Appendix D. Vegetation Classifications and Descriptions

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Introduction

This appendix defines the vegetation classifications that form the basis for many forest plan components related to vegetation and wildlife habitat.

Data Sources

The vegetation classifications used are consistent with the best available data for the HLC NF, based on the R1 Classification System (Barber, Bush, & Berglund, 2011). This approach ensures that reliable information is available for analysis and monitoring through the life of the 2020 Forest Plan.

Forest Inventory and Analysis

The sources of data for quantifying vegetation include Forest Inventory and Analysis (FIA) plots and FIA intensified grid plots. FIA is a national inventory of forest ecosystem data derived from field sample locations distributed systematically across the U.S. (Bush, Berglund, Leach, Lundberg, & Zeiler, 2006). Data collection standards are strictly controlled, and the sample design and collection methods are scientifically designed and repeatable. FIA provides a statistically-sound sample to provide unbiased estimates at broad- and mid-levels. Plots have been permanently established and are remeasured on a regular basis. The National FIA grid covers all NFS lands. The FIA grid has been intensified by four times (4x) on the HLC NF, using protocols compatible with the National FIA grid. For GAs where the 4x intensification is completed, these plots are added to the base FIA to create an enhanced analysis dataset. FIA and FIA intensified grid data are summarized in the Region 1 Summary Database, which is an access database that includes statistical reporting functions and derived attributes or classifications consistent with the R1 Classification System (Barber, Berglund, & Bush, 2009; Bush et al., 2006).

Region 1 Vegetation Map

The Region 1 vegetation mapping system (R1 VMap) (Barber et al., 2011) is the data source for classification and spatial mapping of vegetation. R1 VMap is derived from national and regional remote sensing protocols, using a combination of satellite imagery and airborne acquired imagery, with refinement and verification through field sampling. The product is assessed for accuracy. This product allows for an analysis of the spatial distribution of vegetation. It was designed to allow consistent applications of vegetation classification and map products across all land ownerships (Barber et al., 2009; Barber et al., 2011; Berglund, Bush, Barber, & Manning, 2009). R1 VMap represents the best spatial estimate for vegetation attributes including lifeform, dominance type, size class, and density class.

Broad Potential Vegetation Types

Lands across the HLC NF are grouped into broad potential vegetation types (PVTs), based on climate and site conditions. PVTs serve as a basis for description of ecological conditions (potential productivity, natural biodiversity, and processes). PVTs are assemblages of habitat types, which are aggregations of ecological sites of like biophysical environments (such as climate, aspect, and soil characteristics) that produce plant communities of similar composition, structure and function (Mueggler & Stewart, 1980; Pfister, Kovalchik, Amo, & Presby, 1977). Broad PVTs are used because it is not possible to accurately map and model individual habitat types across the forest. The vegetation communities that would develop over time given no major disturbances (the climax plant community) would be similar in a PVT. It is assumed that PVTs generally remain constant. A consistent hierarchy of broad PVT developed for the Northern Region (Milburn, Bollenbacher, Manning, & Bush, 2015) is used, as shown in Table 1.

Table 1. Potential vegetation type classification for habitat types found on the HLC NF

