CHAPTER 2. EXISTING VEGETATION FOREST SCALE

Gunnison Basin

Current Vegetation

Vegetation mapping for the Grand Mesa, Uncompahgre and Gunnison (GMUG) National Forests is generated primarily from aerial photo interpretation, with periodic updates resulting from field verification, management activities and natural disturbances (i.e., wildfires). Vegetation is classified by cover type. Cover type is determined by the dominant cover or species present at the time of classification. As a result, cover type classifications are more simplified than conditions that actually occur on the ground. (For example: Spruce/fir cover type includes areas where Englemann spruce and/or subalpine fir tree species are the majority of the vegetation. Aspen tree species may or may not be present as subdominant species.)

It is important to note several additional limitations in the cover type classification for the Gunnison Basin Geographic Area. Ponderosa pine, blue spruce and Douglas-fir are under represented. In some cases these species have been misidentified in the aerial photo interpretation. In other cases, these species are listed in the species mix, but because they are not the dominant species, the cover type is identified as some other species. Current vegetation cover type composition on NFS lands within the Gunnison Basin Geographic Area is shown in Figure 1. A map of current vegetation is shown in Figure 2.

Figure 1. Composition of Current Vegetation Cover Types on NFS lands within the Gunnison Basin Geographic Area

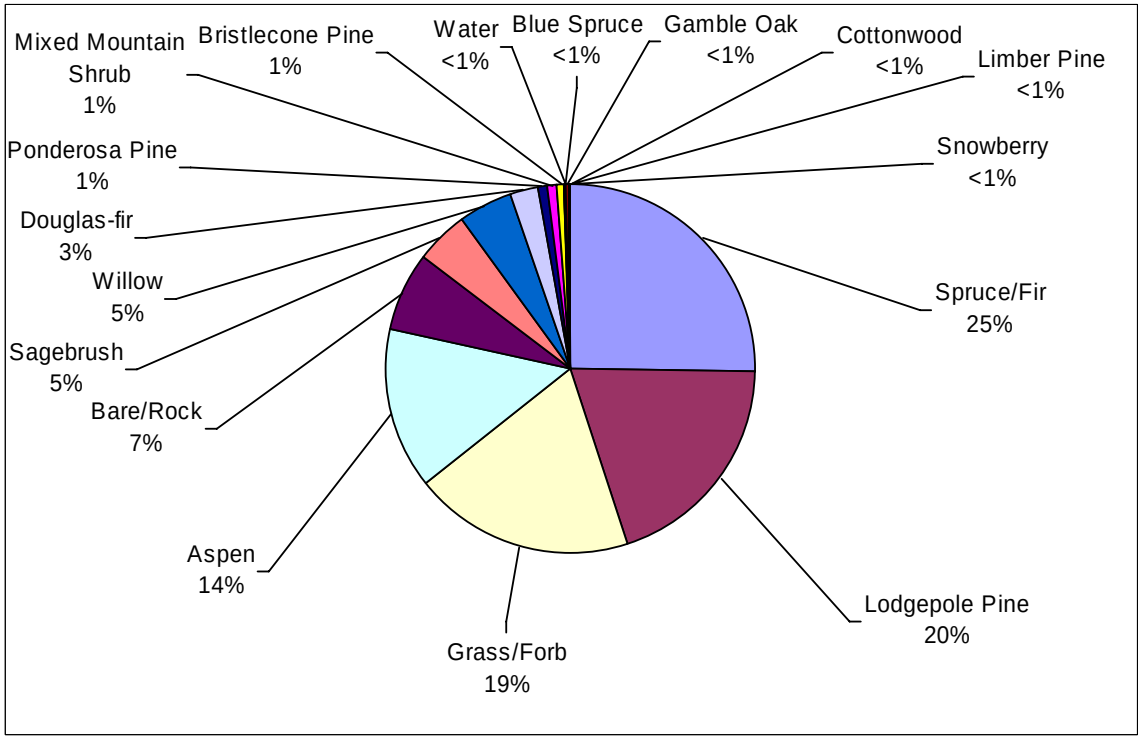
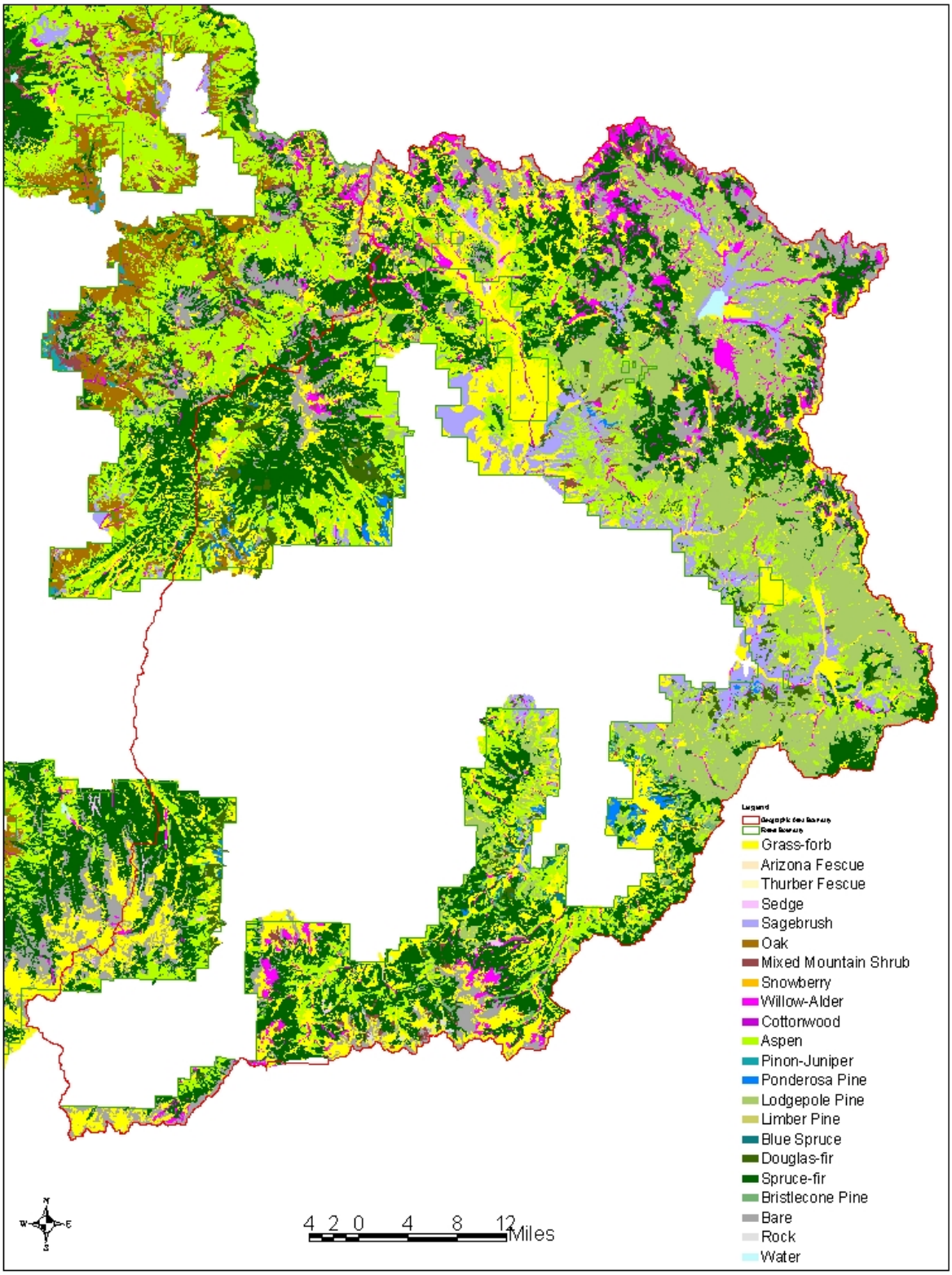


Figure 2. Map of Current Vegetation, Gunnison Basin Geographic Area



Habitat Structural Stages

Vegetation is also characterized by structure. Structure is described by habitat structural stages. Habitat structural stages are defined by size class, tree diameter, and canopy closure (or canopy density measured as crown cover percent). Table 1 displays habitat structural stage definitions (Hoover and Wills, 1987).

