-aspen, and oak. It emphasizes the restoration of terrestrial and aquatic habitat. It treats an average of 18,650 acres annually using fire, harvest, and mechanical treatments. Prescribed fire is used to treat approximately 88 percent of the total acres treated. As shown

through the VDDT model, this alternative moves all vegetation types except Douglas-fir to PFC within the 100-year projection time frame. Douglas-fir does not reach PFC within 10 decades, primarily because it will take longer than 100 years for the oldest structural stage to reach the desired percentage. Like Alternatives 1 and 6, no road construction or reconstruction would be allowed on over 600,000 acres. This alternative has 145,796 acres of recommended wilderness (MPC 1.5) in addition to the 309,079 acres of wilderness already occurring on the Forest. Wilderness status limits the management tools for moving plant communities toward PFC to wildland fire use, and fire use is limited by the ability to manage and control natural ignition burns.

- A priority for treatment in Alternative 2 would be the conversion of conifer-aspen communities back to aspen-dominated communities and to increase age-class diversity in aspen communities.

- Emphasis would be placed on sagebrush treatment, which would be the greatest of all alternatives and would result in this type reaching PFC within 3 decades.

- Fuels reduction in oak would be emphasized although Alternative 7 would treat slightly more acres to reduce fuels mechanically than Alternative 2. This alternative would emphasize mechanical treatment until fire can be safely used to not only maintain fuels but also increase age class diversity.

- Harvest of conifers would be allowed, but would play an insignificant role in moving vegetation diversity toward PFC.

- Removal of conifers that have invaded willow-dominated riparian areas, especially on the north slope (e.g. Middle Fork Beaver Creek), would be emphasized where riparian function has been altered by the invasion of these conifers.

- Maintenance of the wildlife corridor connecting the northern Rocky Mountains with the central and ultimately the southern Rocky Mountains would be emphasized through selection and group selection harvest methods in spruce-fir communities to minimize insect and disease outbreaks.

- Achieves PFC for all types except Douglas-fir.

Alternative 3 has less than half the acres as Alternative 2, but like that alternative relies heavily on the use of prescribed fire to move vegetation toward PFC. This alternative has fewer acres in MPC 5.2 than does Alternative 4. The VDDT model showed this alternative moves oak, aspen and mixed conifer/lodgepole to PFC. All other types across the forest would take more than 10 decades to reach PFC. No road construction or reconstruction would be allowed on over 430,000 acres. This alternative has 51,113 acres of recommended wilderness (MPC 1.5) in addition to the 309,079 acres of wilderness already occurring on the Forest. As noted above, wilderness status limits the management tools for moving plant communities toward PFC to wildland fire use, and fire use is limited by the ability to manage and control natural ignition burns.

- Although Alternative 3 treats less than half the acres than Alternative 2, a primary effort would be on the conversion of conifer-aspen communities back to aspen-dominated communities and to increase age-class diversity in aspen communities through the use of fire and harvest treatments.

- An effort would be placed on fuels reduction in oak and increasing age class diversity.

- Maintains the wildlife corridor connecting the northern Rocky Mountains with the central and ultimately the southern Rocky Mountains by taking actions to minimize insect and disease outbreaks.

- Moves oak, aspen and mixed conifer/lodgepole types to PFC.

Alternative 4 is second only to Alternative 5 in the harvest of aspen and conifer, yet treats the least amount of acres, overall, than any other alternative. Many of the acres of MPC 3.2 in Alternatives 6 and 7 are MPC 5.2 in this alternative, focusing on the commercial harvest of trees (less than Alternative 5, but more than other alternatives) rather than the restoration of ecosystem functions. Timber harvest would play an insignificant role in moving vegetation diversity toward PFC. This alternative treats the fewest acres through prescribed fire than any other alternative, and does not mechanically treat oak. Like Alternative 7, this treats an average of 800 acres of oak each year through prescribed fire. It prohibits high intensity prescribed fire in conifer-dominated mixed aspen stands within 5.2 and 6.2 MPCs, but does allow just over 700 acres of conifer-aspen communities in other MPCs to be burned through prescription each year. Approximately 1,000 acres of sagebrush would be burned each year, half that of Alternatives 3 and 6, one-third that of Alternative 7, and one-fourth that of Alternative 2. No vegetation cover types reach PFC within 10 decades. This alternative also has no acres of recommended wilderness and road construction or reconstruction would be allowed on about 119,000 acres, which would allow for the greatest access for harvest.

- A priority in Alternative 4 would be to maximize commodity production. Timber harvest would be less than Alternative 5, but greater than all other alternatives.

- Sagebrush treatment would be one forth that of Alternative 2, and would be done primarily to improve forage production in existing allotments.

- Like Alternatives 3 and 6, this alternative would emphasize treatment of oak through prescribed fire and mechanical treatments to reduce fuels.

- Does not reach PFC.

Alternative 5 designates more of the lands on the North Slope and in the Bear River Range as MPC 5.2 than any other alternative, therefore focusing more on commodity production than any other alternative, and the least on ecosystem restoration. This alternative has over twice the acres of harvest of aspen and conifer than Alternatives 2 and 3, just less than twice that of Alternative 7, and more than three times that of Alternative 6. Insects and disease would be

controlled Forest-wide to maintain growth of trees in the suitable timber base. Like Alternative 4, this alternative prohibits high intensity prescribed fire in conifer-dominated mixed aspen stands within MPC 5.2 and 6.2, but does allow just over 700 acres of conifer-aspen in other MPCs and approximately 1,000 acres of sagebrush communities to be burned through prescription each year. It allows for treatment of oak communities through fire and mechanical methods at the same levels as Alternative 3 and 6, but half that of Alternative 2. With the exception of oak communities of the Overthrust Mountains Section, which reach PFC within 2 decades according to the VDDT model, no vegetation type forest wide reaches these conditions within 10 decades. Like Alternative 4, this alternative has no acres of recommended wilderness (MPC 1.5); road construction or reconstruction would be allowed on just over 108,000 acres. Existing wilderness on the forest, as mentioned above, is 309,079 acres, which would allow for nearly as much access for timber harvest as Alternative 4.

- A priority in Alternative 5 would be to maximize commodity production. Harvest of conifers would be the greatest of all alternatives, but would play an insignificant role in moving vegetation diversity toward PFC.

- Sagebrush treatment would be one forth that of Alternative 2, and would be done primarily to improve forage production in existing allotments.

- Like Alternatives 3 and 6, this alternative would emphasize treatment of oak through prescribed fire and mechanical treatments to reduce fuels.
- Oak type reaches PFC.

Alternative 6, while similar to Alternative 2 in philosophy, takes a more conservative approach to the restoration of PFC, treating about half the acres annually as Alternative 2. It focuses on maintaining the north-south wildlife corridor; converting conifer-invaded aspen communities back to aspen, and sagebrush and oak age class diversity. This alternative uses both timber harvest and fire in assisting the movement toward PFC. This alternative moves oak, aspen, and mixed conifer/lodgepole to PFC within the 100-year period. No other types, forest wide, reach PFC within 10 decades.

- A priority in Alternative 6 would be to increase age-class diversity in aspen communities and to move conifer-aspen communities to back to aspen-dominated communities.

- Sagebrush treatment would be half that of Alternative 2, but would be the same as Alternative 3 and twice that of Alternatives 4 and 5.

- Like Alternatives 3 and 5, this alternative would emphasize treatment of oak through prescribed fire to increase age class diversity. Mechanical fuels treatment would be half that of Alternative 2 and less than half that of Alternative 7.

- Harvest of conifers would be allowed but, with the exception of Alternative 1, would play the least significant role in moving vegetation diversity toward PFC.

- Like Alternative 2, maintenance of the wildlife corridor connecting the northern Rocky Mountains with the central and ultimately the southern Rocky Mountains would be emphasized through selection and group selection harvest methods in spruce-fir communities to minimize insect and disease outbreaks.

- Oak, aspen, sagebrush and mixed conifer/lodgepole types reach PFC.

Alternative 7 uses timber harvest, mechanical treatment, and fire in assisting the movement toward PFC. While not moving all plant communities toward PFC forest-wide, this alternative focuses on restoration of the most significant landscapes for wildlife purposes. This alternative more than doubles the acres of oak treated mechanically to reduce fuels along the urban interface rather than relying on prescribed fire to move this type toward PFC. With the exception of Alternative 2, this alternative treats more acres of sagebrush and pinyon-juniper than any alternative, and the sagebrush type reaches PFC within 3 decades forest wide. Oak, aspen and mixed conifer/lodgepole reach PFC within the period. All other types, forest wide, do not reach PFC within 10 decades.

- A priority in Alternative 7 would be to increase age-class diversity in aspen communities and to move conifer-aspen communities to back to aspen-dominated communities.

- Sagebrush treatment would be less than Alternative 2, but would be greater than all other alternatives.

- Alternatives 7 would emphasize the mechanical treatment of oak (greater than all other alternatives) to reduce fuels along the urban interface and to move this type toward PFC.

- Harvest of conifers and aspen would be allowed and would play a minor role in moving vegetation diversity toward PFC.

- Like Alternatives 2 and 6, maintenance of the wildlife corridor connecting the northern Rocky Mountains with the central and ultimately the southern Rocky Mountains would be emphasized through selection and group selection harvest methods in spruce-fir communities to minimize insect and disease outbreaks.

- Oak, aspen and mixed conifer/lodgepole reach PFC.

Summary of Alternative Comparisons

The differences between alternatives and their probability of reaching properly functioning condition are shown in Table VEG-7. Alternative 2 shows the greatest likelihood for all cover types except Douglas-fir for reaching PFC within 10 decades. Alternative 5 shows the least accomplishment in reaching PFC because most vegetation treatment is by timber harvest, which does not affect vast amounts of acres as fire.

