# Region 1 Common Stand Exam and Inventory and Monitoring Protocols

**April 11, 2019**

# APPENDICES

# APPENDICES R1 CSE/IM Field Guide:

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# Appendix A: Administrative and Proclaimed National Forest Codes

| *Administrative and Proclaimed National Forest Codes* | | | |
|---|---|---|---|
| **Admin Number** | **Administrative Forest Name** | **Proc Number** | **Proclaimed Forest Name** |
| 02 | Beaverhead-Deerlodge | 02* | Beaverhead-Deerlodge |
| 03 | Bitterroot | 03 | Bitterroot |
| 04 | Idaho Panhandle | 04* | Idaho Panhandle |
| | *See combined forest entry 17* | 05* | Clearwater |
| | *See combined forest entry 11* | 08 | Custer |
| 10 | Flathead | 10 | Flathead |
| 11 | Custer-Gallatin | 11 | Gallatin |
| | *See combined forest entry 15* | 12 | Helena |
| 14 | Kootenai | 14* | Kootenai |
| 15 | Helena-Lewis and Clark | 15 | Lewis and Clark |
| 16 | Lolo | 16 | Lolo |
| 17 | Nez Perce-Clearwater | 17 | Nez Perce |
| 18 | Dakota Prairie | 18 | Dakota Prairie |

**Note:** *Prior to migration to FSVeg, R1 used TSMRS and R1 Edit to manage stand informaton. Those databases did not discern between Administrative and Proclaimed Forest. Therefore, when migrating to FSVeg and FSVeg Spatial, both Administrative and Proclaimed Nation Forest were populated with the Forest number being used in 2000. So, Proclaimed Forest is not necessarily the Congretionally mandated Forest number but the number that was used by the Region in 2000.

# Appendix B: District Codes

Record the 2-digit District code associated with the Proclaimed National Forest. These District numbers *should not* be updated over time due to consolidation. They are the District numbers that were used when the Forest stand layer was migrated to FSVeg Spatial in 2010 based on the TSMRS District codes used in 2005. Refer to appendix B for a list of District Codes.

In order to check the District, associated with a stand in FSVeg Spatial, run the R01 Extract Vegetation Polygons record set writer in the Geospatial Interface, for more information see *Geospatial Interface Content: FSVeg and FSVeg Spatial.*

***District Codes***

| Forest | Code | District |
|---|---|---|
| **Beaverhead - Deerlodge** | 1 | Dillon |
| | 2 | Wise River |
| | 3 | Wisdom |
| | 4 | Butte |
| | 6 | Madison |
| | 7 | Jefferson |
| | 8 | Pintler |
| **Bitterroot** | 1 | Stevensville |
| | 2 | Darby |
| | 3 | Sula |
| | 4 | West Fork |
| **Clearwater** | 1 | Pierce |
| | 2 | Palouse |
| | 3 | North Fork |
| | 5 | Lochsa |
| | 6 | Powell |
| **Custer** | 1 | Sheyenne |
| | 2 | Beartooth |
| | 3 | Sioux |
| | 4 | Ashland |
| | 6 | Grand River |
| | 7 | Medora |
| | 8 | McKenzie |
| **Flathead** | 1 | Swan Lake |
| | 2 | Condon |
| | 4 | Spotted Bear |
| | 6 | Hungry Horse |
| | 7 | Glacier View |
| | 8 | Tally Lake |

***District Codes***

| Forest | Code | District |
|---|---|---|
| **Gallatin** | 1 | Big Timber |
| | 2 | Livingston |
| | 3 | Gardiner |
| | 5 | Bozeman-North |
| | 6 | Bozeman |
| | 7 | Hebgen Lake |
| **Helena** | 1 | Townsend |
| | 2 | Helena |
| | 3 | Helena - West |
| | 4 | Lincoln |
| **Idaho Panhandle** | 1 | Wallace |
| | 2 | St. Joe (Avery) |
| | 3 | Fernan |
| | 4 | St. Joe (St. Maries) |
| | 6 | Sandpoint |
| | 7 | Bonners Ferry |
| | 8 | Priest Lake |
| **Kootenai** | 1 | Rexford |
| | 3 | Fortine |
| | 4 | Three Rivers |
| | 5 | Libby |
| | 7 | Cabinet |
| **Lewis & Clark** | 1 | Rocky Mountain |
| | 3 | Belt Creek |
| | 4 | Judith |
| | 6 | Musselshell |
| | 7 | White Sulpher Springs |
| **Lolo** | 3 | Missoula |
| | 4 | Ninemile |

| *District Codes* | | |
|---|---|---|
| **Forest** | **Code** | **District** |
| | 5 | Plains/Thompson Falls |
| | 6 | Seeley Lake |
| | 7 | Superior |
| | 8 | Thompson Falls |
| **Nezperce** | 1 | Salmon River |
| | 3 | Slate Creek |

| *District Codes* | | |
|---|---|---|
| **Forest** | **Code** | **District** |
| | 4 | Clearwater |
| | 5 | Red River |
| | 6 | Moose Creek |
| | 7 | Selway |
| | 8 | Elk City |

**Note:** Nezperce-Clearwater use the District numbers that were used prior to consolidation.

# Appendix C: State Codes

| *State Codes* | |
|---|---|
| **Code** | **State** |
| ID | Idaho |
| MT | Montana |
| ND | North Dakota |
| SD | South Dakota |
| WA | Washington |

# Appendix D: County Codes

| *County Codes* | | |
|---|---|---|
| **State** | **Code** | **County** |
| **Montana** | 001 | Beaverhead |
| | 007 | Broadwater |
| | 009 | Carbon |
| | 011 | Carter |
| | 013 | Cascade |
| | 015 | Choteau |
| | 023 | Deer Lodge |
| | 027 | Fergus |
| | 029 | Flathead |
| | 031 | Gallatin |
| | 035 | Glacier |
| | 037 | Golden Valley |
| | 039 | Granite |
| | 043 | Jefferson |
| | 045 | Judith Basin |
| | 047 | Lake |
| | 049 | Lewis & Clark |
| | 053 | Lincoln |
| | 057 | Madison |
| | 059 | Meagher |
| | 061 | Mineral |
| | 063 | Missoula |
| | 067 | Park |
| | 071 | Phillip |
| | 073 | Pondera |
| | 075 | Powder River |
| | 077 | Powell |
| | 081 | Ravalli |
| | 087 | Rosebud |
| | 089 | Sanders |
| | 093 | Silver Bow |
| | 095 | Stillwater |
| | 097 | Sweetgrass |
| | 099 | Teton |
| | 107 | Wheatland |

| *County Codes* | | |
|---|---|---|
| **State** | **Code** | **County** |
| **Idaho** | 009 | Benewah |
| | 017 | Bonner |
| | 021 | Boundary |
| | 035 | Clearwater |
| | 049 | Idaho |
| | 055 | Kootenai |
| | 057 | Latah |
| | 061 | Lewis |
| | 069 | Nez Pierce |
| | 079 | Shoshone |
| **South Dakota Washington** | 063 | Hardin |
| | 019 | Ferry |
| | 051 | Pend Oreille |
| | 065 | Stevens |

# Appendix E: Existing Vegetation Composition References and Codes

## Existing Vegetation References:

| *Existing Vegetation References* | | |
|---|---|---|
| **Code** | **Name** | **Author** |
| SAF | Forest Cover Types of the United States and Canada | F.H. Eyre, Editor. Society of American Foresters (1980) |
| SRM | Society for Range Management | |

## SRM Existing Vegetation Codes:

| *SAF Existing Vegetation Codes* | | |
|---|---|---|
| **Reference** | **Code** | **Description** |
| **SAF** | 000 | Nonforest types |
| **SAF** | 201 | White spruce |
| **SAF** | 203 | Balsam poplar |
| **SAF** | 205 | Mountain hemlock |
| **SAF** | 206 | Engelmann spruce - subalpine fir |
| **SAF** | 208 | Whitebark pine |
| **SAF** | 210 | Interior Douglas-fir |
| **SAF** | 211 | White fir- limber pine |
| **SAF** | 212 | Western larch |
| **SAF** | 213 | Grand fir |
| **SAF** | 215 | Western white pine |
| **SAF** | 216 | Blue spruce |
| **SAF** | 217 | Aspen - Western forests - Middle elevation - Interior |
| **SAF** | 218 | Lodgepole pine |
| **SAF** | 219 | Limber pine |
| **SAF** | 220 | Rocky Mountain juniper |
| **SAF** | 224 | Western hemlock |
| **SAF** | 227 | Western redcedar - western hemlock |
| **SAF** | 228 | Western redcedar |
| **SAF** | 230 | Douglas-fir - western hemlock |
| **SAF** | 235 | Cottonwood - willow |
| **SAF** | 236 | Bur oak - Western forests - Low elevation - Interior |
| **SAF** | 237 | Interior ponderosa pine |
| **SAF** | 238 | Western juniper |

| *SAF Existing Vegetation Codes* | | |
|---|---|---|
| **Reference** | **Code** | **Description** |
| **SAF** | 251 | White spruce - aspen |
| **SAF** | 252 | Paper birch |
| **SRM** | 102 | Idaho fescue |
| **SRM** | 104 | Antelope bitterbrush-bluebunch wheatgrass |
| **SRM** | 105 | SRM10 Antelope bitterbrush-Idaho fescue |
| **SRM** | 107 | Western juniper-big sagebrush- bluebunch wheatgrass |
| **SRM** | 109 | Ponderosa pine-shrubland |
| **SRM** | 110 | Ponderosa pine-grassland |
| **SRM** | 203 | Riparian woodland |
| **SRM** | 210 | Bitterbrush |
| **SRM** | 213 | Alpine grassland |
| **SRM** | 215 | Valley grassland |
| **SRM** | 216 | Montane meadows |
| **SRM** | 217 | Wetlands |
| **SRM** | 301 | Bluebunch wheatgrass-blue grama |
| **SRM** | 302 | Bluebunch wheatgrass-sandberg bluegrass |
| **SRM** | 303 | Bluebunch wheatgrass-western wheatgrass |
| **SRM** | 304 | Idaho fescue-bluebunch wheatgrass |
| **SRM** | 305 | Idaho fescue-Richardson needlegrass |
| **SRM** | 306 | Idaho fescue-slender wheatgrass |
| **SRM** | 307 | Idaho fescue-threadleaf sedge |
| **SRM** | 308 | Idaho fescue-tufted hairgrass |
| **SRM** | 309 | Idaho fescue-western wheatgrass |
| **SRM** | 310 | Needle-and-thread-blue grama |
| **SRM** | 311 | Rough fescue-bluebunch wheatgrass |
| **SRM** | 312 | Rough fescue-Idaho fescue |
| **SRM** | 313 | Tufted hairgrass- sedge |
| **SRM** | 314 | Big sagebrush-bluebunch wheatgrass |
| **SRM** | 315 | Big sagebrush-Idaho fescue |
| **SRM** | 316 | Big sagebrush-rough fescue |
| **SRM** | 317 | Bitterbrush-bluebunch wheatgrass |
| **SRM** | 318 | Bitterbrush-Idaho fescue |
| **SRM** | 319 | Bitterbrush rough fescue |
| **SRM** | 320 | Black sagebrush-bluebunch wheatgrass |
| **SRM** | 321 | Black sagebrush-Idaho fescue |
| **SRM** | 322 | Curlleaf mountain-mahogany-bluebunch wheatgrass |
| **SRM** | 323 | Shrubby cinquefoil-rough fescue |
| **SRM** | 401 | Basin big sagebrush |
| **SRM** | 402 | Mountain big sagebrush |
| **SRM** | 403 | Wyoming big sagebrush |

| *SAF Existing Vegetation Codes* | | |
|---|---|---|
| **Reference** | **Code** | **Description** |
| **SRM** | 405 | Black sagebrush |
| **SRM** | 406 | Low sagebrush |
| **SRM** | 408 | Other sagebrush types |
| **SRM** | 409 | Tall forb |
| **SRM** | 410 | Alpine rangeland |
| **SRM** | 411 | Aspen woodland |
| **SRM** | 415 | Curlleaf mountain-mahogany |
| **SRM** | 420 | Snowbush |
| **SRM** | 421 | Chokecherry-serviceberry-rose |
| **SRM** | 422 | Riparian |
| **SRM** | 501 | Saltbush-greasewood |
| **SRM** | 601 | Bluestem prairie |
| **SRM** | 602 | Bluestem-prairie sandreed |
| **SRM** | 603 | Prairie sandreed-needlegrass |
| **SRM** | 604 | Bluestem-grama prairie |
| **SRM** | 605 | Sandsage prairie |
| **SRM** | 606 | Wheatgrass-bluestem-needlegrass |
| **SRM** | 607 | Wheatgrass-needlegrass |
| **SRM** | 608 | Wheatgrass-gama needlegrass |
| **SRM** | 609 | Wheatgrass-gama |
| **SRM** | 610 | Wheatgrass |
| **SRM** | 611 | Blue grama-buffalograss |
| **SRM** | 612 | Sagebrush-grass |
| **SRM** | 613 | Fesque grassland |
| **SRM** | 614 | Crested wheatgrass |
| **SRM** | 615 | Wheatgrass-saltgrass-grama |
| **SRM** | 704 | Blue grama-western wheatgrass |
| **SRM** | 705 | Blue grama-galleta |
| **SRM** | 706 | Blue grama-sideoats grama |
| **SRM** | 707 | Blue grama-sideoats grama-black grama |
| **SRM** | 708 | Bluestem-dropseed |
| **SRM** | 709 | Bluestem-grama |
| **SRM** | 710 | Bluestem prairie |
| **SRM** | 713 | Grama-muhly-threeawn |
| **SRM** | 714 | Grama-bluestem |
| **SRM** | 715 | Grama-buffalograss |
| **SRM** | 720 | Sand bluestem-little bluestem dunes |
| **SRM** | 721 | Sand bluestem-little bluestem plains |
| **SRM** | 722 | Sand sagebrush-mixed prairie |
| **SRM** | 726 | Cordgrass |

| *SAF Existing Vegetation Codes* | | |
|---|---|---|
| **Reference** | **Code** | **Description** |
| **SRM** | 730 | Sand shinnery oak |
| **SRM** | 735 | Sideoats grama-sumac-juniper |
| **SRM** | 801 | Savanna |
| **SRM** | 802 | Missouri prairie |
| **SRM** | 803 | Missouri glades |
| **SRM** | 804 | Tall fesque |
| **SRM** | 805 | Riparian |
| **SRM** | 822 | Slough |
| **SRM** | 901 | Alder |
| **SRM** | 902 | Alpine herb |
| **SRM** | 906 | Broadleaf forest |
| **SRM** | 908 | Fesque |
| **SRM** | 909 | Freshwater marsh |
| **SRM** | 910 | Hairgrass |
| **SRM** | 911 | Lichen tundra |
| **SRM** | 914 | Mesic sedge-grass-herb meadow tundra |
| **SRM** | 915 | Mixed herb-herbaceous |
| **SRM** | 916 | Sedge-shrub tundra |
| **SRM** | 917 | Tall shrub swamp |
| **SRM** | 918 | Tussock tundra |
| **SRM** | 921 | Willow |

# Appendix F: Potential Vegetation References

Note: this appendix contains references for non-forest potential vegetation manuals, these are primarily for special projects and generally are not used for timber based stand exams.

| *Potential Vegetation References* | | |
|---|---|---|
| **Forest Where Manual is Appropriate** | **Reference Code** | **Name/Author** |
| **References Applicable to Common Stand Exams** | | |
| 02, 03, 08, 10, 11, 12, 14, 15, 16 | 101 | **Forest Habitat Types of Montana.** 1977. Pfister, R.D.; Kovalchik, B.L.; Arno, S.F.; Presby. R.C. Gen. Tech. Rep. INT-34. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 174 p. |
| 04, 05, 17 | 110 | **Forest Habitat Types of Northern Idaho: A Second Approximation.** 1991 (revision). Cooper, S.V.; Neiman, K.E.; Roberts, D.W. Gen. Tech. Rep. INT-236. USDA Forest Service. 135 p.<br>Note: Do not use the 1987 version (due to typographical errors). |
| 14, 16 | 111 | For the inventoried stand, potential vegetation code for the plots came from both references: Reference codes 101 and 110. Note: Only use this code in a stand that will have PV codes from both 101 and 110. |
| **References Specific to Special Projects, Not Generally Used For CSE** | | |
| 02, 08,11,12, 15 | 102 | **Key to Montana Forest/Woodland Habitat Types East of the Continental Divide.** 1988. Cooper, S., Pfister, R. Developed for FIA Only |
| All R1 Forests | 103 | **Grassland and Shrubland Habitat Types of Western Montana.** 1980. Mueggler, W.F.; Stewart, W.L. Gen. Tech. Rep. INT-66. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 154 p. |
| 08 | 109 | **Native Woodland Habitat Types of Southwestern North Dakota.** 1989. Girard, M.M.; Goetz, H.; Bjugstad, A.J. Research Paper RM-281. USDA Forest Service. |
| All R1 Forests | 112 | **Classification and Management of Montana's Riparian and Wetland Sites**. 1995. Hansen, Paul L.; Boggs, Keith L.; Cook, Bradley J.; and others. Misc. Pub. #54. Missoula, MT: Montana Riparian Association. |
| Alpine Areas in MT | 113 | **Plant Community Classification for Alpine Vegetation on the Beaverhead National Forest, Montana.** 1997. Stephen V. Cooper, Peter Lesica, and Deborah Page-Dumroese. INT-GTR-362. 61p. |

| *Potential Vegetation References* | | |
|---|---|---|
| **Forest Where Manual is Appropriate** | **Reference Code** | **Name/Author** |
| **References Applicable to Common Stand Exams** | | |
| 08 | 114 | **The Vegetation of the Grand River/Cedar River, Sioux, and Ashland Districts of the Custer NF: A Habitat Type Classification**. 1988. Hansen, Paul L., Hoffman, George R. Gen. Tech. Rep. RM-157. Ft. Collins, CO: USDA FS RMFR Ex St. 68p. |
| 08 | 115 | **Ecological Sites and Habitat Types of Little Missouri National Grasslands and Western North Dakota.** Jensen, Heisner, Dibenedetto, Wessman, Phillipe |
| 02, 08,11,12, 15 | 116 | **The Vegetation of the Sheyenne National Grassland, An Ecological Classification.** 1996. Hansen, Kurt |
| 08 | 402 | **Forest Habitat Types of Eastern Idaho-Western Wyoming.** 1983. Steele, R., Pfister, R.D., Ryker, R. A., Kittams J.A. USDA/FS Gen. Tech. Rep. INT-144 |
| 05,17 | 615 | **Plant Associations of the Wallowa-Snake Province, Wallowa-Whitman National Forest.** 1987. Johnson, C.G, Siimon, S.A., R6 Ecol 255-1986. USDA FS PNWR. |