Table 1. Habitat Structural Stage Definitions

Habitat Structural Stage	Size Class	Diameter	Crown Cover Percent
1T[1]/1M[2]	Grass-Forb	Not applicable	0 – 10%
2T[1]/2S[3]	Shrub-Seedling	< 1 inch	0 - 10%
3A	Sapling-Pole	1 – 9 inches	11 – 40%
3B	Sapling-Pole	1 – 9 inches	41 - 70%
3C	Sapling-Pole	1 – 9 inches	71 - 100%
4A	Mature	9+ inches	11 – 40%
4B	Mature	9+ inches	41 - 70%
4C	Mature	9+ inches	71 - 100%

1 Opening in forest cover type created by some type of disturbance
2 Natural meadow
3 Shrub cover type

Habitat structural stages can be used as indicators for:

- *Wildlife habitat* - Different wildlife species have different habitat requirements. For example, species that require large diameter trees in dense stand conditions find habitat in areas with 4B and 4C habitat structural stages.

- *Potential risk for future fire, insect and/or pathogen activity* - Trees growing in dense stands can be stressed by competition for water, nutrients and sunlight, making them more susceptible to insect attack.

- *Time since disturbances (fire, harvest, etc.) affected an area*. Age of vegetation is not directly linked to habitat structural stage; however, relative stages of succession can be implied. Early stages of succession are shown as habitat structural stages 1 or 2; later successional stages are usually in habitat structural stages 4A/ 4B/4C. Sometimes structural stages 3A/3B/3C may be the same age as 4A/4B/4C.

Current habitat structural stages for NFS lands within the Gunnison Basin Geographic Areas are shown in Figure 3. Please note: natural meadows in grass-forb cover types are shown as structural stage 1M, and shrub cover types are shown as structural stage 2S. An additional limitation of habitat structural stage data for the Gunnison Basin Geographic Area concerns the lodgepole pine cover type. The narrower crowns of lodgepole pine were interpreted as having correspondingly smaller size classes (sapling-pole vs mature) than actually exist, resulting in an overrepresentation of 3A/3B/3C than actually exists. (Also see Table 2.)

Figure 3. Current Habitat Structural Stages, Gunnison Basin Geographic Area

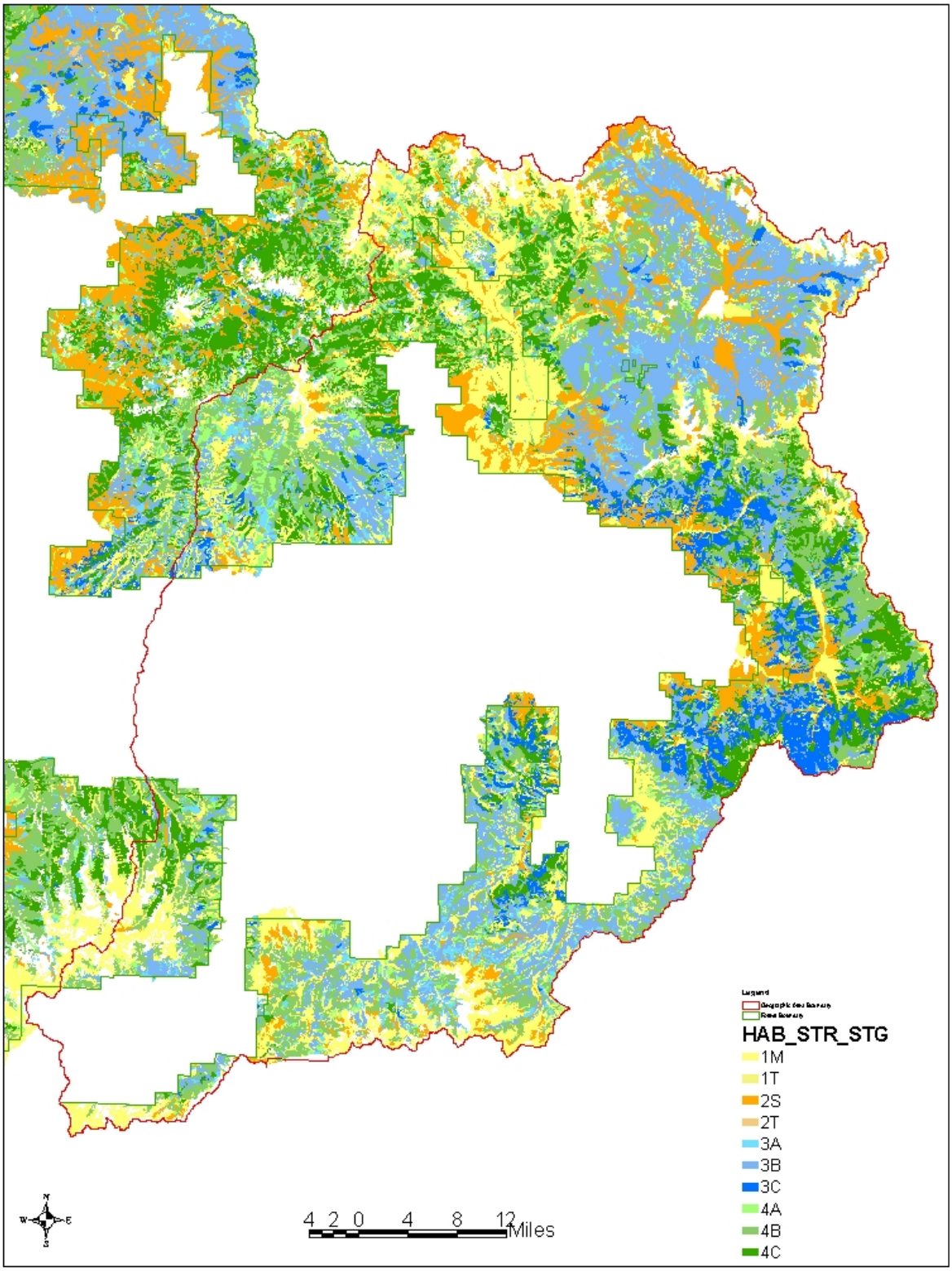
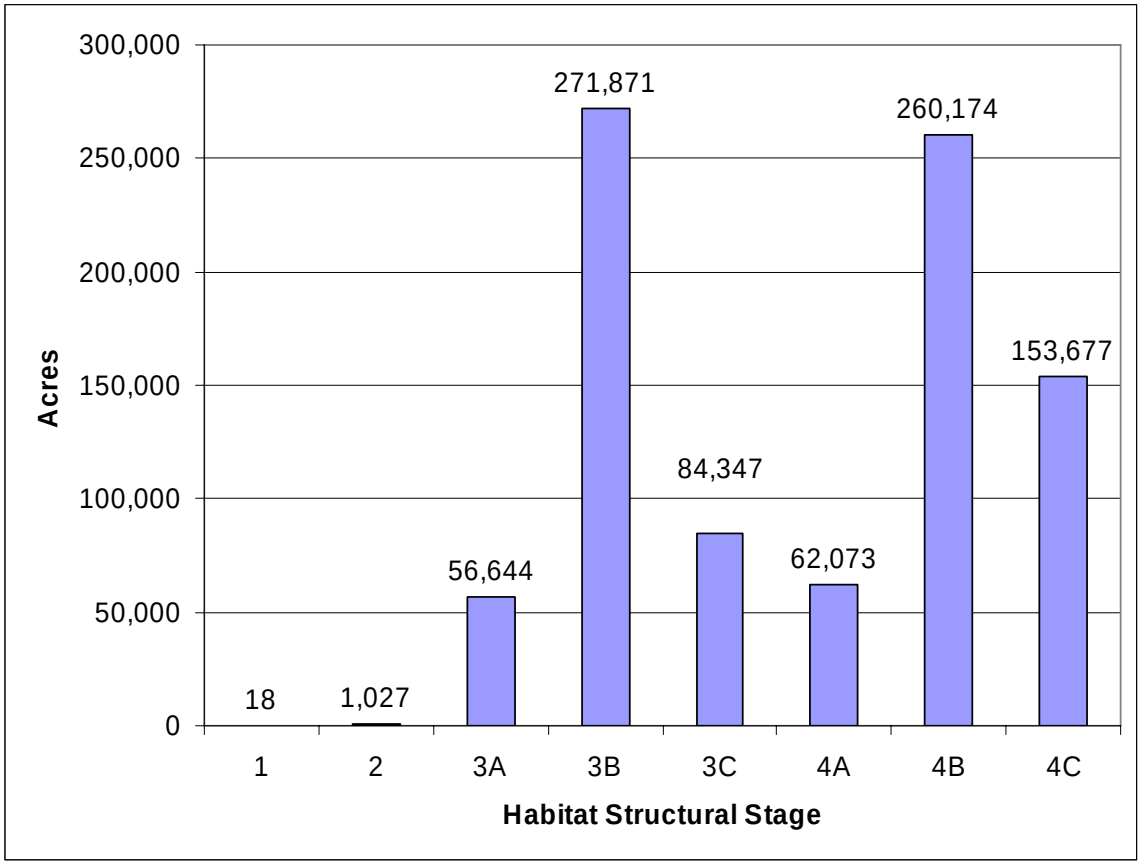