Region 1 broad potential vegetation type	Region 1 habitat type groups	Region 1 MT potential vegetation type	Habitat type codes	General description
Warm dry	Hot dry	pifl	000, 040, 050, 051, 052, 070, 0903, 0913, 0923, 0933, 0943, 0953	The warm dry broad potential vegetation group occupies the warmest and driest sites on the HLC NF that support forests. These sites support ponderosa pine and dry Douglas-fir habitat types. This group occurs at lower elevations, on warm southerly aspects, and/or on droughty soils. Forests are often dominated by Douglas-fir, ponderosa pine, or limber pine. Open forest savannas may occur on this group, where grasses or shrubs are dominant, and trees are widely scattered due to repeated frequent fires.
	Warm dry	pipo	100, 110, 130, 140, 141, 142, 160, 161, 162	
			1034, 1044, 1000325, 1000335, 1000345, 1000355, 1000375, 1054, 1064, 150	
		psme1	200, 210, 220, 230, 2054, 3904	
		psme2	311, 380	
		psme3	321	
		pipo	180, 181, 182	
	Mod warm dry	pipo	170, 171, 172, 190	
		picea	430	
		psme2	2404, 250, 260, 261, 262, 263, 280, 281, 282, 283, 292, 310, 312, 313	
		psme3	360, 320, 322, 323, 324, 330, 350, 370, 340	
	Mod warm Mod dry	psme2	290, 291, 293	
Cool moist	Cool moist	abla2	600, 620, 621, 622, 623, 624, 625, 660, 661, 662670, 671, 673, 740	The cool moist group comprises the most productive forest sites on the HLC NF. Moist Douglas-fir habitat types are in this group, along with lower subalpine fir and spruce habitat types. This setting occurs on mid to high elevation sites across all aspects. Lodgepole pine and Douglas-fir are the most common dominant species, with Engelmann spruce and subalpine fir common as well.
		picea	400, 420, 421, 422, 460, 461, 462, 470, 0046, 4724, 4754	
	Cool wet	abla1	610, 630, 635, 636, 637, 650, 651, 652, 653, 654, 655, 631, 632	
		picea	410, 440, 480	
	Cool mod dry to moist	abla2	663	
		abla3	640, 691, 693, 700, 720, 750, 770, 780, 790, 791, 792, 690, 607, 745	
		picea	450	
		pico	900, 910, 920, 930, 950, 9604	
Cold	Cold	abla3	672, 692, 694, 731, 732, 733,	The cold broad potential vegetation group occupies the highest elevation areas that
		abla4	674, 730, 800, 810, 820, 830, 831, 832	

Region 1 broad potential vegetation type	Region 1 habitat type groups	Region 1 MT potential vegetation type	Habitat type codes	General description
		pico	925, 940	support forests. Some sites are cold, moist subalpine fir habitat types that support moderately dense forest cover. Remaining areas are cold, drier subalpine fir and whitebark pine types where growing conditions are harsher and tree density more open. Subalpine fir, Engelmann spruce, and whitebark pine are the common species.
	Timberline	pial	850, 870, 890	
Xeric grassland	Bluebunch wheatgrass	drygrass	Ref 199: 015, 016, 017, 020, 065; Ref 115: 200, 500, 800; Ref 103: 47130, 47131, 47132, 47140, 47141, 47142, 47143, 47144, 47145, 47146; Ref 114: 100005, 100006, 10010, 100021, 100054, 100055	Xeric grasslands are drought-tolerant, found on dry sites and often at low elevations, containing tall and medium height, cool and warm season grasses such as bluebunch wheatgrass, green/Columbia/western needlegrass; and short grasses such as Sandberg bluegrass.
Mesic grassland	Western wheatgrass	agrsmi	Ref 114: 100001. Ref 115: 100	Mesic grasslands are found on more moist sites, and contain greater amounts of mesic forbs, denser cover, and more species richness than xeric grasslands. The functional plant groups are characterized by long lived, moderately deep rooted cool and warm season grass species (such as rough fescue, Idaho fescue, blue gramma, and tufted hairgrass) with a wide variety of mesic forbs. Shrubs may be present with minor cover.
	Fescue	fesida	Ref 199: 18, 39; Ref 615: GB5917, GB5922; Ref 103: 47003, 47004, 47120, 47121, 47122, 47123, 47124, 47125, 47126, 47127; Ref 114: 100023	
		fessca	Ref 199: 19; Ref 103: 47110, 47111, 47112, 47113, 47114, 47115	
Mesic shrubland	Mesic shrubland	potfru	Ref 199: 34; Ref 103: 46620, 46621, 46622, 46623	Mesic shrublands are often associated with conifer forests and occur as large patches on moist sites or small patches in grasslands. These shrublands can be very productive and favored by wildlife. Communities contain species such as mountain big sagebrush, snowberry, ninebark, and serviceberry, with Idaho fescue, mountain brome and mesic forbs in the understory.
		mesic shrub	Ref 199: 030; Ref 110: 030, 031; Ref 112: 156, 157, 158, 159, 160, 161 Ref 115: 2000, 2100; Ref 114: 100052, 100056; Ref 615: SM19	
Xeric shrubland/ woodland	Low shrubland	sage1	Ref 199: 031; Ref 103: 46600, 46601, 46602, 46603	Xeric shrubland communities occur on dry sites, and support shrub species such as Wyoming big sagebrush, basin big sagebrush, low sagebrush and black
	Mountain shrubland	sage4	Ref 199: 033; Ref 103: 46611, 46612, 46613	