# Appendix G: Potential Vegetation Codes

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 101 | 010 | Scree | |
| 101,111 | 000 | Limber pine series | PIFL2 |
| 101,111 | 040 | Limber pine/bluebunch wheatgrass | PIFL2/PSSPS |
| 101,111 | 050 | Limber pine/Idaho fescue | PIFL2/FEID |
| 101,111 | 051 | Limber pine/Idaho fescue-Idaho fescue | PIFL2/FEID-FEID |
| 101,111 | 052 | Limber pine/Idaho fescue-rough fescue | PIFL2/FEID-FEAL |
| 101,111 | 070 | Limber pine/common juniper | PIFL2/JUCO6 |
| 101 | 100 | Ponderosa pine | PIPO |
| 101 | 110 | Ponderosa pine/bluestem | PIPO/ANDRO2 |
| 101 | 130 | Ponderosa pine/bluebunch wheatgrass | PIPO/PSSPS |
| 101 | 140 | Ponderosa pine/Idaho fescue | PIPO/FEID |
| 101 | 141 | Ponderosa pine/Idaho fescue-Idaho fescue | PIPO/FEID-FEID |
| 101 | 142 | Ponderosa pine/Idaho fescue-rough fescue | PIPO/FEID-FEAL |
| 101 | 160 | Ponderosa pine/bitterbrush | PIPO/PUTR2 |
| 101 | 161 | Ponderosa pine/bitterbrush-bluebunch wheatgrass | PIPO/PUTR2-PSSPS |
| 101 | 162 | Ponderosa pine/bitterbrush-Idaho fescue | PIPO/PUTR2-FEID |
| 101 | 170 | Ponderosa pine/snowberry | PIPO/SYAL |
| 101 | 171 | Ponderosa pine/snowberry-snowberry | PIPO/SYAL-SYAL |
| 101 | 172 | Ponderosa pine/snowberry-creeping Oregon grape | PIPO/SYAL-MARE11 |
| 101 | 180 | Ponderosa pine/chokecherry | PIPO/PRVI |
| 101 | 181 | Ponderosa pine/chokecherry-chokecherry | PIPO/PRVI-PRVI |
| 101 | 182 | Ponderosa pine/chokecherry-buffaloberry | PIPO/PRVI-SHCA |
| 101 | 200 | Douglas-fir | PSME |
| 101 | 210 | Douglas-fir/bluebunch wheatgrass | PSME/PSSPS |
| 101 | 220 | Douglas-fir/Idaho fescue | PSME/FEID |
| 101 | 230 | Douglas-fir/rough fescue | PSME/FEAL |
| 101 | 250 | Douglas-fir/dwarf huckleberry | PSME/VACA13 |
| 101 | 260 | Douglas-fir/ninebark | PSME/PHMA5 |
| 101 | 261 | Douglas-fir/ninebark-ninebark | PSME/PHMA5-PHMA5 |
| 101 | 262 | Douglas-fir/ninebark-pinegrass | PSME/PHMA5-CARU |
| 101 | 280 | Douglas-fir/blue huckleberry | PSME/VAME |
| 101 | 281 | Douglas-fir/blue huckleberry-blue huckleberry | PSME/VAME-VAME |
| 101 | 282 | Douglas-fir/blue huckleberry-kinnikinnick | PSME/VAME-ARUV |
| 101 | 283 | Douglas-fir/blue huckleberry-beargrass | PSME/VAME-XETE |
| 101 | 290 | Douglas-fir/twinflower | PSME/LIBO3 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 101 | 291 | Douglas-fir/twinflower-snowberry | PSME/LIBO3-SYAL |
| 101 | 292 | Douglas-fir/twinflower-pinegrass | PSME/LIBO3-CARU |
| 101 | 293 | Douglas-fir/twinflower-blue huckleberry | PSME/LIBO3-VAME |
| 101 | 310 | Douglas-fir/snowberry | PSME/SYAL |
| 101 | 311 | Douglas-fir/snowberry-bluebunch wheatgrass | PSME/SYAL-PSSPS |
| 101 | 312 | Douglas-fir/snowberry-pinegrass | PSME/SYAL-CARU |
| 101 | 313 | Douglas-fir/snowberry-snowberry | PSME/SYAL-SYAL |
| 101 | 320 | Douglas-fir/pinegrass | PSME/CARU |
| 101 | 321 | Douglas-fir/pinegrass-bluebunch wheatgrass | PSME/CARU-PSSPS |
| 101 | 322 | Douglas-fir/pinegrass-kinnikinnick | PSME/CARU-ARUV |
| 101 | 323 | Douglas-fir/pinegrass-pinegrass | PSME/CARU-CARU |
| 101 | 324 | Douglas-fir/pinegrass-ponderosa pine | PSME/CARU-PIPO |
| 101 | 330 | Douglas-fir/elk sedge | PSME/CAGE2 |
| 101 | 340 | Douglas-fir/white spirea | PSME/SPBE2 |
| 101 | 350 | Douglas-fir/kinnikinnick | PSME/ARUV |
| 101 | 360 | Douglas-fir/common juniper | PSME/JUCO6 |
| 101 | 365 | Douglas-fir/bunchberry dogwood | PSME/COCA13 |
| 101 | 370 | Douglas-fir/heartleaf arnica | PSME/ARCO9 |
| 101 | 380 | Douglas-fir/mountain snowberry | PSME/SYOR2 |
| 101 | 400 | Spruce | PICEA |
| 101 | 410 | Spruce/common horsetail | PICEA/EQAR |
| 101 | 420 | Spruce/queencup beadlily | PICEA/CLUN2 |
| 101 | 421 | Spruce/queencup beadlily-dwarf huckleberry | PICEA/CLUN2-VACA13 |
| 101 | 422 | Spruce/queencup beadlily-queencup beadlily | PICEA/CLUN2-CLUN2 |
| 101 | 430 | Spruce/ninebark | PICEA/PHMA5 |
| 101 | 440 | Spruce/sweetscented bedstraw | PICEA/GATR3 |
| 101 | 450 | Spruce/dwarf huckleberry | PICEA/VACA13 |
| 101 | 460 | Spruce/cleft-leaf groundsel | PICEA/PAST10 |
| 101 | 461 | Spruce/cleft-leaf groundsel-Douglas-fir | PICEA/PAST10-PSME |
| 101 | 462 | Spruce/cleft-leaf groundsel-spruce | PICEA/PAST10-PICEA |
| 101 | 470 | Spruce/twinflower | PICEA/LIBO3 |
| 101 | 480 | Spruce/starry Solomon's seal | PICEA/MAST4 |
| 101 | 500 | Grand fir | ABGR |
| 101 | 501 | Western redcedar | THPL |
| 101 | 502 | Western hemlock | TSHE |
| 101 | 510 | Grand fir/beargrass | ABGR/XETE |
| 101 | 520 | Grand fir/queencup beadlily | ABGR/CLUN2 |
| 101 | 521 | Grand fir/queencup beadlily-queencup beadlilly | ABGR/CLUN2-CLUN2 |
| 101 | 522 | Grand fir/queencup beadlily-wild sarsaparilla | ABGR/CLUN2-ARNU2 |
| 101 | 523 | Grand fir/queencup beadlily-beargrass | ABGR/CLUN2-XETE |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 101 | 530 | Western redcedar/queencup beadlily | THPL/CLUN2 |
| 101 | 531 | Western redcedar/queencup beadlily-queencup beadlily | THPL/CLUN2-CLUN2 |
| 101 | 532 | Western redcedar/queencup beadlily-wild sarsaparilla | THPL/CLUN2-ARNU2 |
| 101 | 533 | Western redcedar/queencup beadlily-menziesia | THPL/CLUN2-MEFE |
| 101 | 550 | Western redcedar/devil's club | THPL/OPHO |
| 101 | 570 | Western hemlock/queencup beadlily | TSHE/CLUN2 |
| 101 | 571 | Western hemlock/queencup beadlily-queencup beadlily | TSHE/CLUN2-CLUN2 |
| 101 | 572 | Western hemlock/queencup beadlily-wild sarsaparilla | TSHE/CLUN2-ARNU2 |
| 101 | 590 | Grand fir/twinflower | ABGR/LIBO3 |
| 101 | 591 | Grand fir/twinflower-twinflower | ABGR/LIBO3-LIBO3 |
| 101 | 592 | Grand fir/twinflower-beargrass | ABGR/LIBO3-XETE |
| 101 | 600 | Subalpine fir | ABLA |
| 101 | 610 | Subalpine fir/devil's club | ABLA/OPHO |
| 101 | 620 | Subalpine fir/queencup beadlily | ABLA/CLUN2 |
| 101 | 621 | Subalpine fir/queencup beadlily-queencup beadlily | ABLA/CLUN2-CLUN2 |
| 101 | 622 | Subalpine fir/queencup beadlily-wild sarsaparilla | ABLA/CLUN2-ARNU2 |
| 101 | 623 | Subalpine fir/queencup beadlily-dwarf huckleberry | ABLA/CLUN2-VACA13 |
| 101 | 624 | Subalpine fir/queencup beadlily-beargrass | ABLA/CLUN2-XETE |
| 101 | 625 | Subalpine fir/queencup beadlily-menziesia | ABLA/CLUN2-MEFE |
| 101 | 630 | Subalpine fir/sweetscented bedstraw | ABLA/GATR3 |
| 101 | 640 | Subalpine fir/dwarf huckleberry | ABLA/VACA13 |
| 101 | 650 | Subalpine fir/bluejoint | ABLA/CACA4 |
| 101 | 651 | Subalpine fir/bluejoint-bluejoint | ABLA/CACA4-CACA4 |
| 101 | 653 | Subalpine fir/bluejoint-sweetscented bedstraw | ABLA/CACA4-GATR3 |
| 101 | 654 | Subalpine fir/bluejoint-dwarf huckleberry | ABLA/CACA4-VACA13 |
| 101 | 660 | Subalpine fir/twinflower | ABLA/LIBO3 |
| 101 | 661 | Subalpine fir/twinflower-twinflower | ABLA/LIBO3-LIBO3 |
| 101 | 662 | Subalpine fir/twinflower-beargrass | ABLA/LIBO3-XETE |
| 101 | 663 | Subalpine fir/twinflower-grouse whortleberry | ABLA/LIBO3-VASC |
| 101 | 670 | Subalpine fir/menziesia | ABLA/MEFE |
| 101 | 680 | Mountain hemlock/menziesia | TSME/MEFE |
| 101 | 690 | Subalpine fir/beargrass | ALBA/XETE |
| 101 | 691 | Subalpine fir/beargrass-blue huckleberry | ALBA/XETE-VAME |
| 101 | 692 | Subalpine fir/beargrass-grouse whortleberry | ALBA/XETE-VASC |
| 101 | 700 | Mountain hemlock | ABLA |
| 101 | 710 | Mountain hemlock/beargrass | TSME/XETE |
| 101 | 720 | Subalpine fir/blue huckleberry | ABLA/VAME |
| 101 | 730 | Subalpine fir/grouse whortleberry | ABLA/VASC |
| 101 | 731 | Subalpine fir/grouse whortleberry-pinegrass | ABLA/VASC-CARU |
| 101 | 732 | Subalpine fir/grouse whortleberry-grouse whortleberry | ABLA/VASC-VASC |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 101 | 733 | Subalpine fir/grouse whortleberry-western meadowrue | ABLA/VASC-THOC |
| 101 | 740 | Subalpine fir/Sitka alder | ABLA/ALVIS |
| 101 | 750 | Subalpine fir/pinegrass | ABLA/CARU |
| 101 | 770 | Subalpine fir/virgin's bower | ABLA/CLCOC2 |
| 101 | 780 | Subalpine fir/heartleaf arnica | ABLA/ARCO9 |
| 101 | 790 | Subalpine fir/elk sedge | ABLA/CAGE2 |
| 101 | 791 | Subalpine fir/elk sedge-elk sedge | ABLA/CAGE2-CAGE2 |
| 101 | 792 | Subalpine fir/elk sedge-Douglas-fir | ABLA/CAGE2-PSME |
| 101 | 800 | Upper subalpine h.t. | ABLA |
| 101 | 810 | Subalpine fir/mountain gooseberry | ABLA/RIMO2 |
| 101 | 820 | Subalpine fir/subalpinefir-whitebark pine/grouse whortleberry | ABLA-PIAL/VASC |
| 101 | 830 | Subalpine fir/smooth woodrush | ABLA/LUGLH |
| 101 | 831 | Subalpine fir/smooth woodrush-grouse whortleberry | ABLA/LUGLH-VASC |
| 101 | 832 | Subalpine fir/smooth woodrush-menziesia | ABLA/LUGLH-MEFE |
| 101 | 840 | Mountain hemlock/smooth woodrush | TSME/LUGLH |
| 101 | 841 | Mountain hemlock/smooth woodrush-grouse whortleberry | TSME/LUGLH-VASC |
| 101 | 842 | Mountain hemlock/smooth woodrush-menziesia | TSME/LUGLH-MEFE |
| 101 | 850 | Whitebark pine-subalpine fir | PIAL-ABLA |
| 101 | 860 | Subalpine larch-subalpine fir | LALY-ABLA |
| 101 | 870 | Whitebark pine | PIAL |
| 101 | 890 | Timberline h.t.s. | ABLA |
| 101 | 900 | Lodgepole pine | PICO |
| 101 | 910 | Lodgepole pine/bitterbrush | PICO/PUTR2 |
| 101 | 920 | Lodgepole pine/dwarf huckleberry | PICO/VACA13 |
| 101 | 930 | Lodgepole pine/twinflower | PICO/LIBO3 |
| 101 | 940 | Lodgepole pine/grouse whortleberry | PICO/VASC |
| 101 | 950 | Lodgepole pine/pinegrass | PICO/CARU |
| 103 | 46201 | antelope bitterbrush/bluebunch wheatgrass | PUTR2/PSSPS |
| 103 | 46301 | curl-leaf mountain mahogany/bluebunch wheatgrass | CELE3/PSSPS |
| 103 | 46600 | little sagebrush series | ARAR8 |
| 103 | 46601 | little sagebrush/Idaho fescue | ARAR8/FEID |
| 103 | 46602 | little sagebrush/bluebunch wheatgrass | ARAR8/PSSPS |
| 103 | 46603 | little sagebrush/bluebunch wheatgrass-needle and thread | ARAR8/PSSPS-HECOC8 |
| 103 | 46610 | big sagebrush series | ARTR2 |
| 103 | 46611 | big sagebrush/Altai fescue | ARTR2/FEAL |
| 103 | 46612 | big sagebrush/Idaho fescue | ARTR2/FEID |
| 103 | 46613 | big sagebrush/Idaho fescue-sticky purple geranium | ARTR2/FEID-GEVI2 |
| 103 | 46614 | big sagebrush/bluebunch wheatgrass | ARTR2/PSSPS |
| 103 | 46620 | shrubby cinquefoil series | DAFL3 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 103 | 46621 | shrubby cinquefoil/Altai fescue | DAFL3/FEAL |
| 103 | 46622 | shrubby cinquefoil/Altai fescue-timber oatgrass | DAFL3/FEAL-DAIN |
| 103 | 46623 | shrubby cinquefoil/Idaho fescue | DAFL3/FEID |
| 103 | 46630 | antelope bitterbrush series | PUTR2 |
| 103 | 46632 | antelope bitterbrush/Idaho fescue | PUTR2/FEID |
| 103 | 46633 | antelope bitterbrush/Altai fescue | PUTR2/FEAL |
| 103 | 46640 | skunkbush sumac series | RHTR |
| 103 | 46641 | skunkbush sumac/Idaho fescue | RHTR/FEID |
| 103 | 46642 | skunkbush sumac/bluebunch wheatgrass | RHTR/PSSPS |
| 103 | 46650 | greasewood series | SAVE4 |
| 103 | 46651 | greasewood/basin wildrye | SAVE4/LECI4 |
| 103 | 46652 | greasewood/western wheatgrass | SAVE4/PASM |
| 103 | 47003 | Idaho fescue-western wheatgrass- streambank wheatgrass | FEID-PASM-ELLAL |
| 103 | 47004 | Idaho fescue/bearded wheatgrass | FEID/ELCA11 |
| 103 | 47100 | tufted hairgrass series | DECA18 |
| 103 | 47101 | tufted hairgrass/sedge | DECA18/CAREX |
| 103 | 47110 | Altai fescue series | FEAL |
| 103 | 47111 | Altai fescue/Idaho fescue | FEAL/FEID |
| 103 | 47112 | Altai fescue/Idaho fescue-Richardson's needlegrass | FEAL/FEID-ACRI8 |
| 103 | 47113 | Altai fescue/Idaho fescue-sticky purple geranium | FEAL/FEID-GEVI2 |
| 103 | 47114 | Altai fescue/bluebunch wheatgrass | FEAL/PSSPS |
| 103 | 47115 | Altai fescue/bluebunch wheatgrass-needle and thread | FEAL/PSSPS-HECOC8 |
| 103 | 47120 | Idaho fescue series | FEID |
| 103 | 47121 | Idaho fescue/Richardson's needlegrass | FEID/ACRI8 |
| 103 | 47122 | Idaho fescue/threadleaf sedge | FEID/CAFI |
| 103 | 47123 | Idaho fescue/tufted hairgrass | FEID/DECA18 |
| 103 | 47124 | Idaho fescue/bearded wheatgrass-sticky purple geranium | FEID/ELCA11-GEVI2 |
| 103 | 47125 | Idaho fescue/western wheatgrass | FEID/PASM |
| 103 | 47126 | Idaho fescue/bluebunch wheatgrass | FEID/PSSPS |
| 103 | 47127 | Idaho fescue/bluebunch wheatgrass-western needlegrass | FEID/PSSPS-ACOCO |
| 103 | 47130 | needle and thread series | HECOC8 |
| 103 | 47131 | needle and thread/blue grama | HECOC8/BOGR2 |
| 103 | 47132 | needle and thread/blue grama-western wheatgrass | HECOC8/BOGR2-PASM |
| 103 | 47140 | bluebunch wheatgrass series | PSSPS |
| 103 | 47141 | bluebunch wheatgrass/blue grama | PSSPS/BOGR2 |
| 103 | 47142 | bluebunch wheatgrass/blue grama-dotted blazing star | PSSPS/BOGR2-LIPU |
| 103 | 47143 | bluebunch wheatgrass/western wheatgrass | PSSPS/PASM |
| 103 | 47144 | bluebunch wheatgrass/western wheatgrass-green needlegrass | PSSPS/PASM-NAVI4 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 110 | 100 | Ponderosa pine | PIPO |
| 110 | 130 | Ponderosa pine/bluebunch wheatgrass | PIPO/PSSPS |
| 110 | 140 | Ponderosa pine/Idaho fescue | PIPO/FEID |
| 110 | 170 | Ponderosa pine/ninebark | PIPO/SYAL |
| 110 | 190 | Ponderosa pine/ninebark | PIPO/PHMA5 |
| 110 | 200 | Douglas fir series | PSME |
| 110 | 210 | Douglas-fir/bluebunch wheatgrass | PSME/PSSPS |
| 110 | 220 | Douglas-fir/Idaho fescue | PSME/FEID |
| 110 | 250 | Douglas-fir/dwarf huckleberry | PSME/VACA13 |
| 110 | 260 | Douglas-fir/ninebark | PSME/PHMA5 |
| 110 | 261 | Douglas-fir/ninebark-ninebark | PSME/PHMA5-PHMA5 |
| 110 | 263 | Douglas-fir/ninebark-starry Solomon's seal | PSME/PHMA5/MAST4 |
| 110 | 280 | Douglas-fir/blue huckleberry | PSME/VAME |
| 110 | 310 | Douglas-fir/common snowberry | PSME/SYAL |
| 110 | 320 | Douglas-fir/pinegrass | PSME/CARU |
| 110 | 322 | Douglas-fir/pinegrass-kinnikinnick | PSME/CARU-ARUV |
| 110 | 323 | Douglas-fir/pinegrass-pinegrass | PSME/CARU-CARU |
| 110 | 330 | Douglas-fir/elk sedge | PSME/CAGE2 |
| 110 | 340 | Douglas-fir/white spirea | PSME/SPBE2 |
| 110 | 500 | Grand fir | ABGR |
| 110 | 501 | Western redcedar series | THPL |
| 110 | 502 | Western hemlock series | TSHE |
| 110 | 505 | Grand fir/white spirea | ABGR/SPBE2 |
| 110 | 506 | Grand fir/ninebark | ABGR/PHMA5 |
| 110 | 507 | Grand fir/ninebark-western gold thread | ABGR/PHMA5/COOC |
| 110 | 508 | Grand fir/ninebark-ninebark | ABGR/PHMA5-PHMA5 |
| 110 | 510 | Grand fir/beargrass | ABGR/XETE |
| 110 | 511 | Grand fir/beargrass-western gold thread | ABGR/XETE/COOC |
| 110 | 512 | Grand fir/beargrass-blue huckleberry | ABGR/XETE-VAME |
| 110 | 515 | Grand fir/blue huckleberry | ABGR/VAME |
| 110 | 516 | Grand fir/wild ginger | ABGR/ASCA2 |
| 110 | 517 | Grand fir/wild ginger-wild ginger | ABGR/ASCA2-ASCA2 |
| 110 | 518 | Grand fir/wild ginger-menziesia | ABGR/ASCA2-MEFE |
| 110 | 519 | Grand fir/wild ginger-Pacific yew | ABGR/ASCA2-TABR2 |
| 110 | 520 | Grand fir/queencup beadlily | ABGR/CLUN2 |
| 110 | 521 | Grand fir/queencup beadlily-queencup beadlily | ABGR/CLUN2-CLUN2 |
| 110 | 523 | Grand fir/queencup beadlily-beargrass | ABGR/CLUN2-XETE |
| 110 | 524 | Grand fir/queencup beadlily-ninebark | ABGR/CLUN2-PHMA5 |
| 110 | 525 | Grand fir/queencup beadlily-menziesia | ABGR/CLUN2-MEFE |
| 110 | 526 | Grand fir/queencup beadlily-Pacific yew | ABGR/CLUN2-TABR2 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 110 | 529 | Grand fir/queencup beadlily-arrowleaf groundsel | ABGR/SETR |
| 110 | 530 | Western redcedar/queencup beadlily | THPL/CLUN2 |
| 110 | 531 | Western redcedar/queencup beadlily-queencup beadlily | THPL/CLUN2-CLUN2 |
| 110 | 533 | Western redcedar/queencup beadlily-menziesia | THPL/CLUN2-MEFE |
| 110 | 534 | Western redcedar/queencup beadlily-beargrass | THPL/CLUN2-XETE |
| 110 | 535 | Western redcedar/queencup beadlily-Pacific yew | THPL/CLUN2-TABR2 |
| 110 | 540 | Western redcedar/lady fern | THPL/ATFI |
| 110 | 541 | Western redcedar/lady fern-maidenhair fern | THPL/ATFI-ADPE |
| 110 | 542 | Western redcedar/lady fern-lady fern | THPL/ATFI-ATFI |
| 110 | 545 | Western redcedar/wild ginger | THPL/ASCA2 |
| 110 | 546 | Western redcedar/wild ginger-wild ginger | THPL/ASCA2-ASCA2 |
| 110 | 547 | Western redcedar/wild ginger-menziesia | THPL/ASCA2-MEFE |
| 110 | 548 | Western redcedar/wild ginger-Pacific yew | THPL/ASCA2-TABR2 |
| 110 | 550 | Western redcedar/devil's club | THPL/OPHO |
| 110 | 555 | Western redcedar/oak fern | THPL/GYDR |
| 110 | 560 | Western redcedar/maidenhair fern | THPL/ADPE |
| 110 | 565 | Western hemlock/oak fern | TSHE/GYDR |
| 110 | 570 | Western hemlock/queencup beadlily | TSHE/CLUN2 |
| 110 | 571 | Western hemlock/queencup beadlily-queencup beadlily | TSHE/CLUN2-CLUN2 |
| 110 | 572 | Western hemlock/queencup beadlily-wild sarsaparilla | TSHE/CLUN2-ARNU2 |
| 110 | 573 | Western hemlock/queencup beadlily-mefe | TSHE/CLUN2-MEFE |
| 110 | 574 | Western hemlock/queencup beadlily-beargrass | TSHE/CLUN2-XETE |
| 110 | 575 | Western hemlock/wild ginger | TSHE/ASCA2 |
| 110 | 576 | Western hemlock/wild ginger-wild sarsaparilla | TSHE/ASCA2-ARNU2 |
| 110 | 577 | Western hemlock/wild ginger-menziesia | TSHE/ASCA2-MEFE |
| 110 | 578 | Western hemlock/wild ginger-wild ginger | TSHE/ASCA2-ASCA2 |
| 110 | 579 | Western hemlock/menziesia | TSHE/MEFE |
| 110 | 590 | Grand fir/twinflower | ABGR/LIBO3 |
| 110 | 591 | Grand fir/twinflower-twinflower | ABGR/LIBO3-LIBO3 |
| 110 | 592 | Grand fir/twinflower-beargrass | ABGR/LIBO3-XETE |
| 110 | 600 | Subalpine fir series | ABLA |
| 110 | 620 | Subalpine fir/queencup beadlily | ABLA/CLUN2 |
| 110 | 621 | Subalpine fir/queencup beadlily-queencup beadlily | ABLA/CLUN2-CLUN2 |
| 110 | 624 | Subalpine fir/queencup beadlily-beargrass | ABLA/CLUN2-XETE |
| 110 | 625 | Subalpine fir/queencup beadlily-menziesia | ABLA/CLUN2-MEFE |
| 110 | 635 | Subalpine fir/twisted stalk | ABLA/STAM2 |
| 110 | 636 | Subalpine fir/twisted stalk-menziesia | ABLA/STAM2-MEFE |
| 110 | 637 | Subalpine fir/twisted stalk-Canby's ligusticum | ABLA/STAM2-LICA2 |
| 110 | 640 | Subalpine fir/dwarf huckleberry | ABLA/VACA13 |
| 110 | 650 | Subalpine fir/bluejoint | ABLA/CACA4 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 110 | 651 | Subalpine fir/bluejoint-bluejoint | ABLA/CACA4-CACA4 |
| 110 | 652 | Subalpine fir/bluejoint-Canby's ligusticum | ABLA/CACA4-LICA2 |
| 110 | 654 | Subalpine fir/bluejoint-dwarf huckleberry | ABLA/CACA4-VACA13 |
| 110 | 655 | Subalpine fir/bluejoint-Labrador tea | ABLA/CACA4-LEGL |
| 110 | 670 | Subalpine fir/menziesia | ABLA/MEFE |
| 110 | 671 | Subalpine fir/menziesia-western gold thread | ABLA/MEFE-COOC |
| 110 | 672 | Subalpine fir/menziesia-smooth woodrush | ABLA/MEFE-LUGLH |
| 110 | 673 | Subalpine fir/menziesia-beargrass | ABLA/MEFE-XETE |
| 110 | 674 | Subalpine fir/menziesia-grouse whortleberry | ABLA/MEFE-VASC |
| 110 | 675 | Mountain hemlock/twisted stalk | TSME/STAM2 |
| 110 | 676 | Mountain hemlock/twisted stalk-smooth woodrush | TSME/STAM2-LUGLH |
| 110 | 677 | Mountain hemlock/twisted stalk-menziesia | TSME/STAM2-MEFE |
| 110 | 680 | Mountain hemlock/menziesia | TSME/MEFE |
| 110 | 681 | Mountain hemlock/menziesia-smooth woodrush | TSME/MEFE-LUGLH |
| 110 | 682 | Mountain hemlock/menziesia-beargrass | TSME/MEFE-XETE |
| 110 | 685 | Mountain hemlock/queencup beadlily | TSME/CLUN2 |
| 110 | 686 | Mountain hemlock/queencup beadlily-menziesia | TSME/CLUN2-MEFE |
| 110 | 687 | Mountain hemlock/queencup beadlily-beargrass | TSME/CLUN2-XETE |
| 110 | 690 | Subalpine fir/beargrass | ABLA/XETE |
| 110 | 691 | Subalpine fir/beargrass-blue huckleberry | ABLA/XETE-VAME |
| 110 | 692 | Subalpine fir/beargrass-grouse whortleberry | ABLA/XETE-VASC |
| 110 | 693 | Subalpine fir/beargrass-western gold thread | ABLA/XETE-COOC |
| 110 | 694 | Subalpine fir/beargrass-smooth woodrush | ABLA/XETE-LUGLH |
| 110 | 700 | Mountain hemlock | TSME series |
| 110 | 710 | Mountain hemlock/beargrass | TSME/XETE |
| 110 | 711 | Mountain hemlock/beargrass-smooth woodrush | TSME/XETE-LUGLH |
| 110 | 712 | Mountain hemlock/beargrass-blue huckleberry | TSME/XETE-VAME |
| 110 | 713 | Mountain hemlock/beargrass-grouse whortleberry | TSME/XETE-VASC |
| 110 | 720 | Subalpine fir/blue huckleberry | ABLA/VAME |
| 110 | 730 | Subalpine fir/grouse whortleberry | ABLA/VASC |
| 110 | 750 | Subalpine fir/pinegrass | ABLA/CARU |
| 110 | 830 | Subalpine fir/smooth woodrush | ABLA/LUGLH |
| 110 | 840 | Mountain hemlock/smooth woodrush | TSME/LUGLH |
| 110 | 850 | Whitebark pie-subalpine fir | PIAL-ABLA |
| 110 | 860 | Subalpine larch-subalpine fir | LALY-ABLA |
| 110 | 900 | Lodgepole pine series | PICO |
| 110 | 920 | Lodgepole pine/dwarf huckleberry | PICO/VACA13 |
| 110 | 925 | Beargrass | PICO/XETE |
| 110 | 940 | Lodgepole pine/grouse whortleberry | PICO/VASC |
| 112 | 4 | Engelmann spruce/field horsetail | PIEN/EQAR |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 112 | 6 | spruce/bluejoint | PICEA/CACA4 |
| 112 | 12 | spruce/fragrant bedstraw | PICEA/GATR3 |
| 112 | 30 | Sitka alder communities | ALVIS |
| 112 | 43 | Engelmann spruce/redosier dogwood | PIEN/COSEO |
| 112 | 44 | Engelmann spruce/American skunkcabbage | PIEN/LYAM3 |
| 112 | 103 | narrowleaf cotonwood/recent alluvial barr | POAN3 |
| 112 | 104 | narrowleaf cotonwood/herbaceous | POAN3 |
| 112 | 105 | narrowleaf cottonleaf/western snowberry | POAN3/SYOC |
| 112 | 106 | narrowleaf cottonleaf/western snowberry | POAN3/COSES |
| 112 | 110 | green ash/chokecherry | FRPE/PRVI |
| 112 | 111 | boxelder/chokecherry | ACNE2/PRVI |
| 112 | 112 | Russian olive | ELAN |
| 112 | 113 | plains cottonwood/redosier deogwood | PODEM/COSES |
| 112 | 114 | plains cottonwood/herbaceous | PODEM |
| 112 | 115 | plains cottonwood/recent alluvial bar | PODEM |
| 112 | 116 | plains cottonwood/western snowberry | PODEM/SYOC |
| 112 | 117 | quaking aspen/creeping barberry | POTR5/MARE11 |
| 112 | 118 | quakingaspen/bluejoint | POTR5/CACA4 |
| 112 | 119 | quaking aspen/redoiser dogwood | POTR5/COSES |
| 112 | 120 | quaking aspen/western sweetroot | POTR5/OSOC |
| 112 | 121 | quaking aspen/Kentucky bluegrass | POTR5/POPR |
| 112 | 122 | black cottonwood/redosier dogwood | POBAT/COSES |
| 112 | 123 | black cottonwood/herbaceous | POBAT |
| 112 | 124 | black cottonwood/recent alluvial bar | POBAT |
| 112 | 125 | Black cottonwood/western snowberry | POBAT/SYOR |
| 112 | 130 | peachleaf willow | SAAM2 |
| 112 | 131 | Bebb willow | SABE2 |
| 112 | 132 | sageleaf willow/beaked sedge | SACA4/CARO6 |
| 112 | 133 | Drummond's willow/bluejoint | SADR/CACA4 |
| 112 | 134 | Drummond's willow/beaked sedge | SADR/CARO6 |
| 112 | 135 | Drummond's willow | SADR |
| 112 | 136 | Geyer willow/bluejoint | SAGE2/CACA4 |
| 112 | 137 | Geyer willow/beaked sedge | SAGE2/CARO6 |
| 112 | 138 | Geyer willow | SAGE2 |
| 112 | 139 | Pacific willow | SALUL |
| 112 | 140 | yellow willow/bluejoint | SALU2/CACA4 |
| 112 | 141 | yellow willow/beaked sedge | SALU2/CARO6 |
| 112 | 142 | yellow willow | SALU2 |
| 112 | 143 | diamondleaf willow/water sedge | SAPL2/CAAQ |
| 112 | 144 | Wolf's willow/water sedge | SAWO/CAAQ |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 112 | 145 | Wolf/s willow/tufted hairgrass | SAWO/DECA18 |
| 112 | 146 | gray alder | ALIN2 |
| 112 | 150 | silver sagebrush/western wheatgrass | ARCA13/PASM |
| 112 | 151 | silver sagebrush/Idaho fescue | ARCA13/FEID |
| 112 | 152 | resin birch/beaked sedge | BEGL/CARO6 |
| 112 | 153 | water birch | BEOC2 |
| 112 | 154 | fleshy hawthorn | CRSU5 |
| 112 | 155 | alpine laurel/mountain sedge | KAMI/CASC12 |
| 112 | 156 | chockcherry | PRVI |
| 112 | 157 | Woods' rose | ROWO |
| 112 | 158 | greasewood/westerm wheatgrass | SAVE4/PASM |
| 112 | 159 | silver buffaloberry | SHAR |
| 112 | 160 | rose spirea | SPDO |
| 112 | 161 | western snowberry | SYOC |
| 112 | 162 | five-stamen tamarisk | TACH2 |
| 112 | 180 | ponderosa pine/chokecherry | PIPO/PRVI |
| 112 | 181 | ponderosa pine/redosier dogwood | PIPO/COSES |
| 112 | 200 | water sedge/water sedge | CAAQ/CAAQ |
| 112 | 201 | water sedge/tufted hairgrass | CAAQ/DECA18 |
| 112 | 202 | mud sedge | CALI7 |
| 112 | 203 | beaked sedge/water sedge | CARO6/CAAQ |
| 112 | 204 | beaked sedge/beaked sedge | CARO6/CARO6 |
| 112 | 205 | beaked sedge/tufted hairgrass | CARO6/DECA18 |
| 112 | 210 | westerm wheatgrass | PASM |
| 112 | 211 | creeping bentgrass | AGST2 |
| 112 | 212 | smooth brome | BRIN2 |
| 112 | 213 | bluejoint | CACA4 |
| 112 | 214 | saltgrass | DISP |
| 112 | 215 | water horsetail | EQFL |
| 112 | 216 | small floating mannagrass | GLBO |
| 112 | 217 | American licorice | GLLE3 |
| 112 | 218 | foxtail barley | HOJU |
| 112 | 219 | reed canarygrass | PHAR3 |
| 112 | 219 | reed canarygrass | PHAR3 |
| 112 | 220 | common reed | PHAU7 |
| 112 | 221 | fowl bluegrass | POPA2 |
| 112 | 222 | water knotweed | POAM8 |
| 112 | 223 | red swampfire | SARU |
| 112 | 224 | hardstem bulrush | SCAC3 |
| 112 | 225 | cosmopolitan bulrush | SCMA8 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 112 | 226 | chairmaker's bulrush | SCAM6 |
| 112 | 227 | arrowleaf ragwort | SETR |
| 112 | 228 | prairie cordgrass | SPPE |
| 112 | 400 | Rocky Mountain juniper/redosier dogwood | JUSC2/COSES |
| 112 | 540 | western red cedar/common ladyfern | THPL/ATFI |
| 112 | 542 | western red cedar/common ladyfern-common ladyfern | THPL/ATFI-ATFI |
| 112 | 550 | western red cedar/devilsclub | THPL/OPHO |
| 112 | 555 | western red cedar/western oakfern | THPL/GYDR |
| 112 | 565 | western hemlock/western oakfern | TSHE/GYDR |
| 112 | 601 | subalpine fir/red baneberry | ABLA/ACRU2 |
| 112 | 610 | subalpine fir/devilsclub | ABLA/OPHO |
| 112 | 613 | grand fir/common ladyfern | ABGR/ATFI |
| 112 | 630 | subalpine fir/fragrant bedstraw | ABLA/GATR3 |
| 112 | 631 | subalpine fir/western labrador tea | ABLA/LEGL |
| 112 | 632 | subalpine fir/western labrador tea-bluejoint | ABLA/LEGL-CACA4 |
| 112 | 633 | subalpine fir/western labrador tea-western labrador tea | ABLA/LEGL-LEGL |
| 112 | 635 | subalpine fir/claspleaf twistedstalk | ABLA/STAM2 |
| 112 | 636 | subalpine fir/claspleaf twistedstalk- claspleaf twistedstalk | ABLA/STAM2-STAM2 |
| 112 | 637 | subalpine fir/claspleaf twistedstalk-rusty menziesia | ABLA/STAM2-MEFE |
| 112 | 650 | subalpine fir/bluejoint | ABLA/CACA4 |
| 112 | 651 | subalpine fir/bluejoint-bluejoint | ABLA/CACA4-CACA4 |
| 112 | 652 | subalpine fir/bluejoint-Canby's licorice-root | ABLA/CACA4-LICA2 |
| 112 | 654 | subalpine fir/bluejoint-dwarf bilberry | ABLA/CACA4-VACA13 |
| 112 | 700 | Dougals-fir/redosier dogwood | PSME/COSES |
| 112 | HCS113 | black cottonwood/thinleaf alder-redosier dogwood | POBAT/ALINT-COSES |
| 112 | MD3111 | Kentucky bluegrass (dry meadow) | POPR |
| 112 | MM1912 | tufted hairgrass (moist meadow) | DECA18 |
| 112 | MM2911 | woolly sedge (moist meadow) | CAPE42 |
| 112 | MM2912 | Nebraska sedge (moist meadow) | CANE2 |
| 112 | MM2914 | water sedge (aquatic moist meadow) | CAAQ |
| 112 | MM2915 | analogue sedge (moist meadow) | CASI2 |
| 112 | MM2917 | Northwest Territory sedge (moist meadow) | CAUT |
| 112 | MM2920 | woollyfruit sedge (moist meadow) | CALA11 |
| 112 | MS3111 | mountain sedge (subalpine wet meadow) | CASC12 |
| 112 | MW3912 | Baltic rush | JUBA |
| 112 | MW4911 | fewflower spikerush | ELQU2 |
| 112 | MW4912 | common spikerush | ELPA3 |
| 112 | SW1117 | narrowleaf willow | SAEX |
| 112 | SW3111 | black hawthorn | CRDO2 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 112 | SW5112 | redosier dogwood | COSES |
| 112 | SW5113 | shrubby cinquefoil/tufted hairgrass | DAFL3/DECA18 |
| 113 | 1 | Idaho fescue/varileaf cinquefoil | FEID/PODI2 |
| 113 | 2 | tufted hairgrass/varileaf cinquefoil | DECA18/PODI2 |
| 113 | 3 | spike fescue/field locoweed | LEKI2/OXCA4 |
| 113 | 4 | blackroot sedge | CAEL3 |
| 113 | 5 | northern singlespike sedge/varileaf cinquefoil | CASC10/PODI2 |
| 113 | 6 | northern singlespike sedge/Ross's avens | CASC10/GERO2 |
| 113 | 7 | eightpetal mountain-avens/alpine bistort | DROC/POVI3 |
| 113 | 8 | arctic willow/American bistort | SAAR27/POBI6 |
| 113 | 9 | curly sedge/sheep cinquefoil | CARU3/POOV2 |
| 113 | 10 | Ross's avens/twinflower sandwort | GERO2/MIOB2 |
| 113 | 11 | eightpetal mountain-avens/curly sedge | DROC/CARU3 |
| 113 | 12 | black alpine sedge | CANI2 |
| 113 | 13 | Drummond's rush/woolly pussytoes | JUDR/ANLA3 |
| 113 | 14 | pink mountainheath/woolly pussytoes | PHEM/ANLA3 |
| 113 | 15 | western moss heather/Payson's sedge | CAME7/CAPA31 |
| 113 | 16 | Parry's rush/Bear River fleabane | JUPA/ERUR2 |
| 113 | 17 | grayleaf willow | SAGL |
| 113 | 18 | tufted hairgrass/white marsh marigold | DECA18/CALE4 |
| 113 | 19 | mountain sedge/white marsh marigold | CASC12/CALE4 |
| 113 | 20 | netleaf willow/white marsh marigold | SARE2/CALE4 |
| 113 | 21 | diamondleaf willow/mountain sedge | SAPL2/CASC12 |
| 113 | 22 | Dry slope communities | |
| 113 | 23 | Moist slope communities | |
| 113 | 24 | spike fescue | LEKI2 |
| 113 | 25 | Ross' avens, Parry's clover | GERO2/TRPA5 |
| 113 | 26 | flowery phlox/dwarf clover | PHMU3/TRNA2 |
| 113 | 27 | cushion phlox/alpine clover | PHPU5/TRDA2 |
| 113 | 28 | alpine clover/Ross' avens | TRDA2/GERO2 |
| 113 | 29 | littleleaf pussytoes/alpine sagebrush | ANMI3/ARSC |
| 115 | 100 | western wheatgrass/green needlegrass | PASM/NAV14 |
| 115 | 1000 | Silver sagebrush/western wheatgrass | ARCA13/PASM |
| 115 | 1100 | Wyoming big sagebrush/western wheatgrass | ARTRW8/PASM |
| 115 | 1200 | Wyoming big sagebrush/bluebunch wheatgrass | ARTRW8/PSSPS |
| 115 | 1300 | Shadescale saltbrush/Wyoming big sagebrush | ATCO/SRTRW8 |
| 115 | 1400 | creeping juniper/little bluestem | JUHO2/SCSCS |
| 115 | 1500 | shrubby cinquefoil/little bluestem | DAFR6/SCSCS |
| 115 | 1600 | fragrant sumac/bluebunch wheatgrass | RHAR4/PSSPS |
| 115 | 1700 | fragrant sumac/plains muhley | RHAR4/MUCU3 |