Figure 4 displays the distribution of habitat structural stages for the forest and woodland cover types (spruce-fir, aspen, lodgepole pine, Douglas-fir, ponderosa pine, cottonwood, bristlecone pine, limber pine, blue spruce) on NFS portion of the Gunnison Basin Geographic Area. Note: Natural meadows and shrublands are not included in the chart below; habitat structural stages 1 and 2 are slightly under represented due to recently harvested lodgepole pine being typed as grass-forb or shrub types; some3A/3B/3C acres are over represented and 4A/4B/4C are under represented due to photo interpretation errors related to size class in lodgepole pine.

Figure 4. Habitat Structural Stage Distribution of Forest and Woodland Cover Types, Gunnison Basin Geographic Area



This information can also be summarized by looking at the distribution of size classes (Figure 5) and densities or canopy closure (Figure 6) of forest and woodland cover types on NFS lands within the Geographic Area. Again, natural meadows and shrublands are not included in the data shown in Figures 5 and 6.

Figure 5. Class Distributions of Forest and Woodland Cover Types*
*Grass/forb and seedling/shrub types are slightly under represented, sapling/pole size class is over represented and mature is under represented due to photo interpretation errors in lodgepole pine.

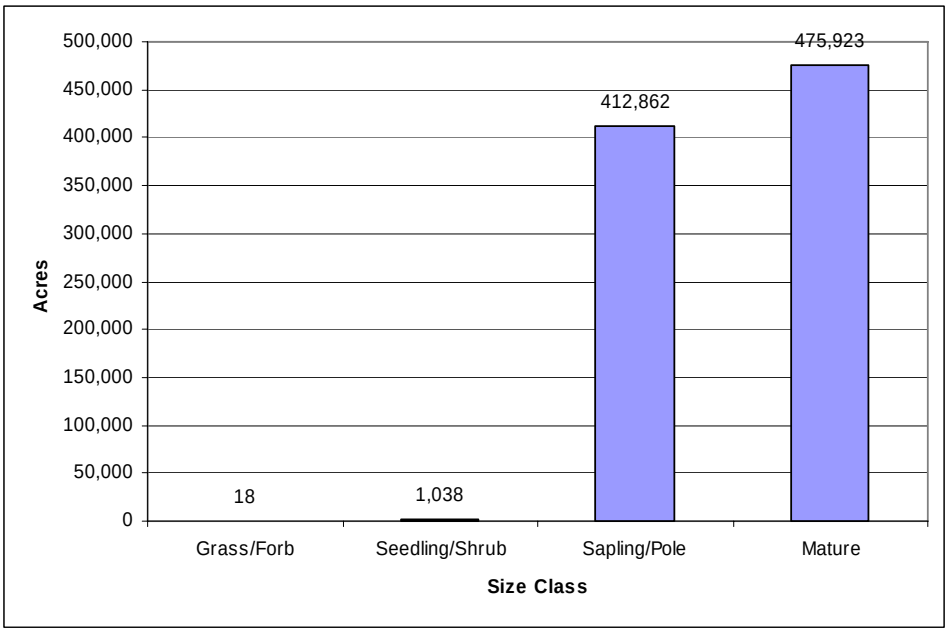
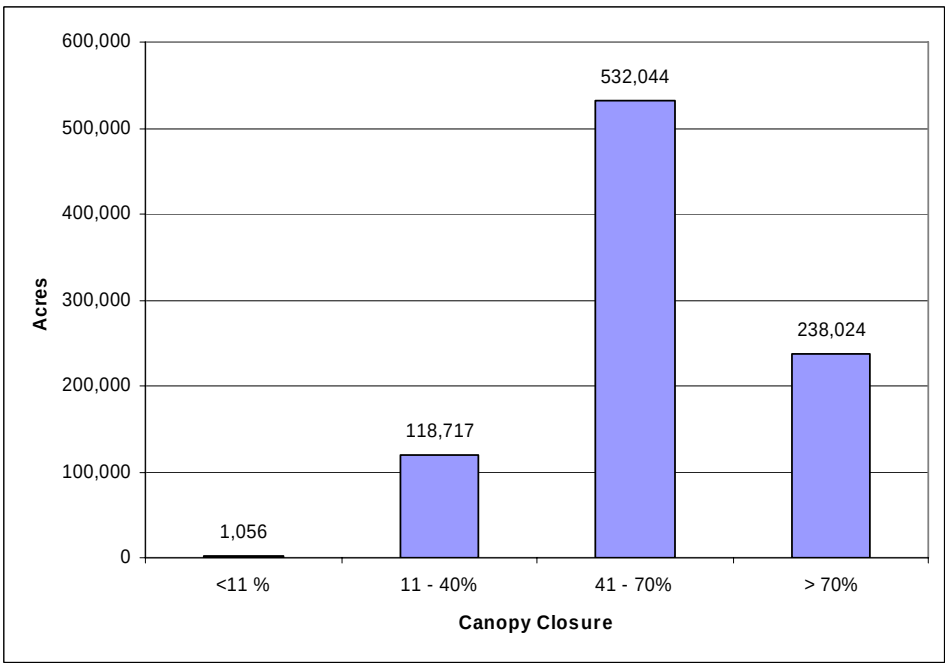


Figure 6. Canopy Closure Distributions in Forest and Woodland Cover Types



Characterization of Current Vegetation Conditions

Additional information on current conditions of different cover types is summarized in Table 2. (Also see timber, range and fire management sections).