Region 1 broad potential vegetation type	Region 1 habitat type groups	Region 1 MT potential vegetation type	Habitat type codes	General description
	Xeric sagebrush	sage3	Ref 199: 032	sagebrush. Low sagebrush tends to occupy the lower, drier and hotter sites with shallow soils whereas basin big sagebrush typically dominates sites with deeper soils and more plant available moisture. The understory is typically be dominated by graminoid species such as needle-and-thread, Sandberg bluegrass and bluebunch wheatgrass. Xeric woodlands are typically hot and dry or are steep, with shallow soil. The dominant overstory species include Rocky Mountain juniper and mountain mahogany, with the latter usually found on rocky outcrops.
		sage2	Ref 115: 1100, 1200; Ref 103: 46610, 46614; Ref 114: 100014, 100015	
	Xeric shrubland	dry shrub	Ref 103: 46201, 46301, 46630, 46632, 46633; Ref 114: 100028; Ref 115: 1400; Ref 199: 035; Ref 615: SD49	
		rhus	Ref 199: 036, 037; Ref 103:46640, 46641, 46642; Ref 114: 100046, 100047, 10048	
		sage5	Ref 114: 100013; Ref 115: 1000	
	Salt desert shrub	saltshrub	Ref 199: 038; Ref 115: 1300; Ref 103: 46650, 46651, 46652; Ref 114: 100049, 100050.	
	Juniper woodland	juniper	Ref 102: 151, 152; Ref 114: 100029, 100030; Ref 199: 50	
Riparian/wetland	Aspen woodland	poptre	Ref 102: 351, 356; Ref 112: 117, 118, 119, 120, 121; Ref 114: 100040; Ref 199: 078	Riparian systems occur along creeks and rivers and occupy floodplains, streambanks, islands in rivers, narrow bands in steep channels, and backwater channels. Vegetation is comprised of a mosaic of plants which tolerate periodic flooding and a seasonally high water table. Trees may be present with riparian shrubs and herbaceous species. In wide valley bottoms, the vegetation is a mosaic of all lifeforms with patterns reflecting the meander patterns of the stream/river. Key tree species include aspen, cottonwood, Engelmann spruce and
	Riparian shrub	ripshrub	Ref 112:030, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 150, 151, 152, 153, 154, 155, SW1117, SW5112, SW5113; Ref 199:071, 072, 073, 074	
	Wetland graminoid	ripgrass	Ref 615: MW19; Ref 199: 021, 061, 070; Ref 112: 200, 201, 202, 203, 204, 205, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, MD3111, MM1912, MM2912, MM2914, MM2915, MM2917, MM2920, MS31111, MW3912, MW4911, MW4912. Ref 103: 47100, 47101	