| *Potential Vegetation Codes* | | | |
|---|---|---|---|
| **Reference Code** | **ADP Code** | **Common Name** | **PLANTS Code Abbreviation** |
| 115 | 1800 | greasewood/western wheatgrass | SAVE4/PASM |
| 115 | 1900 | greasewood/bluebunch wheatgrass | SAVE4/PSSPS |
| 115 | 200 | little bluestem/threadleaf sedge | SCSCS/CAFI |
| 115 | 2000 | silver buffaloberry | SHAR |
| 115 | 2100 | western snowberry | SYOC |
| 115 | 300 | big bluestem | ANGE |
| 115 | 400 | western wheatgrass/needle and thread | PASM/HECOC8 |
| 115 | 500 | prairie sandreed/carex | CALO/CAREX |
| 115 | 600 | saltgrass | DISP |
| 115 | 700 | Nuttall's alkaligrass/saltgrass | PUNU2/DISP |
| 115 | 800 | needle and thread/threadleaf sedge | HECOC8/CAFI |
| 115 | 900 | little sagebrush/bluegramma | ARAR8/BOGR2 |
| 116 | 10 | American basswood/bur oak | TIAM/QUMA2 |
| 116 | 20 | quaking aspen/western poinson ivy | POTR5/TORY |
| 116 | 30 | sand bluestem/little bluestem | ANHA/BOCU |
| 116 | 40 | big bluestem/little bluestem | ANGE/SCSC (ANGE/ANSC10) |
| 116 | 50 | wolly sedge/slimstem reedgrass | CALA30/CAST36 |
| 116 | 60 | Hummock types | BOGR2 or POPR |
| 199 | 090 | Limber pine series | PIFL2 |
| 199 | 091 | Limber pine/bluebunch wheatgrass | PIFL2/PSSPS |
| 199 | 092 | Limber pine/Idaho fescue | PIFL2/FEID |
| 199 | 093 | Limber pine/Idaho fescue-Idaho fescue | PIFL2/FEID-FEID |
| 199 | 094 | Limber pine/Idaho fescue-rough fescue | PIFL2/FEID-FEAL |
| 199 | 095 | Limber pine/common juniper | PIFL/JUCO6 |
| | | | |

# Appendix H: List of Species

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| | | | |
| **Tree Species (temporary symbol):** | | | |
| 2TD | Tree, deciduous | | To be used temporarily until local Botanist identifies species. Not to be loaded into FSVeg. |
| 2TE | Tree, evergreen | | To be used temporarily until local Botanist identifies species. Not to be loaded into FSVeg. |
| | | | |
| **Tree Species:** | | | |
| ABGR | grand fir | *Abies grandis* | |
| ABLA | subalpine fir | *Abies lasiocarpa* | |
| ALRU2 | red alder | *Alnus rubra* | |
| BEOC2 | water birch | *Betula occidentalis* | |
| BEPA | paper birch | *Betula papyrifera* | |
| CELE3 | Curl-leaf mountain mahogany | *Cercocarpus ledifolius* | |
| FRPE | green ash | *Fraxinus pennsylvanica* | |
| JUOS | Utah juniper | *Juniperus osteosperma* | |
| JUSC2 | Rocky Mountain juniper | *Juniperus scopulorum* | |
| LALY | subalpine larch | *Larix lyallii* | |
| LAOC | western larch | *Larix occidentalis* | |
| PIAL | whitebark pine | *Pinus albicaulis* | |
| PICO | lodgepole pine | *Pinus contorta* | |
| PIEN | Engelmann spruce | *Picea engelmannii* | |
| PIFL2 | limber pine | *Pinus flexilis* | |
| PIGL | white spruce | *Picea glauca* | |
| PIMO3 | western white pine | *Pinus monticola* | |
| PIPO | ponderosa pine | *Pinus ponderosa* | |
| POBA2 | Balsam poplar | *Populus balsamifera* | |
| POBAT | black cottonwood | *Populus balsamifera trichocarpa* | |
| POTR5 | quaking aspen | *Populus tremuloides* | |
| PSME | Douglas-fir | *Pseudotsuga menziesii* | |
| TABR2 | Pacific yew | *Taxus brevifolia* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| THPL | western redcedar | *Thuja plicata* | |
| TSHE | western hemlock | *Tsuga heterophylla* | |
| TSME | mountain hemlock | *Tsuga mertensiana* | |
| | | | |
| **Shrub Species:** | | | |
| ACGL | Rocky Mountain maple | *Acer glabrum* | |
| ALIN2 | mountain alder | *Alnus incana* | Includes *A. tenuifolia*- thinleaf alder |
| ALVI5 | green alder | *Alnus viridis* | Includes *A. sinuata* – Sitka alder |
| AMAL2 | Saskatoon serviceberry | *Amelanchier alnifolia* | |
| ARUV | kinnikinnick | *Arctostaphylos uva-ursi* | |
| ARTR2 | big sagebrush | *Artemisia tridentata* | |
| ARVU | Common wormwood | *Artemisia vulgaris* | |
| BENA | bog birch | *Betula nana* | |
| BEOC2 | water birch | *Betula occidentalis* | |
| CESA | redstem ceanothus | *Ceanothus sanguineus* | Also called bog birch |
| CEVE | Snowbrush ceanothus | *Ceanothus velutinus* | |
| CEMO2 | mountain mahogany | *Cercocarpus montanus* | |
| CHME | little pipsissewa | *Chimaphila menziesii* | |
| CHUM | common prince's-pine | *Chimaphila umbellata* | |
| CLCO2 | rock clematis | *Clematis columbiana* | Includes *C. columbiana* and *C. tenuiloba* |
| CLDO2 | yerba buena | *Clinopodium douglasii* | Includes *Satureja douglasii* |
| COCA13 | Bunchberry dogwood | *Cornus canadensis* | |
| COSE16 | redosier dogwood | *Cornus sericea* | Includes *C. stolonifera* |
| CRDO2 | black hawthorn | *Crataegus douglasii* | |
| DAFL3 | shrubby cinquefoil | *Dasiophora floribunda* | |
| ERNA10 | rubber rabbitbrush | *Ericameria nauseosa* | |
| FRPU7 | Cascara | *Frangula purshiana* | Includes *Rhamnus purshiana* |
| GABO2 | northern bedstraw | *Galium boreale* | |
| GAHU | alpine spicywintergreen | *Gaultheria humifusa* | |
| GAOV2 | wintergreen | *Gaultheria ovalifolia* | |
| HODI | oceanspray | *Holodiscus discolor* | |
| JUCO6 | common juniper | *Juniperus communis* | |
| JUHO2 | creeping juniper | *Juniperus horizontalis* | |
| LEGL | western Labrador tea | *Ledum glandulosum* | |
| LIBO3 | Twinflower | *Linnaea borealis* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| LOCI3 | orange honeysuckle | *Lonicera ciliosa* | |
| LOIN5 | twinberry honeysuckle | *Lonicera involucrata* | |
| LOUT2 | Utah honeysuckle | *Lonicera utahensis* | |
| MAAQ2 | tall Oregon grape | *Mahonia aquifolium* | Includes *Berberis aquifolium* |
| MARE11 | creeping barberry | *Mahonia repens* | Includes *Berberis repens* |
| MEFE | rusty menziesia | *Menziesia ferruginea* | |
| OPHO | Devilsclub | *Oplopanax horridum* | |
| PAMY | Oregon boxleaf | *Paxistima myrsinites* | *= Pachistima myrsinites* |
| PHLE4 | mockorange; syringa | *Philadelphus lewisii* | |
| PHEM | pink mountainheath | *Phyllodoce empetriformis* | |
| PHMA5 | mallow ninebark | *Physocarpus malvaceus* | |
| PREM | bittercherry | *Prunus emarginata* | |
| PRVI | chokecherry | *Prunus virginiana* | |
| PUTR2 | antelope bitterbrush | *Purshia tridentata* | |
| RHAL | alder buckthorn | *Rhamnus alnifolia* | |
| RHAL2 | Cascade azalea | *Rhododendron albiflorum* | |
| RHTR | skunkbush sumac | *Rhus trilobata* | |
| RICE | squaw currant | *Ribes cereum* | |
| RIHU | stinking currant | *Ribes hudsonianum* | |
| RILA | prickly currant | *Ribes lacustre* | |
| RIMO2 | gooseberry currant | *Ribes montigenum* | |
| RIVI3 | sticky currant | *Ribes viscosissimum* | |
| ROAC | prickly rose | *Rosa acicularis* | |
| ROGY | dwarf rose | *Rosa gymnocarpa* | |
| RONU | nootka rose | *Rosa nutkana* | |
| ROWO | Woods' rose | *Rosa woodsii* | |
| RUID | red raspberry | *Rubus idaeus* | |
| RUNI2 | snow dewberry | *Rubus nivalis* | |
| RUPA | thimbleberry | *Rubus parviflorus* | |
| RUUR | blackberry | *Rubus ursinus* | |
| SALIX | Willow | *Salix spp.* | |
| SASC | Scouler's willow | *Salix scouleriana* | |
| SANI4 | European black elderberry | *Sambucus nigra* | Includes *S. cerulea* |
| SARA2 | elderberry | *Sambucus racemosa* | |
| SHCA | russet buffaloberry | *Shepherdia canadensis* | |
| SOSC2 | Greene mountain-ash | *Sorbus scopulina* | |
| SOSI2 | Sitka mountain-ash | *Sorbus sitchensis* | |
| SPBE2 | white spirea | *Spiraea betulifolia* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| SYAL | common snowberry | *Symphoricarpos albus* | |
| SYHE | creeping snowberry | *Symphoricarpos hesperius* | |
| VAME | thinleaf huckleberry | *Vaccinium membranaceum* | Includes *V. globulare* |
| VACA13 | dwarf huckleberry | *Vaccinium caespitosum* | Includes *V. cespitosum* |
| VAMY | Velvetleaf blueberry | *Vaccinium myrtilloides* | |
| VAMY2 | whortleberry | *Vaccinium myrtillus* | |
| VAOV | early blueberry | *Vaccinium ovalifolium* | |
| VAOX | small cranberry | *Vaccinium oxycoccos* | |
| VASC | grouse whortleberry | *Vaccinium scoparium* | |
| VAUL | alpine blueberry | *Vaccinium uliginosum* | Includes *V. occidentale* |
| | | | |
| **Forb Species:** | | | |
| ACMI2 | common yarrow | *Achillea millefolium* | |
| ACCO4 | monkshood | *Aconitum columbianum* | |
| ACRU2 | red baneberry | *Actaea rubra* | |
| ADBI | American trailplant | *Adenocaulon bicolor* | |
| ALCE2 | nodding onion | *Allium cernuum* | |
| ANMA | common pearly-everlasting | *Anaphalis margaritacea* | |
| ANPI | windflower | *Anemone piperi* | |
| ANAR3 | sharptooth angelica | *Angelica arguta* | |
| ANRA | raceme pussy-toes | *Antennaria racemosa* | |
| APAN2 | spreading dogbane | *Apocynum androsaemifolium* | |
| AQFL | yellow columbine | *Aquilegia flavescens* | |
| AQFO | red columbine | *Aquilegia formosa* | |
| ARNU2 | wild sarsaparilla | *Aralia nudicaulis* | |
| ARCO9 | heartleaf arnica | *Arnica cordifolia* | |
| ARLA8 | Broadleaf arnica | *Arnica latifolia* | |
| ASCA2 | British Columbia wildginger | *Asarum caudatum* | |
| BASA3 | Arrowleaf balsamroot | *Balsamorhiza sagittata* | |
| CAAP | pointed mariposa | *Calochortus apiculatis* | |
| CALE4 | white marsh marigold | *Caltha leptosepala* | Includes *C. biflora* |
| CABU | fairy slipper | *Calypso bulbosa* | |
| CARO2 | Harebell | *Campanula rotundifolia* | |
| CACO27 | Constance's bittercress | *Cardamine constancei* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| CAMI12 | scarlet paintbrush | *Castilleja miniata* | |
| CESTM | spotted knapweed | *Centaurea biebersteinii* | Noxious weed |
| CESO3 | yellow starthistle | *Centaurea solstitalis* | Noxious weed |
| CHAN9 | Fireweed | *Chamerion angustifolium* | Includes *Epilobium angustifolium* |
| CIAL | enchanter's nightshade | *Circaea alpina* | |
| CIAR4 | Canada thistle | *Cirsium arvense* | Noxious weed |
| CLCO3 | broadleaved montia | *Claytonia cordifolia* | Includes *Montia cordifolia* |
| CLUN2 | bride's bonnet / Queen's cup beadlily | *Clintonia uniflora* | |
| COOC | Idaho goldthread | *Coptis occidentalis* | |
| COMA4 | Pacific coralroot | *Corallorhiza maculata* | |
| COME4 | western coralroot | *Corallorhiza mertensiana* | |
| COST | striped coralroot | *Corallorhiza striata* | |
| DIHO3 | drops of gold | *Disporum hookeri* | |
| DITR2 | Roughfruit fairybells | *Disporum trachycarpum* | |
| DOJE | sierra shootingstar | *Dodecatheon jeffreyi* | |
| ERPE3 | Subalpine daisy | *Erigeron peregrinus* | |
| ERGR9 | glacier-lily | *Erythronium grandiflorum* | |
| EUCO36 | eastern showy aster | *Eurybia conspicua* | |
| EUES | leafy spurge | *Euphorbia esula* | Noxious weed |
| FRVE | Woodland strawberry | *Fragaria vesca* | |
| FRVI | Virginia strawberry | *Fragaria virginiana* | |
| FRFA | Clustered frasera | *Frasera fastigiata* | |
| GATR3 | fragrant bedstraw | *Galium triflorum* | |
| GELI2 | northern comandra | *Geocaulon lividum* | |
| GERI | Richardson's geranium | *Geranium richardsonii* | |
| GEVI2 | sticky geranium | *Geranium viscosissimum* | |
| GOOB2 | western rattlesnake plantain | *Goodyera oblongifolia* | |
| HEMA80 | common cowparsnip | *Heracleum maximum* | Includes *H. lanatum* |
| HECY2 | Roundleaf alumroot | *Heuchera cylindrica* | |
| HIAL2 | white-flowered hawkweed | *Hieracium albiflorum* | |
| HICY | houndstongue hawkweed | *Hieracium cynoglossoides* | |
| HIGR | slender hawkweed | *Hieracium gracile* | |
| HYPE | common St. John's-wort | *Hypericum perforatum* | |
| LANE | sierran peavine | *Lathyrus nevadensis* | |
| LAOC2 | cream pea | *Lathyrus ochroleucus* | |
| LICA2 | Canby's licorice-root | *Ligusticum canbyi* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| LIVE | verticillate-umbel licorice-root | *Ligusticum verticillatum* | |
| LICA10 | western twayblade | *Listera caurina* | |
| LICO6 | heart-leaved twayblade | *Listera cordata* | |
| LODI | fern-leaved desert-parsley | *Lomatium dissectum* | |
| LOTR2 | nine-leaf lomatium | *Lomatium triternatum* | |
| LUAR3 | silvery lupine | *Lupinus argenteus* | |
| LUSE4 | silky lupine | *Lupinus sericeus* | |
| MARA7 | feathery false lily of the valley | *Maianthemum racemosa* | |
| MAST4 | starry false lily of the valley | *Maianthemum stellatum* | Includes *Smilacina stellatum* |
| MELI2 | cow-wheat | *Melampyrum lineare* | |
| MEPA | tall bluebells | *Mertensia paniculata* | |
| MIBR6 | Brewer's miterwort | *Mitella breweri* | |
| MICA5 | Miterwort | *Mitella caulescens* | |
| MINU3 | naked miterwort | *Mitella nuda* | |
| MIPE | fivestamen miterwort | *Mitella pentandra* | |
| MIST3 | smallflower mitrewort | *Mitella stauropetala* | |
| MOMA3 | bigleaf sandwort | *Moehringia macrophylla* | Includes *Arenaria macrophylla* |
| MOUN2 | single delight | *Moneses uniflora* | Includes *Pyrola uniflora* |
| ORSE | sidebells wintergreen | *Orthilia secunda* | Includes *Pyrola secunda* |
| OSBE | sweetcicely | *Osmorhiza berteroi* | Includes *Osmorhiza chilensis* |
| PAST10 | Rocky Mountain groundsel | *Packera streptanthifolia* | Includes *Senecio streptanthifolius* |
| PEBR | bracted lousewort | *Pedicularis bracteosa* | |
| PERA | leafy lousewort | *Pedicularis racemosa* | |
| PHHE2 | varileaf phacelia | *Phacelia heterophylla* | |
| PIEL2 | hillside rein-orchid | *Piperia elegans* | |
| PIUN3 | Alaska rein-orchid | *Piperia unalascensis* | Includes *Habenaria unalascensis* |
| PLOR4 | large rein-orchid | *Platanthera orbiculata* | Includes *Habenaria orbiculata* |
| PLST4 | slender bog-orchid | *Platanthera stricta* | Includes *Habenaria saccata* |
| POPU3 | showy Jacob's-ladder | *Polemonium pulcherrimum* | |
| POGL9 | sticky cinquefoil | *Potentilla glandulosa* | |
| POGR9 | slender cinquefoil | *Potentilla gracilis* | |
| PORE5 | sulfer cinquefoil | *Potentilla recta* | Noxious weed |
| PRVU | self-heal | *Prunella vulgaris* | |
| PTAN2 | Woodland pinedrops | *Pterospora andromedea* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| PYAS | liverleaf wintergreen | *Pyrola asarifolia* | |
| PYCH | green wintergreen | *Pyrola chlorantha* | Includes *Pyrola virens* |
| PYPI2 | white-veined pyrola | *Pyrola picta* | |
| RAUN | little buttercup | *Ranunculus uncinatus* | |
| RUPE | strawberry bramble | *Rubus pedatus* | |
| RUOC2 | western coneflower | *Rudbeckia occidentalis* | |
| SEST2 | Wormleaf stonecrop | *Sedum stenopetalum* | |
| SETR | Arrowleaf ragwort | *Senecio triangularis* | |
| SIME | Menzie's silene | *Silene menziesii* | |
| STAM2 | claspleaf twistedstalk | *Streptopus amplexifolius* | |
| SYMI | Mountain kittentails | *Synthyris missurica* | |
| SYPL | Idaho kittentails | *Synthyris platycarpa* | |
| THOC | western meadow-rue | *Thalictrum occidentale* | |
| THMO6 | Montana golden pea | *Thermopsis montana* | |
| TITR | threeleaf foamflower | *Tiarella trifoliata* | |
| TRCA | Carolina bugbane | *Trautvetteria caroliniensis* | |
| TRBO2 | starflower | *Trientalis borealis* | |
| TROV2 | white trillium | *Trillium ovatum* | |
| TRLA14 | American globeflower | *Trollius laxus* | |
| VASI | Sitka valerian | *Valeriana sitchensis* | |
| VECA2 | California false-hellebore | *Veratrum californicum* | |
| VEVI | green false-hellebore | *Veratrum viride* | |
| VIAM | American vetch | *Vicia americana* | |
| VIAD | hookedspur violet | *Viola adunca* | |
| VICA4 | Canadian white violet | *Viola canadensis* | |
| VIGL | pioneer violet | *Viola glabella* | |
| VIOR | darkwoods violet | *Viola orbiculata* | |
| XETE | common beargrass | *Xerophyllum tenax* | |
| | | | |
| **Graminoid Species:** | | | |
| AGSC5 | rough bentgrass | *Agrostis scabra* | |
| BRTE | cheatgrass | *Bromus tectorum* | |
| BRVU | Columbia brome | *Bromus vulgaris* | |
| CACA4 | Bluejoint | *Calamagrostis canadensis* | |
| CARU | pinegrass | *Calamagrostis rubescens* | |
| CACO11 | northwestern sedge | *Carex concinnoides* | |
| CAGE2 | Geyer's sedge | *Carex geyeri* | |

| *List of Species* | | | |
|---|---|---|---|
| **Symbol** | **Common Name** | **Scientific Name** | **Comments** |
| CARO5 | Ross sedge | *Carex rossii* | |
| CILA2 | drooping woodreed | *Cinna latifolia* | |
| DAGL | orchard-grass | *Dactylis glomerata* | |
| ELGL | blue wildrye | *Elymus glaucus* | |
| FECA4 | rough fescue | *Festuca campestris* | |
| FEID | Idaho fescue | *Festuca idahoensis* | |
| FEOC | western fescue | *Festuca occidentalis* | |
| JUNCU | Rush | *Juncus spp.* | |
| KOMA | prairie Junegrass | *Koeleria macrantha* | Includes *K. cristata* and *K. nitida* |
| LEKI2 | spike fescue | *Leucopoa kingii* | Includes *Hesperochloa kingii* |
| LUCA2 | field woodrush | *Luzula campestris* | |
| LUGL2 | smooth woodrush | *Luzula glabrata* | Includes *L. hitchcockii* |
| LUPA4 | small-flowered woodrush | *Luzula parviflora* | |
| MESU | Alaska oniongrass | *Melica subulata* | |
| ORAS | Roughleaf ricegrass | *Oryzopsis asperifolia* | |
| PHPR3 | common timothy | *Phleum pratense* | |
| POPR | Kentucky bluegrass | *Poa pratensis* | |
| PSSP6 | bluebunch wheatgrass | *Pseudoroegneria spicata* | Includes *Agropyron spicatum* and *Elytrigia spicata* |
| SCPU | false melic | *Schizachne purpurascens* | |
| TRCA21 | tall trisetum | *Trisetum canescens* | |
| | | | |
| **Fern Species:** | | | |
| Note: For Lifeform, classify fern species as “Forb” (FB). | | | |
| ADAL | Aleutian maidenhair | *Adiantum aleuticum* | Includes *A. pedatum* |
| ADPE | maidenhair fern | *Adiantum pedatum* | |
| ATFI | common ladyfern | *Athyrium filix-femina* | |
| BOVI | Virginia grape-fern | *Botrychium virginianum* | |
| CYFR2 | brittle bladder-fern | *Cystopteris fragilis* | |
| DRAU8 | mountain woodfern | *Dryopteris austriaca* | |
| DRFI2 | male fern | *Dryopteris filix-mas* | |
| EQAR | field horsetail | *Equisetum arvense* | |
| GYDR | western oakfern | *Gymnocarpium dryopteris* | |
| LYAN2 | stiff club-moss | *Lycopodium annotinum* | |
| POMU | western swordfern | *Polystichum munitum* | |
| PTAQ | bracken fern | *Pteridium aquilinum* | |
| WOOR | woodsia | *Woodsia oregana* | |