Table 2. Current Vegetation Characterization for NFS lands on Gunnison Basin Geographic Area

Cover Type[1]	Composition of GA[1]	Age Distribution[2]	Habitat Structural Stages[1]	Canopy Conditions[1]	Past Activities (1955 – 2003)[3]	Effects of Roads/Trails[4]
Spruce-fir (Englemann spruce – subalpine fir)	354,300 acres 25%.	Ranges from 28 to 435 years. Most spruce-fir is between 120 and 200 yr. old	7%-3A 20%-3B 2%-3C 10%-4A **42%-4B** 19%-4C	21% - single-storied 79% - multi-storied 98% - continuous canopies	11% of type has been affected by timber harvest	78% of type is within ½ mile of an open road or trail. Includes: 363 miles roads 330 miles trails
Aspen	197,500 acres 14%.	Ranges from 19 to 241 years. Most aspen is between 80-120 yr. old.	<1%-2T 9%-3A **34%-3B** 10%-3C 5%-4A 22%-4B 21%-4C	26% - single-storied 74% - multi-storied 96% - continuous canopies	1% of type has been affected by timber harvest 1% of this type has been treated with prescribed fire	82% of type is within ½ mile of an open road or trail. Includes: 252 mile roads 181 miles trails
Lodgepole Pine	279,900 acres 20%.	Ranges from 15 to 356 years. Most lodgepole pine is between 120-160 yr. old.	<1%-2T 2%-3A **44%-3B** 20%-3C 2%-4A 18%-4B 14%-4C Note: 1T/2T is under represented, 3A/3B/3C is under represented and 4A/4B/4C is over represented due to a photo interpretation error.	7% - single-storied 93% - multi-storied 100% - continuous canopies	10% of type has been affected by timber harvest 4% of this type has been treated with prescribed fire. Note: large areas were tiehacked in the late 1800s.	81% of type is within ½ mile of an open road or trail. Includes: 377 miles roads 185 miles trails

Cover Type[1]	Composition of GA[1]	Age Distribution[2]	Habitat Structural Stages[1]	Canopy Conditions[1]	Past Activities (1955 – 2003)[3]	Effects of Roads/Trails[4]
Douglas-fir	35,400 acres 3%	Ranges from 50 to 398 years. Most Douglas-fir is between 120-180 yr. old.	7%-3A 18%-3B 6%-3C 18%-4A **36%-4B** 15%-4C	8% - single-storied 92% - multi-storied 96% - continuous canopies	10% of type has been affected by timber harvest 9% of this type has been treated with prescribed fire Note: Large areas were cutover between the late 1800s and 1950s.	77% of type is within ½ mile of an open road or trail. Includes: 22 miles roads 31 miles trails
Ponderosa Pine	11,500 acres 1%	Age data very limited.	19%-3A **27%-3B** **27%-4A** **26%-4B** 1%-4C	18% - single-storied 82% - multi-storied 100% - continuous canopies	9% of type has been affected by timber harvest. Note: Large areas were cutover between the late 1800s and 1950s.	83% of type is within ½ mile of an open road or trail. Includes: 15 miles roads 4 miles trails
Bristlecone Pine	7,400 acres 1%	Age data very limited.	**32%-3A** 21%-3B 1%-3C 28%-4A 18%-4B	16% - single-storied 84% - multi-storied 100% - continuous canopies	<1% of type has been affected by timber harvest 5% of this type has been treated with prescribed fire	91% of type is within ½ mile of an open road or trail. Includes: 8 miles roads 1 mile trail
Limber Pine	600 acres 0%	Age data very limited.	4%-4A **91%-4B** 6%-4C	14% - single-storied 86% - multi-storied 100% - continuous canopies	7% of this type has been treated with prescribed fire	83% of type is within ½ mile of an open road or trail. Includes: 2 miles roads <1 mile trail
Blue Spruce	2,300 acres <1%	Age data very limited.	4%-3A 10%-3B 24%-3C 4%-4A 20%-4B **37%-4C**	1% - single-storied 99% - multi-storied 100% - continuous canopies	46% of type has been affected by timber harvest 1% of this type has been treated with prescribed fire	91% of type is within ½ mile of an open road or trail. Includes: 3 miles roads <1 mile trail

Cover Type[1]	Composition of GA[1]	Age Distribution[2]	Habitat Structural Stages[1]	Canopy Conditions[1]	Past Activities (1955 – 2003)[3]	Effects of Roads/Trails[4]
Cottonwood	700 acres <1%	No age data available.	3%-3A **74%-4A** 23%-4B	78% - single-storied 22% - multi-storied 97% - continuous canopies	None recorded.	57% of these types are within ½ mile of an open road or trail. Includes: <1 miles roads 0 miles trails
Gamble Oak – Mixed Mountain Shrub	13,600 acres 1%	No age data available.	100% 2S 1% large (>6.5') 63% med. (2.5-6.4') 36% small (<2.5')	37% - single-storied 63% - multi-storied 31% - >40% cover 69% - <= 40% cover	<1% of these types have been treated with prescribed fire.	74% of these types are within ½ mile of an open road or trail. Includes: 21 miles roads 17 miles trails
Sagebrush	68,300 acres 5%.	No age data available.	100% 2S 27% med. (2.5-6.4') 73% small (<2.5')	13% - single-storied 87% - multi-storied 70% - >40% cover 30% - <= 40% cover	19% of this type has been treated with prescribed fire	90% of type is within ½ mile of an open road or trail. Includes: 244 miles roads 30 miles trails
Willow	63,300 acres 5%	No age data available	100% 2S 15% large (>6.5') 66% med. (2.5-6.4') 19% small (<2.5')	21% - single-storied 78% - multi-storied 58% - >40% cover 42% - <= 40% cover	None recorded.	82% of these types are within ½ mile of an open road or trail. Includes: 152 miles roads 102 miles trails
Snowberry	400 acres 0%	No age data available	100% 2S 100% large (>6.5')	5% - single-storied 95% - multi-storied 4% - >40% cover 96% - <= 40% cover	None recorded	25% of these types are within ½ mile of an open road or trail. Includes: 1 miles roads 0 miles trails

Cover Type[1]	Composition of GA[1]	Age Distribution[2]	Habitat Structural Stages[1]	Canopy Conditions[1]	Past Activities (1955 – 2003) [3]	Effects of Roads/Trails[4]
Grass/Forb	268,700 acres 19%	No age data available.	100% 1M	Not applicable	3% of these types have been treated with prescribed fire.	74% of these types are within ½ mile of an open road or trail. Includes: 510 miles roads 348 miles trails.

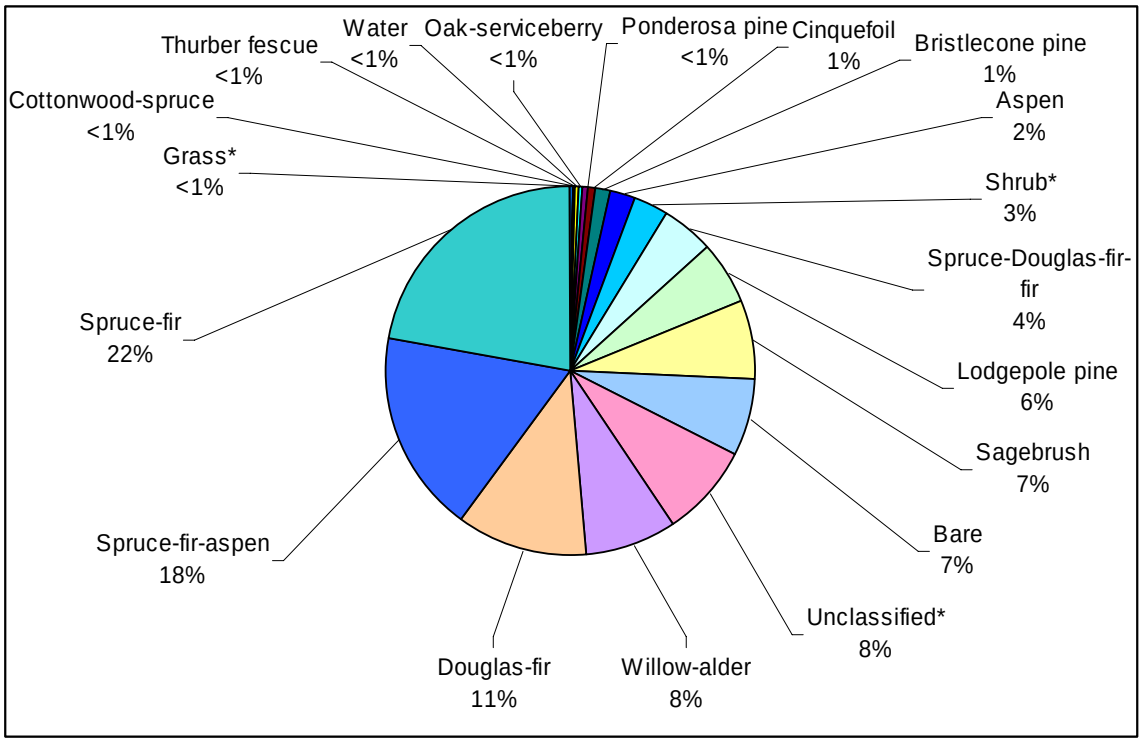
1 Common Vegetation Unit/R2VEG database
2 Stand exam data for Grand Mesa Geographic Area.
3 RMACT database
4 INFRA transportation data related to R2VEG data. Includes all inventoried roads and trail, not just routes open to public use.