Table VEG-7 Cover types in the Uinta Mountains and Overthrust Mountains Sections reaching Properly Functioning Condition within 10 Decades

Cover Types	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
Sagebrush[1]	Yes	Yes	No	No	No	No	Yes
Oak	No	Yes	Yes	No	Yes[3]	Yes	Yes
Aspen	No	Yes	Yes	No	No	Yes	Yes
Douglas-Fir	No	No	No	No	No	No	No
Mixed Conifer Lodgepole	Yes [2]	Yes	Yes	No	No	Yes	Yes
Spruce Fir	No	Yes	No	No	No	No	No

[1]Modeled outside VDDT
[2]Uinta Mountain section only
[3]Overthrust Mountain section only

Effects on Vegetation Communities from Roads and Access Management

In general, effects from travelways are direct and result in the loss of cover types and an increase in fragmentation of plant communities. The greatest effect is from the application or not of the new Roadless Rule (which is discussed in detail in **Effects on Vegetation Communities from Roadless Area Management**) and/or the road construction that will be used to treat various vegetation communities through timber harvest and prescribed fire. Roads provide access for vehicles that may carry noxious weed seeds into the forest. The greater the miles of open road, the greater the likelihood of new infestation areas.

In Alternative 1 the new Roadless Rule applies so inventoried roadless areas would remain roadless and no new roads or motorized trails would be built under any management prescription category (MPC) except in Concentrated Development Areas (MPC 8). The effects of this alternative, which are increased age of forested communities and an increase in susceptibility to insects, disease, and failed fire suppression, are more related to the associated lack of vegetation treatment than the lack of road or motorized trail construction. Impacts from travelways, therefore, would be the least of all alternatives. No additional fragmentation of habitat is anticipated and new noxious weeds infestations would be minimized, based on fewer miles of travelways which act as conduits for the expansion of weed populations. Hiking trails would be allowed, as in all other alternatives.

This alternative would have greater effects from roads than Alternative 1. Active restoration activities outside inventoried roadless would permit timber harvest and associated road construction and reconstruction of approximately 6 miles. However, harvest activities would use existing roads, limiting disturbance to reconstruction of existing roads. This may result in a very slight reduction in vegetated lands where reconstruction includes realignment or widening. Road improvements may encourage vehicle travel, which may in turn increase the transport of noxious weed seeds, requiring eradication efforts on additional acres.

Alternative 2 adjusts generally allowed activities for management prescriptions with application of the National Roadless Area Conservation Rule. Road construction and reconstruction are not allowed in inventoried roadless areas nor is cutting, sale, and removal of timber except: for the cutting, sale or removal of generally small diameter trees which maintains or improves roadless characteristics and: 1) to improve habitat for threatened, endangered, proposed, or sensitive species; or 2) to maintain or restore ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects. About 145,900 acres or 24% of inventoried roadless areas are recommended for wilderness.

The new Roadless Rule does not apply, however, Alternative 3 emphasizes reducing adverse impacts from roads. With limited area in MPC 5.2, the likelihood of new construction is less than Alternatives 4 and 5, significantly greater than Alternative 2. Road construction would require approximately 39 miles of new roads, with a corresponding loss of vegetation and increase of potential noxious weed infestations.

In Alternative 4 the new Roadless Rule does not apply. New roads and motorized trails could be built everywhere but in existing wilderness, some special management area prescriptions (MPCs 2.1, 2.4, 2.6 and 2.7), and some recreation prescriptions (MPCs 4.1 and 4.2). New construction required to meet management direction would total an estimated 49 miles. This would increase the acreage dedicated to roads and the probability of noxious weed infestations.

In Alternative 5 the new Roadless Rule does not apply. New roads and motorized trails could be built everywhere but in existing or proposed wilderness, some special management areas prescriptions (MPCs 2.1, 2.4, 2.6 and 2.7), and some recreation prescriptions (MPCs 4.1 and 4.2). The miles of road needed are the same as in Alternative 4. However, this alternative has the largest acreage in MPC 5.2, and would therefore have the highest probability of road construction with an estimated 49 miles for timber harvest and an additional 14-15 miles for oil and gas exploration and development. Impacts from travelways, therefore, would greater than all other alternatives. This alternative would have the greatest the probability of noxious weed infestations from the establishment of new vectors for invasions of these species.

In Alternative 6 the new Roadless Rule does apply so no new road construction in inventoried roadless areas could occur. Because most of the area outside inventoried roadless is adequately roaded, reconstruction would be the major impact to vegetation. Approximately 6 miles of new timber harvest roads would be constructed and approximately 10 miles of roads would be constructed for oil and gas exploration and development. Potential for noxious weed infestations would be slightly more than Alternative 1, similar to Alternatives 2 and 7, but significantly less than Alternatives 3, 4, and 5.

In Alternative 7 the Roadless Rule does not apply so no new road construction in inventoried roadless areas could occur. Approximately 6 miles of new timber harvest roads would be constructed and approximately 11.5 miles of roads would be constructed for oil and gas exploration and development. Potential for noxious weed infestations would be slightly more than Alternative 1, similar to Alternatives 2 and 6, but significantly less than Alternatives 3, 4, and 5.

Effects on Vegetation Communities from Timber Harvest

Forest health has been affected by a history of fire suppression on the forest as well as through practices such as tie hacking, clear-cutting spruce-fir, and by harvesting very small units in areas that historically burned in relatively large patches. And while timber harvest and fire have played a role in maintaining some age-class diversity and distribution (patterns) of the plant communities across the Forest, these have had a limited effect. Timber harvest is used in varying degrees in each alternative. Table VEG-4 includes the acres by alternative that would be treated

through timber harvest as well as through prescribed fire, which is discussed in detail below. Timber harvest does not play a significant role in moving vegetation toward PFC under any alternative because of forested acres in lands withdrawn from timber management as well as those lands within various management prescriptions that do not allow timber harvest. This tool can, however, play an important role in maintaining wildlife corridors, and moving smaller scale (watersheds and/or landscapes) toward PFC.

Alternative 1 does not allow for timber harvest in managing forest ecosystems and does not allow the building of any roads. The lack of active management, coupled with a lack of prescribed fire would increase the likelihood of insect epidemics and disease spread. There would be a continued conversion of aspen- to conifer-dominated stands as well as a movement toward older age classes and toward uncharacteristically large fires forest-wide.

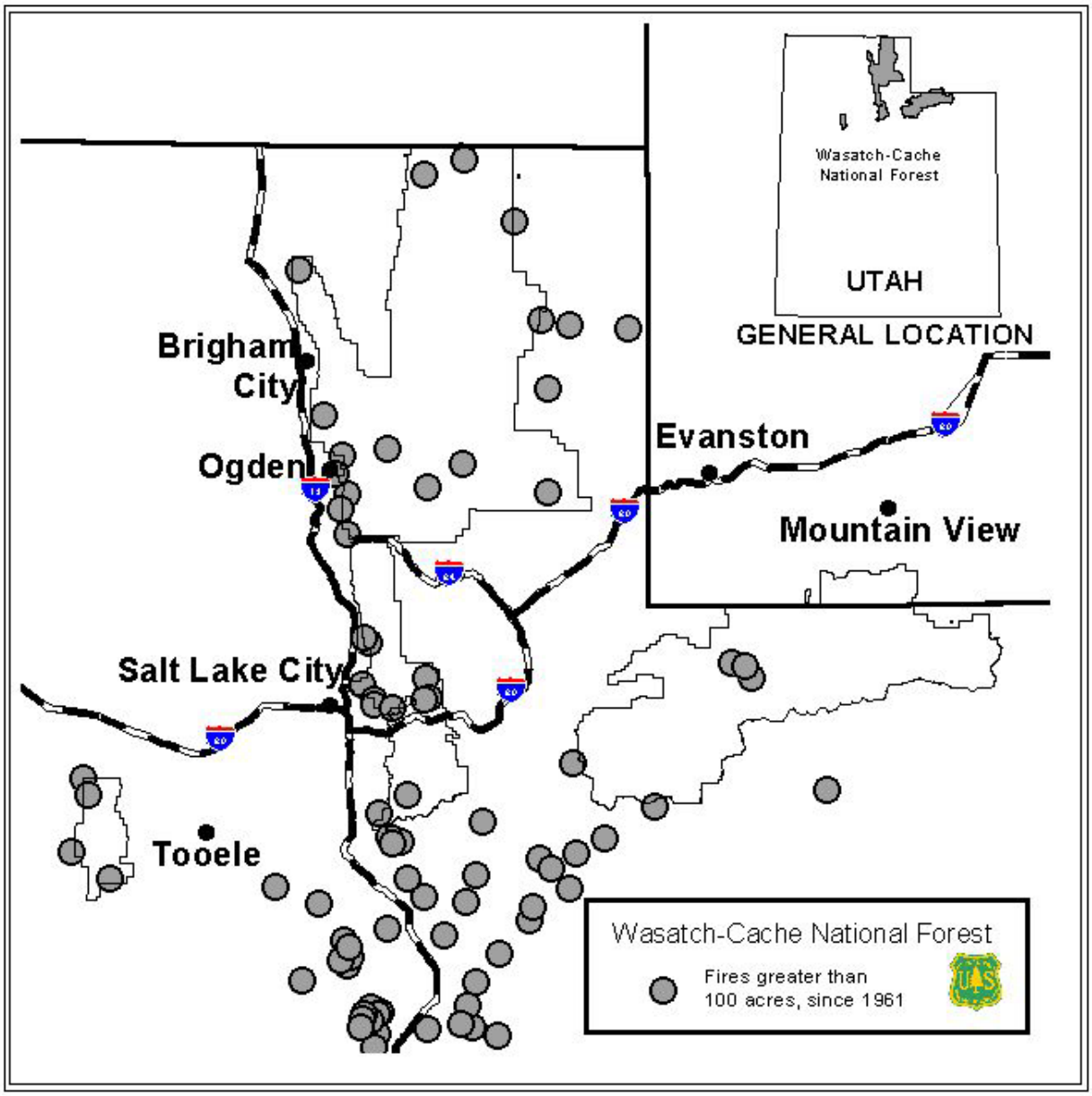
As shown in Table VEG-4 above, Alternative 2 allows for the harvest of 6,500 acres of conifer and aspen-conifer communities over the 10-year planning period, or approximately 650 acres each year. This is more than Alternative 7 and Alternative 1, which does not allow for timber harvest, but somewhat less than Alternatives 3 and 6. It is nearly half those acres harvested in Alternative 4 and less than half of the acres harvested in Alternative 5. Timber harvest would contribute an important, but relatively small component of moving these forested types toward PFC. This Alternative relies more heavily on prescribed fire to move toward these conditions. Alternative 3 allows for slightly more timber harvest than Alternative 2. Approximately 750 acres of aspen and conifer would be harvested each year. Alternative 4 focuses more on timber harvest with approximately 1,250 acres of aspen and conifer harvested each year. Alternative 5 provides the greatest level of timber harvest; nearly 1,600 acres of aspen and conifer would be harvested each year, which is greater than all other alternatives and more than twice the acres harvested in Alternatives 2, 3, and 7. Alternative 6 would harvest almost 900 acres of aspen and conifer each year, while Alternative 7 would harvest 500 acres each year.