# Appendix I: Fuel Photo References and Codes

| *Fuel Photo References and Codes* | |
|---|---|
| **Reference Code** | **Fuel Photo Reference** |
| 1 | **Photo Guide for Appraising Downed Woody Fuels in Montana Forests: Grand fir - Larch - Douglas-fir, Western Redcedar Cover Types.** 1981. Fischer, William C. Gen. Tech. Rep. INT-96. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 53 p. |
| 2 | **Photo Guide for Appraising Downed Woody Fuels in Montana Forests: Interior Ponderosa Pine, Ponderosa Pine - Larch - Douglas-fir, Larch -Douglas-fir, and Interior Douglas-fir Cover Types.** 1981. Fischer, William C. Gen. Tech. Rep. INT-97. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 133 p. |
| 3 | **Photo Guide for Appraising Downed Woody Fuels in Montana Forests: Lodgepole Pine and Engelmann Spruce-Subalpine Fir Cover Types.** 1981. Fischer, William C. Gen. Tech. Rep. INT-98. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 143 p. |
| 4 | **Photo Guides for Appraising Downed Woody Fuels in Montana Forests: How They Were Made.** 1981. Fischer, William C. Research Note INT-299. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 12 p. |
| 5 | **Photo series for Appraising Thinning Slash in North Idaho: Western Hemlock, Grand fir, and Western Redcedar Timber Types.** 1979. Koski, Wayne H.; Fischer, William C. Gen. Tech. Rep. INT-46. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 50 p. |
| 6 | **Photo series for Quantifying Forest Residues in the: Ponderosa Pine Type, Ponderosa Pine and associated species type, Lodgepole pine type.** 1976. Maxwell, Wayne G.; Ward, Franklin R. Gen. Tech. Rep. PNW-52. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 74 p. |
| 8 | **Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest**. 1980. Maxwell, Wayne G; Ward, Franklin R. Gen Tech. Rep. PNW-105. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 229 p. |
| 10 | **Photo Series for Quantifying Forest Residues in: Douglas-fir, Engelmann Spruce Type, Limber Pine Type, Lodgepole Pine Type, Ponderosa Pine Type, Subalpine Fir Type for Eastern Montana.** Mackay, Douglas H.; Stiger, Everett M.; Goss, Delman; Bonney, Byron. USDA Forest Service, Northern Region. 162 p |

## Associated Fuel Photo Codes:

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **1** | 3A |
| **1** | 4A |
| **1** | 5A |
| **1** | 6A |
| **1** | 7A |
| **1** | 8A |
| **1** | 9A |
| **1** | 10A |
| **1** | 11A |
| **1** | 13A |
| **1** | 15 |
| **1** | 15A |
| **1** | 16 |
| **1** | 16A |
| **1** | 17A |
| **1** | 18A |
| **1** | 19A |
| **1** | 25 |
| **1** | 63 |
| **1** | 65 |
| **1** | 66 |
| **1** | 67 |
| | |
| **2** | 5 |
| **2** | 7 |
| **2** | 8 |
| **2** | 9 |
| **2** | 12A |
| **2** | 13 |
| **2** | 14 |
| **2** | 14A |
| **2** | 17 |
| **2** | 18 |
| **2** | 23 |
| **2** | 24 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **2** | 27A |
| **2** | 28 |
| **2** | 28A |
| **2** | 29 |
| **2** | 29A |
| **2** | 30 |
| **2** | 30A |
| **2** | 31 |
| **2** | 31A |
| **2** | 32 |
| **2** | 32A |
| **2** | 33 |
| **2** | 33A |
| **2** | 34 |
| **2** | 37A |
| **2** | 38A |
| **2** | 39A |
| **2** | 40A |
| **2** | 41A |
| **2** | 42 |
| **2** | 42A |
| **2** | 43 |
| **2** | 43A |
| **2** | 48 |
| **2** | 49 |
| **2** | 56 |
| **2** | 64 |
| **2** | 68 |
| **2** | 69 |
| **2** | 70 |
| **2** | 71 |
| **2** | 72 |
| **2** | 73 |
| **2** | 74 |
| **2** | 75 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **2** | 76 |
| **2** | 77 |
| **2** | 78 |
| **2** | 79 |
| **2** | 80 |
| **2** | 84 |
| **2** | 86 |
| **2** | 88 |
| **2** | 89 |
| **2** | 91 |
| **2** | 95 |
| | |
| **3** | 1 |
| **3** | 1A |
| **3** | 2 |
| **3** | 2A |
| **3** | 3 |
| **3** | 4 |
| **3** | 6 |
| **3** | 10 |
| **3** | 11 |
| **3** | 12 |
| **3** | 19 |
| **3** | 20 |
| **3** | 20A |
| **3** | 21 |
| **3** | 21A |
| **3** | 22 |
| **3** | 22A |
| **3** | 23A |
| **3** | 24A |
| **3** | 25A |
| **3** | 26 |
| **3** | 26A |
| **3** | 27 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **3** | 34A |
| **3** | 35 |
| **3** | 35A |
| **3** | 36 |
| **3** | 37 |
| **3** | 38 |
| **3** | 39 |
| **3** | 40 |
| **3** | 41 |
| **3** | 44 |
| **3** | 44A |
| **3** | 45 |
| **3** | 45A |
| **3** | 46 |
| **3** | 46A |
| **3** | 47 |
| **3** | 47A |
| **3** | 48A |
| **3** | 49A |
| **3** | 50 |
| **3** | 51 |
| **3** | 53 |
| **3** | 54 |
| **3** | 55 |
| **3** | 57 |
| **3** | 58 |
| **3** | 59 |
| **3** | 60 |
| **3** | 61 |
| **3** | 62 |
| **3** | 81 |
| **3** | 82 |
| **3** | 83 |
| **3** | 85 |
| **3** | 87 |
| **3** | 90 |
| **3** | 92 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **3** | 93 |
| **3** | 94 |
| **3** | 96 |
| **3** | 97 |
| **3** | 98 |
| | |
| **6** | 1PP4CC |
| **6** | 2PP4CC |
| **6** | 1PP4PC |
| **6** | 2PP4PC |
| **6** | 3PP4PC |
| **6** | 4PP4PC |
| **6** | 5PP4PC |
| **6** | 1PP1TH |
| **6** | 2PP1TH |
| **6** | 3PP1TH |
| **6** | 4PP1TH |
| **6** | 5PP1TH |
| **6** | 6PP1TH |
| **6** | 1PP&ASSOC4PC |
| **6** | 2PP&ASSOC4PC |
| **6** | 3PP&ASSOC4PC |
| **6** | 4PP&ASSOC4PC |
| **6** | 5PP&ASSOC4PC |
| **6** | 6PP&ASSOC4PC |
| **6** | 7PP&ASSOC4PC |
| **6** | 8PP&ASSOC4PC |
| **6** | 1LP3CC |
| **6** | 1LP3PC |
| **6** | 2LP3PC |
| **6** | 3LP3PC |
| **6** | 4LP3PC |
| **6** | 5LP3PC |
| **6** | 5PP&ASSOC4PC |
| **6** | 6PP&ASSOC4PC |
| **6** | 7PP&ASSOC4PC |
| **6** | 8PP&ASSOC4PC |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| | |
| **8** | 1BR |
| **8** | 1DF2 |
| **8** | 1DF3 |
| **8** | 1DF4 |
| **8** | 1DFHD3 |
| **8** | 1DFHD4 |
| **8** | 1GR |
| **8** | 1HD2 |
| **8** | 1JU2 |
| **8** | 1LP1 |
| **8** | 1LP2 |
| **8** | 1LP3 |
| **8** | 1MC2 |
| **8** | 1MC3 |
| **8** | 1MC4 |
| **8** | 1PP&ASSOC3 |
| **8** | 1PP&ASSOC4 |
| **8** | 1PP1 |
| **8** | 1PP2 |
| **8** | 1PP3 |
| **8** | 1PP4 |
| **8** | 1SA1 |
| **8** | 1SA2 |
| **8** | 1SA3 |
| **8** | 1SA4 |
| **8** | 2BR |
| **8** | 2DF2 |
| **8** | 2DF3 |
| **8** | 2DF4 |
| **8** | 2DFHD3 |
| **8** | 2DFHD4 |
| **8** | 2GR |
| **8** | 2HD2 |
| **8** | 2JU2 |
| **8** | 2LP1 |
| **8** | 2LP2 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **8** | 2LP3 |
| **8** | 2MC2 |
| **8** | 2MC3 |
| **8** | 2MC4 |
| **8** | 2PP&ASSOC3 |
| **8** | 2PP&ASSOC4 |
| **8** | 2PP1 |
| **8** | 2PP2 |
| **8** | 2PP3 |
| **8** | 2PP4 |
| **8** | 2SA1 |
| **8** | 2SA2 |
| **8** | 2SA3 |
| **8** | 2SA4 |
| **8** | 3DF4 |
| **8** | 3DFHD3 |
| **8** | 3DFHD4 |
| **8** | 3LP1 |
| **8** | 3LP2 |
| **8** | 3LP3 |
| **8** | 3MC2 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **8** | 3MC3 |
| **8** | 3PP&ASSOC3 |
| **8** | 3PP&ASSOC4 |
| **8** | 3PP1 |
| **8** | 3PP2 |
| **8** | 3PP3 |
| **8** | 3PP4 |
| **8** | 3SA1 |
| **8** | 3SA3 |
| **8** | 4DF4 |
| **8** | 4DFHD4 |
| **8** | 4LP2 |
| **8** | 4PP&ASSOC3 |
| **8** | 4PP2 |
| **8** | 4PP3 |
| **8** | 4PP4 |
| **8** | 5DF4 |
| **8** | 5DFHD4 |
| **8** | 5PP&ASSOC3 |
| **8** | 5PP3 |
| **8** | 5PP4 |

| *Associated Fuel Photo Codes* | |
|---|---|
| **Reference Code** | **Residue Code** |
| **8** | 6DF4 |
| **8** | 6PP3 |
| **8** | 6PP4 |
| **8** | 7DF4 |
| **8** | 7PP3 |
| **8** | 7PP4 |
| **8** | 8PP3 |
| **8** | 8PP4 |
| | |
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| | |
| | |
| | |

# Appendix J: Fixed-Radius Plot

## J.1 Horizontal fixed-radius plot distances:

| *Horizontal fixed-radius plot distances* | |
|---|---|
| **Plot Size (acre)** | **Plot Radius** |
| 1/1000 | 3.7 feet |
| 1/500 | 5.3 feet |
| 1/400 | 5.9 feet |
| 1/300 | 6.8 feet |
| 1/250 | 7.4 feet |
| 1/200 | 8.3 feet |
| 1/150 | 9.6 feet |
| 1/100 | 11.8 feet |
| 1/50 | 16.7 feet |

| *Horizontal fixed-radius plot distances* | |
|---|---|
| **Plot Size (acre)** | **Plot Radius** |
| 1/24 | 24.0 feet |
| 1/20 | 26.3 feet |
| 1/10 | 37.2 feet |
| 1/5 | 52.7 feet |
| 1/4 | 58.9 feet |
| 1/3 | 67.6 feet |
| 1/2 | 83.3 feet |
| 1 | 117.1 feet |

For all **fixed-radius plots located on slopes ≥ 10 percent**, distance correction for slope is necessary.

## J.2 Correcting for Slope

R1 does not use the method that uses a single “corrected” plot radius distance based on an average percent slope for the plot area because this method does not meet R1 accuracy standards.

Correcting a fixed plot radius for slope will always result in an oval plot shape on the ground because the plot radius will be longest in the direction of the fall line and it will be uncorrected perpendicular to the slope fall line. See the following figure for an example of a fixed radius plot layout on a slope ≥ 10%.

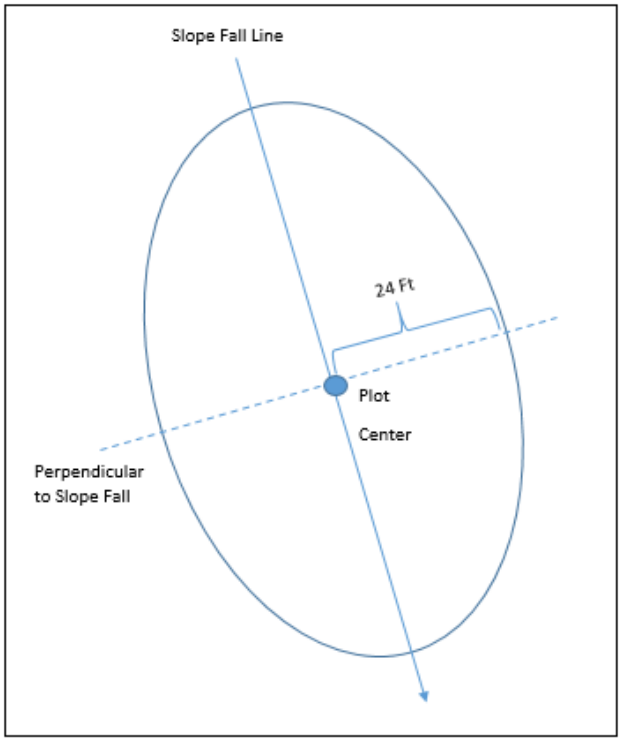



**Figure J1– Fixed Radius Plot Orientation when Slope Fall Line is >10%**

## J.3 Converting between horizontal distance and slope distance

The same formula is used to correct for slope when determining the lengths of the DWM transects and associated sub-population transect lengths, tree canopy cover transects, tree distances and whether noxious species or aspen are within the plot perimeter, etc.

**Slope Ground Distance = (Horizontal Ground Dist.) x SCF**

Example:

- A 25 ft. tree canopy cover transect needs to be installed along a slope of 35%.
- If there is a 35% slope, then SCF = 1.06
- Slope Ground Distance = 25.0 x 1.06
- Slope Ground Distance = 26.5 ft

Thus, when installing a transect that extends 25 ft horizontal distance from the center of the plot, the end stake should be installed at 26.5 ft slope distance from the center stake.

Calculate a tree's horizontal distance from the plot center using the same formula. See the following example.

**Horizontal Distance = Slope Ground Distance/SCF**

Example:

- If there is a 50% slope, then SCF = 1.12; the measured slope distance to the tree is 24.5 ft.
- The horizontal distance to the tree is:
- Horizontal Distance = 24.5/1.12
- Horizontal Distance = 21.88 ft

## J.4 Determining Sample Status for Borderline Trees on a Slope (fixed-radius plot)

To determine if a borderline tree located on a slope is "in" or "out" of the fixed-radius plot area, complete the following steps:

1. Determine the slope percent from plot center to the borderline tree (using a clinometer). Note: This slope percent is not necessarily the same as the average slope percent for the overall sample area; measure slope parallel to the ground line.

2. The slope correction factor can be determined in two ways:
   - Use a clinometer to measure the slope percent and then determining the correction factor from Table J.4
   - Use a clinometer with the slope correction factor built in (% slope and slope correction factor are on the dial)

3. Compute the slope limiting distance using the following formula (horizontal fixed-radius plot distances are listed below):

   **Slope Limiting Distance** = radius of the plot **x** SCF

4. Measure the **slope distance** (parallel to the ground line) from plot center to the **geographic center** (where tree comes out of the ground) of the borderline tree.

   If the measured distance is *less than or equal* to the "slope limiting distance," then the tree is "in" the fixed-radius plot area and should be included in the sample. If the measured distance is *greater than* the "slope limiting distance," then the tree is "out" of the fixed-radius plot area.

   Example:
   - Fixed-radius plot size – 1/10$^{th}$ acre (horizontal plot radius = 37.2 feet)
   - Slope percent from plot center to borderline tree – 25 percent
   - SCF – 1.03 (value from Table J.4)
   - Slope limiting distance:

   Slope Limiting Distance = 37.2 feet **x** 1.03
   = 38.3 feet

- Measured slope distance from plot center to geographic center of borderline tree – 38.2 feet

The tree is “in” the fixed-radius plot sample area (the measured slope distance of 38.2 feet is *less than or equal to* the slope limiting distance of 38.3 feet).

## J.4 Slope Correction Table:

| ***Slope Correction Table*** | | |
|---|---|---|
| **Percent of Slope** | **Degree of Slope** | **Slope Correction Factor (SCF)** |
| 0 to 9 | 0-6 | 1.00 |
| 10 to 17 | 7-10 | 1.01 |
| 18 to 22 | 11-12 | 1.02 |
| 23 to 26 | 13-14 | 1.03 |
| 27 to 30 | 15-17 | 1.04 |
| 31 to 33 | 18 | 1.05 |
| 34 to 36 | 19-20 | 1.06 |
| 37 to 39 | 21 | 1.07 |
| 40 to 42 | 22 | 1.08 |
| 43 to 44 | 23 | 1.09 |
| 45 to 47 | 24 | 1.10 |
| 48 to 49 | 25-26 | 1.11 |
| 50 to 51 | 27 | 1.12 |
| 52 to 53 | 28 | 1.13 |
| 54 to 55 | 29 | 1.14 |
| 56 to 57 | 29 | 1.15 |
| 58 to 59 | 30 | 1.16 |
| 60 to 61 | 31 | 1.17 |
| 62 to 63 | 32 | 1.18 |
| 64 to 65 | 33 | 1.19 |
| 66 to 67 | 34 | 1.20 |
| 68 to 69 | 34 | 1.21 |
| 70 | 35 | 1.22 |
| 71 to 72 | 36 | 1.23 |
| 73 to 74 | 37 | 1.24 |
| 75 | 37 | 1.25 |
| 76 to 77 | 38 | 1.26 |
| 78 to 79 | 38 | 1.27 |
| 80 | 39 | 1.28 |
| 81 to 82 | 39 | 1.29 |
| 83 | 40 | 1.30 |

| ***Slope Correction Table*** | | |
|---|---|---|
| **Percent of Slope** | **Degree of Slope** | **Slope Correction Factor (SCF)** |
| 84 to 85 | 40 | 1.31 |
| 86 | 41 | 1.32 |
| 87 to 88 | 41 | 1.33 |
| 89 | 42 | 1.34 |
| 90 to 91 | 42 | 1.35 |
| 92 | 43 | 1.36 |
| 93 to 94 | 43 | 1.37 |
| 95 | 44 | 1.38 |
| 96 to 97 | 44 | 1.39 |
| 98 | 44 | 1.40 |
| 99 to 100 | 45 | 1.41 |
| 101 | 45 | 1.42 |
| 102 | 46 | 1.43 |
| 103 to 104 | 46 | 1.44 |
| 105 | 46 | 1.45 |
| 106 to 107 | 47 | 1.46 |
| 108 | 47 | 1.47 |
| 109 | 47 | 1.48 |
| 110 to 111 | 48 | 1.49 |
| 112 | 48 | 1.50 |
| 113 | 48 | 1.51 |
| 114 to 115 | 49 | 1.52 |
| 116 | 49 | 1.53 |
| 117 | 49 | 1.54 |
| 118 to 119 | 50 | 1.55 |
| 120 | 50 | 1.56 |
| 121 | 50 | 1.57 |
| 122 | 51 | 1.58 |
| 123 to 124 | 51 | 1.59 |
| 125 | 51 | 1.60 |
| 126 | 52 | 1.61 |

| *Slope Correction Table* | | |
|---|---|---|
| **Percent of Slope** | **Degree of Slope** | **Slope Correction Factor (SCF)** |
| 127 to 128 | 52 | 1.62 |
| 129 | 52 | 1.63 |
| 130 | 52 | 1.64 |
| 131 | 53 | 1.65 |
| 132 to 133 | 53 | 1.66 |
| 134 | 53 | 1.67 |
| 135 | 53 | 1.68 |
| 136 | 54 | 1.69 |
| 137 to 138 | 54 | 1.70 |
| 139 | 54 | 1.71 |

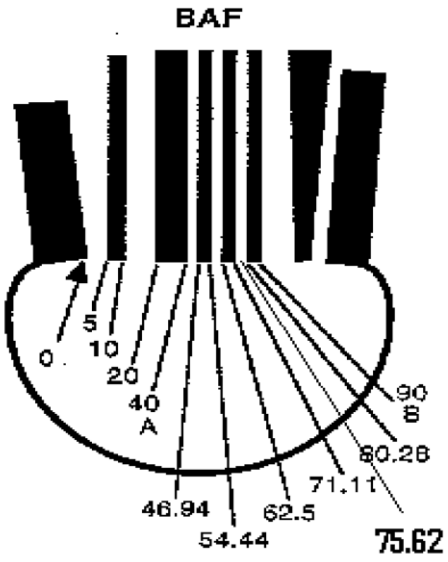
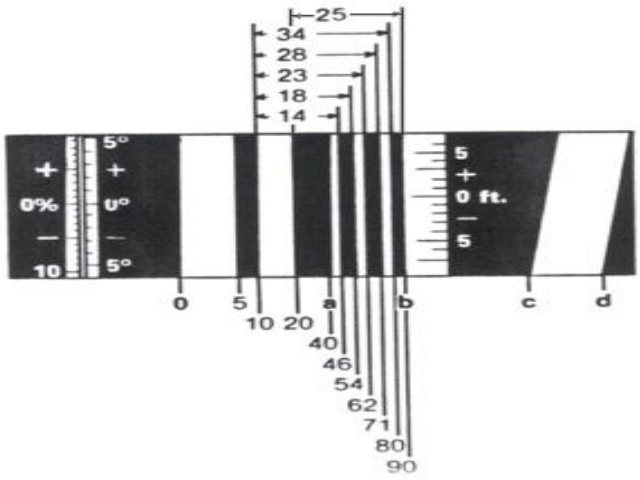
| *Slope Correction Table* | | |
|---|---|---|
| **Percent of Slope** | **Degree of Slope** | **Slope Correction Factor (SCF)** |
| 140 | 54 | 1.72 |
| 141 | 55 | 1.73 |
| 142 to 143 | 55 | 1.74 |
| 144 | 55 | 1.75 |
| 145 | 55 | 1.76 |
| 146 | 56 | 1.77 |
| 147 | 56 | 1.78 |
| 148 to 149 | 56 | 1.79 |
| 150 | 56 | 1.80 |

# Appendix K: Variable-Radius Plot *(borderline trees)*

Variable-radius plot sampling is a method that involves selection of trees with a probability proportional to their size. Under this sampling method, a plot center is established, and trees are selected for sample by rotating a fixed angle around the plot. The plot radius varies according to the diameter (DBH or DRC) and distance of each tree from plot center.

The experienced field person using a wedge prism, angle gauge can quickly tell in most cases if a tree is “in" or "out" of the variable plot. The Relaskop is an extremely delicate and expensive instrument that corrects for slope while determining if a tree is in or out on a variable radius plot. Looking through the small window on the Relaskop, a series of black and white lines (bars) should be visible. When the instrument is tilted down 60º, the scales are identified at the base of the scale bars. These scales can be difficult to read in certain light conditions. See the following illustrations of the American Relaskop scales. The first illustration shows the standard relaskop scales. The second illustration shows how the relaskop scales can be used for selecting sample trees using “non-standard” BAFs. See Table K-0 for the actual BAFs that would be entered into the sample design in Exams software when using the additional BAFs available using the American Scale Relaskop.

**American Relaskop Scales**

| Standard Relaskop Scales | Additional BAFs Available Using the American Scale Relaskop |
|---|---|
|  |  |





**Measurement of Borderline Trees to Determine “In” or “Out” Status:**

There are certain trees that are questionable (borderline) for tally because they are located at the outer limits of the variable-plot radius. This narrative describes the procedures needed to ascertain if borderline trees qualify for tally.

For information on the theory and mathematics of variable plot cruising; and formulas for determining the plot radius factor for any given BAF, refer to *Log Scaling and Timber Cruising* (1973, J. R. Dilworth, OSU Book Stores, Inc., Corvallis, Oregon).

In variable-radius plot sampling, limiting distance is a function of the selected basal area factor (e.g., 20 or 40) and the diameter of the tree. The limiting distance is the maximum distance that a tree can be from plot center and still qualify for tally.

To determine if a borderline tree is "in" or "out" of the variable-radius plot area, complete the following steps. Refer to section A if the borderline tree is located on a slope that is < 10 percent. Refer to section B if the borderline tree is located a slope that is ≥ 10 percent.

Note: For **down-dead trees** on a variable-radius plot, determine the sample status ("in" or "out") based on where DBH (or DRC) now lies, not on where the tree once stood. Measure distance from plot center to the nearest face of the tree at DBH (or DRC).

## A. Determining Sample Status for Borderline Trees (when slope is < 10 percent)

Tables K-1 through K-5 display **horizontal limiting distances** for various tree diameters and commonly used basal area factors (BAF). For these tables, limiting distance is measured from plot center to the **face of the tree** at DBH (or DRC) along a horizontal line; the table value is the maximum horizontal distance that a tree can be from plot center and still be considered "in."

**Procedure:**

1. Measure the diameter of the tree to the nearest tenth of an inch.
2. Determine the **horizontal limiting distance** using one of the following options:
   - Option 1 – Refer to tables K-1 through K-5; use the table that is applicable to the specified BAF. Locate the limiting distance value within the table based on the row and column for the tree diameter; the values listed are in feet.
   - Option 2 – Compute limiting distance using the following formula:

**Limiting Distance** = Corrected Plot Radius Factor **x** Diameter

**Table K-0. Basal Area Factors**

| BAF (rounded) | BAF (actual) Value used in Exams Sample Design for Expansion Factor | *Corrected PRF (face of tree) |
|---|---|---|
| 5 | 5 | 3.847 |
| 10 | 10 | 2.708 |
| 14 | 13.61 | 2.316 |
| 15 | 15 | 2.204 |
| 18 | 17.78 | 2.021 |
| 20 | 20 | 1.903 |
| 23 | 22.5 | 1.792 |
| 25 | 25.15 | 1.692 |
| 28 | 27.78 | 1.608 |
| 30 | 30 | 1.546 |

| BAF (rounded) | BAF (actual) Value used in Exams Sample Design for Expansion Factor | *Corrected PRF (face of tree) |
|---|---|---|
| 34 | 33.61 | 1.458 |
| 35 | 35 | 1.428 |
| 40 | 40 | 1.333 |
| 46 | 46.94 | 1.228 |
| 50 | 50 | 1.188 |
| 54 | 54.44 | 1.137 |
| 60 | 60 | 1.081 |
| 62 | 62.5 | 1.058 |
| 71 | 71.11 | 0.990 |
| 80 | 80.27 | 0.929 |
| 90 | 89.99 | 0.875 |
| Horizontal Limiting Distance = PRF x Diameter (1/10") | | |

Columns shaded grey are not available on the Relaskop.

***** The plot radius factors (PRF) listed have been corrected for determining the limiting distance to the **face of the tree.** A standard plot radius factor is used to determine limiting distance to the center of a tree, and is computed by 8.696/SQR(BAF). A corrected PRF subtracts 1/24 (.041666) from the standard plot radius factor.

**3.** Measure the **horizontal distance** from plot center to the nearest face of the tree at DBH (or DRC).

If the measured distance is *less than or equal* to the "limiting distance," then the tree is "in" and is tallied as a sample tree. If the measured distance is *greater than* the "limiting distance," then the tree is "out" and is not tallied.

**Example 1** (determining sample status for borderline tree on slope < 10 percent):

- Basal Area Factor – 40 BAF
- Slope Percent (from face of tree to plot center) – 5 percent
- DBH – 20.9 inches
- PRF – 1.333 (value from table above)
- Horizontal Distance (from plot center the face of the tree at DBH) – 27.7 feet

Compute limiting distance:

**Limiting Distance** = Plot Radius Factor **x** DBH
= 1.333 **x** 20.9
= 27.9 feet

Since the measured horizontal distance of 27.7 feet is *less than or equa*l *to* the limiting distance of 27.9 feet, the tree is "in" and is tallied as a sample tree.