Comparison of Current Conditions to Historic Conditions

Environmental factors such as soils, slope, aspect, climate, and elevation determine the plant communities that potentially can grow on a given area. The stable plant community that establishes in the absence of any disturbances (i.e., fire, insect/pathogen mortality, windthrow, drought, harvest) is called the climax plant community. The area where a given climax plant community can grow is classified as a Potential Natural Vegetation (PNV) type, and is named for the climax plant community. For example, spruce-fir forests are the climax plant community at elevations from 10,000 to 12,000 feet, in the subalpine climatic zone (30-40 inches of precipitation annually, 50-70 frost free days, 30-40ºF mean annual air temperature) (Johnston et al. 2001). Areas where spruce-fir is the climax plant community are classified as the spruce-fir PNV type.

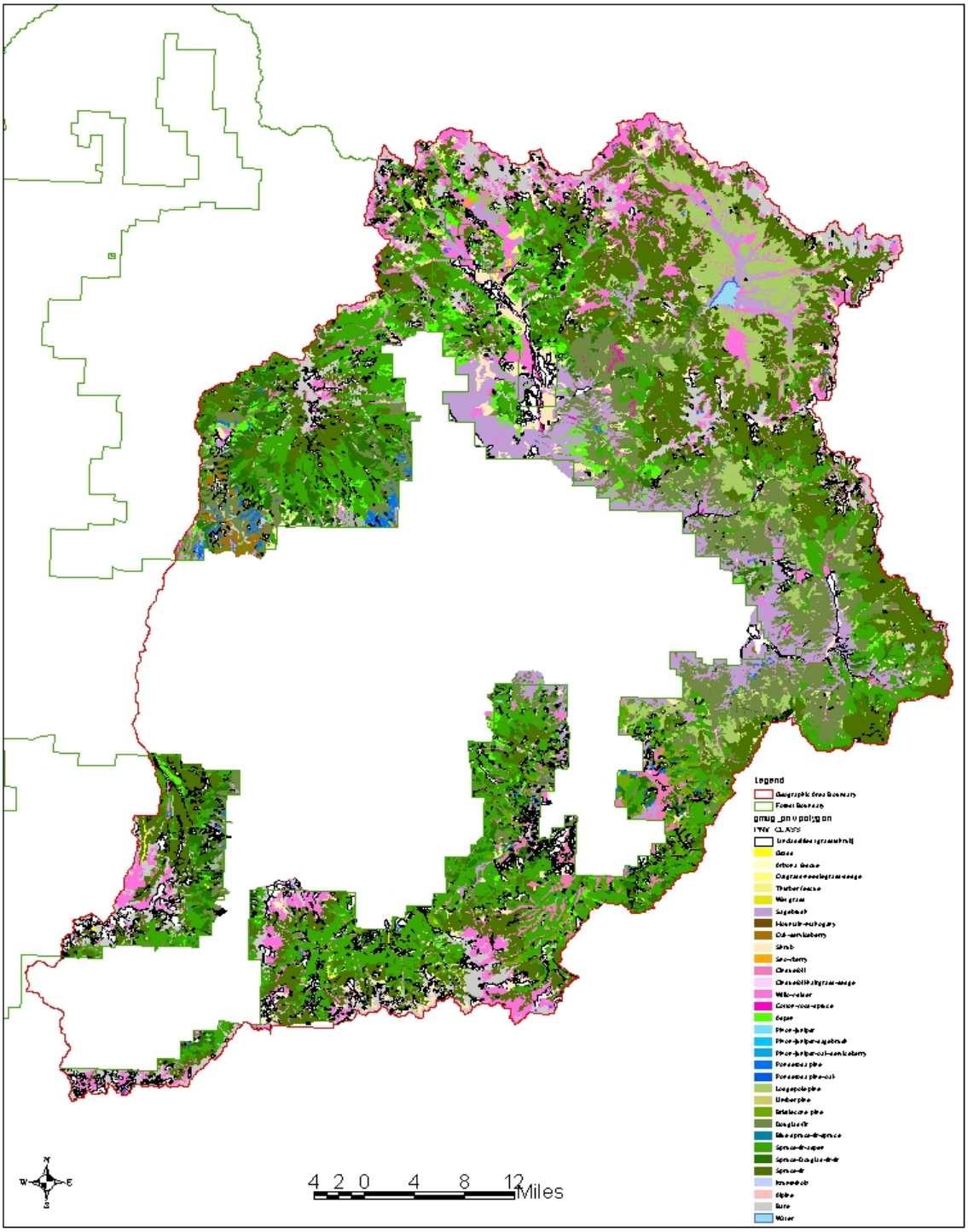
Draft PNV type classification has been completed for this Geographic Area. The PNV type composition on NFS lands within the Gunnison Basin Geographic Area is shown in Figure 7. (PNV types with <0.1 percent composition are not included in Figure 7.) A map of PNV for the Gunnison Basin GA is shown in Figure 8.

Figure 7. Composition of Potential Natural Vegetation Types on NFS lands within the Gunnison Basin Geographic Area



* Unclassified, grass/forb or shrub types where the PNV type has not yet been assigned.

Figure 8. Potential Natural Vegetation on NFS portion of Gunnison Basin Geographic Area



Historically, for any given PNV type, natural disturbances (i.e., fires, insect outbreaks) occurred at characteristic intervals and intensities, called regimes. When a disturbance was intense enough to change the existing plant community (e.g., some or all of the overstory was killed), the remaining vegetation followed a natural progression, or succession, of plant communities that changed over time. If no further disturbances

occurred, an area eventually returned to the climax plant community. However, if multiple disturbances occurred on the same area earlier seral plant communities would be perpetuated on a site for extended periods. The natural disturbance regimes and succession cycles resulted in shifting mixtures (or ranges) of different seral plant communities (or stages) within any given PNV type at any point in time.

The Vegetation Dynamics Development Tool (VDDT) (Beukema et al. 2003) was used to model the expected range in seral conditions that would have existed under historic disturbance regimes for forest, woodland and shrub PNV types. The results displayed in the following tables are conditions that would have been distributed across an entire PNV type on the Geographic Area. Results are scale dependant. For example, if a large fire burned an entire watershed, all of a given PNV type in that watershed could be set back to an early seral condition. However, when the watershed is considered as part of the Geographic Area, the mixture of seral conditions for that PNV type would be within the expected ranges. Both situations would have occurred naturally.

The next sections include comparisons of current conditions to historic conditions for the most common PNV types on the Grand Mesa Geographic Area, to see where differences occur. This information can be used to identify future management opportunities.

Spruce-Fir PNV Type

The spruce-fir PNV type is mapped on 22 percent of the Gunnison Basin Geographic Area. The climax community in this PNV type includes Englemann spruce and supalpine fir as the overstory species. In some areas Englemann spruce may be the only overstory species (Romme et al. 1999, Johnston et al. 2001). In the lower elevation range of this type (10,000 to 11,000 feet) lodgepole pine is often present as an early seral species, and remnant lodgepole pine trees may persist into the later seral stages. The spruce-fir PNV type includes 61 percent of what is currently classified as spruce-fir cover type and 28 percent of what is currently in lodgepole pine cover type.

Table 3 describes the seral stages and the timeline for succession in the spruce-fir PNV type. This table also displays a comparison of the modeled historic range of seral conditions to the current seral conditions (as percentages) within the spruce-fir PNV type.