Effects on Vegetation Communities from Fire Management

Currently there is a relative abundance of mature and older age classes in all vegetation types. For example, in the Wasatch-Cache National Forest portion of the Overthrust Mountains Section, nearly all of the Aspen, 82 percent of Bear River mixed conifer and Lodgepole, 93 percent of Spruce-fir, 89 percent of Douglas-fir types are in mature to old age-class categories. The pattern is much the same for the Uinta Mountains Section and Stansbury Mountains portion of the Bonneville Basin Section. These older age classes are more susceptible to beetle impacts than the younger age classes. Because of the lack of vegetation treatment, including the use of prescribed fire, there has been an increase the likelihood of insect epidemics and disease spread. Fire has played a role in maintaining some age-class diversity and distribution of some of the vegetation communities across the Forest, although fire suppression has limited this effect. The following map (Figure VEG-2) shows ignitions from 1961 to present that resulted in more than 100 acres being burned. Many of these fires burned at lower elevations on the Forest. Fires of this size are considered to have important effects on age class diversity in a variety of vegetation cover types across the forest. Most of the fire occurrences on the forest during this period were less than 1 acre in size, often human-caused and often along travelways. Because these human-caused fires typically burn in small areas and often in areas that have recently burned, they play

only a minor role in establishing a range of age class diversity in any vegetation cover type. In fact, many of these areas that burn frequently at lower elevations are currently dominated by non-native species such as cheatgrass and various noxious weeds. Table VEG-4 shows the acres of vegetation treated through prescribed fire and Table VEG-6 shows the potential for failed fire suppression by alternative as identified by the VDDT model.

Figure VEG-2. Fires since 1961 that burned at least 100 acres across the Wasatch-Cache National Forest.



Under Alternative 1 movement toward PFC would be the least predictable of any alternative and would depend on the number of acres burned by the combination of failed fire suppression, and wildland fire use. As shown in Table VEG-4, no acres would be harvested, mechanically

treated, or burned under prescription. Any change in vegetation structure would be the result of insects and disease, windthrow, and fires. Because of historic fire suppression, an unnatural build-up of fuels has occurred which will likely result in uncharacteristically large and severe fires than occurred historically. The VDDT model predicted the greatest potential for failed fire suppression (Table VEG-6).

Alternative 2, as shown in Table VEG-4, treats the greatest number of acres using prescribed fire, more than twice the acres of Alternatives 3, 6, and 7, over four times that of Alternative 5 and more than 6.5 times that of Alternative 4. The oak and aspen and sagebrush types reach PFC in two to three decades under this alternative, and a majority of the treatments (88 percent of the acres treated) are through prescribed fire. The mixed conifer–lodgepole types would reach PFC within 6 decades in the Wasatch-Cache portion of the Overthrust Mountains Section and within 10 decades in the Uinta Mountains Section. An average of 4,000 acres of oak, 4,000 acres of sagebrush and pinyon-juniper, 8,000 acres of aspen and aspen/conifer mix, and 400 acres of Douglas-fir would be burned annually. For oak, significantly less than 4,000 acres would be burned in the first portion of the first decade, while more would be burned as the decade progressed.

Alternative 3, like Alternatives 6 and 7 as shown in Table VEG-4 above, is very active in managing for ecosystem diversity through the use of many available tools. An average of 2,000 acres of oak, 2,000 acres of sagebrush and pinyon-juniper, 3,200 acres of aspen/conifer mix, and 200 acres of Douglas-fir (this is mechanical and prescribed fire) would be burned annually. Less than 2,000 acres of oak would be burned in the first portion of the first decade, while more would be burned as the decade progressed. Treatments in the Stansbury Mountains would include some additional acres of sagebrush and pinyon-juniper treated each year. In the Wasatch-Cache portion of the Overthrust Mountains Section prescribed fire plays the predominant role in oak and aspen vegetation communities reaching PFC within 5 decades. The VDDT model shows that spruce-fir reach PFC within 4 to 6 decades, but as noted above in **General Alternative Comparisons**, this assumes that large-scale fires (several hundred to several thousand acres in size) would allow spruce and/or fir to regenerate within 10 years, which does not happen at the high elevations where this type occurs. In the Wasatch-Cache portion of the Uinta Mountains Section the mixed conifer – lodgepole types reach PFC within 5 decades and the aspen within 9 decades. No other vegetation types reach PFC within 10 decades.

Alternative 4 has the least amount of fire of all alternatives. An average of 1,000 acres of sagebrush, 800 acres of oak, and 720 acres of aspen would be burned annually. Alternative 5 is similar, except it allows for an average of 2000 acres of oak to be burned annually. And, like Alternatives 3 and 6, less than 2,000 acres of oak would be burned in the first potion of the first decade and more would be burned as the decade progressed.

Alternative 5 is similar to Alternative 4 in its treatment through prescribed fire, but treats an average of 2,000 acres rather than 800 acres per year of oak. And, with the exception of the oak type, which reaches PFC within 2 decades, no vegetation type reaches PFC within 10 decades.

Alternative 6, like Alternative 3, would provide for movement toward PFC by primarily relying on fire but also using timber harvest practices as well. And like Alternative 3, this alternative

would annually burn an average of 2,000 acres of oak, 2,000 acres of sagebrush and pinyon-juniper, 3,200 acres of aspen/conifer mix, and 200 acres of Douglas-fir. Less than 2,000 acres of oak would be burned in the first portion of the first decade, while more would be burned as the decade progressed. In the Wasatch-Cache portion of the Overthrust Mountains Section, oak would reach PFC within 2 decades, mixed conifer – lodgepole within 3 decades, and aspen and spruce-fir within 9 decades. In the Wasatch-Cache portion of the Uinta Mountains Section, aspen would reach PFC within 8 decades and mixed conifer – lodgepole within 10 decades. No other types would reach PFC within 10 decades.

Approximately 72% of the total acres treated are treated through prescribed fire and wildland fire use to move the vegetation toward PFC. This alternative would burn an average of 800 acres of oak each year, 3,000 acres of sagebrush and pinyon-juniper, 3,200 acres of aspen and aspen/conifer mix, and 200 acres of Douglas-fir. In the Wasatch-Cache portion of the Overthrust Mountains Section, all vegetation types reach PFC, with the exception of Douglas-fir, within 10 decades. Oak reaches PFC here within 2 decades, mixed conifer within 3 decades, and aspen and spruce-fir within 9 decades. Like Alternative 6, in the Wasatch-Cache portion of the Uinta Mountains Section, aspen reaches PFC within 8 decades, and mixed conifer – lodgepole within 10 decades. Forest wide, sagebrush would reach PFC within 3 decades.

Effects on Vegetation Communities from Mechanical Vegetation Treatment

Mechanical vegetation treatments would be focused primarily on the oak type along the urban interface of the forest where fire hazards have the greatest potential to result in property damage. It would occur, to some degree, elsewhere in other cover types (e.g. Douglas-fir, sagebrush, and mountain brush) to provide for more natural fire hazard conditions, but these would be determined at a project level and are not described here.

Alternatives 1 and 4 would not allow for mechanical treatment of oak communities and, therefore, have the least impact on hazardous fuels. Alternatives 3, 5, and 6 would have an intermediate effect by allowing an average of approximately 800 acres mechanically treated per year. Alternative 2 would allow for an average of approximately 1,600 acres per year to be mechanically treated, while Alternative 7 would reduce fuels hazards the most, by allowing an average of 2,000 acres per year to be mechanically treated.

Effects on Vegetation Communities from Recreation

Effects on vegetation may result from various forms of recreation use, but are most prominent in areas of high undeveloped camping, in development of new roads, trails and facilities, and especially from unauthorized summer OHV use. Unauthorized OHV use occurs throughout the forest, but is most prominent in the North Wasatch-Ogden Valley and Cache-Box Elder Management Areas. It also occurs in the Central Wasatch Management Area, primarily along the Davis County foothills. This unauthorized use occurs to a greater degree during the hunting season in the Western Uinta and Eastern Uinta Management Areas. The effect of these activities is a disturbance and loss of native perennial vegetation on uplands and riparian/wetland areas. In association is watershed disturbance (ground cover loss and soil compaction), spread of noxious weeds, and wildlife habitat disturbance. The management of these activities, outside direction in

existing district travel plans, is not addressed in this document. Commonly associated with high recreation use, especially along the foothills and lower elevations of the forest, are human ignitions of unwanted fires. Ski area expansions and allowed activities in ski areas, the development of new recreation trails and/or recreation facilities, could potentially have a localized impact through type conversion and associated alteration of vegetation composition and structure, and associated wildlife habitat functions.
Alternatives 1, 2, 3, 4, 6 and 7 would have no impacts to vegetation from ski area development outside currently permitted boundaries because they do not allow expansion of resort boundaries; Alternative 5 would have the greatest impact because it allows for new ski areas as well as ski area expansions.