## B. Determining Sample Status for Borderline Trees (when slope is ≥ 10 percent)

**Procedure:**

1. Measure the diameter of the tree to the nearest tenth of an inch.
2. Measure the percent slope from the face of the tree at DBH (or DRC), nearest plot center, to plot center. Note: This slope measurement and the distance measurement, from step 4 below, must be along the same line.
3. Determine the **limiting distance** using one of the following options:

- Option 1 (use of table K-6)–

  **a.** First, determine the **slope corrected plot radius factor** listed in table K-6 (refer to table below) – look under the "Combined Factor" column for the appropriate BAF. Locate the value associated with the percent slope from the face of the tree to plot center; this value will be referred to as the "Combined Factor" in the formula below.

  **b.** Compute limiting distance using the following formula:

  **Limiting Distance** = Diameter **x** "Combined Factor"

- Option 2 (formulas)–

  **a.** First, compute the **slope correction factor (SCF)** using the following formula (note: this value is also listed in table K-6 under the "Slope Correction Factor" column; locate the SCF associated with the percent slope from the face of the tree to plot center):

  $$\textbf{SCF} = \text{SQR}\,(1 + (\text{slope}/100)^2)$$

  **b.** Next, compute the slope corrected plot radius factor using the following formula; plot radius factors (PRF) are listed above under step 3:

  **Slope Corrected PRF** = Slope Correction Factor **x** PRF

**c.** Compute limiting distance using the following formula:

**Limiting Distance** = Slope Corrected PRF **x** Diameter

**4.** Measure the **slope distance** from plot center to the nearest face of the tree at DBH (or DRC). Note: This distance measurement and the slope percent measurement, from step 2 above, must be along the same line.

If the measured distance is *less than or equal* to the "limiting distance," then the tree is "in" and is tallied as a sample tree. If the measured distance is *greater than* the "limiting distance," then the tree is "out" and is not tallied.

**Example 2** (determining limiting distance for borderline tree on slope using formulas):

- Basal Area Factor – 40 BAF
- Slope Percent (from face of tree at DBH to plot center) – 20 percent
- DBH – 20.9 inches
- PRF – 1.333 (value from table above)

**Slope Correction Factor:** = SQR $(1 + (\text{slope}/100)^2)$
= $(1 + (20/100)^2)$
= 1.0198

**Slope Corrected PRF:** = SCF **x** PRF
= 1.0198 **x** 1.333
= 1.359

**Limiting Distance:** = Slope Corrected PRF **x** DBH
= 1.359 **x** 20.9
= 28.4 feet

**Example 3** (determining sample status for borderline tree on slope ≥ 10 percent – using table K-6):

- Basal Area Factor – 40 BAF
- Slope Percent (from face of tree at DBH to plot center) – 50 percent
- DBH – 15.0 inches
- Slope Distance (from face of tree at DBH to plot center) – 21.0 feet

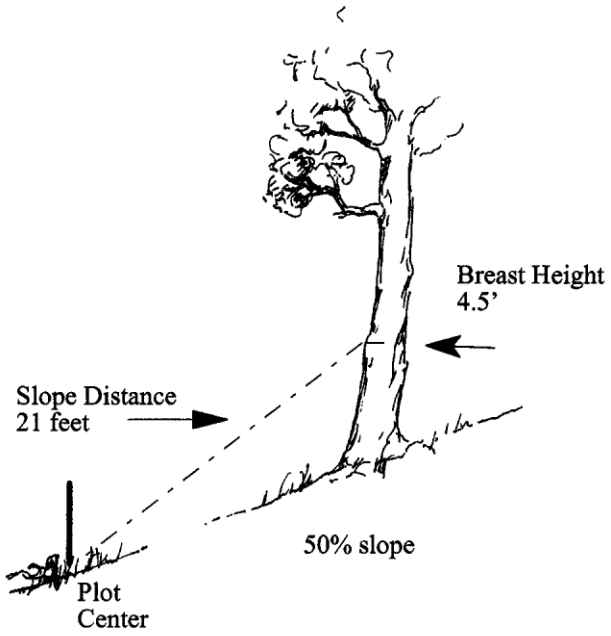



**Figure K-1 –** Determining limiting distance on a slope.

The "Combined Factor" for a slope of 50 percent with a 40 BAF is 1.490 (referring to table K-6).

**Limiting Distance** = DBH **x** "Combined Factor"
= 15.0 **x** 1.490
= 22.35 feet

Since the measured slope distance of 21.0 feet is *less than or equal to* the limiting distance of 22.35 feet, the tree is "in" and is tallied as a sample tree.

## Table K-1: BAF 10 plot radii from plot center to face of tree at DBH for 0% slope (in feet)

| 10 BAF | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inches** | **0** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
| 5 | 13.5 | 13.8 | 14.1 | 14.4 | 14.6 | 14.9 | 15.2 | 15.4 | 15.7 | 16.0 |
| 6 | 16.2 | 16.5 | 16.8 | 17.1 | 17.3 | 17.6 | 17.9 | 18.1 | 18.4 | 18.7 |
| 7 | 19.0 | 19.2 | 19.5 | 19.8 | 20.0 | 20.3 | 20.6 | 20.9 | 21.1 | 21.4 |
| 8 | 21.7 | 21.9 | 22.2 | 22.5 | 22.7 | 23.0 | 23.3 | 23.6 | 23.8 | 24.1 |
| 9 | 24.4 | 24.6 | 24.9 | 25.2 | 25.5 | 25.7 | 26.0 | 26.3 | 26.5 | 26.8 |
| 10 | 27.1 | 27.4 | 27.6 | 27.9 | 28.2 | 28.4 | 28.7 | 29.0 | 29.2 | 29.5 |
| 11 | 29.8 | 30.1 | 30.3 | 30.6 | 30.9 | 31.1 | 31.4 | 31.7 | 32.0 | 32.2 |
| 12 | 32.5 | 32.8 | 33.0 | 33.3 | 33.6 | 33.9 | 34.1 | 34.4 | 34.7 | 34.9 |
| 13 | 35.2 | 35.5 | 35.7 | 36.0 | 36.3 | 36.6 | 36.8 | 37.1 | 37.4 | 37.6 |
| 14 | 37.9 | 38.2 | 38.5 | 38.7 | 39.0 | 39.3 | 39.5 | 39.8 | 40.1 | 40.3 |
| 15 | 40.6 | 40.9 | 41.2 | 41.4 | 41.7 | 42.0 | 42.2 | 42.5 | 42.8 | 43.1 |
| 16 | 43.3 | 43.6 | 43.9 | 44.1 | 44.4 | 44.7 | 45.0 | 45.2 | 45.5 | 45.8 |
| 17 | 46.0 | 46.3 | 46.6 | 46.8 | 47.1 | 47.4 | 47.7 | 47.9 | 48.2 | 48.5 |
| 18 | 48.7 | 49.0 | 49.3 | 49.6 | 49.8 | 50.1 | 50.4 | 50.6 | 50.9 | 51.2 |
| 19 | 51.5 | 51.7 | 52.0 | 52.3 | 52.5 | 52.8 | 53.1 | 53.3 | 53.6 | 53.9 |
| 20 | 54.2 | 54.4 | 54.7 | 55.0 | 55.2 | 55.5 | 55.8 | 56.1 | 56.3 | 56.6 |
| 21 | 56.9 | 57.1 | 57.4 | 57.7 | 58.0 | 58.2 | 58.5 | 58.8 | 59.0 | 59.3 |
| 22 | 59.6 | 59.8 | 60.1 | 60.4 | 60.7 | 60.9 | 61.2 | 61.5 | 61.7 | 62.0 |
| 23 | 62.3 | 62.6 | 62.8 | 63.1 | 63.4 | 63.6 | 63.9 | 64.2 | 64.5 | 64.7 |
| 24 | 65.0 | 65.3 | 65.5 | 65.8 | 66.1 | 66.3 | 66.6 | 66.9 | 67.2 | 67.4 |
| 25 | 67.7 | 68.0 | 68.2 | 68.5 | 68.8 | 69.1 | 69.3 | 69.6 | 69.9 | 70.1 |
| 26 | 70.4 | 70.7 | 70.9 | 71.2 | 71.5 | 71.8 | 72.0 | 72.3 | 72.6 | 72.8 |
| 27 | 73.1 | 73.4 | 73.7 | 73.9 | 74.2 | 74.5 | 74.7 | 75.0 | 75.3 | 75.6 |
| 28 | 75.8 | 76.1 | 76.4 | 76.6 | 76.9 | 77.2 | 77.4 | 77.7 | 78.0 | 78.3 |
| 29 | 78.5 | 78.8 | 79.1 | 79.3 | 79.6 | 79.9 | 80.2 | 80.4 | 80.7 | 81.0 |
| 30 | 81.2 | 81.5 | 81.8 | 82.1 | 82.3 | 82.6 | 82.9 | 83.1 | 83.4 | 83.7 |
| 31 | 83.9 | 84.2 | 84.5 | 84.8 | 85.0 | 85.3 | 85.6 | 85.8 | 86.1 | 86.4 |
| 32 | 86.7 | 86.9 | 87.2 | 87.5 | 87.7 | 88.0 | 88.3 | 88.6 | 88.8 | 89.1 |
| 33 | 89.4 | 89.6 | 89.9 | 90.2 | 90.4 | 90.7 | 91.0 | 91.3 | 91.5 | 91.8 |
| 34 | 92.1 | 92.3 | 92.6 | 92.9 | 93.2 | 93.4 | 93.7 | 94.0 | 94.2 | 94.5 |
| 35 | 94.8 | 95.1 | 95.3 | 95.6 | 95.9 | 96.1 | 96.4 | 96.7 | 96.9 | 97.2 |
| 36 | 97.5 | 97.8 | 98.0 | 98.3 | 98.6 | 98.8 | 99.1 | 99.4 | 99.7 | 99.9 |
| 37 | 100.2 | 100.5 | 100.7 | 101.0 | 101.3 | 101.6 | 101.8 | 102.1 | 102.4 | 102.6 |
| 38 | 102.9 | 103.2 | 103.4 | 103.7 | 104.0 | 104.3 | 104.5 | 104.8 | 105.1 | 105.3 |
| 39 | 105.6 | 105.9 | 106.2 | 106.4 | 106.7 | 107.0 | 107.2 | 107.5 | 107.8 | 108.0 |
| 40 | 108.3 | 108.6 | 108.9 | 109.1 | 109.4 | 109.7 | 109.9 | 110.2 | 110.5 | 110.8 |
| 41 | 111.0 | 111.3 | 111.6 | 111.8 | 112.1 | 112.4 | 112.7 | 112.9 | 113.2 | 113.5 |
| 42 | 113.7 | 114.0 | 114.3 | 114.5 | 114.8 | 115.1 | 115.4 | 115.6 | 115.9 | 116.2 |
| 43 | 116.4 | 116.7 | 117.0 | 117.3 | 117.5 | 117.8 | 118.1 | 118.3 | 118.6 | 118.9 |
| 44 | 119.2 | 119.4 | 119.7 | 120.0 | 120.2 | 120.5 | 120.8 | 121.0 | 121.3 | 121.6 |
| 45 | 121.9 | 122.1 | 122.4 | 122.7 | 122.9 | 123.2 | 123.5 | 123.8 | 124.0 | 124.3 |
| 46 | 124.6 | 124.8 | 125.1 | 125.4 | 125.7 | 125.9 | 126.2 | 126.5 | 126.7 | 127.0 |
| 47 | 127.3 | 127.5 | 127.8 | 128.1 | 128.4 | 128.6 | 128.9 | 129.2 | 129.4 | 129.7 |
| 48 | 130.0 | 130.3 | 130.5 | 130.8 | 131.1 | 131.3 | 131.6 | 131.9 | 132.2 | 132.4 |
| 49 | 132.7 | 133.0 | 133.2 | 133.5 | 133.8 | 134.0 | 134.3 | 134.6 | 134.9 | 135.1 |
| 50 | 135.4 | 135.7 | 135.9 | 136.2 | 136.5 | 136.8 | 137.0 | 137.3 | 137.6 | 137.8 |

Prepared by multiplying the BAF 10 Plot Radius Factor 2.708 * DBH.
For example, if DBH = 14.3 inches, then 2.708 * 14.3 = 38.7 feet

## Table K-2: BAF 20 plot radii from plot center to face of tree at DBH for 0% slope (in feet)

| 20 BAF | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inches** | **0** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
| 5 | 9.5 | 9.7 | 9.9 | 10.1 | 10.3 | 10.5 | 10.7 | 10.8 | 11.0 | 11.2 |
| 6 | 11.4 | 11.6 | 11.8 | 12.0 | 12.2 | 12.4 | 12.6 | 12.8 | 12.9 | 13.1 |
| 7 | 13.3 | 13.5 | 13.7 | 13.9 | 14.1 | 14.3 | 14.5 | 14.7 | 14.8 | 15.0 |
| 8 | 15.2 | 15.4 | 15.6 | 15.8 | 16.0 | 16.2 | 16.4 | 16.6 | 16.7 | 16.9 |
| 9 | 17.1 | 17.3 | 17.5 | 17.7 | 17.9 | 18.1 | 18.3 | 18.5 | 18.6 | 18.8 |
| 10 | 19.0 | 19.2 | 19.4 | 19.6 | 19.8 | 20.0 | 20.2 | 20.4 | 20.6 | 20.7 |
| 11 | 20.9 | 21.1 | 21.3 | 21.5 | 21.7 | 21.9 | 22.1 | 22.3 | 22.5 | 22.6 |
| 12 | 22.8 | 23.0 | 23.2 | 23.4 | 23.6 | 23.8 | 24.0 | 24.2 | 24.4 | 24.5 |
| 13 | 24.7 | 24.9 | 25.1 | 25.3 | 25.5 | 25.7 | 25.9 | 26.1 | 26.3 | 26.5 |
| 14 | 26.6 | 26.8 | 27.0 | 27.2 | 27.4 | 27.6 | 27.8 | 28.0 | 28.2 | 28.4 |
| 15 | 28.5 | 28.7 | 28.9 | 29.1 | 29.3 | 29.5 | 29.7 | 29.9 | 30.1 | 30.3 |
| 16 | 30.4 | 30.6 | 30.8 | 31.0 | 31.2 | 31.4 | 31.6 | 31.8 | 32.0 | 32.2 |
| 17 | 32.4 | 32.5 | 32.7 | 32.9 | 33.1 | 33.3 | 33.5 | 33.7 | 33.9 | 34.1 |
| 18 | 34.3 | 34.4 | 34.6 | 34.8 | 35.0 | 35.2 | 35.4 | 35.6 | 35.8 | 36.0 |
| 19 | 36.2 | 36.3 | 36.5 | 36.7 | 36.9 | 37.1 | 37.3 | 37.5 | 37.7 | 37.9 |
| 20 | 38.1 | 38.3 | 38.4 | 38.6 | 38.8 | 39.0 | 39.2 | 39.4 | 39.6 | 39.8 |
| 21 | 40.0 | 40.2 | 40.3 | 40.5 | 40.7 | 40.9 | 41.1 | 41.3 | 41.5 | 41.7 |
| 22 | 41.9 | 42.1 | 42.2 | 42.4 | 42.6 | 42.8 | 43.0 | 43.2 | 43.4 | 43.6 |
| 23 | 43.8 | 44.0 | 44.1 | 44.3 | 44.5 | 44.7 | 44.9 | 45.1 | 45.3 | 45.5 |
| 24 | 45.7 | 45.9 | 46.1 | 46.2 | 46.4 | 46.6 | 46.8 | 47.0 | 47.2 | 47.4 |
| 25 | 47.6 | 47.8 | 48.0 | 48.1 | 48.3 | 48.5 | 48.7 | 48.9 | 49.1 | 49.3 |
| 26 | 49.5 | 49.7 | 49.9 | 50.0 | 50.2 | 50.4 | 50.6 | 50.8 | 51.0 | 51.2 |
| 27 | 51.4 | 51.6 | 51.8 | 52.0 | 52.1 | 52.3 | 52.5 | 52.7 | 52.9 | 53.1 |
| 28 | 53.3 | 53.5 | 53.7 | 53.9 | 54.0 | 54.2 | 54.4 | 54.6 | 54.8 | 55.0 |
| 29 | 55.2 | 55.4 | 55.6 | 55.8 | 55.9 | 56.1 | 56.3 | 56.5 | 56.7 | 56.9 |
| 30 | 57.1 | 57.3 | 57.5 | 57.7 | 57.9 | 58.0 | 58.2 | 58.4 | 58.6 | 58.8 |
| 31 | 59.0 | 59.2 | 59.4 | 59.6 | 59.8 | 59.9 | 60.1 | 60.3 | 60.5 | 60.7 |
| 32 | 60.9 | 61.1 | 61.3 | 61.5 | 61.7 | 61.8 | 62.0 | 62.2 | 62.4 | 62.6 |
| 33 | 62.8 | 63.0 | 63.2 | 63.4 | 63.6 | 63.8 | 63.9 | 64.1 | 64.3 | 64.5 |
| 34 | 64.7 | 64.9 | 65.1 | 65.3 | 65.5 | 65.7 | 65.8 | 66.0 | 66.2 | 66.4 |
| 35 | 66.6 | 66.8 | 67.0 | 67.2 | 67.4 | 67.6 | 67.7 | 67.9 | 68.1 | 68.3 |
| 36 | 68.5 | 68.7 | 68.9 | 69.1 | 69.3 | 69.5 | 69.6 | 69.8 | 70.0 | 70.2 |
| 37 | 70.4 | 70.6 | 70.8 | 71.0 | 71.2 | 71.4 | 71.6 | 71.7 | 71.9 | 72.1 |
| 38 | 72.3 | 72.5 | 72.7 | 72.9 | 73.1 | 73.3 | 73.5 | 73.6 | 73.8 | 74.0 |
| 39 | 74.2 | 74.4 | 74.6 | 74.8 | 75.0 | 75.2 | 75.4 | 75.5 | 75.7 | 75.9 |
| 40 | 76.1 | 76.3 | 76.5 | 76.7 | 76.9 | 77.1 | 77.3 | 77.5 | 77.6 | 77.8 |
| 41 | 78.0 | 78.2 | 78.4 | 78.6 | 78.8 | 79.0 | 79.2 | 79.4 | 79.5 | 79.7 |
| 42 | 79.9 | 80.1 | 80.3 | 80.5 | 80.7 | 80.9 | 81.1 | 81.3 | 81.4 | 81.6 |
| 43 | 81.8 | 82.0 | 82.2 | 82.4 | 82.6 | 82.8 | 83.0 | 83.2 | 83.4 | 83.5 |
| 44 | 83.7 | 83.9 | 84.1 | 84.3 | 84.5 | 84.7 | 84.9 | 85.1 | 85.3 | 85.4 |
| 45 | 85.6 | 85.8 | 86.0 | 86.2 | 86.4 | 86.6 | 86.8 | 87.0 | 87.2 | 87.3 |
| 46 | 87.5 | 87.7 | 87.9 | 88.1 | 88.3 | 88.5 | 88.7 | 88.9 | 89.1 | 89.3 |
| 47 | 89.4 | 89.6 | 89.8 | 90.0 | 90.2 | 90.4 | 90.6 | 90.8 | 91.0 | 91.2 |
| 48 | 91.3 | 91.5 | 91.7 | 91.9 | 92.1 | 92.3 | 92.5 | 92.7 | 92.9 | 93.1 |
| 49 | 93.2 | 93.4 | 93.6 | 93.8 | 94.0 | 94.2 | 94.4 | 94.6 | 94.8 | 95.0 |
| 50 | 95.2 | 95.3 | 95.5 | 95.7 | 95.9 | 96.1 | 96.3 | 96.5 | 96.7 | 96.9 |

Prepared by multiplying the BAF 20 Plot Radius Factor 1.902 * DBH.
For example, if DBH = 14.3 inches, then 1.902 * 14.3 = 27.2

## Table K-3: BAF 30 plot radii from plot center to face of tree at DBH for 0% slope (in feet)

| 30 BAF | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inches** | **0** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
| 5 | 7.7 | 7.9 | 8.0 | 8.2 | 8.3 | 8.5 | 8.7 | 8.8 | 9.0 | 9.1 |
| 6 | 9.3 | 9.4 | 9.6 | 9.7 | 9.9 | 10.0 | 10.2 | 10.4 | 10.5 | 10.7 |
| 7 | 10.8 | 11.0 | 11.1 | 11.3 | 11.4 | 11.6 | 11.7 | 11.9 | 12.1 | 12.2 |
| 8 | 12.4 | 12.5 | 12.7 | 12.8 | 13.0 | 13.1 | 13.3 | 13.5 | 13.6 | 13.8 |
| 9 | 13.9 | 14.1 | 14.2 | 14.4 | 14.5 | 14.7 | 14.8 | 15.0 | 15.2 | 15.3 |
| 10 | 15.5 | 15.6 | 15.8 | 15.9 | 16.1 | 16.2 | 16.4 | 16.5 | 16.7 | 16.9 |
| 11 | 17.0 | 17.2 | 17.3 | 17.5 | 17.6 | 17.8 | 17.9 | 18.1 | 18.2 | 18.4 |
| 12 | 18.6 | 18.7 | 18.9 | 19.0 | 19.2 | 19.3 | 19.5 | 19.6 | 19.8 | 19.9 |
| 13 | 20.1 | 20.3 | 20.4 | 20.6 | 20.7 | 20.9 | 21.0 | 21.2 | 21.3 | 21.5 |
| 14 | 21.6 | 21.8 | 22.0 | 22.1 | 22.3 | 22.4 | 22.6 | 22.7 | 22.9 | 23.0 |
| 15 | 23.2 | 23.3 | 23.5 | 23.7 | 23.8 | 24.0 | 24.1 | 24.3 | 24.4 | 24.6 |
| 16 | 24.7 | 24.9 | 25.0 | 25.2 | 25.4 | 25.5 | 25.7 | 25.8 | 26.0 | 26.1 |
| 17 | 26.3 | 26.4 | 26.6 | 26.7 | 26.9 | 27.1 | 27.2 | 27.4 | 27.5 | 27.7 |
| 18 | 27.8 | 28.0 | 28.1 | 28.3 | 28.4 | 28.6 | 28.8 | 28.9 | 29.1 | 29.2 |
| 19 | 29.4 | 29.5 | 29.7 | 29.8 | 30.0 | 30.1 | 30.3 | 30.5 | 30.6 | 30.8 |
| 20 | 30.9 | 31.1 | 31.2 | 31.4 | 31.5 | 31.7 | 31.8 | 32.0 | 32.2 | 32.3 |
| 21 | 32.5 | 32.6 | 32.8 | 32.9 | 33.1 | 33.2 | 33.4 | 33.5 | 33.7 | 33.9 |
| 22 | 34.0 | 34.2 | 34.3 | 34.5 | 34.6 | 34.8 | 34.9 | 35.1 | 35.2 | 35.4 |
| 23 | 35.6 | 35.7 | 35.9 | 36.0 | 36.2 | 36.3 | 36.5 | 36.6 | 36.8 | 36.9 |
| 24 | 37.1 | 37.3 | 37.4 | 37.6 | 37.7 | 37.9 | 38.0 | 38.2 | 38.3 | 38.5 |
| 25 | 38.7 | 38.8 | 39.0 | 39.1 | 39.3 | 39.4 | 39.6 | 39.7 | 39.9 | 40.0 |
| 26 | 40.2 | 40.4 | 40.5 | 40.7 | 40.8 | 41.0 | 41.1 | 41.3 | 41.4 | 41.6 |
| 27 | 41.7 | 41.9 | 42.1 | 42.2 | 42.4 | 42.5 | 42.7 | 42.8 | 43.0 | 43.1 |
| 28 | 43.3 | 43.4 | 43.6 | 43.8 | 43.9 | 44.1 | 44.2 | 44.4 | 44.5 | 44.7 |
| 29 | 44.8 | 45.0 | 45.1 | 45.3 | 45.5 | 45.6 | 45.8 | 45.9 | 46.1 | 46.2 |
| 30 | 46.4 | 46.5 | 46.7 | 46.8 | 47.0 | 47.2 | 47.3 | 47.5 | 47.6 | 47.8 |
| 31 | 47.9 | 48.1 | 48.2 | 48.4 | 48.5 | 48.7 | 48.9 | 49.0 | 49.2 | 49.3 |
| 32 | 49.5 | 49.6 | 49.8 | 49.9 | 50.1 | 50.2 | 50.4 | 50.6 | 50.7 | 50.9 |
| 33 | 51.0 | 51.2 | 51.3 | 51.5 | 51.6 | 51.8 | 51.9 | 52.1 | 52.3 | 52.4 |
| 34 | 52.6 | 52.7 | 52.9 | 53.0 | 53.2 | 53.3 | 53.5 | 53.6 | 53.8 | 54.0 |
| 35 | 54.1 | 54.3 | 54.4 | 54.6 | 54.7 | 54.9 | 55.0 | 55.2 | 55.3 | 55.5 |
| 36 | 55.7 | 55.8 | 56.0 | 56.1 | 56.3 | 56.4 | 56.6 | 56.7 | 56.9 | 57.0 |
| 37 | 57.2 | 57.4 | 57.5 | 57.7 | 57.8 | 58.0 | 58.1 | 58.3 | 58.4 | 58.6 |
| 38 | 58.7 | 58.9 | 59.1 | 59.2 | 59.4 | 59.5 | 59.7 | 59.8 | 60.0 | 60.1 |
| 39 | 60.3 | 60.4 | 60.6 | 60.8 | 60.9 | 61.1 | 61.2 | 61.4 | 61.5 | 61.7 |
| 40 | 61.8 | 62.0 | 62.1 | 62.3 | 62.5 | 62.6 | 62.8 | 62.9 | 63.1 | 63.2 |
| 41 | 63.4 | 63.5 | 63.7 | 63.8 | 64.0 | 64.2 | 64.3 | 64.5 | 64.6 | 64.8 |
| 42 | 64.9 | 65.1 | 65.2 | 65.4 | 65.6 | 65.7 | 65.9 | 66.0 | 66.2 | 66.3 |
| 43 | 66.5 | 66.6 | 66.8 | 66.9 | 67.1 | 67.3 | 67.4 | 67.6 | 67.7 | 67.9 |
| 44 | 68.0 | 68.2 | 68.3 | 68.5 | 68.6 | 68.8 | 69.0 | 69.1 | 69.3 | 69.4 |
| 45 | 69.6 | 69.7 | 69.9 | 70.0 | 70.2 | 70.3 | 70.5 | 70.7 | 70.8 | 71.0 |
| 46 | 71.1 | 71.3 | 71.4 | 71.6 | 71.7 | 71.9 | 72.0 | 72.2 | 72.4 | 72.5 |
| 47 | 72.7 | 72.8 | 73.0 | 73.1 | 73.3 | 73.4 | 73.6 | 73.7 | 73.9 | 74.1 |
| 48 | 74.2 | 74.4 | 74.5 | 74.7 | 74.8 | 75.0 | 75.1 | 75.3 | 75.4 | 75.6 |
| 49 | 75.8 | 75.9 | 76.1 | 76.2 | 76.4 | 76.5 | 76.7 | 76.8 | 77.0 | 77.1 |
| 50 | 77.3 | 77.5 | 77.6 | 77.8 | 77.9 | 78.1 | 78.2 | 78.4 | 78.5 | 78.7 |

Prepared by multiplying the BAF 30 Plot Radius Factor 1.546 * DBH.
For example, if DBH = 14.3 inches, then 1.546 * 14.3 = 22.1