Table 3. Succession (Seral Stages) in Spruce-Fir PNV Type

	Early	**Early-Mid**	**Late-Mid**	**Late**
Seral Stage Descriptions*	Initially grass/forb, low shrub with lodgepole pine or spruce seedlings eventually becoming established. May last 50 to-200 years, depending on the time it takes trees to become established.	Dense pole-sized lodgepole pine or spruce, grass and forb understory, lasting up to 150 years	Mature lodgepole pine overstory with fir and spruce trees growing in the understory. May persist 150 to 300 years.	Variable density of mature spruce and fir, remnant lodgepole pine, multiple age and size classes. New trees can become established in gaps in canopy. Lasts until next stand replacing disturbance
VDDT Modeled Range of Seral Conditions	27-32%	20-24%	12-13%	31-40%
Current Seral Conditions	5%	49%	45% (Limited age data makes it difficult to differentiate between late-mid and late seral conditions.)	

*Romme et al. 2003

Currently much of the spruce-fir PNV type is in mid-seral conditions (includes both early-mid and late-mid), little is in early seral conditions. Approximately 69 percent of this PNV type is dominated by spruce-fir (mostly in the later seral condition above), 25 percent of this PNV type is dominated by lodgepole pine (in the early-mid seral stage), and 5 percent is in grass-forb cover.

The historic fire regime for the spruce-fir PNV type was long return interval (> 200 years), stand replacing fires, which could cover areas from 1,000 to 10,000 acres (Peet 1981 as cited in Neely et al. 2001) mixed with infrequent low-intensity surface fires that affected much smaller areas. Fire return intervals tended to be longer at higher elevations and in moist depressions and valley bottoms, up to 500 years (Romme et al. 1999). Since 1970 there have been only 60 fires in this PNV type and 63 percent were human caused. All but 2 fires burned less than 1 acre, each. The human-caused Crystal Creek fire in 1980 burned approximately 200 acres, 30 acres in this PNV type.

This PNV type occurs at higher elevations throughout the Geographic Area. Past harvest activities have affected approximately 15 percent of the spruce-fir PNV type. Shelterwood and selection harvests have been the silvicultural systems used the most (affecting 8 percent of the PNV type). Much smaller amounts of sanitation, seed tree and clearcut harvests have occurred (affecting 4 percent of the PNV type). The majority of the harvest activities have occurred since 1960, with peaks in activity in the 1980s.

The clearcuts are in the early seral stage. The sanitation/salvage cuts are included in the early-mid conditions. Shelterwood and selection harvest practices reduced the density of stands but did not alter the seral condition. Areas treated with this method are mostly in the late-mid seral condition.

Spruce-Fir-Aspen PNV Type

The spruce-fir-aspen PNV type is mapped on 18 percent of the Gunnison Basin. The climax community in this PNV type includes Englemann spruce and subalpine fir as the dominant overstory species with aspen and lodgepole occurring in all seral stages. This PNV type is currently comprised of 47 percent of the current aspen cover type, 14 percent of the current lodgepole pine type and 30 percent of the current spruce-fir cover type.

Table 4 describes the seral stages and timeline for succession in the Spruce-Fir-Aspen PNV type. This table also displays a comparison of the modeled historic range of seral conditions to the current seral conditions (as percentages) within the spruce-fir-aspen PNV type.

Table 4. Succession (Seral Stages) in Spruce-Fir-Aspen PNV Type

	Early	**Early-Mid**	**Late-Mid**	**Late**
Seral Stage Descriptions*	New stand of aspen seedlings/suckers , and occasional lodgepole pine with grass and forb understory lasting 30-50 years	Dense pole-sized aspen and occasional lodgepole pine, grass and forb understory, lasting up to 100 years	Mature aspen overstory with conifer trees growing in the understory. May take 100 to 200 years for conifers to dominate stand.	Mature conifer, scattered mature aspen in overstory. New trees can become established in gaps in canopy. Lasts until next stand replacing disturbance
VDDT Modeled Range of Seral Conditions	13-19%	22-29%	13-16%	35-49%
Current Seral Conditions	4%	63%	33% (Limited age data makes it difficult to differentiate between late-mid and late seral conditions.)	

*Romme et al. 2003

Table 4 shows the majority of this PNV type is in mid-seral conditions. This PNV type takes a very long time to progress through the different successional stages. A large percent of this type is in inaccessible areas, and information on stand ages and disturbance history that would validate seral stage assignments has not been collected.

This PNV type is generally below the spruce-fir PNV type in elevation. Approximately 43 percent of the spruce-fir-aspen PNV type is currently dominated by spruce-fir (mostly in late-mid seral stage), 16 percent of this PNV type has lodgepole pine as the dominant overstory species (early-mid seral stage), and 38 percent is currently dominated by aspen in the overstory (early-mid seral stage).

The fire regime in the spruce-fir-aspen PNV type is similar to that described above for the spruce-fir PNV type (long return interval stand replacing fires affecting large areas, mixed with infrequent low-intensity fires affecting small areas). The large amount of mid-seral conditions in this PNV type is an indication that large areas were affected by fire in the past (Johnston et al. 2001). Recent fires have been very infrequent and usually very small. Since 1970, 39 fires have been reported in this PNV type, mostly caused by

lightning. A man-caused fire in 1991 burned approximately 300 acres in the West Elk Wilderness. Approximately 200 acre of the spruce-fir-aspen PNV type burned.

Timber harvest has not had a significant influence on seral stage conditions in this PNV type. Approximately 10 percent of the spruce-fir-aspen PNV type has been affected by timber harvest activities. Selection harvests, predominantly before 1950, have affected 5 percent of this PNV type. Other harvest methods include: shelterwood (1970s and 1980s, affected 3 percent of the PNV type), final removal and clearcuts (1960s, affected less than one percent). Harvests were roughly split between lodgepole pine and spruce-fir. Most of the harvest methods used result in lessening stand densities, but do not alter seral stages.

Douglas-fir PNV Type

The Douglas-fir PNV type is mapped on 11 percent of the Gunnison Basin Geographic Area. The climax community in this PNV type includes Douglas-fir as the dominant overstory species. At lower elevations (8,000-9,500 feet) in this PNV type aspen is an early seral species and may persist in the overstory in later stages. Exclusive to the Gunnison Basin Geographic Area (on the GMUG) lodgepole pine is the early seral species at higher elevations (9,000-10,500 feet). Both aspen and lodgepole pine may occur at the mid elevations. Lodgepole pine is more prevalent in the northern half of the Geographic Area (Johnston et al. 2001). Other conifer species such as ponderosa pine, limber pine, bristlecone pine, subalpine fir and spruce species may also occur in this PNV type. Currently the Douglas-fir PNV type is comprised of 25 percent of the current aspen cover type, 60 percent of the Douglas-fir cover type, 29 percent of the current lodgepole pine type and 37 percent of the identified ponderosa pine cover type.

Table 5 describes the seral stages and timeline for succession in the Douglas-fir PNV type. This table also displays a comparison of the modeled historic range of seral conditions to the current seral conditions (as percentages).

Table 5. Succession (Seral Stages) in Douglas-fir PNV Type

	Early	**Early-Mid**	**Late-Mid**	**Late**
Seral Stage Descriptions*	New stand of aspen and/or lodgepole pine seedlings/suckers with grass and forb understory lasting 30-50 years	Dense pole-sized aspen and/or lodgepole pine, grass and forb understory, lasting up to 100 years	Mature aspen/lodgepole pine overstory with Douglas-fir trees growing in the understory. May take 100 to 200 years for Douglas-fir to dominate stand.	Mature Douglas-fir, scattered mature aspen/lodgepole pine in overstory. New trees can become established in gaps in canopy. Lasts until next stand replacing disturbance
VDDT Modeled Range of Seral Conditions	14-20%	19-20%	15-17%	58%
Current Seral Conditions	2%	63%	35% (Limited age data makes it difficult to differentiate between late-mid and late seral conditions.)	

*Komarkova et al. 1988, Johnston et al. 2001

The Douglas-fir PNV type in the Gunnison Basin Geographic Area is currently comprised of 51 percent lodgepole pine dominated stands(both early-mid and late-mid seral conditions), 31 percent aspen dominated stands (early-mid seral conditions) and 13 percent Douglas-fir dominated stands (late-mid seral conditions). The large amount of lodgepole pine and aspen dominated stands (both early-mid and late-mid seral conditions) are an indication of past extensive fires in this Geographic Area. In some cases Douglas-fir seed may have been eliminated from some of these areas as a result of repeated fires (Johnston et al. 2001). This type tends to be on steeper, drier sites than the previously discussed PNV types.