Alternative 1 maintains the greatest number of acres of non-motorized lands (Table 2-4) and roadless area values (Table 2-6). Only 3 miles of new roads are projected to be constructed for oil and gas development (Table 2-2), which if managed as open, could allow for greater recreation access. No new trails would be developed. Existing trails and roads could only be relocated to repair environmental concerns. Unlike all other alternatives, no additional developed recreation sites would be allowed. In addition, like all alternatives except Alternative 5, no expansion of ski area boundaries is allowed. Approximately 2 miles of existing roads and 76 miles of trails would be closed to motorized access as a result of wilderness recommendations. This reduced access and lack of development is likely to minimize unauthorized OHV use on the Forest, which would result in the least potential for disturbance and loss of native perennial vegetation from these activities. The lower potential for unauthorized OHV use and the limited development of new facilities, including trails would likely result in the fewest acres disturbed. In addition, the focus on repairing environmental concerns could enhance the existing conditions. Because no new roads would be established in roadless areas, no trails would be constructed, and no recreation sites would be developed, this alternative would have the least potential impacts on vegetation communities from recreation management.

Alternative 2, like Alternatives 6 and 7, maintain approximately 60 percent of the Forest as non-motorized (Table 2-4) and maintain nearly as many acres for roadless area values as Alternative 1 (Table 2-6). This Alternative would close about 7 miles of trails to motorized access as a result of wilderness recommendations. And like Alternative 1, this alternative would likely maintain lower access for unauthorized OHV use. A total of approximately 9 miles of roads would be built for timber harvest and oil and gas exploration, which if managed as open, could allow for increased recreation access. Some new trails could be developed and existing trails and roads could be relocated to repair environmental concerns. Some additional recreation facilities would be allowed consistent with prescription. Like all alternatives except Alternative 5, no expansion of ski area boundaries is allowed. This alternative would have greater impacts on vegetation communities from recreation management (new developed recreation sites) than Alternative 1, but less than all other alternatives because of the greater potential for unauthorized OHV access as well as the direct effects of a loss of vegetation to road and trail development. Like Alternative 1, however, this alternative would have one of the lowest potentials for disturbance and loss of native perennial vegetation from recreation management.

Alternative 3 maintains nearly as many acres of non-motorized use as Alternatives 2, 6, and 7 and maintains or mostly maintains twice as many acres for roadless values as Alternatives 6 and 7, but less than Alternatives 1 and 2. Like Alternatives 4, 5, 6 and 7, no miles of existing trails would be closed to motorized use from wilderness recommendations. Approximately 39 miles of roads could be constructed for timber harvest and 10 miles for oil and gas exploration and development (Table 2-2), which if managed as open, could increase the potential for recreation access. Unauthorized OHV use would likely be greater than in Alternative 1 and about the same as Alternatives 2, 6, and 7 because of the amount of non-motorized acres. This alternative would have a moderate potential for disturbance and loss of native vegetation from this use. New trail development could be allowed and existing trails and roads would be relocated to repair environmental concerns. Some additional recreation facilities would be allowed consistent with MPCs. Like all alternatives except Alternative 5, no expansion of ski area boundaries is allowed. Overall, this alternative would have greater potential impacts on vegetation communities from recreation management than Alternatives 1 and 2, but less than Alternatives 4, 5, 6, and 7.

Alternative 4 maintains the least amount of non-motorized areas, and allows approximately 49 miles of new road construction for timber harvest (Table 2-2), which could increase the potential for recreation access. Unauthorized OHV use would likely be the same as Alternative 3, less than Alternative 5, and greater than Alternatives 1, 2, 6, and 7. This alternative would have the same potential for disturbance and loss of native vegetation from this use as Alternative 3, less than Alternative 5, and more than all other alternatives. Like Alternatives 3, 5, 6, and 7, no miles of existing trails would be closed to motorized use from wilderness recommendations. New trail construction would be allowed to meet demand and would be restricted primarily by budgets. Additional recreation facilities would be allowed consistent with MPCs, but like all alternatives except Alternative 5, no expansion of ski area boundaries is allowed. This alternative would have similar impacts on vegetation communities from recreation management as Alternative 5, and more than all other alternatives.

Alternative 5, maintains more non-motorized acres than Alternative 4, but allows the greatest amount of new road construction (49 miles for timber harvest and 14-15 miles for oil and gas exploration and development – Table 2-2). Because of this, unauthorized OHV use would likely continue, and the potential impacts to existing native plant communities would be the greatest of all alternatives. New trail construction would be allowed consistent with MPCs. Additional recreation facilities would be allowed to expand and accommodate demand for multiple-use. Roads would be reconstructed and new roads developed for resource development could be left open. This alternative would also allow for ski area expansion, which would not occur under any other alternative. This alternative would have less impacts in the form of disturbance and loss of native vegetation from recreation management than Alternative 4, but greater than all other alternatives.

Alternative 6 would maintain about the same amount of non-motorized acres as Alternatives 2, 3, and 7, less than Alternatives 1 and 2, and more than Alternatives 4 and 5. Because of this there would be a relatively low potential for additional access by unauthorized OHV use and resulting disturbance and loss of native vegetation. New trail construction would be allowed consistent with watershed, MPCs, and biodiversity goals. More emphasis would be on realignment of existing trails causing watershed and other undesirable impacts. Additional recreation facilities

would be allowed consistent with ROS, but like all alternatives except Alternative 5, no expansion of ski area boundaries is allowed. This alternative would have fewer impacts in the form of disturbance and loss of native vegetation from recreation management than alternatives 3, 4, and 5, but more than alternatives 1 and 2.

Alternative 7 would maintain or mostly maintain about the same amount of non-motorized acres as Alternatives 2, 3, and 6, less than Alternatives 1 and 2, and more than Alternatives 4 and 5. Approximately 7 miles of new roads could be constructed for timber harvest and about 11.5 miles for oil and gas exploration and development (Table 2-2). Like Alternative 6, there would be a relatively low potential for additional access by unauthorized OHV use and resulting disturbance and loss of native vegetation. New trail construction would be allowed consistent with watershed and biodiversity goals. More emphasis would be on realignment of existing trails causing watershed and other undesirable impacts. Unauthorized OHV use and the resulting potential loss and disturbance to native vegetation would likely be about the same as Alternative 3, more than Alternatives 1, 2 and 6, and less than Alternatives 4 and 5. This unauthorized use would result in the loss of and disturbance to native vegetation. Additional recreation facilities would be allowed consistent with ROS, but like all alternatives except Alternative 5, no expansion of ski area boundaries is allowed. Overall, this alternative would have fewer impacts on vegetation communities from recreation management than Alternatives 3, 4 and 5, but would be slightly more than alternatives 1, 2 and 6.

Effects on Vegetation Communities from Livestock Grazing

The standards and guidelines in the Rangeland Health Amendment to the Wasatch-Cache Land and Resource Management Plan (USDA Forest Service 1996) are applied to all alternatives. Alternatives 1, 2, 3, and 6 subtract acres of capable rangeland in unsatisfactory condition from suitable acres. This, along with vegetation treatments (primarily prescribed fire in aspen and sagebrush or mountain brush) could result in a range of improvements of vegetation conditions depending on factors discussed below. Alternative 7 applies a lower forage utilization guideline to rangelands in unsatisfactory condition, which could result in a more consistent improvement of vegetation conditions in riparian areas as well as uplands. The primary difference between alternatives for effects on vegetation communities other than this is the status of vacant allotments (vacant allotments closed or vacant allotments left open for potential use), which are also discussed below.

Effects on vegetation communities from removal of areas in unsatisfactory condition from suitable acres would vary across the forest because of site-specific factors. Areas in unsatisfactory condition that can be easily avoided through livestock herding, and/or salting would be most likely to improve in ground cover and species composition over the long-term. Areas that are fenced or can be fenced would also be likely to improve if removed from livestock grazing. Areas in unsatisfactory condition that are relatively small, scattered, or in locations where it is difficult to avoid grazing without expensive structural improvements (fence construction) would be much less likely to improve in ground cover and/or species composition. Given that acres for this analysis were extrapolated forest-wide from areas with monitoring, the relative proportions of the above conditions are unknown. There would likely be a range of improvement probability that can only be predicted with site-specific assessment. Alternatives 1,

2, and 6 would result in this range of improvement on a total of 18,300 upland and riparian acres and Alternative 3 would result in 2,100 acres with a range of improvement on riparian acres.

Alternatives 4 and 5 do not remove areas in unsatisfactory condition nor do they implement a lower forage utilization allowance for these areas. Some improvement of these areas is expected through implementation of management direction from the 1996 Rangeland Health Amendment, however it is expected that it would be more gradual and less consistent than in any of the other Alternatives.
In Alternative 1 all vacant allotments are closed and removed from allotment status. The effects on vegetation communities would be continuation of ungrazed conditions, which generally depend on the degree of recovery from any historic grazing impacts and the role fire has played in a given area. Species composition and ground cover within these ungrazed areas would continue to be affected by wildlife use, recreation and wildfire.

As in Alternative 1, all vacant allotments are removed from allotment status in Alternative 2 with similar effects except that Alternative 2 includes use of prescribed fire to reduce brush canopy cover and increase ground cover so vegetation conditions would remain ungrazed. Since the specific locations of future prescribed fire projects are unknown, the degree to which prescribed fire would be used within these closed vacant allotments is unknown.

In Alternative 3 vacant allotments remain vacant or could be used, primarily as grazing areas where existing allotments, or portions of allotments, need rest as a part of management activities (e.g. prescribed fire, wildland fire use, etc.). However, given available resources to conduct necessary analyses prior to reintroducing grazing to these areas, it is unlikely that these vacant allotments would be stocked during the planning period. Short term, the effects on vegetation communities would be that they would remain in an ungrazed condition and might be improved through prescribed fire.

In Alternative 4 vacant allotments would be addressed on a case-by-case basis. Some could be reopened while others might be used where existing allotments, or portions of allotments, need rest as a part of management activities. However, given available resources to conduct necessary analyses prior to reintroducing grazing to these areas, it is unlikely that these vacant allotments would be stocked during the planning period. Short term, the effects on vegetation communities would be that they would remain in an ungrazed condition.