## Table K-4: BAF 40 plot radii from plot center to face of tree at DBH for 0% slope (in feet)

| 40 BAF | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inches** | **0** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
| 5 | 6.7 | 6.8 | 6.9 | 7.1 | 7.2 | 7.3 | 7.5 | 7.6 | 7.7 | 7.9 |
| 6 | 8.0 | 8.1 | 8.3 | 8.4 | 8.5 | 8.7 | 8.8 | 8.9 | 9.1 | 9.2 |
| 7 | 9.3 | 9.5 | 9.6 | 9.7 | 9.9 | 10.0 | 10.1 | 10.3 | 10.4 | 10.5 |
| 8 | 10.7 | 10.8 | 10.9 | 11.1 | 11.2 | 11.3 | 11.5 | 11.6 | 11.7 | 11.9 |
| 9 | 12.0 | 12.1 | 12.3 | 12.4 | 12.5 | 12.7 | 12.8 | 12.9 | 13.1 | 13.2 |
| 10 | 13.3 | 13.5 | 13.6 | 13.7 | 13.9 | 14.0 | 14.1 | 14.3 | 14.4 | 14.5 |
| 11 | 14.7 | 14.8 | 14.9 | 15.1 | 15.2 | 15.3 | 15.5 | 15.6 | 15.7 | 15.9 |
| 12 | 16.0 | 16.1 | 16.3 | 16.4 | 16.5 | 16.7 | 16.8 | 16.9 | 17.1 | 17.2 |
| 13 | 17.3 | 17.5 | 17.6 | 17.7 | 17.9 | 18.0 | 18.1 | 18.3 | 18.4 | 18.5 |
| 14 | 18.7 | 18.8 | 18.9 | 19.1 | 19.2 | 19.3 | 19.5 | 19.6 | 19.7 | 19.9 |
| 15 | 20.0 | 20.1 | 20.3 | 20.4 | 20.5 | 20.7 | 20.8 | 20.9 | 21.1 | 21.2 |
| 16 | 21.3 | 21.5 | 21.6 | 21.7 | 21.9 | 22.0 | 22.1 | 22.3 | 22.4 | 22.5 |
| 17 | 22.7 | 22.8 | 22.9 | 23.1 | 23.2 | 23.3 | 23.5 | 23.6 | 23.7 | 23.9 |
| 18 | 24.0 | 24.1 | 24.3 | 24.4 | 24.5 | 24.7 | 24.8 | 24.9 | 25.1 | 25.2 |
| 19 | 25.3 | 25.5 | 25.6 | 25.7 | 25.9 | 26.0 | 26.1 | 26.3 | 26.4 | 26.5 |
| 20 | 26.7 | 26.8 | 26.9 | 27.1 | 27.2 | 27.3 | 27.5 | 27.6 | 27.7 | 27.9 |
| 21 | 28.0 | 28.1 | 28.3 | 28.4 | 28.5 | 28.7 | 28.8 | 28.9 | 29.1 | 29.2 |
| 22 | 29.3 | 29.5 | 29.6 | 29.7 | 29.9 | 30.0 | 30.1 | 30.3 | 30.4 | 30.5 |
| 23 | 30.7 | 30.8 | 30.9 | 31.1 | 31.2 | 31.3 | 31.5 | 31.6 | 31.7 | 31.9 |
| 24 | 32.0 | 32.1 | 32.3 | 32.4 | 32.5 | 32.7 | 32.8 | 32.9 | 33.1 | 33.2 |
| 25 | 33.3 | 33.5 | 33.6 | 33.7 | 33.9 | 34.0 | 34.1 | 34.3 | 34.4 | 34.5 |
| 26 | 34.7 | 34.8 | 34.9 | 35.1 | 35.2 | 35.3 | 35.5 | 35.6 | 35.7 | 35.9 |
| 27 | 36.0 | 36.1 | 36.3 | 36.4 | 36.5 | 36.7 | 36.8 | 36.9 | 37.1 | 37.2 |
| 28 | 37.3 | 37.5 | 37.6 | 37.7 | 37.9 | 38.0 | 38.1 | 38.3 | 38.4 | 38.5 |
| 29 | 38.7 | 38.8 | 38.9 | 39.1 | 39.2 | 39.3 | 39.5 | 39.6 | 39.7 | 39.9 |
| 30 | 40.0 | 40.1 | 40.3 | 40.4 | 40.5 | 40.7 | 40.8 | 40.9 | 41.1 | 41.2 |
| 31 | 41.3 | 41.5 | 41.6 | 41.7 | 41.9 | 42.0 | 42.1 | 42.3 | 42.4 | 42.5 |
| 32 | 42.7 | 42.8 | 42.9 | 43.1 | 43.2 | 43.3 | 43.5 | 43.6 | 43.7 | 43.9 |
| 33 | 44.0 | 44.1 | 44.3 | 44.4 | 44.5 | 44.7 | 44.8 | 44.9 | 45.1 | 45.2 |
| 34 | 45.3 | 45.5 | 45.6 | 45.7 | 45.9 | 46.0 | 46.1 | 46.3 | 46.4 | 46.5 |
| 35 | 46.7 | 46.8 | 46.9 | 47.1 | 47.2 | 47.3 | 47.5 | 47.6 | 47.7 | 47.9 |
| 36 | 48.0 | 48.1 | 48.2 | 48.4 | 48.5 | 48.7 | 48.8 | 48.9 | 49.1 | 49.2 |
| 37 | 49.3 | 49.5 | 49.6 | 49.7 | 49.9 | 50.0 | 50.1 | 50.3 | 50.4 | 50.5 |
| 38 | 50.7 | 50.8 | 50.9 | 51.1 | 51.2 | 51.3 | 51.5 | 51.6 | 51.7 | 51.9 |
| 39 | 52.0 | 52.1 | 52.2 | 52.4 | 52.5 | 52.7 | 52.8 | 52.9 | 53.1 | 53.2 |
| 40 | 53.3 | 53.5 | 53.6 | 53.7 | 53.9 | 54.0 | 54.1 | 54.3 | 54.4 | 54.5 |
| 41 | 54.7 | 54.8 | 54.9 | 55.1 | 55.2 | 55.3 | 55.5 | 55.6 | 55.7 | 55.9 |
| 42 | 56.0 | 56.1 | 56.2 | 56.4 | 56.5 | 56.7 | 56.8 | 56.9 | 57.1 | 57.2 |
| 43 | 57.3 | 57.5 | 57.6 | 57.7 | 57.9 | 58.0 | 58.1 | 58.3 | 58.4 | 58.5 |
| 44 | 58.7 | 58.8 | 58.9 | 59.1 | 59.2 | 59.3 | 59.5 | 59.6 | 59.7 | 59.9 |
| 45 | 60.0 | 60.1 | 60.2 | 60.4 | 60.5 | 60.7 | 60.8 | 60.9 | 61.1 | 61.2 |
| 46 | 61.3 | 61.5 | 61.6 | 61.7 | 61.9 | 62.0 | 62.1 | 62.3 | 62.4 | 62.5 |
| 47 | 62.7 | 62.8 | 62.9 | 63.1 | 63.2 | 63.3 | 63.5 | 63.6 | 63.7 | 63.9 |
| 48 | 64.0 | 64.1 | 64.2 | 64.4 | 64.5 | 64.7 | 64.8 | 64.9 | 65.1 | 65.2 |
| 49 | 65.3 | 65.5 | 65.6 | 65.7 | 65.9 | 66.0 | 66.1 | 66.3 | 66.4 | 66.5 |
| 50 | 66.7 | 66.8 | 66.6 | 67.0 | 67.2 | 67.3 | 67.4 | 67.6 | 67.7 | 67.8 |

Prepared by multiplying the BAF 40 Plot Radius Factor 1.333 * DBH.
For example, if DBH = 14.3 inches, then 1.333 * 14.3 = 19.1

## Table K-5: BAF 60 plot radii from plot center to face of tree at DBH for 0% slope (in feet)

| 60 BAF | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inches** | **0** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
| 5 | 5.4 | 5.5 | 5.6 | 5.7 | 5.8 | 5.9 | 6.1 | 6.2 | 6.3 | 6.4 |
| 6 | 6.5 | 6.6 | 6.7 | 6.8 | 6.9 | 7.0 | 7.1 | 7.2 | 7.4 | 7.5 |
| 7 | 7.6 | 7.7 | 7.8 | 7.9 | 8.0 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 |
| 8 | 8.6 | 8.8 | 8.9 | 9.0 | 9.1 | 9.2 | 9.3 | 9.4 | 9.5 | 9.6 |
| 9 | 9.7 | 9.8 | 9.9 | 10.1 | 10.2 | 10.3 | 10.4 | 10.5 | 10.6 | 10.7 |
| 10 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 | 11.4 | 11.5 | 11.6 | 11.7 | 11.8 |
| 11 | 11.9 | 12.0 | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 12.6 | 12.8 | 12.9 |
| 12 | 13.0 | 13.1 | 13.2 | 13.3 | 13.4 | 13.5 | 13.6 | 13.7 | 13.8 | 13.9 |
| 13 | 14.1 | 14.2 | 14.3 | 14.4 | 14.5 | 14.6 | 14.7 | 14.8 | 14.9 | 15.0 |
| 14 | 15.1 | 15.2 | 15.4 | 15.5 | 15.6 | 15.7 | 15.8 | 15.9 | 16.0 | 16.1 |
| 15 | 16.2 | 16.3 | 16.4 | 16.5 | 16.6 | 16.8 | 16.9 | 17.0 | 17.1 | 17.2 |
| 16 | 17.3 | 17.4 | 17.5 | 17.6 | 17.7 | 17.8 | 17.9 | 18.1 | 18.2 | 18.3 |
| 17 | 18.4 | 18.5 | 18.6 | 18.7 | 18.8 | 18.9 | 19.0 | 19.1 | 19.2 | 19.3 |
| 18 | 19.5 | 19.6 | 19.7 | 19.8 | 19.9 | 20.0 | 20.1 | 20.2 | 20.3 | 20.4 |
| 19 | 20.5 | 20.6 | 20.8 | 20.9 | 21.0 | 21.1 | 21.2 | 21.3 | 21.4 | 21.5 |
| 20 | 21.6 | 21.7 | 21.8 | 21.9 | 22.1 | 22.2 | 22.3 | 22.4 | 22.5 | 22.6 |
| 21 | 22.7 | 22.8 | 22.9 | 23.0 | 23.1 | 23.2 | 23.3 | 23.5 | 23.6 | 23.7 |
| 22 | 23.8 | 23.9 | 24.0 | 24.1 | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.8 |
| 23 | 24.9 | 25.0 | 25.1 | 25.2 | 25.3 | 25.4 | 25.5 | 25.6 | 25.7 | 25.8 |
| 24 | 25.9 | 26.1 | 26.2 | 26.3 | 26.4 | 26.5 | 26.6 | 26.7 | 26.8 | 26.9 |
| 25 | 27.0 | 27.1 | 27.2 | 27.3 | 27.5 | 27.6 | 27.7 | 27.8 | 27.9 | 28.0 |
| 26 | 28.1 | 28.2 | 28.3 | 28.4 | 28.5 | 28.6 | 28.8 | 28.9 | 29.0 | 29.1 |
| 27 | 29.2 | 29.3 | 29.4 | 29.5 | 29.6 | 29.7 | 29.8 | 29.9 | 30.1 | 30.2 |
| 28 | 30.3 | 30.4 | 30.5 | 30.6 | 30.7 | 30.8 | 30.9 | 31.0 | 31.1 | 31.2 |
| 29 | 31.3 | 31.5 | 31.6 | 31.7 | 31.8 | 31.9 | 32.0 | 32.1 | 32.2 | 32.3 |
| 30 | 32.4 | 32.5 | 32.6 | 32.8 | 32.9 | 33.0 | 33.1 | 33.2 | 33.3 | 33.4 |
| 31 | 33.5 | 33.6 | 33.7 | 33.8 | 33.9 | 34.1 | 34.2 | 34.3 | 34.4 | 34.5 |
| 32 | 34.6 | 34.7 | 34.8 | 34.9 | 35.0 | 35.1 | 35.2 | 35.3 | 35.5 | 35.6 |
| 33 | 35.7 | 35.8 | 35.9 | 36.0 | 36.1 | 36.2 | 36.3 | 36.4 | 36.5 | 36.6 |
| 34 | 36.8 | 36.9 | 37.0 | 37.1 | 37.2 | 37.3 | 37.4 | 37.5 | 37.6 | 37.7 |
| 35 | 37.8 | 37.9 | 38.1 | 38.2 | 38.3 | 38.4 | 38.5 | 38.6 | 38.7 | 38.8 |
| 36 | 38.9 | 39.0 | 39.1 | 39.2 | 39.3 | 39.5 | 39.6 | 39.7 | 39.8 | 39.9 |
| 37 | 40.0 | 40.1 | 40.2 | 40.3 | 40.4 | 40.5 | 40.6 | 40.8 | 40.9 | 41.0 |
| 38 | 41.1 | 41.2 | 41.3 | 41.4 | 41.5 | 41.6 | 41.7 | 41.8 | 41.9 | 42.1 |
| 39 | 42.2 | 42.3 | 42.4 | 42.5 | 42.6 | 42.7 | 42.8 | 42.9 | 43.0 | 43.1 |
| 40 | 43.2 | 43.3 | 43.5 | 43.6 | 43.7 | 43.8 | 43.9 | 44.0 | 44.1 | 44.2 |
| 41 | 44.3 | 44.4 | 44.5 | 44.6 | 44.8 | 44.9 | 45.0 | 45.1 | 45.2 | 45.3 |
| 42 | 45.4 | 45.5 | 45.6 | 45.7 | 45.8 | 45.9 | 46.1 | 46.2 | 46.3 | 46.4 |
| 43 | 46.5 | 46.6 | 46.7 | 46.8 | 46.9 | 47.0 | 47.1 | 47.2 | 47.3 | 47.5 |
| 44 | 47.6 | 47.7 | 47.8 | 47.9 | 48.0 | 48.1 | 48.2 | 48.3 | 48.4 | 48.5 |
| 45 | 48.6 | 48.8 | 48.9 | 49.0 | 49.1 | 49.2 | 49.3 | 49.4 | 49.5 | 49.6 |
| 46 | 49.7 | 49.8 | 49.9 | 50.1 | 50.2 | 50.3 | 50.4 | 50.5 | 50.6 | 50.7 |
| 47 | 50.8 | 50.9 | 51.0 | 51.1 | 51.2 | 51.3 | 51.5 | 51.6 | 51.7 | 51.8 |
| 48 | 51.9 | 52.0 | 52.1 | 52.2 | 52.3 | 52.4 | 52.5 | 52.6 | 52.8 | 52.9 |
| 49 | 53.0 | 53.1 | 53.2 | 53.3 | 53.4 | 53.5 | 53.6 | 53.7 | 53.8 | 53.9 |
| 50 | 54.1 | 54.2 | 54.3 | 54.4 | 54.5 | 54.6 | 54.7 | 54.8 | 54.9 | 55.0 |

Prepared by multiplying the BAF 60 Plot Radius Factor 1.081 * DBH.
For example, if DBH = 14.3 inches, then 1.081 * 14.3 = 15.5

**Table K-6: Limiting distance to face of tree for various basal area factors**

This table provides an expanded list of slope correction factors (SCF) to the face of the tree for use with various basal area factors. To use the table, measure the slope and the distance from plot center to the face of the tree at DBH. To obtain the corrected limiting distance to a tree, multiply DBH by the "Combined Factor" shown under the appropriate BAF heading.

| *Combined Factors – limiting distance to face of tree* | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Percent Slope** | **SCF** | **Combined Factor** | | | | | |
| | | **5 BAF** | **10 BAF** | **15 BAF** | **20 BAF** | **30 BAF** | **40 BAF** |
| 1 | 1.00000 | 3.847 | 2.708 | 2.203 | 1.902 | 1.546 | 1.333 |
| 2 | 1.00020 | 3.848 | 2.709 | 2.203 | 1.902 | 1.546 | 1.333 |
| 3 | 1.00045 | 3.849 | 2.709 | 2.204 | 1.903 | 1.547 | 1.334 |
| 4 | 1.00080 | 3.850 | 2.710 | 2.205 | 1.904 | 1.547 | 1.334 |
| 5 | 1.00125 | 3.852 | 2.711 | 2.206 | 1.904 | 1.548 | 1.335 |
| 6 | 1.00180 | 3.854 | 2.713 | 2.207 | 1.905 | 1.549 | 1.335 |
| 7 | 1.00245 | 3.856 | 2.715 | 2.208 | 1.907 | 1.550 | 1.336 |
| 8 | 1.00319 | 3.859 | 2.717 | 2.210 | 1.908 | 1.551 | 1.337 |
| 9 | 1.00404 | 3.863 | 2.719 | 2.212 | 1.910 | 1.552 | 1.338 |
| 10 | 1.00499 | 3.866 | 2.722 | 2.214 | 1.911 | 1.554 | 1.340 |
| 11 | 1.00603 | 3.870 | 2.724 | 2.216 | 1.912 | 1.555 | 1.341 |
| 12 | 1.00717 | 3.875 | 2.727 | 2.219 | 1.916 | 1.557 | 1.343 |
| 13 | 1.00841 | 3.879 | 2.731 | 2.222 | 1.918 | 1.559 | 1.344 |
| 14 | 1.00975 | 3.884 | 2.734 | 2.224 | 1.921 | 1.567 | 1.346 |
| 15 | 1.01119 | 3.890 | 2.738 | 2.228 | 1.923 | 1.563 | 1.348 |
| 16 | 1.01272 | 3.896 | 2.742 | 2.231 | 1.926 | 1.566 | 1.350 |
| 17 | 1.01435 | 3.902 | 2.747 | 2.235 | 1.921 | 1.568 | 1.352 |
| 18 | 1.01607 | 3.909 | 2.752 | 2.238 | 1.933 | 1.571 | 1.354 |
| 19 | 1.01789 | 3.916 | 2.756 | 2.245 | 1.936 | 1.574 | 1.357 |
| 20 | 1.01980 | 3.923 | 2.762 | 2.245 | 1.940 | 1.577 | 1.359 |
| 21 | 1.02181 | 3.931 | 2.767 | 2.251 | 1.943 | 1.580 | 1.362 |
| 22 | 1.02391 | 3.939 | 2.773 | 2.256 | 1.947 | 1.583 | 1.365 |
| 23 | 1.02611 | 3.947 | 2.779 | 2.261 | 1.952 | 1.586 | 1.368 |
| 24 | 1.02840 | 3.956 | 2.785 | 2.266 | 1.956 | 1.590 | 1.371 |
| 25 | 1.03078 | 3.965 | 2.791 | 2.271 | 1.967 | 1.594 | 1.374 |
| 26 | 1.03325 | 3.975 | 2.798 | 2.276 | 1.965 | 1.597 | 1.377 |
| 27 | 1.03581 | 3.985 | 2.805 | 2.282 | 1.970 | 1.601 | 1.381 |
| 28 | 1.03846 | 3.995 | 2.812 | 2.288 | 1.975 | 1.605 | 1.384 |
| 29 | 1.04120 | 4.005 | 2.820 | 2.294 | 1.980 | 1.610 | 1.388 |
| 30 | 1.04403 | 4.016 | 2.827 | 2.300 | 1.986 | 1.614 | 1.392 |
| 31 | 1.04695 | 4.028 | 2.835 | 2.306 | 1.991 | 1.619 | 1.396 |
| 32 | 1.04995 | 4.039 | 2.843 | 2.313 | 1.997 | 1.623 | 1.400 |

| *Combined Factors – limiting distance to face of tree* | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Percent Slope** | **SCF** | **Combined Factor** | | | | | |
| | | **5 BAF** | **10 BAF** | **15 BAF** | **20 BAF** | **30 BAF** | **40 BAF** |
| 33 | 1.05304 | 4.051 | 2.852 | 2.320 | 2.003 | 1.628 | 1.404 |
| 34 | 1.05622 | 4.063 | 2.960 | 2.327 | 2.009 | 1.633 | 1.408 |
| 35 | 1.05948 | 4.076 | 2.869 | 2.334 | 2.015 | 1.638 | 1.412 |
| 36 | 1.06283 | 4.089 | 2.878 | 2.341 | 2.022 | 1.643 | 1.417 |
| 37 | 1.06626 | 4.102 | 2.887 | 2.349 | 2.028 | 1.648 | 1.421 |
| 38 | 1.06977 | 4.115 | 2.897 | 2.357 | 2.035 | 1.654 | 1.426 |
| 39 | 1.07336 | 4.129 | 2.907 | 2.365 | 2.042 | 1.659 | 1.431 |
| 40 | 1.07703 | 4.143 | 2.917 | 2.373 | 2.049 | 1.665 | 1.436 |
| 41 | 1.08079 | 4.158 | 2.927 | 2.381 | 2.056 | 1.671 | 1.441 |
| 42 | 1.08462 | 4.173 | 2.937 | 2.389 | 2.063 | 1.677 | 1.446 |
| 43 | 1.08853 | 4.188 | 2.948 | 2.398 | 2.070 | 1.683 | 1.451 |
| 44 | 1.09252 | 4.203 | 2.959 | 2.407 | 2.078 | 1.689 | 1.456 |
| 45 | 1.09659 | 4.219 | 2.970 | 2.416 | 2.086 | 1.695 | 1.462 |
| 46 | 1.10073 | 4.235 | 2.981 | 2.425 | 2.094 | 1.702 | 1.467 |
| 47 | 1.10494 | 4.251 | 2.992 | 2.434 | 2.102 | 1.708 | 1.473 |
| 48 | 1.10923 | 4.267 | 3.004 | 2.444 | 2.110 | 1.715 | 1.479 |
| 49 | 1.11360 | 4.284 | 3.016 | 2.453 | 2.118 | 1.723 | 1.484 |
| 50 | 1.11803 | 4.301 | 3.028 | 2.463 | 2.126 | 1.728 | 1.490 |
| 51 | 1.12254 | 4.318 | 3.040 | 2.473 | 2.135 | 1.735 | 1.496 |
| 52 | 1.12712 | 4.336 | 3.052 | 2.483 | 2.144 | 1.743 | 1.502 |
| 53 | 1.13177 | 4.354 | 3.065 | 2.493 | 2.153 | 1.750 | 1.509 |
| 54 | 1.13649 | 4.372 | 3.078 | 2.504 | 2.162 | 1.757 | 1.515 |
| 55 | 1.14127 | 4.390 | 3.091 | 2.514 | 2.171 | 1.764 | 1.521 |
| 56 | 1.14612 | 4.409 | 3.104 | 2.525 | 2.180 | 1.772 | 1.528 |
| 57 | 1.15104 | 4.428 | 3.117 | 2.536 | 2.189 | 1.780 | 1.534 |
| 58 | 1.15603 | 4.447 | 3.131 | 2.547 | 2.199 | 1.788 | 1.541 |
| 59 | 1.16108 | 4.467 | 3.144 | 2.558 | 2.208 | 1.795 | 1.548 |
| 60 | 1.16619 | 4.486 | 3.158 | 2.569 | 2.218 | 1.803 | 1.555 |
| 61 | 1.17137 | 4.506 | 3.172 | 2.581 | 2.228 | 1.811 | 1.561 |
| 62 | 1.17661 | 4.526 | 3.186 | 2.592 | 2.238 | 1.819 | 1.568 |
| 63 | 1.18191 | 4.547 | 3.201 | 2.604 | 2.248 | 1.827 | 1.575 |
| 64 | 1.18727 | 4.567 | 3.215 | 2.616 | 2.258 | 1.836 | 1.583 |
| 65 | 1.19269 | 4.588 | 3.230 | 2.627 | 2.268 | 1.844 | 1.590 |
| 66 | 1.19817 | 4.609 | 3.245 | 2.640 | 2.279 | 1.852 | 1.597 |
| 67 | 1.20370 | 4.631 | 3.260 | 2.652 | 2.289 | 1.861 | 1.605 |
| 68 | 1.20930 | 4.652 | 3.275 | 2.664 | 2.300 | 1.870 | 1.612 |
| 69 | 1.21949 | 4.691 | 3.302 | 2.687 | 2.319 | 1.885 | 1.626 |
| 70 | 1.22066 | 4.696 | 3.306 | 2.689 | 2.322 | 1.887 | 1.627 |
| 71 | 1.22642 | 4.718 | 3.321 | 2.702 | 2.333 | 1.896 | 1.635 |