Region 1 broad potential vegetation type	Region 1 habitat type groups	Region 1 MT potential vegetation type	Habitat type codes	General description
	Riparian deciduous tree	ripdecid	Ref 102: 301; Ref 110: 20; Ref 112: 103, 104, 105, 106, 110, 111, 112, 113, 114, 115, 116, 122, 123, 124, 125, 130; Ref 114: 100024; Ref 199: 60, 71, 72, 73, 74, 79	subalpine fir; and Douglas fir, and Rocky Mountain juniper on drier sites. Shrubs may include mountain alder, various species of willows, river birch, dogwood, hawthorn, chokecherry, rose, silver buffaloberry, Rocky Mountain maple and/or snowberry. A wide variety of herbaceous species may be present. Wetlands are characterized by dominant vegetation adapted to saturated soil conditions. The vegetation complex is represented by a mosaic of herbaceous and woody plants. Low willow species, bog birch and bog blueberry are often present. Herbaceous species may be dominated by cattails, sedges, rushes, spikerushes or bulrushes. Bryophytes may occur in fens.
Alpine	Alpine herbaceous	alpine	Ref 113: 001,002, 003,004,005, 006, 009, 010, 012, 013, 015, 016, 018, 019, 022, 023, 024, 025, 026, 027, 028, 029; Ref 199: 080, 081, 084	Alpine ecosystems occupy harsh high elevation sites, resulting in short stature and relatively slow growth for both shrubs and herbaceous species. Wetland communities are present in snowloaded depressions. Alpine ecosystems are mostly treeless, although some conifers may be present, often with a krummholz growth form. The plant communities are dominated by a number of shrubs, forbs and graminoids including: arctic willow (turf community), mountain avens, (cushion plant community), mountain heather and moss-heather (snow bed communities).
	Alpine shrub		Ref 113: 007, 008, 011, 014, 017, 020, 021; Ref 199: 087	
Sparse	Sparse	Sparse	Ref 101: 010	Rocky habitats include rock outcrops and scree. Vegetation is sparse or largely lacking. Bryophytes and lichens often occur in crevices and flourish on open rock surfaces. Rock outcrop and scree habitats may also be found at lower elevations.

Table 2 provides the acres and proportion of each Region 1 broad PVT that occurs on the HLC NF.

Table 2. Percent of broad potential vegetation types on NFS lands on the HLC NF[1]

Broad potential vegetation type	Total HLC NF	Big Belts	Castles	Crazies	Divide	Elkhorn[3]	High-woods	Little Belts	Rocky Mtn	Snowies	Upper Black-foot
Warm dry forest	41%	72%	54%	45%	52%	35%/49 %	68%	46%	17%	45%	37%
Cool moist forest	31%	12%	17%	26%	27%	12%/2%	3%	32%	48%	44%	39%
Cold forest	24%	11%	20%	26%	17%	32%/39 %	3%	18%	32%	5%	23%
Xeric grassland[2]	0	<1%	0%	0%	0%	0%/0%	0%	<1%	0%	0%	0%
Mesic grassland[2]	<1%	3%	2%	0%	2%	16%/0%	3%	1%	<1%	0%	<1%
Mesic shrubland[2]	<1%	0%	0%	0%	0%	0%/0%	6%	<1%	<1%	2%	0%
Xeric shrub/wood-land[2]	<1%	<1%	6%	2%	0%	4%/4%	18%	<1%	0%	0%	0%
Riparian/ wetland[2]	<1%	0%	0%	0%	0%	0%/0%	0%	<1%	0%	0%	0%
Alpine[2]	0%	0%	0%	0%	0%	0%/0%	0%	0%	0%	0%	0%
Sparse	2%	<1%	2%	0%	1%	2%/6%	0%	1%	2%	4%	3%

[1] Data is from the R1 Summary Database, FIA and FIA Intensified Grid plot data. Base FIA ("Hybrid 2011" dataset) is used forestwide and for the Rocky Mountain Range GA. Intensified grid data ("F12F15 Partial IntGrid 4x Hybrid 2016 Combined") is used for all other GAs. Values are rounded to the nearest whole number. Plots that have been impacted by fire and harvest are included, because these events would not change the PVT.
[2] Rare types or those distributed in small patches are not well captured by grid data, but are known to occur.
3 The HLC NF portion of the Elkhorns is represented by intensified grid data. The entire Elkhorns (all) is represented by base FIA data ("Hybrid 2011") and includes the portion of the GA on the Beaverhead-Deerlodge NF.

Cover Type

Cover types are assemblages of dominant vegetation, including forested and nonforested plant communities. They are groupings of dominance types that simplify analysis for the broad scale. Dominance types describe the most common species present, giving an indication of their relative abundance. Dominance type and cover type describe assemblages of plant species and are named after the most dominant species present. Information on how dominance types are determined is found in Barber and others (2011). The cover types on the HLC NF are shown in Table 3, based on the work of Milburn and others (2015).