In Alternative 5 vacant allotments could be stocked. However, given available resources to conduct necessary analyses prior to reintroducing grazing to these areas, it is unlikely that these vacant allotments would be stocked during the planning period. Short term, the effects on vegetation communities would be that they would remain in an ungrazed condition.

Alternative 6 closes only the three vacant allotments in the Eastern Uinta Mountains Management Area for bighorn sheep habitat. All other vacant allotments would be evaluated on a case-by-case basis and would either be removed from allotment status or would be used where there is an opportunity to improve conditions on other allotments by spreading out use. However, given available resources to conduct necessary analyses prior to reintroducing grazing to these areas, it is unlikely that these vacant allotments would be stocked during the planning

period. Short term, the effects on vegetation communities would be that they would remain in an ungrazed condition.

Alternative 7 closes three vacant allotments in the Eastern Uinta Mountains Management Area for bighorn sheep habitat and five vacant allotments in the Salt Lake County and Davis County watersheds to protect watershed values. The effects on vegetation communities would be continuation of ungrazed conditions, which generally depend on the degree of recovery from any historic grazing impacts and the role fire has played in a given area. Species composition and ground cover within these ungrazed areas would continue to be affected by wildlife use, recreation and wildfire.

Effects on Vegetation Communities from Insects, Disease, and Noxious Weeds

A majority of forested stands are currently susceptible to insect and disease outbreaks because of the predominance of mature and older age-classes forest-wide as described in affected environment above. Each alternative described below takes a different approach to management of age-class diversity, which can ultimately affect future outbreaks.

Alternative 1 would have the greatest effects from insects and disease and subsequent failed fire suppression forest-wide because no management activities would be allowed that might curb their spread (Table VEG-6). Primary causal agents are the mountain pine beetle (lodgepole pine) and the spruce and Douglas-fir bark beetles. All of these insects are host-specific; that is, they only attack a particular species or group of species of tree. Insect epidemics occur under conditions of large contiguous acreages of large, old trees, a condition which is common on the forest. Without a change in stand structure, the likelihood of epidemic impacts from these beetles will continue to increase. Engelmann spruce stands and mixed conifer/lodgepole pine stands in the Bear River Range would tend to convert to subalpine fir stands as a result of spruce beetle and mountain pine beetle mortality that would remove or reduce the percentage of the host species, while not affecting the associated subalpine fir trees. Lodgepole pine stands in the Uinta Mountains tend to be primarily composed of pine, without the associated fir component. These stands would continue to experience mortality from mountain pine beetles, leading to increased fuels, and a subsequent increased likelihood of stand replacement fires, rather than converting to fir. Salvage of insect killed trees would not be permitted with this alternative, thereby preventing the removal of insect “pockets”. Removal of these infestation areas is a primary tool in preventing epidemic outbreaks. This alternative would rely on successful wildland fire use to improve age class diversity and to reduce susceptibility to insect and disease damage. It is expected, however, that insect epidemic probability would be higher in this alternative. Similarly, no salvage of dead trees would be permitted which would in turn increase fuel loadings and the probability of stand replacement fires.

Because roads act as conduits for the translocation of noxious weeds, this alternative would likely see fewer new populations. However, because only biological control methods would be used there would probably be a lower control of existing populations of noxious weeds.

Alternative 2 will protect more than twice the acres from insect and disease and subsequent failed fire suppression than Alternative 1. It would be similar to Alternatives 3, 6, and 7, but

provide less protection than Alternatives 4 or 5. Insects and disease would affect vegetation in the same manner as in Alternative 1; however, the effects would be reduced due to active management to restore ecosystems. A variety of treatments would be possible, including timber harvest, although harvest is limited to roaded areas. Within inventoried roadless, the primary tool to modify stand structure and associated insect susceptibility is the use of prescribed fire. Use of fire to modify stand structure will be limited by budget and other considerations such as its affect on recreation values. Therefore, use of prescribed fire may reduce susceptibility to a certain extent, but the majority of the inventoried roadless area would increase in insect susceptibility over time. Insect activity may increase within and adjacent to prescribed burning areas due to fire related stress on the surviving trees. Outside of inventoried roadless, harvest activity can be used to modify stand structure and thereby reduce the probability of insect epidemics. Emphasis would be placed on controlling insects and disease primarily in areas where older forested ecosystems are important as wildlife habitat and travel corridors.

Like Alternatives 1, 6 and 7, this alternative would have a low potential of creating new vectors for noxious weed invasions. Alternative 2 also takes a very active role (perhaps the highest) in the biological and chemical treatment of noxious weeds. Noxious weed control would be focused on preventing new weed invasions in order to maintain natural functions. Because roadless values will be maintained on most roadless area, this alternative would have a low potential for noxious weed spread along roads.

Insect and disease effects for Alternative 3 would be less than Alternative 2 because more acres are in MPCs that permit active management to modify stand structure and the roadless rule does not preclude entering inventoried roadless areas. This alternative would be intermediate to Alternatives 4 and 5 and Alternative 2 in effects from insects and disease. Conversion of spruce and mixed conifer stands would continue on MPC 3.2. The emphasis is management of wildlife and recreation and less on commodity outcomes. The miles of new roads allowed in this alternative, like Alternative 4, would have nearly the greatest potential of creating new vectors for noxious weed invasions (less than Alternative 5, but more than Alternatives 1, 2, 6, and 7. Like Alternative 2, noxious weed control would focus on preventing new weed invasions in order to maintain natural functions.

Alternative 4 takes high action against the spread of insects and disease (less than Alternative 5, but more than other alternatives). Conversion of spruce to subalpine fir would continue in the Bear River Range, but to a lesser extent than Alternatives 1, 2 and 3 due to the increase of acreage in the 5.1 and 5.2 MPCs. This alternative does not take a vigorous approach to the control of noxious weeds, however, and the continued advancement of weed populations is expected. The miles of new roads allowed in this alternative, like Alternative 3, would have nearly the greatest potential of creating new vectors for noxious weed invasions (less than Alternative 5, but more than Alternatives 1, 2, 6, and 7).

Alternative 5 would take the greatest action against the spread of insects, disease, and noxious weeds forest-wide using both biological and chemical agents. A greater focus would be placed on tentatively suited timber stands and those adjacent that might facilitate the spread of insects and disease. The roadless rule does not apply to this alternative, and treatments could be applied to all areas except high value recreation and wilderness areas. Treatments would concentrate on

spruce-fir stands in the Bear River Range and lodgepole pine stands in the Uinta Mountains, which are the highest risk types in their respective ranges. The miles of new roads allowed in this alternative would have the greatest potential of creating new vectors for noxious weed invasions than all other alternatives.

Alternatives 6 and 7 would take a moderate degree of action against the spread of insects, disease, and noxious weeds forest-wide using mechanical treatments (primarily to treat insects and disease) as well as biological and chemical agents (primarily to treat noxious weeds). Emphasis would be placed on controlling insects and disease primarily on MPC 5.2 lands and in other management prescription categories where older forested ecosystems are important as wildlife habitat and travel corridors. Effects on inventoried roadless areas would be the same as Alternatives 1 and 2. Noxious weed control would be focused on preventing new weed invasions in order to maintain natural functions. The miles of new roads allowed in these alternatives would have a relatively low potential of creating new vectors for noxious weed invasions (less than Alternatives 3, 4 and 5).

Effects on Vegetation Communities from Wildlife Management

Wildlife Management to improve habitat will have an overall positive effect on vegetation communities. Management of wildlife habitat focuses on improving age-class diversity and corresponding structural diversity. Habitat management generally uses fire management and timber harvest tools, which are described in those sections in detail.

Effects on Vegetation Communities from Aquatic and Semi-aquatic Species Management

The effects on vegetation from aquatic and semi-aquatic resources is primarily associated with livestock management in and around riparian and wetland communities. Alternatives 4 and 5 do not focus on aquatic and semi-aquatic species management, while Alternatives 1, 2, 3, 6, and 7 do so by removing riparian acres not meeting forest plan objectives from the suitable rangelands. In addition, Alternative 2 also removes over 26,000 acres of uplands in portions of 6^{th} order watersheds that have known populations of Colorado River or Bonneville cutthroat trout within allotments and that have at least 20 acres of these riparian areas that are not meeting forest plan objectives. As a result, Alternative 2 would improve these watershed and riparian conditions the most rapidly. Alternatives 1, 3, 6, and 7 only remove those riparian areas not meeting forest plant objectives from the suitable range, which would result in a very minor effect (0.1 percent reduction of total capable rangelands resulting 0.1 percent in livestock numbers).

Effects on Vegetation Communities from Oil and Gas Activities

The following description of effects refers only to the area identified as the "Appeal Settlement Zone" as described in Topic 9. It is estimated to be about 68,300 acres.

Vegetation productivity could be lost as a result of from oil and gas exploration and development from well pad placement, road construction and ancillary facilities. Effects to riparian areas are discussed in Topic 1 – Soil and Water Resources. For a successful well, a site of about 40% of the original drill site would remain disturbed for the life of the well (USDA Forest Service, 1997b). However unsuccessful drill sites can be reclaimed. Reclamation generally includes spreading topsoil and reseeding with native species. If disturbed sites are prepared and seeded with native species properly, reclamation would further reduce impacts.

Surface disturbance associated with leasing, such as drilling and road construction can cause weeds to spread. As discussed earlier, roads can serve as conduits for the transport of certain weed species. Seeds clinging to drilling equipment and vehicles used in infested areas could be carried to previously uninfested areas during construction activities. Standards and guidelines should minimize these types of impacts. Any operation would be responsible for implementing a plan to control and eradicate noxious weeds to reduce the risks of surface disturbance.
Oil and gas activities also have the potential to disturb habitat of threatened, endangered and sensitive plant species. There are no known occurrences of plant species classified as threatened or endangered in this area of the Forest. There is one sensitive plant species, Uinta Greenthread, known to occur outside the Appeal Settlement Zone on the Mountain View Ranger District.