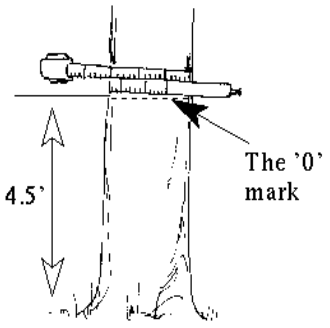
| *Combined Factors – limiting distance to face of tree* | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Percent Slope** | **SCF** | **Combined Factor** | | | | | |
| | | **5 BAF** | **10 BAF** | **15 BAF** | **20 BAF** | **30 BAF** | **40 BAF** |
| 72 | 1.23223 | 4.740 | 3.337 | 2.715 | 2.344 | 1.905 | 1.643 |
| 73 | 1.23810 | 4.763 | 3.353 | 2.728 | 2.355 | 1.914 | 1.650 |
| 74 | 1.24403 | 4.786 | 3.369 | 2.741 | 2.366 | 1.923 | 1.658 |
| 75 | 1.25000 | 4.809 | 3.385 | 2.754 | 2.378 | 1.933 | 1.666 |
| 76 | 1.25603 | 4.832 | 3.401 | 2.767 | 2.389 | 1.942 | 1.674 |
| 77 | 1.26210 | 4.855 | 3.418 | 2.780 | 2.401 | 1.951 | 1.682 |
| 78 | 1.26823 | 4.879 | 3.434 | 2.794 | 2.412 | 1.961 | 1.691 |
| 79 | 1.27440 | 4.903 | 3.451 | 2.808 | 2.424 | 1.970 | 1.699 |
| 80 | 1.28062 | 4.927 | 3.468 | 2.821 | 2.436 | 1.980 | 1.707 |
| 81 | 1.28690 | 4.951 | 3.485 | 2.835 | 2.448 | 1.990 | 1.715 |
| 82 | 1.29321 | 4.975 | 3.502 | 2.849 | 2.460 | 1.999 | 1.724 |
| 83 | 1.29958 | 4.999 | 3.519 | 2.863 | 2.472 | 2.009 | 1.732 |
| 84 | 1.30599 | 5.024 | 3.537 | 2.877 | 2.484 | 2.019 | 1.741 |
| 85 | 1.31244 | 5.049 | 3.554 | 2.891 | 2.496 | 2.029 | 1.749 |
| 86 | 1.31894 | 5.074 | 3.572 | 2.906 | 2.509 | 2.039 | 1.758 |
| 87 | 1.32548 | 5.099 | 3.589 | 2.920 | 2.521 | 2.049 | 1.767 |
| 88 | 1.33207 | 5.124 | 3.607 | 2.935 | 2.534 | 2.059 | 1.776 |
| 89 | 1.33870 | 5.150 | 3.625 | 2.949 | 2.546 | 2.070 | 1.784 |
| 90 | 1.34536 | 5.176 | 3.643 | 2.964 | 2.559 | 2.080 | 1.793 |
| 91 | 1.35207 | 5.201 | 3.661 | 2.979 | 2.572 | 2.090 | 1.802 |
| 92 | 1.35882 | 5.227 | 3.680 | 2.993 | 2.584 | 2.101 | 1.811 |
| 93 | 1.36561 | 5.254 | 3.698 | 3.008 | 2.597 | 2.111 | 1.820 |
| 94 | 1.37244 | 5.280 | 3.717 | 3.023 | 2.610 | 2.122 | 1.829 |
| 95 | 1.37931 | 5.306 | 3.735 | 3.039 | 2.623 | 2.132 | 1.839 |
| 96 | 1.38622 | 5.333 | 3.754 | 3.054 | 2.637 | 2.143 | 1.848 |
| 97 | 1.39316 | 5.359 | 3.773 | 3.069 | 2.650 | 2.154 | 1.857 |
| 98 | 1.40014 | 5.386 | 3.792 | 3.085 | 2.663 | 2.165 | 1.866 |
| 99 | 1.40716 | 5.413 | 3.811 | 3.100 | 2.676 | 2.175 | 1.876 |
| 100 | 1.41421 | 5.440 | 3.830 | 3.116 | 2.690 | 2.186 | 1.885 |
| 102 | 1.42843 | 5.495 | 3.868 | 3.147 | 2.717 | 2.208 | 1.904 |
| 103 | 1.43558 | 5.523 | 3.888 | 3.163 | 5.730 | 2.219 | 1.914 |
| 104 | 1.44278 | 5.550 | 3.907 | 3.178 | 2.744 | 2.231 | 1.923 |
| 105 | 1.45000 | 5.578 | 3.927 | 3.194 | 2.758 | 2.242 | 1.933 |
| 106 | 1.45726 | 5.606 | 3.946 | 3.210 | 2.772 | 2.253 | 1.943 |
| 107 | 1.46455 | 5.634 | 3.966 | 3.226 | 2.786 | 2.264 | 1.952 |
| 108 | 1.47187 | 5.662 | 3.986 | 3.243 | 2.799 | 2.276 | 1.962 |
| 109 | 1.47922 | 5.691 | 4.006 | 3.259 | 2.813 | 2.287 | 1.972 |
| 110 | 1.48661 | 5.719 | 4.026 | 3.275 | 2.828 | 2.298 | 1.982 |
| 111 | 1.49402 | 5.747 | 4.046 | 3.291 | 2.842 | 2.310 | 1.992 |

| *Combined Factors – limiting distance to face of tree* | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Percent Slope** | **SCF** | **Combined Factor** | | | | | |
| | | **5 BAF** | **10 BAF** | **15 BAF** | **20 BAF** | **30 BAF** | **40 BAF** |
| 112 | 1.50147 | 5.776 | 4.066 | 3.308 | 2.856 | 2.321 | 2.001 |
| 113 | 1.50894 | 5.805 | 4.086 | 3.324 | 2.870 | 2.333 | 2.011 |
| 114 | 1.51644 | 5.834 | 4.107 | 3.341 | 2.884 | 2.344 | 2.021 |
| 115 | 1.52498 | 5.863 | 4.127 | 3.357 | 2.899 | 2.356 | 2.031 |
| 116 | 1.53154 | 5.892 | 4.147 | 3.374 | 2.913 | 2.368 | 2.042 |
| 117 | 1.53912 | 5.921 | 4.168 | 3.391 | 2.927 | 2.379 | 2.052 |
| 118 | 1.54674 | 5.950 | 4.189 | 3.407 | 2.942 | 2.391 | 2.062 |
| 119 | 1.55438 | 5.980 | 4.209 | 3.424 | 2.956 | 2.403 | 2.072 |
| 120 | 1.56205 | 6.000 | 4.230 | 3.441 | 2.971 | 2.415 | 2.082 |
| 121 | 1.56975 | 6.039 | 4.251 | 3.458 | 2.985 | 2.427 | 2.092 |
| 122 | 1.57747 | 6.069 | 4.272 | 3.475 | 3.000 | 2.439 | 2.103 |
| 123 | 1.58521 | 6.098 | 4.293 | 3.492 | 3.015 | 2.451 | 2.113 |
| 124 | 1.59298 | 6.128 | 4.314 | 3.509 | 3.030 | 2.463 | 2.123 |
| 125 | 1.60078 | 6.158 | 4.335 | 3.527 | 3.045 | 2.475 | 2.134 |
| 126 | 1.60860 | 6.188 | 4.356 | 3.544 | 3.060 | 2.487 | 2.144 |
| 127 | 1.61645 | 6.218 | 4.377 | 3.561 | 3.074 | 2.499 | 2.155 |
| 128 | 1.62432 | 6.249 | 4.399 | 3.578 | 3.089 | 2.511 | 2.165 |
| 129 | 1.63221 | 6.279 | 4.420 | 3.595 | 3.104 | 2.523 | 2.176 |
| 130 | 1.64012 | 6.310 | 4.441 | 3.613 | 3.120 | 2.536 | 2.186 |
| 131 | 1.64806 | 6.340 | 4.463 | 3.631 | 3.135 | 2.546 | 2.197 |
| 132 | 1.65602 | 4.370 | 4.485 | 3.648 | 3.150 | 2.560 | 2.207 |
| 133 | 1.66400 | 6.401 | 4.506 | 3.666 | 3.165 | 2.573 | 2.218 |
| 134 | 1.67200 | 6.432 | 4.528 | 3.683 | 3.180 | 2.585 | 2.229 |
| 135 | 1.68003 | 6.463 | 4.550 | 3.701 | 3.195 | 2.597 | 2.239 |
| 136 | 1.68808 | 6.494 | 4.571 | 3.719 | 3.211 | 2.261 | 2.250 |
| 137 | 1.69614 | 6.525 | 4.593 | 3.737 | 3.226 | 2.622 | 2.261 |
| 138 | 1.70423 | 6.556 | 4.615 | 3.754 | 3.241 | 2.635 | 2.272 |
| 139 | 1.71234 | 6.587 | 4.637 | 3.772 | 3.257 | 2.647 | 2.283 |
| 140 | 1.72047 | 6.619 | 4.659 | 3.790 | 3.272 | 2.660 | 2.293 |
| 141 | 1.72861 | 6.650 | 4.681 | 3.808 | 3.288 | 2.672 | 2.304 |
| 142 | 1.73678 | 6.681 | 4.703 | 3.826 | 3.303 | 2.685 | 2.315 |
| 143 | 1.74497 | 6.713 | 4.725 | 3.844 | 3.319 | 2.698 | 2.326 |
| 144 | 1.75317 | 6.744 | 4.748 | 3.862 | 3.335 | 2.710 | 2.337 |
| 145 | 1.76139 | 6.776 | 4.770 | 3.880 | 3.350 | 2.723 | 2.348 |
| 146 | 1.76963 | 6.808 | 4.792 | 3.898 | 3.366 | 2.736 | 2.359 |
| 147 | 1.77789 | 6.840 | 4.815 | 3.917 | 3.382 | 2.749 | 2.370 |
| 148 | 1.78617 | 6.871 | 4.837 | 3.935 | 3.397 | 2.761 | 2.381 |

# Appendix L: Measuring Diameter

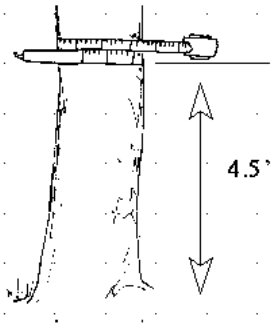
Tree diameter at breast height (DBH) is the outside bark diameter at 4.5 feet above the forest floor on the uphill side of the tree. To determine breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line. If a dead tree (snag) is missing bark, measure the DBH without the bark and record that measurement.

Correct Method



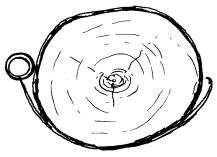

End of tape (with the '0' mark or hook) crossed under.

Optional method if left handed



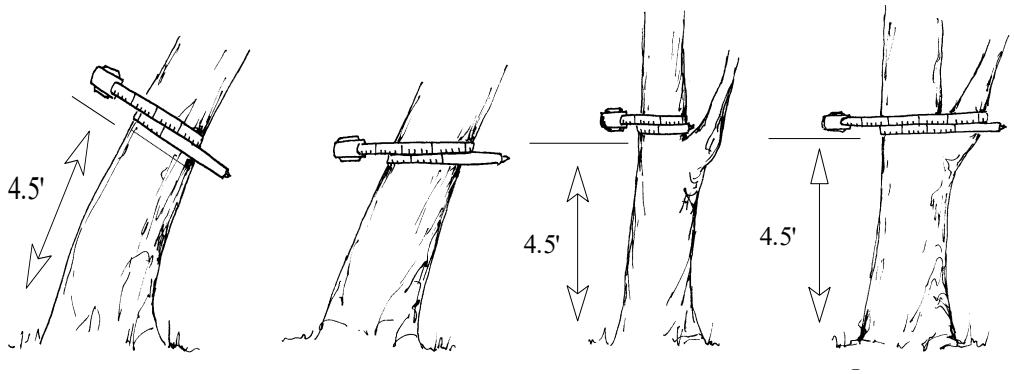

End of tape crossed under (Becareful -- reading will be be made from upside down d-tape marks).

Press the tape firmly against the tree. Do not pull it out at a tangent to the tree at the point of measurement



Correct

Incorrect




Correct | Incorrect | Correct | Incorrect

Tape must be at right angles to lean of tree.

Do not place tape at abnormal location on bole of tree.

Diameter at Root Collar (DRC) is the diameter measured at the root collar or at the natural ground line, whichever is higher, outside the bark. Measure tree stems only, not branches. A stem generally grows in an upright position and contributes to the main structural support of a tree crown. If the diameter is measured at root collar, the number of stems is required.

**Point of Measurement for DRC**

Measure at ground line when reasonable

Measure above butt swell

Excessive diameter below stems.
Measure each stem and compute DRC

Multistemmed above diameter

Measure missing stem(s) and
compute DRC

Multistemmed at or below ground.
Measure each stem and compute DRC.

# Appendix M: Point of Diameter Measurement

**DBH guidelines** – point of measurement for trees measured at breast height:

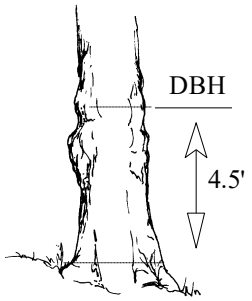
| *DBH guidelines* | |
|---|---|
| **Tree Description** | **Point of Measurement** |
| **Tree species with no abnormalities** | For tree species that are measured at breast height (i.e., timber species), the diameter measurement (DBH) is the outside bark diameter at 4.5 feet above the forest floor on the uphill side of the tree. To determine breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line. |
| **Forked tree** | In order to qualify as a fork, the stem in question must be at least 1/3 the diameter of the main stem and must branch out from the main stem at an angle of 45 degrees or less. Forks originate at the point on the bole where the piths intersect. Forked trees are handled differently depending on whether the fork originates above or below 4.5 feet. |
| | **Trees forked below 4.5 feet** are treated as distinctly separate trees. DBH is measured for each stem at 4.5 ft above the ground. |
| | **Trees forked at or above 4.5 feet** count as one tree. If a fork occurs at or immediately above 4.5 ft, measure diameter below the fork just beneath any swelling that would inflate DBH. |
| **Stump sprouts** | Stump sprouts originate between ground level and 4.5 feet on the boles of trees that have died or been cut. Stump sprouts are handled the same as forked trees, with the exception that stump sprouts are not required to be 1/3 the diameter of the dead bole. Stump sprouts originating below 1.0 ft are measured at 4.5 ft from ground line. |
| **Tree with irregularities at DBH** | On trees with swellings, bumps, depressions, and branches at DBH, measure diameter immediately above the irregularity at the place it ceases to affect normal stem form. If this is not possible, because of the vertical extent of the irregularity, then adjust the DBH measurement to better reflect the diameter of a regular bole. |
| **Tree on slope** | Measure diameter at 4.5 feet from the ground along the bole on the uphill side of the tree. |
| **Leaning tree** | Measure diameter at 4.5 feet from the ground along the bole. |
| **Turpentine tree** | On trees with turpentine face extending above 4.5 feet, estimate the diameter at 10.0 ft above the ground and multiply by 1.1 to estimate DBH outside bark. |

| *DBH guidelines* | |
|---|---|
| **Tree Description** | **Point of Measurement** |
| **Independent trees that grow together** | If two or more independent stems have grown together at or above the point of DBH, continue to treat them as separate trees. |
| **Dead Tree – missing wood or bark** | To qualify as "standing," dead trees (snags) must have 50% or more of the circumference of the bole intact at DBH, and lean less than 45 degrees from vertical. If a dead tree is missing bark, measure the DBH without the bark and record that measurement. |

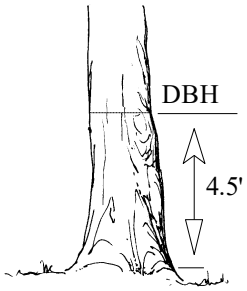
**DRC guidelines –** point of measurement for trees measured at root collar:

| *DRC Guidelines* | |
|---|---|
| **Tree Description** | **Point of Measurement** |
| **Tree species measured at root collar** | For tree species that are measured at root collar (Rocky Mountain Juniper, Utah Juniper, and Curl-Leaf Mountain Mahogany), the diameter measurement (DRC) is taken at the root collar or at the point nearest the natural ground line (whichever is higher) that represents the basal area of the tree stem or stems. The place of diameter measurement may vary for trees with stems that are abnormally formed. |
| **Stump sprouts** | For multi-stemmed woodland species, treat all new sprouts as part of the same new tree. |
| **Minimum Stem Size** | Stems must be at least 1.5" dia and one foot in length to be included in the DRC calculation. |

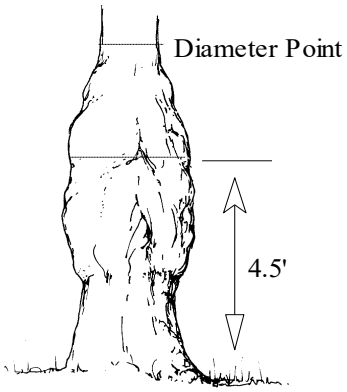
## Point of Measurement for DBH:



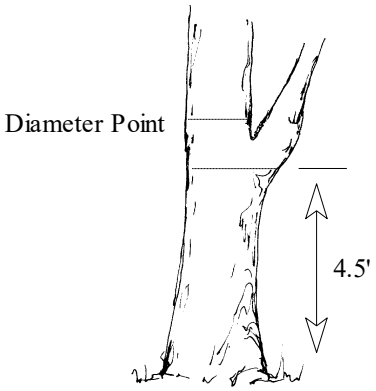

Tree on slope



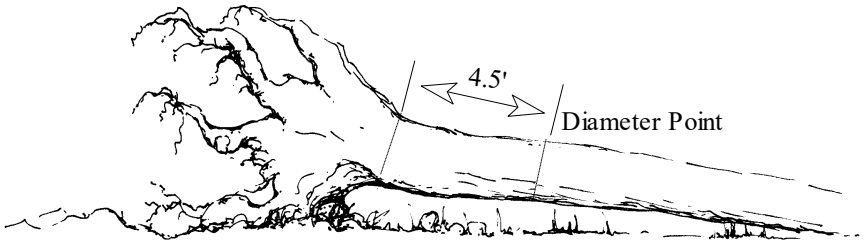

Tree on level ground



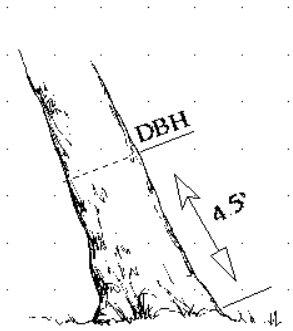

Tree deformed at DBH



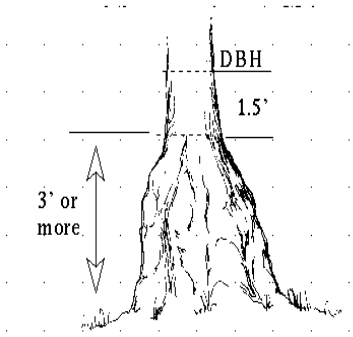

Tree with branch at 4.5 feet



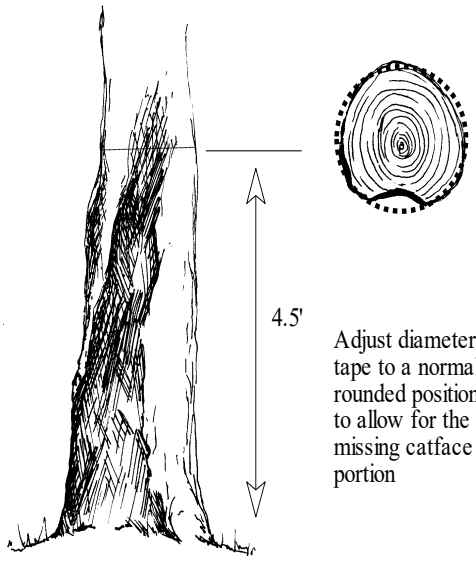

Windthrown tree



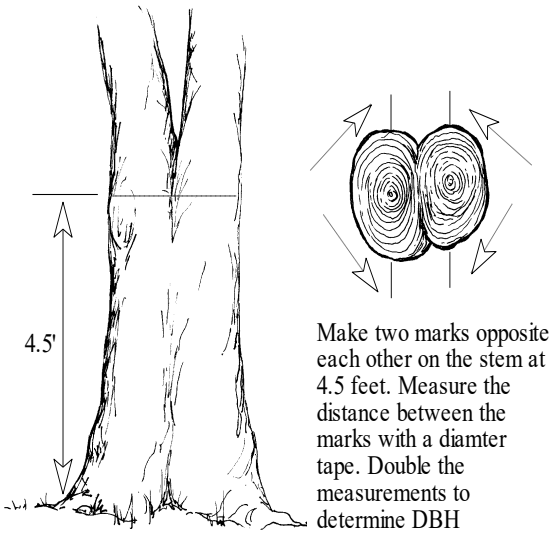

Leaning tree

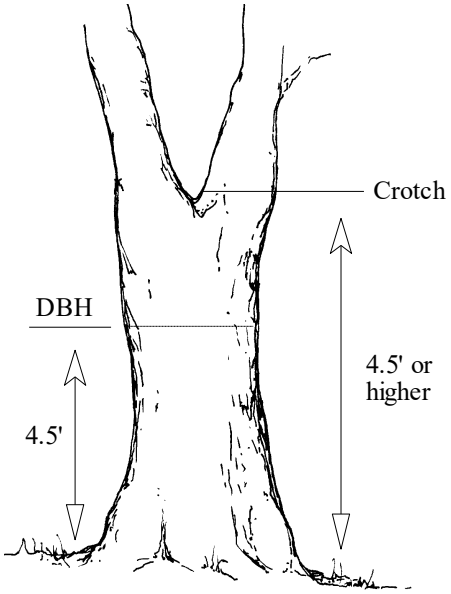



Bottleneck tree

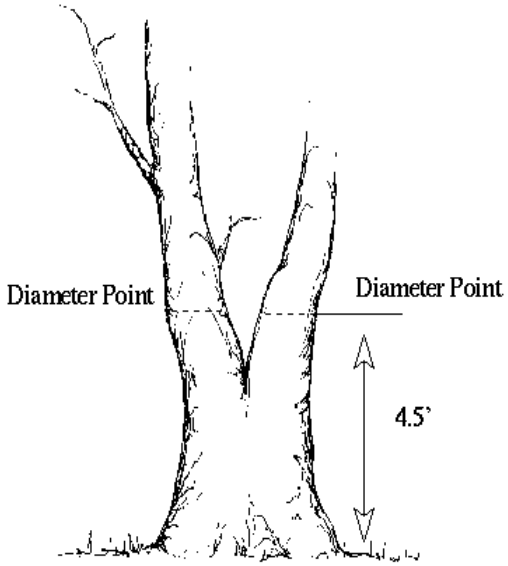



Tree with a catface




Tree forked at 4.5 feet or higher. Record as one tree and consider only the main fork




Tree forked below 4.5 feet. Record each fork that is "in" as a separate tree. Measure diameter at 4.5 feet.

# Appendix N: Radial Growth and Height Growth

Refer to section A for procedures on measuring radial growth. Refer to section B for procedures on measuring height growth.

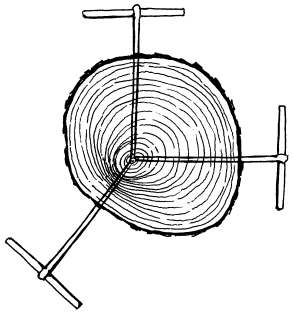
## A. Radial Growth Measurement

The procedures outlined below are for a 10-year radial growth increment measurement:

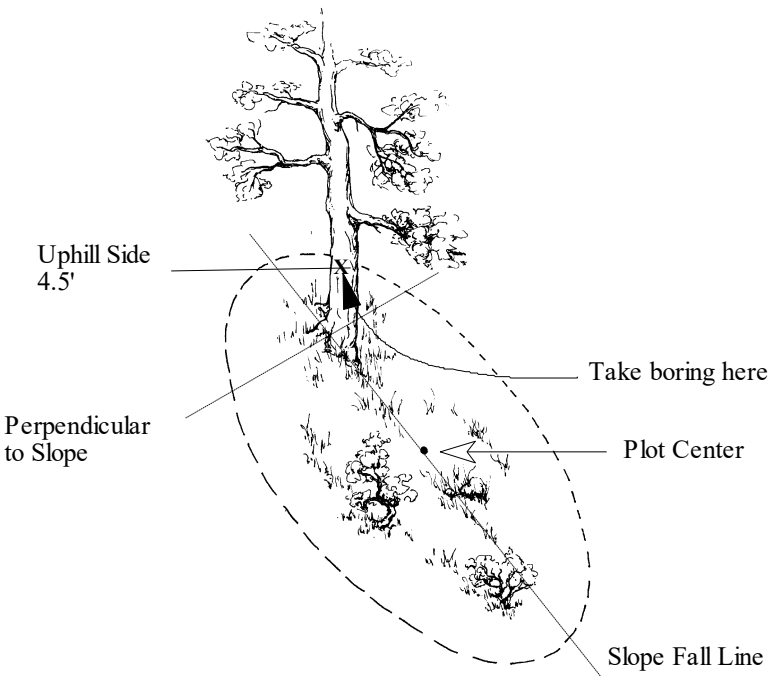
1. Bore the tree just below the point of diameter measurement, on the side of the tree facing plot center to reduce bias in selecting the radial growth sampling cores. There can be considerable growth difference between the various areas of the same breast height X-section. Slope, aspect, influence from neighboring trees, etc., can affect the width of the growth rings in any given core area.

2. Count back 10 growth rings from the cambium end of the core.

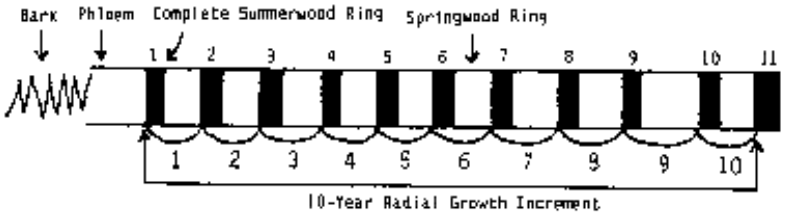
3. Measure the length of this segment of the core to the nearest 1/20$^{th}$-inch to get radial increment. Enter this radial increment as the number of twentieths, e.g. 18/20 is recorded "18" and 27/20 is recorded "27."



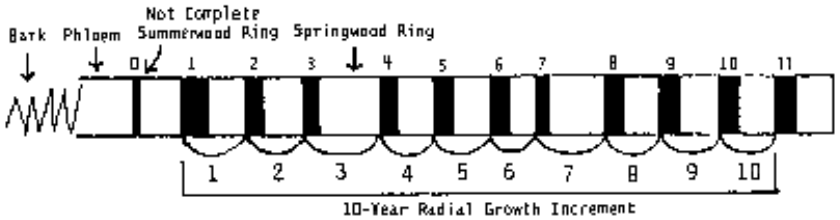
**Steep slopes** – It may be difficult or impossible to obtain an increment boring at breast height on very steep slopes when the plot center is downhill from the tree. In this circumstance, obtain the core at breast height on a side of the tree perpendicular to the slope fall line.




The radial increment growth period is usually 10 years. The measurement is taken from the outside edge of the most current, complete summerwood (denser, dark-colored) ring to the outside edge of the eleventh summerwood ring, so that 10 complete annual increments are included. The last summerwood growth ring is considered complete by September 1 each year.




Example of a 10-year radial growth increment with the first summerwood ring being a complete growth ring.

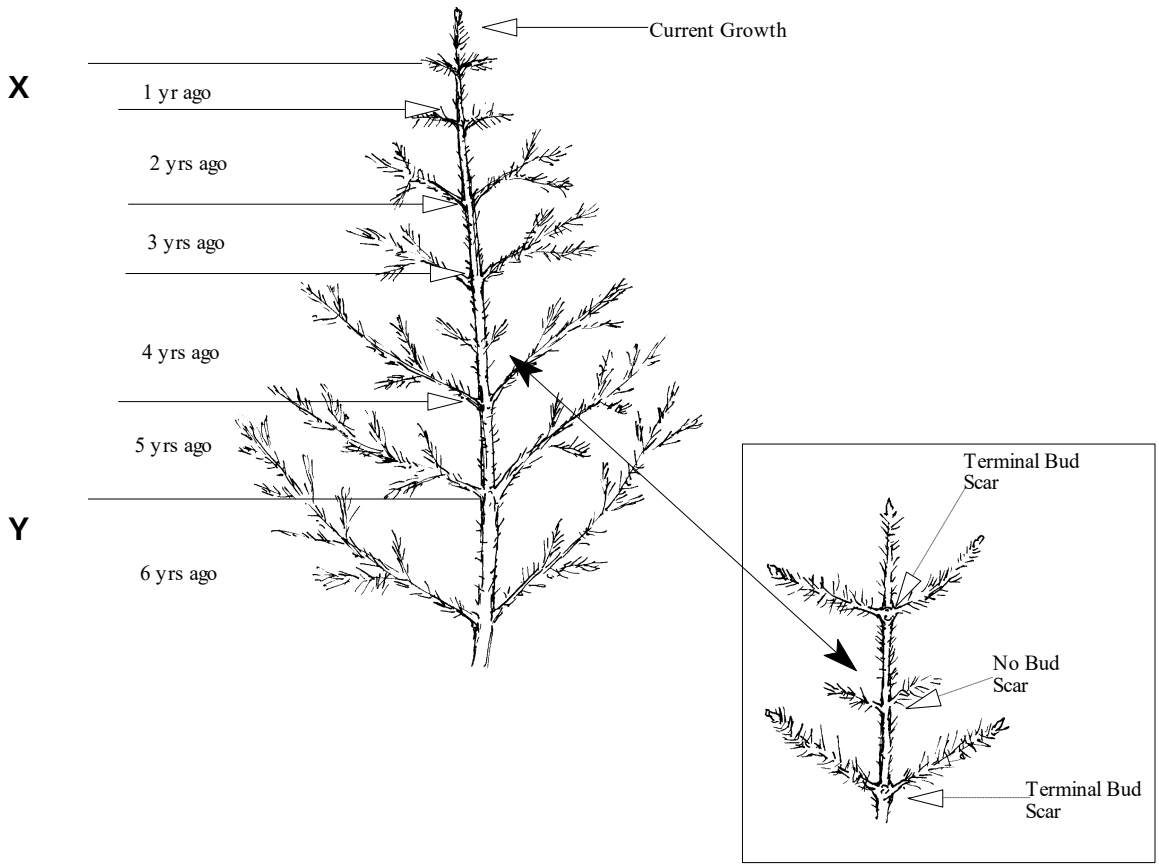



Example of a 10-year radial growth increment with the first summerwood ring not a complete growth ring.

Use a ruler with a 1/20$^{th}$-inch scale to measure the radial growth increment.

## B. Height Growth Measurement

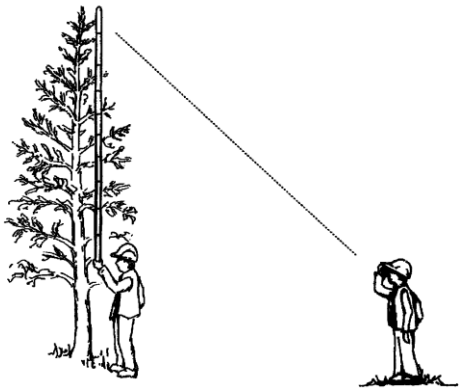
Five-year height growth is measured on trees less than 3.0 inches DBH. It is measured in feet (to the nearest 0.1 foot). The measurement is taken on the most recent five complete height segments. The current terminal leader is excluded unless subset has occurred. Height increments are recognized by the presence of budscale scars on the nodes (except western redcedar) or by dissecting the leader and counting annual rings with a hand lens.




Between lines **X** and **Y** is the 5-year Height Increment.