Table 3. Cover type classification for dominance types found on the HLC NF

Cover type	Description and species associations	Region1 vegetation map: DomMid40*
Ponderosa pine	This cover type includes sites dominated by ponderosa pine, juniper, and/or limber pine. A minor component of Douglas-fir may be present. Ponderosa pine is found on a narrow elevation band between non-forested types and Douglas-fir forests. This cover type usually grows on the warm dry broad PVT.	MX-PIFL2, MX-PIPO, or MX-JUNIP1

Cover type	Description and species associations	Region1 vegetation map: DomMid40*
Douglas-fir	This cover type includes the R1 Dry Douglas-fir and Mixed Mesic Conifer types; on the HLC NF both are dominated by Douglas-fir. The Dry Douglas-fir portion is found on dry sites dominated by Douglas-fir, with potential components of ponderosa pine, limber, or juniper; it occurs primarily on the warm dry broad PVT. The mixed mesic conifer portion encompasses moist sites dominated by Douglas-fir which can be mixed with lodgepole pine, western larch, and/or subalpine fir/spruce. This type is found on sites more moist and productive than the dry Douglas-fir type, on both warm dry and cool moist broad PVTs.	Dry Douglas-fir: (IMIX or MX-PSME) AND (PVT = pifl, pipo, psme1, or psme3) Mixed mesic conifer: TMIX or [(MX-PSME or IMIX) AND (PVT is not pifl, pipo, psme1, or psme3)]
Western larch Mixed conifer	These sites are dominated by western larch, with components of Douglas-fir, lodgepole pine, and/or spruce. This type would commonly be found on the cool moist broad PVT, and is only present on the Upper Blackfoot GA.	MX-LAOC
Lodgepole pine	This type is dominated by lodgepole pine with minor components of other species. This cover type can occur on any forested broad PVT.	MX-PICO
Aspen/ hardwood	This cover type includes areas dominated by aspen or cottonwood, often with shrubs such as willow and alder. This type often occurs in association with riparian and moist upland areas and can be found in any forested broad PVT.	HMIX, MX-POPUL, or MX-POTR5
Spruce/fir	This cover type describes where subalpine fir and/or Engelmann spruce dominate, with minor components of other species. These are often climax forests. This cover type most often occurs on the cool moist or cold broad PVT.	MX-ABLA or MX-PIEN
Whitebark pine	The whitebark pine cover type occurs at the high elevations, most commonly on the cold broad PVT but sometimes in cool moist. Minor components of subalpine fir, spruce, or lodgepole pine may be present.	MX-PIAL
Grass	Grass can dominate the xeric and mesic grassland broad PVTs, and some dry forest types. Plant communities include forb mixes; rough fescue; Idaho fescue; western wheatgrass; bluebunch wheatgrass, needle-and-thread grass; tufted hairgrass; little bluestem; prairie sandreed; green needle grass; needlegrass; wheatgrass; timothy; crested wheatgrass; blue grama; kentucky bluegrass; buegrass; cool season short grass mix; cool season mid grass mix; warm season mid grass mix; warm season short grass mix; and mixed grass. Common nonnative species include timothy, crested wheatgrass, smooth brome, and Kentucky bluegrass.	Grass-dry; Grass-bunch; Grass-singlestem
Dry shrub	The dry shrub cover type occurs on the xeric shrub/woodland broad PVT, as well as some dry forest sites. Dominant shrubs include sagebrush; antelope bitterbrush; shrubby cinquefoil; skunkbush sumac; curl-leaf mountain mahogany; rabbitbrush; low shrub; saltbush, soapweed yucca sagebrush, and rabbitbrush.	Shrub-Xeric; MX-CELE3 MX-JUNIP, JUNIP
Riparian grass/shrub	This cover type occurs typically in the riparian/wetland broad PVT, but also potentially in cool and wet forest habitat types. Common species include willow, alder, mountain brome, smooth brome, dry sedge, wet sede/spikerush/juncus, and annual brome.	Grass-wet
Mesic shrub	Mesic shrubs most commonly dominate the mesic shrubland broad PVT. Species may include chokecherry, plum; rose; snowberry; huckleberry; mallow ninebark; white spirea, and buffaloberry.	Shrub-mesic
Sparse or non-vegetated	In addition to the vegetated cover types, some areas on the Forest are categorized as “sparse” (containing little vegetation cover, such scree slopes) or non-vegetated (such as lakes or urban areas). These areas are excluded from the composition analysis	URBAN, WATER, SPARSE