The decision being made in the Forest Plan affects new leases not existing ones. In all alternatives (except Alt 4) the Table Top Unit, an area of existing leases, could be explored and result in effects to wildlife habitat. The degree to which exploration is predicted within the Table Top Unit is affected by whether or not new leases could be issued and under what stipulations.

Though Alternative 1 does not allow new leasing in the Appeal Settlement Zone, development of existing leases within the Table Top Unit could remove vegetation on an estimated 20 acres because of oil and gas exploration activities. In areas outside of the Table Top Unit that are not currently leased there would be no effects to vegetation.

Alternative 2 is very similar. Again, development of existing leases within the Table Top Unit could remove vegetation on about 20 acres. Once existing leases expire, leasing availability in areas recommended for wilderness is precluded. On remaining available acres, new leases could be issued but surface occupancy would not be allowed.

Alternative 3 precludes leasing availability in areas recommended for wilderness in the future and does not allow new leases with surface occupancy in areas managed for undeveloped (Prescription 2.6) and backcountry recreation (Prescription 4.1 and 4.2) values and terrestrial habitat (Prescription 3.2). Additional new leases could be issued outside the areas listed above with stipulations applied to protect sensitive resources. An estimated 10,500 acres are available under Standard Lease Terms. Oil and gas activities are estimated to disturb about 75 acres. Some of this development is predicted on existing leases within the Table Top Unit. The degree

of effects depends on the leasing terms applied. Vegetation productivity could be affected for 20-30 years because of field development. Some of this development is predicted within the Table Top Unit. A Controlled Surface Use Stipulation would be attached to all leases requiring surveys to determine the possible presence of any sensitive plant species. Operations would be designed or located so as to not adversely affect the viability of populations. Lease Notices would be attached where threatened or endangered plant species are potentially located. This would ensure the protection of these species through the Endangered Species Act.

Alternative 4 does not make a leasing decision. Because lessees would not be able to effectively develop a field should one be discovered due to nearby unleased parcels, future activities are not likely. No effects to vegetation are probable.

Alternative 5 would provide for leasing with standard lease terms and therefore provide the greatest opportunity for full field development. Oil and gas activities are estimated to affect vegetation productivity on about 105 acres. Some of the effects could last 20-30 years because of field development. Other mitigation measures that could be required as conditions of approval could include moving the site up to 200 meters (656 feet) if the site could be better located.

In Alternative 6, leasing availability is precluded in areas recommended for wilderness in the future and new leases issued as a result of the leasing decision made in the plan revision would not allow surface occupancy. However, existing leases in the Table Top Unit that expire would be immediately renewed in areas not precluded by management plan direction. Leases would be renewed in areas managed for motorized recreation values and terrestrial habitat. Oil and gas activities are estimated to disturb about 75 acres. Some of this development is predicted on existing leases within the Table Top Unit. Vegetation productivity could be affected for 20-30 years should a field be discovered. In the remainder of the area the effects to vegetation would be minimal because of no surface occupancy.

Alternative 7 would preclude leasing on 20,400 acres recommended for wilderness. On the remaining 47,900 acres available for leasing, surface occupancy would be allowed on 27,000 acres. Of this acreage, oil and gas activities are estimated to disturb about 85 acres. Vegetation would be removed for road construction and well pads. Vegetation productivity could be affected 20-30 years should a field be discovered. Some development (included in the 85 acre estimate) is predicted within the Table Top Unit because of existing leases and new leases being offered.

The likelihood of encountering a plant species at risk through oil and gas activities is increased because there are more acres available for surface occupancy in Alternative 7. Because a Controlled Surface Use Stipulation would require surveys to determine the possible presence of any sensitive plant species, operations would be designed or located so as to not adversely affect the viability of the populations. Lease Notices would be attached where threatened or endangered plant species are potentially located. This would ensure the protection of these species through the Endangered Species Act.

Further impacts to the vegetation could occur as a result of the development of private minerals. Oil and gas activities on lands with private minerals are not required to meet Forest Plan standards.

Effects on Vegetation Communities from Roadless Area Management

Roadless area management would have varying degrees of both positive and negative effects. Roadless areas, by definition, are not necessarily non-motorize. Motorized trails are allowed within roadless area and it is the management of areas as non-motorized that reduces the potential for negative effects from recreation activities (especially unauthorized OHV use), noxious weed spread, and from unwanted human-caused fire ignitions, which typically occur along roadways. It is the lack of roads, however, that reduces the ability to manage these landscapes for Properly Functioning Conditions using mechanical and timber harvest tools, and may reduce the ability to manage prescribed fire depending on the need to access the areas to be burned.

Alternative 1 manages over 550,000 acres as non-motorized, which is more than any other alternative. This alternative maintains roadless area values on all the roadless acres (over 600,000 acres). Alternative 1 prohibits road construction, reconstruction, and timber harvest in any roadless area. Without additional roads, access for management would be the most limited of the alternatives. Wildland fire use and failed fires suppression would be greatest under this alternative because of the increased age of existing vegetation, and subsequent increase in fuels because of no prescribed fires or other mechanical vegetation treatments including timber harvest would be allowed. It would have the lowest potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.

Alternative 2 is second only to Alternative one, in the acres managed as non-motorized (436,000 acres). This alternative maintains or mostly maintains roadless area values on approximately 97 percent (over 585,000 acres) of the existing roadless areas. This alternative does not allow road construction and reconstruction in inventoried roadless areas but does allow some vegetation to be managed to improve habitat for rare species, or to maintain or restore ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects. It would be similar to Alternative 1 in its low potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.

Alternative 3 manages over 390,000 acres as non-motorized and maintains or mostly maintains roadless area values on approximately 70 percent of the existing roadless areas (425,000 acres). In this alternative, roadless area management would have a moderately high effect on vegetation communities because nearly 40 miles of new road would be constructed to manage vegetation through timber harvest. Most roadless areas in this alternative would generally only be developed where it would be necessary for achieving habitat improvement or restoration. Because of road construction, however, this alternative would have a high potential for negative effects from recreation activities in existing roadless areas, including unauthorized OHV use. It would have an intermediate potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.

Alternative 4 manages nearly 242,000 acres as non-motorized and mostly maintains roadless area values on approximately 22 percent (132,000 acres) of existing roadless areas. Inventoried roadless areas in this alternative generally allow development for commodity outputs and

recreation access. This alternative has the greatest ability to manage vegetation for PFC, but also has a very high potential for negative effects on vegetation from recreation activities, including unauthorized OHV use. It would have the highest potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.

Alternative 5 manages approximately 308,000 acres as non-motorized and maintains or mostly maintains roadless area values on approximately 19 percent (117,000 acres) of the existing roadless areas. In Alternative 5, most inventoried roadless areas are managed to provide access for timber and grazing management, oil and gas exploration and development, and recreation with project-by-project attention to critical habitats for wildlife, fish, and plant population viability. This alternative produces the greatest amount of commercial timber harvest (12,400 acres), which would require the greatest about of road construction in existing roadless areas. Like Alternative 4, this alternative has a great ability to manage vegetation for PFC but as noted in **Effects on Vegetation Communities from Recreation Management,** has the highest potential for negative effects on vegetation from recreation activities in existing roadless areas, including unauthorized OHV use. It would be similar to Alternative 4 in its high potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.
Alternative 6 manages about 412,000 acres as non-motorized and maintains or mostly maintains roadless area values on about 96 percent (over 580,000 acres) of the existing roadless areas. Like Alternative 1, Alternative 6 adjusts allowed activities to be consistent with the National Roadless Area Conservation Rule. Only 6 miles of new road are allowed for timber harvest, which focuses on cutting and removal of generally small diameter trees to maintain or improve roadless characteristics or habitat for rare species, or to maintain or restore ecosystem composition and structure, and/or reducing the risk of uncharacteristic wildfire effects. It would be similar to Alternative 2 in its low potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.

Alternative 7 manages nearly 416,000 acres as non-motorized and maintains or mostly maintains roadless area values on approximately 75 percent (456,000 acres) of the existing roadless areas. This alternative identifies individual roadless area values and resource capabilities and conditions. Road construction and reconstruction are not allowed in some areas, nor is cutting, sale, and removal of timber. Timber harvest and road construction (approximately 7 miles) are allowed in portions of some roadless areas for purposes of improving habitat for threatened, endangered, proposed, or sensitive species, or to maintain or restore ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects. Like Alternative 6, it would be similar to Alternative 2 in its low potential for unauthorized OHV use, spread of noxious weeds, and unwanted human-caused fires.

Effects from non-motorized ROS are also discussed in more detail in **Effects on Vegetation Communities from Recreation Management**.

Effects on Vegetation Communities from Special Designation

Special designations, research natural areas (RNA), special interest areas (SIA), and special areas (SA) would be beneficial to vegetation communities because they would minimize the likelihood for undesirable impacts from management or recreational activities. RNA status would be the

most restrictive on allowed activities and would focus on maintaining reference conditions for various cover types on the Forest. SIA and SA status would manage for the vegetation values, but would allow more management activities consistent with the purposes for which these areas are established.

Alternative 2 provides the most protection by designating approximately 6,900 acres of RNAs and about 32,500 acres of SIAs and SAs (this is the only alternative that establishes a Tri-Canyons Special Area in the Cottonwood Canyons area). The SIAs and SAs in this alternative are, for the most part, directed at maintaining values of rare communities (such as Tall Forb Communities), reference vegetation communities (e.g. Douglas-fir/Ninebark habitat type), and rare plant species. Alternative 7 provides nearly as much protection as Alternative 2. This alternative, while omitting the Tri-Canyons Special Area, increases the Logan Canyon SIA by adding approximately 8,800 acres in the lower portion of the canyon to include the south-facing slopes with several Species At Risk and bigtooth maple and juniper communities. Alternatives 1 and 6 are intermediate in the protection they provide, primarily because they do not include Tri-Canyons Special Area. They also focus on maintaining many of the values identified in Alternative 2. Alternatives 3, 4, and 5 each provide approximately 6,900 acres of protection through RNA and/or SIA designation.