Douglas-fir is often thought to have a fire-maintained open seral stage that develops from frequent, low intensity fires. Older Douglas-fir trees are resistant to fire and survive these types of fires. However, in the Gunnison Basin Geographic Area, the predominance of lodgepole pine, which has a fire regime of large scale stand replacing fires, seems to suggest that the fire regime for this PNV type may be more similar to that of lodgepole pine.

Since 1970, 59 fires have been recorded in this PNV type. Most (63 percent) have been caused by lightning and have burned less than an acre each. Several fires have burned several hundred acres, both human-caused.

Fuel loads in much of this PNV type are typically high (Johnston et al. 2001). Lack of frequent low intensity fires in this PNV type have allowed blue spruce and lodgepole pine to regenerate in the understories, creating much denser stand conditions than would have occurred historically. The potential for larger, more intense fires due to increased ladder fuels now exists in many stands. Prescribed fire has been used on approximately 8 percent of this PNV type, to reduce fuel accumulations and retain earlier seral conditions.

Timber harvest activities have affected approximately 12 percent of this PNV type. The majority of the harvest was done through selection harvests, with most of the acres being treated prior to the 1960s. Limited clearcutting, shelterwood, thinning and salvage harvest have occurred in this PNV type, predominantly in the 1970s and 1980s.

Lodgepole Pine PNV Type

The lodgepole pine PNV type is mapped on 6 percent of the Gunnison Basin Geographic Area. This PNV type only occurs on the Gunnison Basin Geographic Area portion of the GMUG. Lodgepole pine is often the only tree species that grows in the climax plant community of this PNV type. Occasionally aspen is present in the species mix. This PNV type occurs mostly in the northern half of the Geographic Area (Johnston et al. 2001). This PNV type includes approximately 27 percent of what is currently in the lodgepole pine cover type.

Table 6 depicts the seral stages and timeline for this PNV type as well as a comparison of the modeled historic range of seral conditions to the current seral conditions (as percentages).

Table 6. Succession (Seral Stages) in Lodgepole Pine PNV Type

	Early	**Early-Mid**	**Late-Mid**	**Late**
Seral Stage Descriptions*	Initially grass/forb, low shrub with lodgepole pine seedlings eventually becoming established. May last 50 years, depending on the time it takes trees to become established.	Dense pole-sized lodgepole pine, grass and forb understory, lasting to 100 years	Mature lodgepole pine overstory, lodgepole pine and regeneration in the understory where overstory gaps results from individual tree mortality, lasting up to 100 years	Stable multi-storied, multi-aged lodgepole pine stand, predominantly forb understory. Lasts until next stand replacing disturbance
VDDT Modeled Range of Seral Conditions	8-14%	23-26%	17-24%	23-43%
Current Seral Conditions	6%	43%	50% (Limited age data makes it difficult to differentiate between late-mid and late seral conditions.)	

*Komarkova et al. 1988, Johnston et al. 2001

Ninety-seven percent of this PNV type is currently dominated by lodgepole pine. As shown in the table above, the majority of this PNV type is in mid seral conditions (includes both early-mid and late-mid). The majority of the lodgepole pine PNV type is located in the Taylor Park area, and in scattered pockets south to Cochetopa Pass.

Fires are more frequent in lodgepole pine than spruce-fir, as lodgepole pine forests occur in warmer and drier environments. Fire intervals were historically between 200-400 years at higher elevations; however 50-150 year intervals were probably more characterisc at lower elevations (Peet 1981 as cited in Neely et al. 2001). Recent fire has

not had much role in shaping this PNV type. Since 1974 only 46 fires have been reported and 70 percent have been human-caused. All but one fire burned less than 5 acres (see Fire Management section).

Approximately 27 percent of this PNV type has been affected by some type of timber harvest. Selection harvests have affected three percent of this PNV type, but most of this harvest occurred prior to 1950. Shelterwood harvests have affected one percent of the lodgepole pine PNV type since the mid-1970s. Clearcut harvests have been used on seven percent, with most acres being harvests since 1980 (these are the areas included in the early seral condition, above). Dwarf mistletoe is a problem in some areas of this PNV type. Timber stand improvement treatments to make stands less susceptible have occurred on 9 percent of this type, and disease control harvests have occurred on an addition 4 percent, since the mid-1980s. Timber harvests have mostly resulted in reducing stand densities, which tends to extend the length of time a stand remains in a given seral condition.

Aspen PNV Type

In the Aspen PNV type, pure aspen is the climax plant community, with no conifer species present. The Aspen PNV type is mapped on two percent of the Gunnison Basin Geographic Area. This PNV type is much less prevalent on this Geographic Area than any other on the GMUG. Approximately 16 percent of the current aspen cover type is within the aspen PNV type.

Table 7 depicts the seral stages and timeline for this PNV type as well as a comparison of the modeled historic range of seral conditions to the current seral conditions (as percentages).

Table 7. Succession (Seral Stages) in Aspen PNV Type

	Early	**Early-Mid**	**Late-Mid**	**Late**
Seral Stage Descriptions*	New stand of aspen seedlings/suckers with grass and forb understory lasting 10 to 20 years	Dense pole-sized aspen, grass and forb understory, lasting 50 to 80 years	Mature aspen overstory, aspen regeneration in the understory where overstory gaps results from individual tree mortality, lasting up to 80 years	Stable multi-storied, multi-aged aspen stand, predominantly forb understory.Lasts until next stand replacing disturbance
VDDT Modeled Range of Seral Conditions	8-14%	23-26%	17-24%	23-43%
Current Seral Conditions	6%	43%	50% (Limited age data makes it difficult to differentiate between late-mid and late seral conditions.)	

*Romme et al. 2003

The Aspen PNV type is also predominantly in mid seral conditions (includes both early-mid and late-mid). Few areas are in early seral. As with the previous PNV types, the distribution of seral conditions in the aspen PNV type is the result of past large scale fire activity in the late 1800s (Johnston et al. 2001).

Fire has had very little effect on this PNV type. Since 1970 only eight fires have burned in this PNV type, affecting less than one acre each, on average. Historically fire would have maintained a mosaic of aspen seral conditions through relatively frequent fire intervals (Peet 1981 as cited in Neely et al. 2001).

Less than two percent of the aspen PNV type has been affected by timber harvest. Clearcuts were done in the early 1990s affecting less than 250 acres, and selection harvest in the early 1900s affected less than 450 acres.

Aspen, particularly at lower elevations, is declining. Aspen regeneration has been reduced due to the lack of frequent fire disturbance. When aspen regeneration does occur, it is often impacted by grazing wild ungulates that eat regenerating suckers as well as inflict damage to mature trees by eating bark. Elk populations are currently much higher than historical levels.

Sagebrush

The Sagebrush PNV type is mapped on approximately seven percent of the Gunnison Basin Geographic Area. This mapping includes three different types of sagebrush communities. Wyoming big sagebrush communities are found below 9,000 feet in elevation. Big sagebrush communities usually include antelope bitterbrush in the species mix, and occur up to 10,000 feet in elevation. Both of these types reach average heights of 1.6 feet (Johnston et al. 2001). Black sagebrush communities can be found interspersed among both the big sagebrush types, on areas of heavy clay soils. Black sagebrush has a shorter growth form, averaging 0.6 feet (Johnston et al. 2001).

Current seral condition classification in the Sagebrush PNV type indicates 30 percent in early seral (currently dominated by grass and forb cover types), 51 percent in mid seral conditions and 19 percent in late seral conditions. This classification is in need of further refinement because the primary determining factor for seral condition classification was shrub height. All black sagebrush areas would have been classified as mid seral based on shrub height, and only big sagebrush types could have been classified as late seral. Seral condition in sagebrush is related to plant species composition and this information is limited in our vegetation data.