*This is a dominance type from VMap

Individual Tree Species Presence

Tree species presence indicates the proportion of an area where there is at least one live tree per acre of a given species, of any size. This measure gives an indication of how widely distributed the species is across the landscape, although not necessarily dominant or even common in all the places it occurs. Most forest stands are composed or more than one tree species. As shown above, cover types are named for the dominant tree species representing the group (i.e., the ponderosa pine cover type). However, ponderosa pine as an individual species may also be found in other cover types. Therefore, the estimates for a given cover type are not the same as the distribution of the tree species for which it is named. There are eleven native tree species found on the HLC NF, although not all occur on every GA: Rocky mountain juniper, limber pine, ponderosa pine, Douglas-fir, lodgepole pine, western larch, aspen, cottonwood, Engelmann spruce, subalpine fir, and whitebark pine.

Size Class

Tree size is an indicator of the structure and age of forests across the landscape. Forest size classes are defined based on the predominant tree diameter in the stand (basal area weighted average diameter). The five size classes are shown in Table 4. Details on how forests are classified into size class can be found in Barber and others (2011).

Table 4. Forest size classes on the HLC NF

Size Class	Diameter range	Description
Seedling/sapling	0 to 5 inches	The seedling/sapling size class represents the early successional stage of development. Forests are dominated by seedlings (less than 4 ½ feet tall) and saplings (less than 5 inches diameter). There may be low numbers of overstory larger trees present. Most trees are less than 40 years old and less than 40 feet tall. On sites of lower productivity (higher elevation, poor soils) or in dense stands, trees in in this class may be older because of their slower diameter growth rates.
Small tree	5 to 8.9 inches	Small size class forests are in the mid-successional stage of development, composed mostly of immature trees 5 to 8.9 inches diameter. Typical tree ages range from 40 to 75 years old. They often have a single canopy layer, but two or more layers are not uncommon, depending on disturbance history and site conditions.
Medium tree	9 to 14.9 inches	Medium size class forests are also in the mid-successional stage of development, where trees 9 to 14.9 inches diameter dominate. Vertical structures vary considerably. Tree age varies depending on species composition, site conditions, and stand density, but is typically 75 to 110 years old. On sites with harsher growing conditions or in stands of very high densities and low growth rates, trees in this medium size class might be substantially older.
Large tree	15 to 19.9 inches	Large size class forests are usually older than those in the medium class. Trees 15 to 19.9 inches diameter dominate. Most trees are over 90 years old, and most stands are in the mid or late successional stage of development. There are sites where trees of large tree size classes are substantially younger or much older.
Very large tree	20+ inches	Very large size class forests represent the oldest stands, where trees >=20 inches diameter dominate. The larger trees are typically over 130 years old, and some may be several centuries in age. Forests are in the late successional stage of development, and some correlate to old growth forest. These forests typically have a more complex structure than other successional stages.

Large-tree Structure

Large trees are greater than or equal to 15” diameter, and very large trees are greater than or equal to 20” diameter. The large and very large forest size classes described in the previous section reflect areas where large and very large trees occur in relative abundance. However, scattered individuals, groups, and clumps of large and very large trees occur in forests classified into smaller size classes. The large-tree structure attribute is developed to more fully describe these components (Milburn et al 2019). The minimum densities of large- and very large-trees used to define large-tree structure reflect, to the best of our ability, quantities at sufficient amounts to contribute substantially to ecosystem functions (ibid). The label of large or very large is based on minimum tree density values (trees per acre) using diameter at breast-height thresholds by broad PVTs (Milburn et al. 2015), as shown in Table 5. A plot or stand may be classified as meeting the large subclass, the very large subclass, or both. For the desired condition in the 2020 Forest Plan, the large subclass does not include areas that also meet the very large subclass definition. However, the very large subclass may include areas that also meet the large subclass definition.