Effects on Vegetation Communities from Heritage Resource Management

Heritage Resource Management will have little effect on vegetation communities, except to avoid impacts where these resources occur in areas of potential vegetation management. The greatest potential for effects through avoidance would be in Alternative 2 where over 186,000 acres are treated, primarily through prescribed fire. The lowest potential for effects would be in Alternative 1 where no acres are treated.

Cumulative Effects

Vegetation communities on nearby or intermingled private lands have been experiencing changes in recent years through land development that will likely continue in the future. Some intermingled private lands in the Uinta Mountains have been harvested to a greater degree than adjacent National Forest lands. Approximately 8 Sections (over 5,000 acres) have been, or will be harvested on the North Slope, and on an additional 5 sections (over 3,000 acres) were harvested in the past with some clean-up harvesting (removal of the remaining merchantable timber) being done. Some harvest may occur within approximately 5,000 acres of private land just north of the Forest boundary and west of the Bear River to reduce fire hazard near homes and to produce some wood fiber. Because of the scenic values managed for on these lands, however, large-scale harvests are not expected. Nearly all of the lands adjacent to the Wasatch Mountains (Bear River and Wasatch Ranges) are developed. This has resulted in the loss of many thousands of acres of the sagebrush and other rangeland types in these lower elevation areas. In addition, some private ranch lands at lower elevations adjacent to the Forest have been converted from rangelands and pasturelands to rural home sites.

There has been an increase in noxious weeds on private lands contributing to increased infestation on the Forest and a continuing increased threat in the future. This has occurred

especially in the Wasatch Mountains, but is also occurring in the Uinta Mountains and the Stansbury Mountains as well.

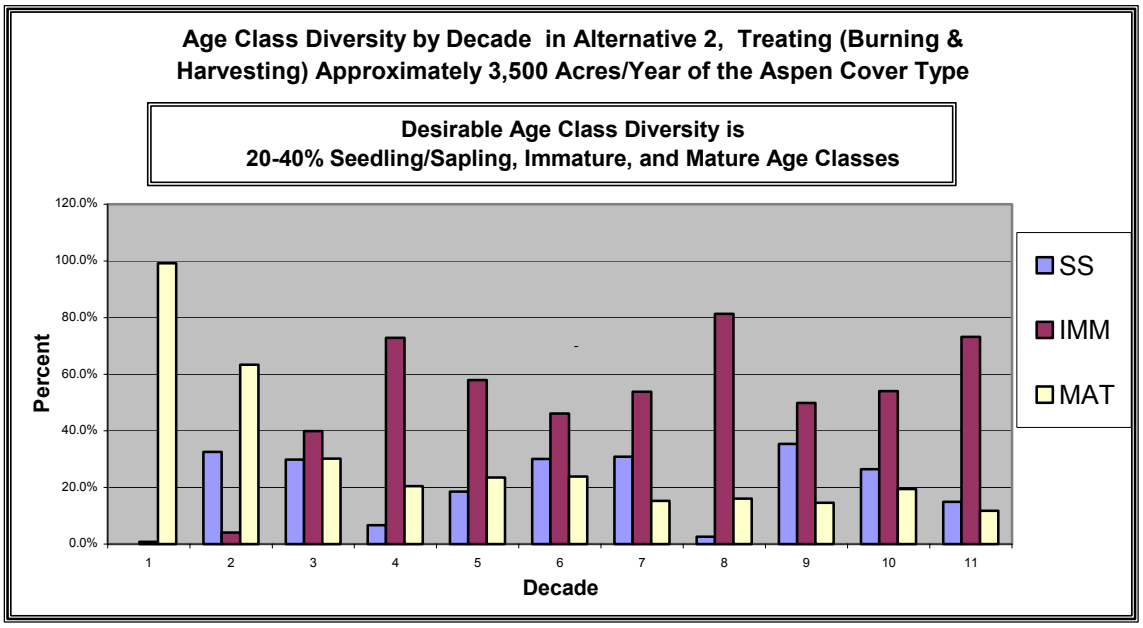
It is the combination of all vegetation treatments (harvest, fire, and mechanical treatment), access (roads and roadless area management), livestock grazing, and recreation impacts that ultimately result in the rate at which the alternatives move the vegetation composition, structure (age classes and patterns) and functions toward PFC. Because Alternative 2 provides the most active management and Alternative 1 the least, all others are compared to those two. Figure VEG-3 illustrates how long it takes, with harvest and prescribed fire under Alternative 2, for the Aspen vegetation type to reach PFC on the Wasatch-Cache National Forest portion of the **Overthrust Mountains ecological section**. Figure VEG-4 shows that PFC will not be reached in the Conifer vegetation types within the next 100 years in the **Uinta Mountains** ecological section, even through the most active management. It will likely involve unplanned ignitions (fires) in order for PFC to be reached. Figure VEG-5 shows that the Oak Cover Type will reach PFC within the second decade (20 years) in the Overthrust Mountains ecological section. Figure VEG-6 shows that the Sagebrush Cover Type approaches PFC in decade 4 and will reach PFC by decade 7 (70 years) across the Forest, then maintains PFC for the next 3 decades. Unlike the outcome for sagebrush in Figure VEG-6, the outcomes for aspen, conifer, and oak shown in Figures VEG-3, VEG-4 and VEG-5 illustrate that with continued treatments as originally proposed (e.g. 3,200 acres per year for aspen and aspen-conifer), the vegetation types may reach PFC within the first few decades, but they go away from PFC within a decade or two after those conditions are reached. Under any alternative, management (number of acres treated) would be adjusted to maintain PFC once it is reached.

Cumulatively, Alternative 1 would have the least predictable effect on returning vegetation cover types to PFC because no acres would be treated mechanically or through harvest or prescribed fire, relying on wildland fire to bring ecosystems back to PFC. Alternative 1 would have the least impacts from development. No roads would be constructed or reconstructed and no new recreation facilities would be allowed. As a result, this alternative would likely have the least negative effect on vegetation communities from recreation and unauthorized uses, because no new roads would be constructed. In addition, 2 miles of roads and 76 miles of motorized trails would be closed in recommended wilderness. Alternative 1 would have the lowest potential for noxious weed expansion because roads are one of the greatest vectors for their spread. This alternative would likely have the greatest effects from insects and disease in forest-dominated vegetation communities, which could result in the greatest amount of acres burned through failed fire suppression in the next 100 years. These fires would likely be more severe in nature than any other alternative as well as being uncharacteristically large, which could threaten adjacent private lands. No vegetation cover types are predicted to reach PFC forest wide in the next 100 years.

Cumulatively, Alternative 2 would have the greatest effect on returning vegetation cover types to PFC. This alternative returns all cover types to PFC, except Douglas-fir communities in the Overthrust Mountains and Uinta Mountains Ecological Sections to PFC in 10 decades or less (2-3 decades for sagebrush, oak, and aspen communities). About 19,000 acres would be treated annually primarily through prescribed burning, but also through mechanical treatment of non-timber vegetation and through timber harvest of forested communities. Approximately 6 miles of new roads would be constructed for timber harvest and 3 miles of roads for oil and gas

exploration. About 7 miles of trails would be closed to motorized use in recommended wilderness areas. Some new recreation facilities would be allowed. Alternative 2 would have a low effect from insects and disease especially in forest-dominated vegetation communities where wildlife habitat/corridors are critical. Insect and fire effects on adjacent private lands would be less than Alternative 1.

Figure VEG-3. Age class diversity of the Aspen and Aspen/Conifer vegetation cover types under Alternative 2 (most active management alternative) on the Overthrust Mountains Ecological Section of the Wasatch-Cache National Forest over the next 10 decades. Decade 1 is the current conditions.



Cumulatively, Alternative 3 would have an intermediate effect on returning vegetation cover types to PFC. About 9,000 acres would be treated annually through prescribed burning, mechanical treatment of non-timber vegetation and through prescribed burning and timber harvest of forested communities. In the Overthrust Mountains Ecological Section, oak and aspen cover types reach PFC within 5 decades and in the Uinta Mountains Ecological Section mixed conifer reaches PFC within 5 decades and aspen within 9 decades. Alternative 3 would have an intermediate effect in vegetation communities from various forms of development. This alternative would allow approximately 10 miles of roads constructed for oil and gas development or exploration. Approximately 39 miles of new timber harvest roads would be constructed and some new recreation facilities would be allowed. Similar to Alternative 2, this alternative would have a low effect from insects and disease especially in forest-dominated vegetation communities where wildlife habitat/corridors are critical. Insect and fire effects on adjacent private lands would be greater than Alternative 2, but less than Alternative 1.

Figure VEG-4. Age class diversity of all Conifer vegetation cover types under Alternative 2 (most active management alternative) on the Uinta Mountains Ecological Section of the Wasatch-Cache National Forest over the next 10 decades. Decade 1 is the current conditions.