Historically, frequent fires (both natural and human ignitions) created mosaics of seral conditions in the sagebrush PNV types. During the past century the sagebrush PNV types in the Gunnison Basin Geographic Area have been influenced by livestock grazing, past spraying to reduce shrub cover and increase grass and forb production, reseeding, fire suppression and most recently prescribed burning. All three sagebrush community types recover relatively quickly (within 30 years) following burning and seeding. Livestock grazing has the largest effect on plant species composition. Activity records are not complete for treatments prior to 1980. Since 1983 approximately 14 percent of

this PNV type has been treated with prescribed fire to increase early and mid seral conditions, to provide improved forage for wildlife and livestock.

This PNV type is very important to big game as winter range, and each of the different community types are used for different reasons by Gunnison sage grouse.

Key Findings

- Lodgepole pine is the most common tree species occurring on the Gunnison Basin Geographic Area. This species occurs as the dominant species on 20 percent of the Geographic Area, and is a component of the species mix on an additional 9 percent of the Geographic Area. Lodgepole pine occurs naturally only on the Gunnison Basin Geographic Area portion of the GMUG.

- Aspen is the second most common tree species occurring on the Gunnison Basin Geographic Area. This species occurs as the dominant species on 14 percent of the Geographic Area, and is a component of the species mix on an additional 13 percent of the Geographic Area.

- The large extent of lodgepole pine and aspen is the result of large scale fires in the past (Johnston et al. 2001). As a result, the majority of this geographic area is currently in mid seral conditions.

- Current vegetation classification shows approximately 46 percent of forest and woodland cover types are in the sapling/pole size class (mostly in the lodgepole pine and aspen cover types), and 53 percent are in mature size class (mostly in the spruce-fir cover type). As mentioned above, photo interpretation errors in lodgepole pine have resulted in inflating the sapling/pole size class and under representing the mature size class that actually exists.

- The majority of the current forest and woodland vegetation conditions – 87 percent - have dense canopy closures (> 40 percent canopy closure).

- There is very little early seral condition in any cover type on the Gunnison Basin Geographic Area, as shown in Tables 3 through 7.

- When comparing the compositions of current vegetation cover types to PNV types (Figure 1 to Figure 7), the forest types total percentages are approximately equivalent. The majority of the Geographic Area is in mid seral stages currently dominated by lodgepole pine and aspen, however much of these areas will eventually succeed to spruce-fir and Douglas-fir. The biggest difference occurs in the grass/forb types. Much of the current grass/forb cover type is classified as early seral stages of sagebrush and willow PNV types.

Vegetation Trends

- The trend across all vegetation cover types on the Gunnison Basin is to continue successional progress predominantly with the absence of either natural or human-caused disturbances. Structural and compositional conditions in each cover type

will continue to progress along successional timelines. A shift from aspen dominated forests to conifer dominated forests is also occurring as a result of successional changes.

Vegetation Management Implications

Management implications of vegetation conditions relate to differences between current and historic vegetation conditions. Where landscape conditions are similar to historic conditions landscapes are more resilient following disturbances, suitable habitat is provided for all species that evolved there, and ecosystems are productive and sustainable over time. Where current conditions deviate from historic ranges, there are increased risks for natural disturbances to be of higher intensities and affect larger areas than in the past; some habitats may become very limited or lost, threatening species viability; and loss of productivity can result in both ecological and economic losses. Management activities that can include both human and natural disturbances can be used to restore more desirable vegetation conditions. Management implications for specific cover types are discussed below.

Spruce-Fir

- The spruce-fir cover type occurs in the spruce-fir, spruce-fir-aspen, and spruce-Douglas-fir-fir PNV types. Disturbances (human or natural) that occur in the spruce-fir-aspen PNV type will result in aspen regeneration within a very short period of time. Intensive, large scale disturbances in the spruce-fir or spruce-Douglas-fir-fir PNV type do not have aspen as an early seral species, and may take over 200 to 300 years to regenerate to mature spruce.

- All three PNV types dominated by spruce and fir currently have large percentages in mature, dense structural conditions. These conditions are ripe for fire and epidemic insect and pathogen outbreaks (see Forest Health and Fire Management sections). Because so much of the landscape is in the same condition, there is a high probability that large areas can be affected at the same time. Large scale disturbances (both fire and insect outbreaks) are the natural regimes for these PNV types. Management activities that increase diversity in age, size and seral condition, could be used to reduce the potential effects of natural disturbances.

- The majority of this cover type in the Gunnison Basin Geographic Area is in Wilderness and currently unroaded areas. Only natural processes will alter vegetation conditions in Wilderness areas and potentially where future management decisions (i.e., theme designations) limit or restrict management activities in these unroaded areas.

Lodgepole Pine

- The lodgepole pine cover type is found in the spruce-fir, spruce-Douglas-fir-fir and Douglas-fir PNV types as an early and mid seral species. It is found in all seral stages of the lodgepole pine PNV type.

- Lodgepole pine regeneration naturally occurs in very dense stands, which can have suppressed growth rates (Johnston et al. 2001) and become very susceptible to dwarf mistletoe and mountain pine beetle. A majority of this cover type are in these stand conditions. (See Forest Health section). As with the spruce-fir type above, there is a high probability that large areas could be affected at the same time by an insect or pathogen disturbance. If diversity in stand structure, age and size was increased, potential effects from disturbances could be reduced.

Douglas-fir

- There is currently much less Douglas-fir on the Gunnison Basin Geographic Area than would be expected historically. Much of what could be in Douglas-fir is currently in lodgepole pine cover. This shift is likely due to historic fires and past insect outbreaks eliminating much of the Douglas-fir seed source (Johnston et al. 2001). Douglas-fir tends to occur on steeper, drier sites, reducing the chance that this species will regenerate if disturbed.

- Much of the Douglas-fir that does occur on the Gunnison Basin Geographic Area is in stands mixed with blue spruce. In the past frequent low intensity fires would have created and maintained more open stands. In the absence of fire resulting from approximately 100 years of fire suppression, blue spruce and other vegetation has established in the understory resulting in the currently dense stands, creating a potential for future fires to be more intense than would have occurred historically.

Aspen

- The aspen cover type occurs in most of the conifer PNV type as the early and mid seral conditions, with the exception of the spruce-fir and lodgepole pine PNV types. The aspen cover type is in all seral stages of the aspen PNV type.

- Aspen stands become very susceptible to cankers and root rots as they mature. A large percentage of the aspen cover type on the Gunnison Basin Geographic Area is between the age of 80 and 120 years. An increasing amount of mortality caused by these agents is expected in the future.

- Over half of the aspen stands on the Gunnison Basin Geographic Area include conifer species in the understory or as codominant species. In the absence of some disturbance, these stands will eventually succeed to conifer dominated cover types. A shift from an aspen cover type to various conifer cover types will change the types of habitat available on the Gunnison Basin Geographic Area to favor those species that require mature conifer forests.

- Aspen, particularly at lower elevations is in decline due to a combination of lack of disturbance that normally generates suckering and a large wild ungulate population that browses what regeneration does occur.

Sagebrush

- Past fire suppression, range treatments and livestock grazing altered the understory species composition in this cover type. Structural stage diversity has become more uniform and less patchy across the landscape. These combined changes have altered the habitat that historically would have been provided by this cover type.

- A small percent of the sagebrush cover type currently found in the Geographic Area is located on NFS lands. This cover type is very important as winter range for big game species and different elevations provide habitat for Gunnison sage grouse. The importance of these areas on Forest for species conservation may increase, depending on the condition and future management of this cover type off Forest. Any future treatments in this cover type must consider how this cover type responds to disturbances so that desired conditions will be achieved.

Grass/Forb

- Grass/forb cover types make up 19 percent of the NFS landscape in the Gunnison Basin Geographic Area. This includes areas at all elevations, including alpine areas. The species composition in grass-forb cover types has been altered from historic conditions through livestock grazing, and introduction of non-native species. These cover types may be candidates for future restoration efforts.

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