Table 5. Large-tree structure definitions for the HLC NF by broad potential vegetation group

Broad potential vegetation type	Large	Very large
Warm dry	At least 5 trees per acre > or = 15” diameter	At least 4 trees per acre > or = 20” diameter
Cool moist	At least 10 trees per acre > or = 15” diameter	At least10 trees per acre > or = 20” diameter
Cold	At least 8 trees per acre > or = 15” diameter	At least 8 trees per acre > or = 20” diameter

Density Class and Vertical Structure

Forest density is a measure of the area occupied by trees. For the HLC NF, tree canopy cover is used as the measure of density. Canopy cover is the percentage of ground covered by a vertical projection of the outermost perimeter of the tree crowns, considering trees of all heights. Vertical structure is not a key indicator; however, it is described in conjunction with density. Vertical structure is categorized as single-storied (one canopy layer), two-storied (two canopy layers), or multistoried (three or more canopy layers). The four canopy cover classes and associated vertical structures are described in Table 6.

Table 6. Forest density classes and associated vertical structures on the HLC NF

Density class	Canopy cover range	Description
Nonforested	<10%	Areas with less than 10% canopy cover are considered nonforested. This class may include open forest savannas or persistent grass/shrub communities that occur on the warm dry broad PVT. Such sites may have multiple age classes but large, fire resistant and drought tolerant trees such as ponderosa pine are favored. This class also includes areas on any PVT that has been recently de-forested through disturbance and trees have not yet re-established. Finally, true nonforested communities are included (grasslands, shrublands, riparian/wetlands, and alpine communities).
Low to medium	10-39.9%	Low and medium tree canopy cover classes represent relatively open forests with 10 to 39.9% canopy cover. This class is common in young forests. In addition, low densities are found in dry forest types at all stages of succession, where site conditions or disturbances maintain low tree density. Cool moist or cold forests may also be in this condition particularly where impacted by disturbances such as mountain pine beetle.
Medium-high	40-59.9%	The medium to high tree canopy cover class represents a more fully stocked forest, a condition which is common in mature moist forests of shade tolerant species. Examples of forests with this density could include mature single-storied lodgepole pine or spruce/fir multistoried stands. Dry forests may also be in this density class particularly where fire has been excluded and understory layers have developed.
High	60%+	The high canopy cover class includes forests with a relatively closed canopy, most often on productive sites. This density class is common in stands with a spruce/fir component in a multi-storied condition. This condition also arises in single-storied lodgepole pine and sometimes Douglas-fir that regenerate to high densities after fire. This condition may also occur in dry forests that have missed natural fire entries and developed layers in the understory.

Snags

Snag components are developed for the quantity and distribution of snags. The components for snags are classified by snag analysis groups defined by Bollenbacher and others (2008). These snag analysis groups are generally consistent with the broad PVTs (warm dry, cool moist, and cold), except that areas currently dominated by lodgepole pine are addressed separately. Snag quantity is estimated as average snags per acre. Snag distribution reflects the percent of the area that contains one or more snags in the size class indicated. Three size classes are included; the smaller classes contain the snags in the larger classes.

- medium (10” + diameter at breast height);
- large (15” + diameter at breast height); and
- very large (20”+ diameter at breast height)

Old Growth

Old growth is a forest structural condition that can exist during the late successional stage of forest development. The components for old growth are related to the estimated abundance (acres or percent of the area) of this condition on the landscape. The HLC NF has adopted definitions of old growth developed by the Regional Old Growth Task Force and documented by Green and others (Green et al., 1992). This work contains measurable criteria to consistently define old growth. The definitions are specific to forest type (dominant tree species) and habitat type group. Minimum thresholds have been established for these attributes. Associated characteristics are also defined, including factors such as

probabilities of downed woody material and number of snags, number of canopy layers, and number of snags over 9 inches diameter at breast height.

Coarse Woody Debris

Downed wood is derived from snags, as well as from live trees or parts of trees that fall due to wind, during fires, and to other factors. Long, larger diameter downed wood is generally more important for wildlife because it can be used by a greater range of species and provides a stable and persistent structure, as well as better protection from weather extremes. Plan components are built to describe coarse woody debris, or downed wood that is 3" in diameter or greater, measured in tons per acre.

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