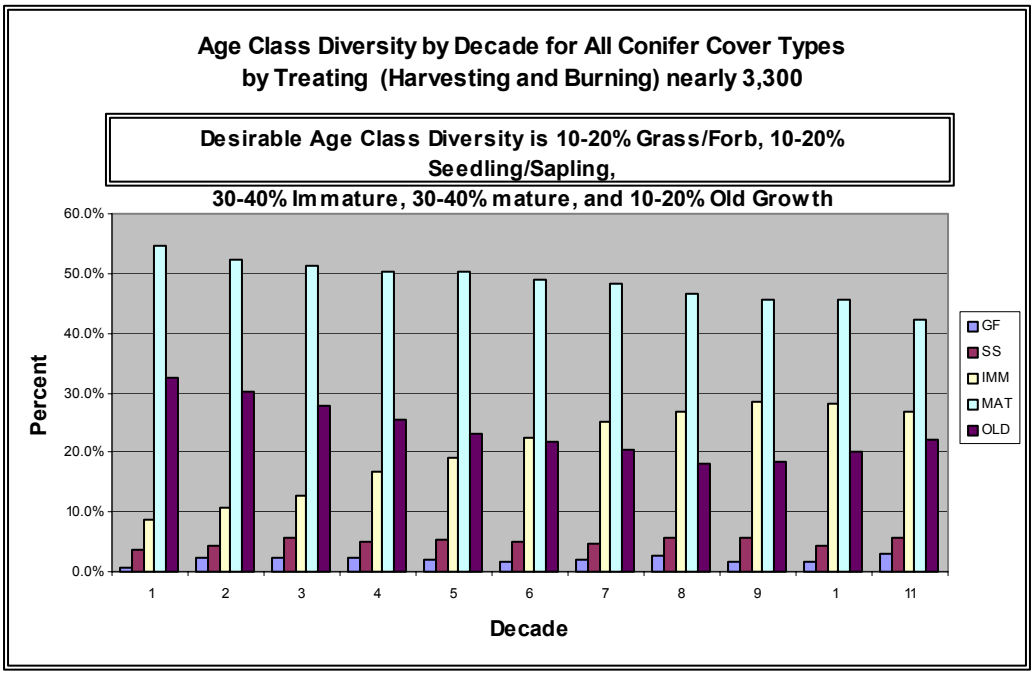


Figure VEG-5. Age class diversity of the Oak vegetation cover type *under Alternative 2 (most active management alternative)* on the Overthrust Mountains Ecological Section of the Wasatch-Cache National Forest over the next 10 decades. Decade 1 is the current conditions

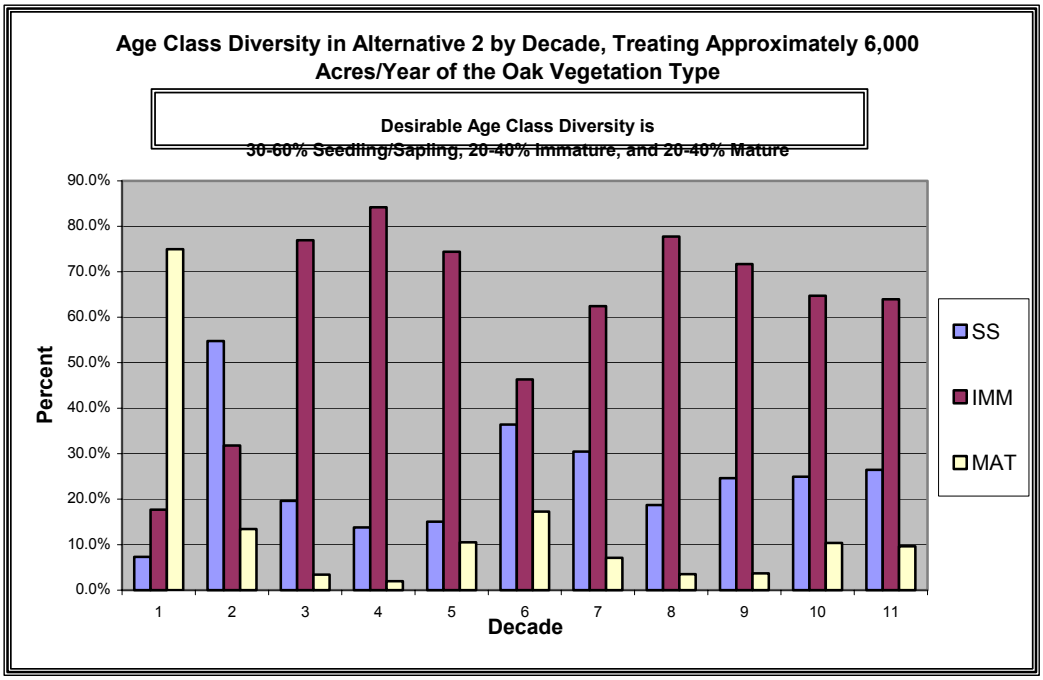
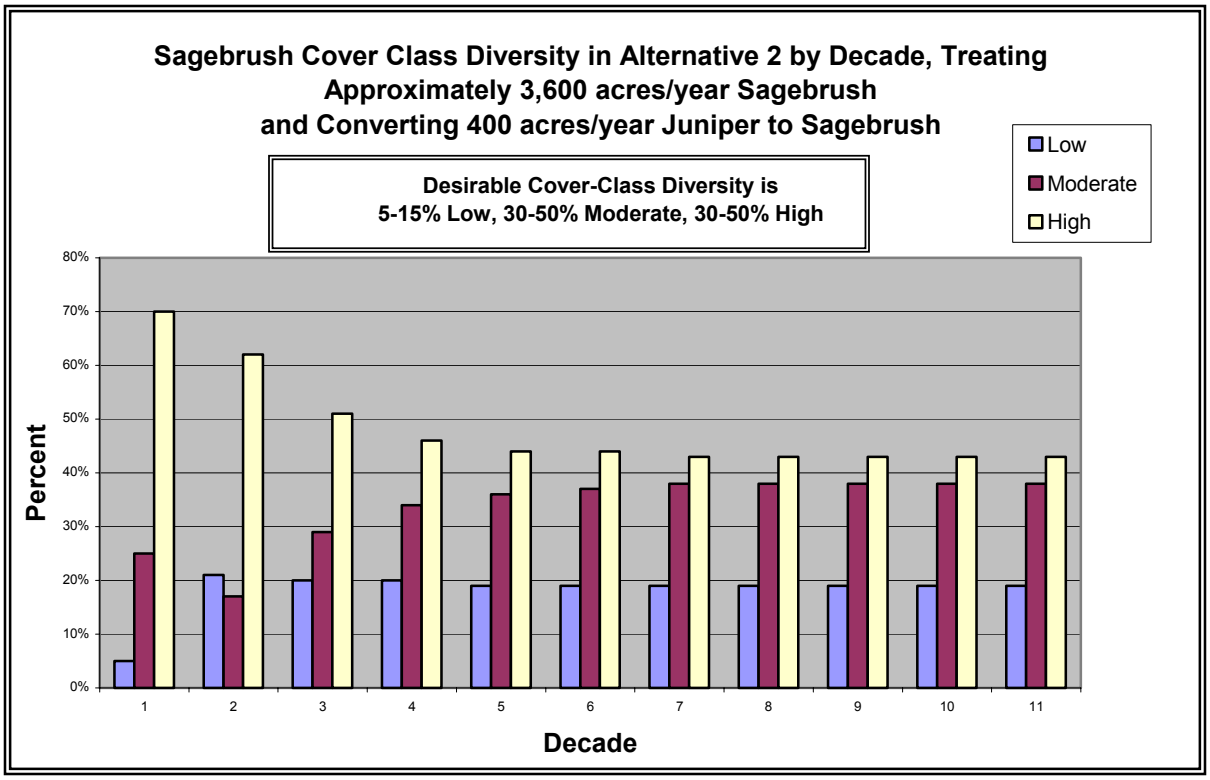


Figure VEG-6. Age class diversity of the Sagebrush vegetation cover types under Alternative 2 (most active management alternative) over the entire Wasatch-Cache National Forest over the next 10 decades. Decade 1 is the current conditions.



Cumulatively, Alternative 4 would the lowest effect, when compared to all alternatives, on returning vegetation cover types to PFC. With the exception of Alternative 1, Alternative 4 treats the fewest acres (nearly 3,800) annually through prescribed burning and timber harvest. No mechanical treatment of the oak vegetation type would occur. This alternative would allow the construction of 49 miles of new timber harvest roads, which could result in increased recreation access as well as additional miles that could serve as a conduit for noxious weeds introductions. Alternative 4 would have an intermediate effect on vegetation communities from various forms of development. This alternative would continue the suspension of oil and gas leasing/ development. New recreation facilities would be allowed. This alternative would continue to have a moderate effect from insects and disease because less is being done to manage and maintain these effects.

Cumulatively, Alternative 5 would have a low effect on returning vegetation cover types to PFC. Nearly 6,100 acres would be treated annually, through prescribed burning, mechanical treatment of non-timber vegetation and through prescribed burning and timber harvest of forested communities. Alternative 5 would have the greatest effect in vegetation communities from various forms of development. This alternative would allow 70 acres of disturbance for oil and gas leasing/development. Approximately 49 miles of new timber harvest roads would be constructed and new recreation facilities would be allowed. Similar to Alternative 2, this alternative would have the lowest effect from insects and disease in forest-dominated vegetation communities, because management emphasis on commercial timber harvest would permit

prevention and suppression treatments, and would tend to minimize the effects of insects and fire on adjacent private lands.

Alternative 6, Like Alternative 3, would cumulatively have an intermediate effect on returning vegetation cover types to PFC. Approximately 9,100 acres would be treated annually, through prescribed burning, mechanical treatment of non-timber vegetation and through prescribed burning and timber harvest of forested communities. Alternative 6 would also have an intermediate effect (lower than Alternative 3) on vegetation communities from various forms of development. This alternative would also allow 50 acres of disturbance for oil and gas leasing/development. Slightly more than 6 miles of new timber harvest roads would be constructed. Some new recreation facilities would be allowed. Similar to Alternatives 2 and 3, this alternative would have a relatively low effect from insects and disease especially in forest-dominated vegetation communities where wildlife habitat/corridors are critical, and affects on adjacent private lands.

Alternative 7, like Alternatives 3 and 6, would cumulatively have an intermediate effect on returning vegetation cover types to PFC. Approximately 8,700 acres would be treated annually, through prescribed burning, mechanical treatment of non-timber vegetation and through prescribed burning and timber harvest of forested communities. Alternative 7 would also have an intermediate effect (lower than Alternative 3) on vegetation communities from various forms of development. This alternative would also allow 50 acres of disturbance for oil and gas leasing/development. Like Alternative 6, slightly more than 6 miles of new timber harvest roads would be constructed. Some new recreation facilities would be allowed. Similar to Alternatives 2, 3, and 6 this alternative would have a relatively low effect from insects and disease especially in forest-dominated vegetation communities where wildlife habitat/corridors are critical, and affects on adjacent private lands.