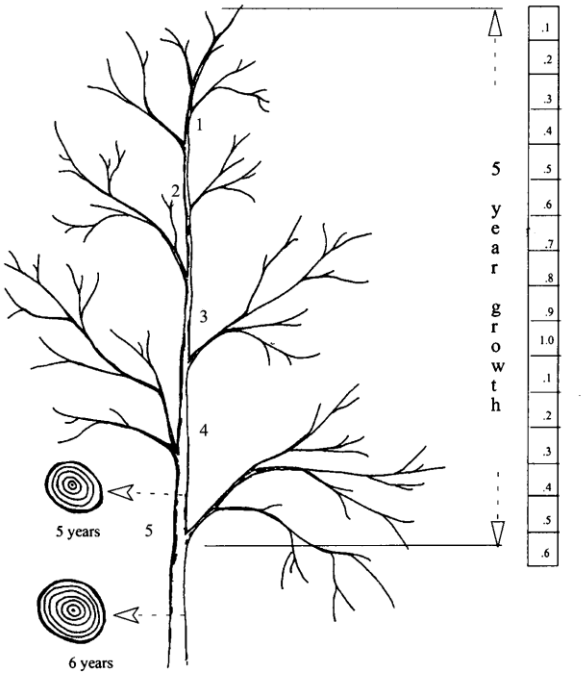
**Height Growth on Trees Taller than 10 Feet:**

One crewmember holds up the height pole to the top of the tree. The other crewmember uses binoculars to locate 5 year growth node and read the length on the height pole.



**Using Destructive Sampling:**

Cut down the tree and measure the 5-year growth.




1. Cut at suspected internode between 5 and 6 years.
2. Cut between suspected internode between 4 and 5 years.
3. Measure at the 5th node.

Note: This graphic illustrates measurement to the top of the tree. If the measurement is taken during the spring or summer, when the tree has a partial years flush of new growth, do NOT include the partial growth. Measure the 5 most recent COMPLETE increments of height growth

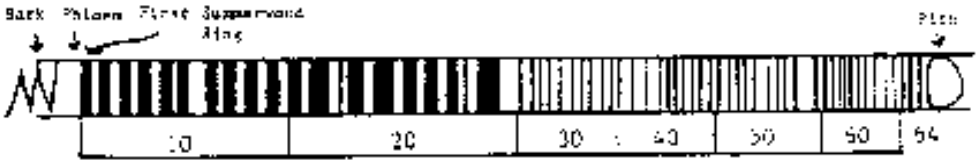
# Appendix O: Measuring Age

Refer to section A for procedures on measuring age for trees ≥ 3.0 inches DBH. Refer to section B for procedures on measuring age for trees < 3.0 inches DBH.

## A. Age Measurements for Trees ≥ 3.0-inches DBH

For sample trees 3.0-inches DBH and larger, age is determined from an increment boring made at breast height. The increment boring should be made at breast height facing plot center, to reduce bias. Usually the boring for measuring radial growth is also used for age measurement.

Age is counted from the most current summerwood ring to the pith of the tree. Record the age counted, do not add an estimate of the number of years to grow to breast height.




The ring count is 64 years. Record “64” for Tree Age.

### Procedure for Estimating Age:

If a tree is rotten or hollow, or if a tree has a radius greater than the length of the increment borer, use the following procedure:

Bore into the tree as far as possible, extract core and count the rings. Measure the diameter of the tree and divide by two, then subtract the bark thickness. This gives the radius of the wood part of the tree. Measure the length of the core and subtract from the radius of the wood to determine how much longer the core would have to be to reach the pith. Count the number of rings in the inner-most inch and extrapolate to the center.

**Note:** It is critical to keep increment borers properly sharpened and regularly cleaned. A dull, chipped, or gummed-up increment borer will not take a usable core. Age estimates are only to be used for rotten or hollow trees, or for trees so large that the center cannot be reached. Age estimates are not acceptable due to improper maintenance of increment borers.

**Example** (age estimate for large tree):

- DBH – 40.0-inches
- Bark thickness – 2.0 inches
- Core – 16.0 inches long
- Ring count – 200 rings, and inner-most inch has 5 rings

**Procedure for estimating age:**

| Step | Procedure | Measurement or Calculation |
|---|---|---|
| **1** | DBH | 40.0 inches |
| **2** | Radius of bark and wood (DBH / 2) | 40.0 / 2 = 20.0 |
| **3** | Bark Thickness | 2.0 inches |
| **4** | Radius of wood (*step 2 – step 3*) | 20.0 – 2.0 = 18.0 inches |
| **5** | Core length | 16.0 inches |
| **6** | Distance short of hitting center:<br>Radius of wood – core length<br>(*step 4 – step 5*) | 18.0 – 16.0 = 2.0 inches |
| **7** | Number of rings (inner-most inch) | 5 rings |
| **8** | Product (*step 6 x step 7*) | 2 X 5 = 10 rings |
| **9** | Ring count (number of rings on core) | 200 years |
| **9** | **Estimated Tree Age:**<br>Ring count + product (*step 9* + *step 8*) | 200 + 10 = 210 years |

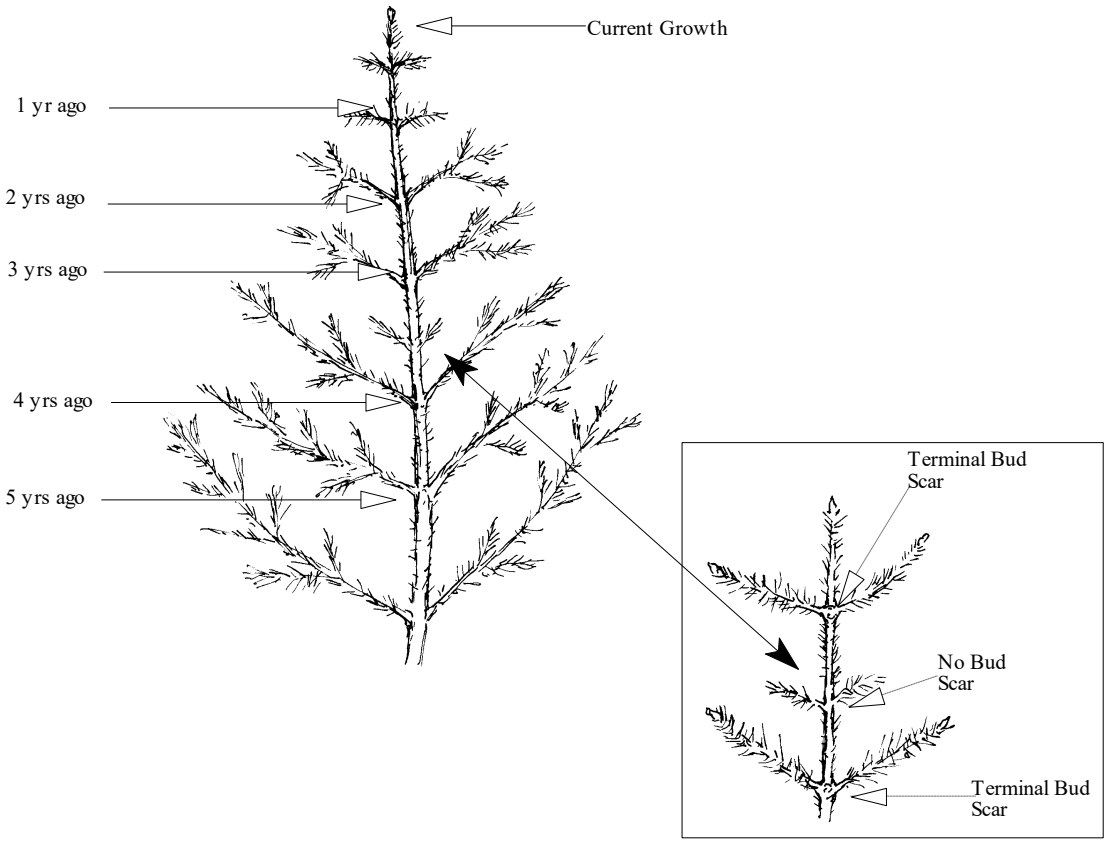
## B. Age Measurements for Trees < 3.0-inches DBH

For sample trees less than 3.0-inches DBH, total tree age may be determined by one of the following methods: (1) counting branch whorls that represent annual height increments, (2) severing the tree at the root collar and counting annual rings, or (3) taking an increment boring at the root collar.

### 1. Counting Branch Whorls

In general, the presence of budscale scars guarantees that the branch whorl represents an annual growth increment. However, as a tree ages, budscale scars become masked by bark development. Be cautious of false branch whorls; these whorls will never have budscale scars at the node, and they sometimes have shorter branches. The total age is recorded in Tree Age.

Note: Western redcedar does not have budscale scars and false whorls are common. Therefore, counting branch whorls is never appropriate for cedar.



## 1. Cutting Tree at Root Collar to Count Annual Rings

Sample trees can be severed at the root collar in order to count annual rings. The root collar is the transition zone between the stem and the root, and may be recognized by the presence of a slight swelling. The counted age is recorded in Tree Age.

## 2. Increment Boring at Root Collar

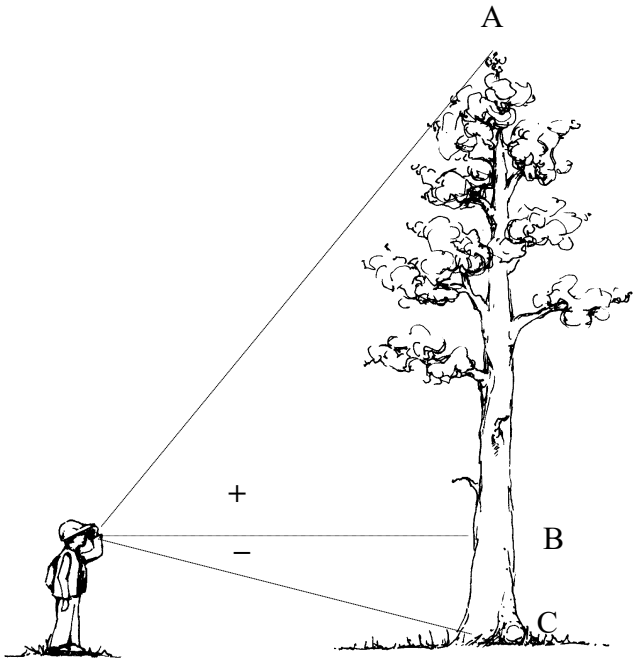
Sample trees can be bored at the root collar to determine age. The same procedures for boring trees at breast height (see above) are used for boring trees at root collar. The counted age is recorded in Tree Age.

# Appendix P: Measuring Height

Refer to section A for procedures on measuring total tree height. Section B describes height procedures for leaning trees. Section C describes height procedures for trees with forked, broken, or missing tops.

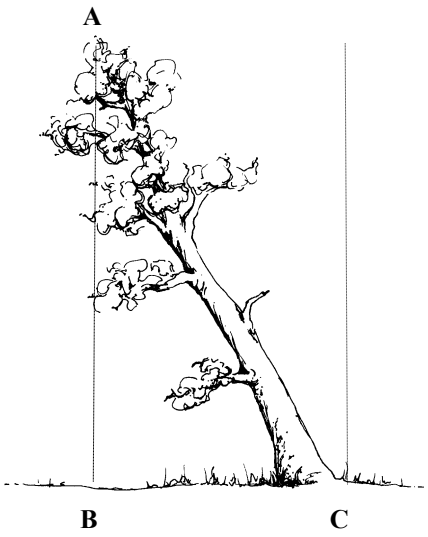
## A. Total Tree Height

To determine total tree height, measure from the base of the tree on the high ground side to the tip of the tree leader. Measure height from a point uphill or on the same contour line as the tree. Record total tree height to the nearest foot.



## B. Height for Leaning Trees

Trees leaning 25% (about 15°) or more from vertical require the following special height measuring technique.




**Procedure:** Locate point on ground directly under tip of leaning tree. Measure height **A B**. Measure horizontal distance **B C**. Determine actual tree height (**A C**) using either the Pythagorean theory for right triangles where:

Tree Height = $\sqrt{AB^2 + BC^2}$

**Example:**

Measured height (AB) = 120'
Horizontal distance (BC) = 40'

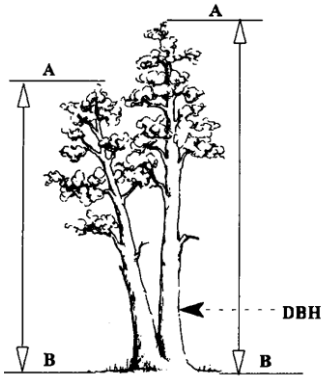
Corrected tree height = $\sqrt{120^2 + 40^2}$ = 126.49

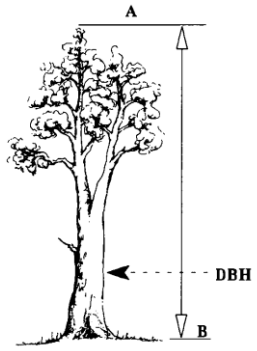
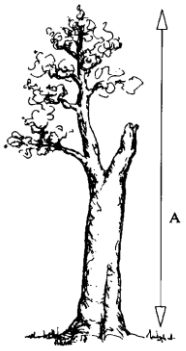
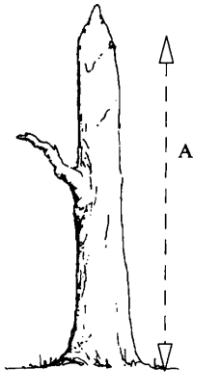
Actual tree height (**A C** in above diagram) may also be obtained using the following table:

| ***Actual Tree Height (feet)*** | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MS HT** | **Horizontal Distance** - tip to center of bole at ground (**B C**) | | | | | | | | | | | | | | | | | |
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 81 | 85 | 90 |
| 40 | 40 | 41 | 43 | 45 | | | | | | | | | | | | | | |
| 50 | 50 | 51 | 52 | 54 | 56 | | | | | | | | | | | | | |
| 60 | 60 | 61 | 62 | 63 | 65 | 67 | | | | | | | | | | | | |
| 70 | | 71 | 72 | 73 | 74 | 76 | 78 | | | | | | | | | | | |
| 80 | | 81 | 81 | 82 | 84 | 86 | 87 | 89 | | | | | | | | | | |
| 90 | | 91 | 91 | 92 | 94 | 95 | 97 | 98 | 101 | | | | | | | | | |
| 100 | | 101 | 101 | 102 | 103 | 104 | 106 | 108 | 110 | 112 | | | | | | | | |
| 110 | | | 111 | 112 | 113 | 114 | 116 | 117 | 119 | 121 | 123 | | | | | | | |
| 120 | | | 121 | 122 | 123 | 124 | 125 | 126 | 128 | 130 | 132 | 134 | | | | | | |
| 130 | | | 131 | 131 | 132 | 133 | 135 | 136 | 138 | 139 | 141 | 143 | 145 | | | | | |
| 140 | | | 141 | 141 | 142 | 143 | 144 | 146 | 147 | 149 | 150 | 152 | 154 | 157 | | | | |
| 150 | | | 151 | 151 | 152 | 153 | 154 | 155 | 157 | 158 | 160 | 162 | 164 | 166 | 168 | | | |
| 160 | | | 161 | 161 | 162 | 163 | 164 | 165 | 166 | 168 | 169 | 171 | 173 | 175 | 177 | 179 | | |
| 170 | | | 171 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 179 | 180 | 182 | 184 | 186 | 188 | 190 | |
| 180 | | | 181 | 181 | 182 | 183 | 183 | 184 | 176 | 187 | 188 | 190 | 191 | 193 | 195 | 197 | 199 | 201 |
| 190 | | | | 191 | 192 | 192 | 193 | 194 | 195 | 196 | 198 | 200 | 201 | 203 | 204 | 206 | 208 | 210 |
| 200 | | | | 201 | 202 | 202 | 203 | 204 | 205 | 206 | 208 | 209 | 211 | 212 | 214 | 215 | 217 | 219 |

MS HT = (**A B**) Measured Height

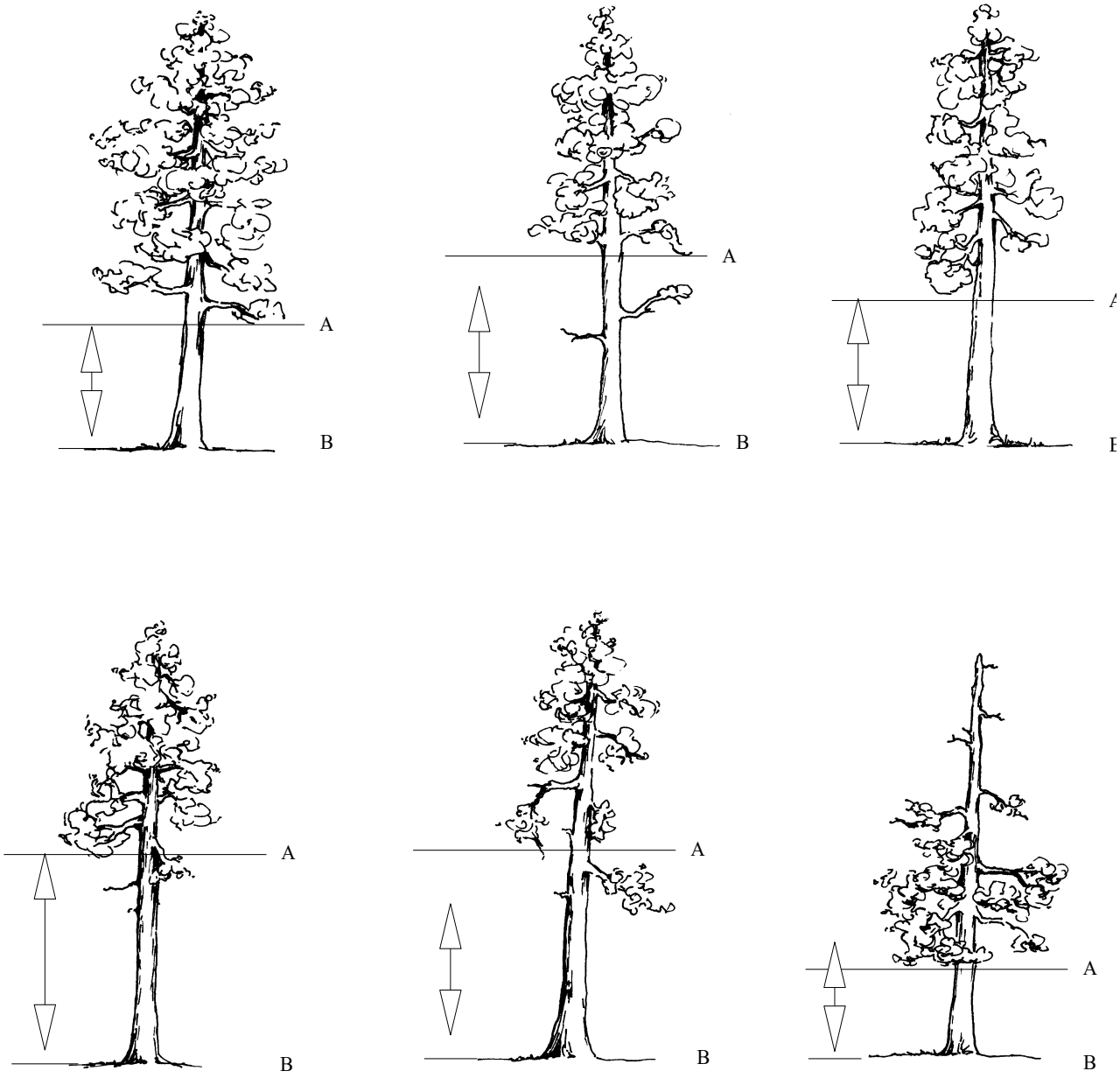
## C. Height for Trees with Forked, Broken, or Missing Tops

<table>
<tr>
<td>Forked Trees<br>If tree forks below DBH, treat as two trees and measure height of each stem from base of tree to tip of tree.<br><br>If the fork crotch occurs at or above 4.5 feet on high ground side, the tree is treated as a single tree. Measure height of the tallest fork.</td>
<td> 


</td>
</tr>
<tr>
<td>Forked Tree with a Broken Top<br>Measure height of the tallest fork and record in the "Total Height" field. Record a tree damage of “broken top.”</td>
<td> 
</td>
</tr>
<tr>
<td>Trees with a Missing Top<br>Measure height of stub and record in the "Total Height" field. Record a tree damage of “missing top.” If the tree is forked, measure the height of the stub of the dominant fork.</td>
<td> 
</td>
</tr>
</table>

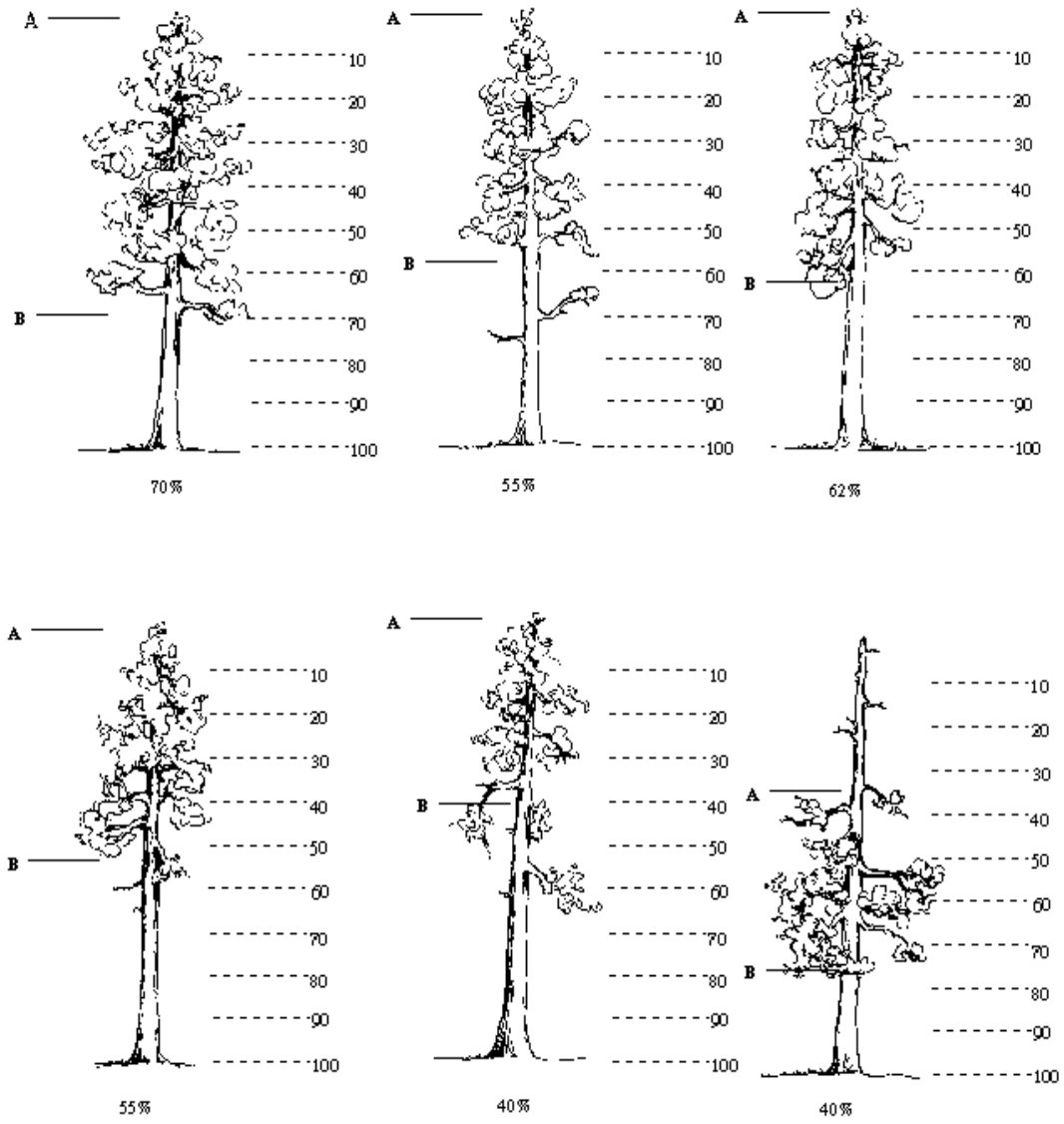
# Appendix Q: Measuring Crowns

### Height to Live Crown:




Measure the height from the base of the tree on the uphill side (**B**) to the base (**A**) of the live crown. Base of the live crown is the lowest branch whorl with live branches in at least two quadrants exclusive of epicormic branching and of whorls not continuous with the main crown.

**Crown Ratio:**




Crown ratio is the portion of the tree bole supporting live, healthy foliage and is expressed as a percent of the actual tree height. The distance between **A** and **B** is the existing crown length.

# Appendix R: Damage Categories, Agents, Severity Ratings, and Tree Parts

## Damage Categories:

| *Damage Categories* | |
|---|---|
| **Code** | **Description** |
| 10 | General Insects |
| 11 | Bark Beetles |
| 12 | Defoliators |
| 13 | Chewing Insects |
| 14 | Sucking Insects |
| 15 | Boring Insects |
| 16 | Seed / Cone / Flower / Fruit Insects |
| 17 | Gallmaker Insects |
| 18 | Insect Predators |
| 19 | General Diseases |
| 20 | Biotic Damage |
| 21 | Root / Butt Diseases |
| 22 | Stem Decays / Cankers |
| 23 | Parasitic / Epiphytic Plants |
| 24 | Decline Complexes / Dieback / Wilts |
| 25 | Foliage Diseases |
| 26 | Stem Rusts |
| 27 | Broom Rusts |
| 30 | Fire |
| 41 | Wild Animals |
| 42 | Domestic Animals |
| 50 | Abiotic Damage |
| 60 | Competition |
| 70 | Human Activities |
| 71 | Harvest |
| 80 | Multi-damage (insect/disease) |
| 90 | Unknown |
| 99 | Physical Effects |

## Damage Categories, Agents, and Severity Ratings:

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **Category 10: General Insects** | | | |
| **SEVERITY RATING** | | | |
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. | | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | | |
| **Category** | **Agent** | **Common Name** | **Scientific Name** |
| **10** | **000** | **General Insects** | |
| **10** | 001 | Thrips | |
| **10** | 007 | Clerid beetle | *Cleridae* |
| **10** | 009 | Green Rose Chafer | *Dichelonyx backi* |
| **10** | 017 | Bagworm moth | *Psychidae* |
| **10** | 019 | Scarab | *Scarabaeidae* |
| **10** | 021 | | *Steremnius carinatus* |
| **10** | 023 | Wood wasps | *Siricidae spp.* |
| **Category 11: Bark Beetles** | | | |
| **SEVERITY RATING** | | | |
| **1** | **Unsuccessful bole attack** – pitchout and beetle brood absent; pitchouts are recognized by clear or cream colored pitch tubes (globules) on pines and streams of pitch on true firs; no boring dust is present. | | |
| **2** | **Strip attacks –** galleries and brood present; presence of boring dust and/or reddish-brown colored pitch tubes or streams occurring on less than ¾ of the bole circumference. | | |
| **3** | **Successful bole attack –** galleries and brood present; boring dust and/or reddish-brown pitch exudations are found on greater than ¾ of the bole circumference. | | |
| **4** | **Topkill** – the upper portion of the crown fading or dead. | | |
| **5** | **Successful attack last year** | | |
| **6** | **Older dead** | | |
| **Category** | **Agent** | **Common Name** | **Scientific Name** |
| **11** | **000** | **Bark Beetles** | |
| **11** | 001 | Roundheaded pine beetle | *Dendroctonus adjunctus* |
| **11** | 002 | Western pine beetle | *Dendroctonus brevicomis* |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **11** | 005 | Lodgepole pine beetle | *Dendroctonus murrayanae* |
| **11** | 006 | Mountain pine beetle | *Dendroctonus ponderosae* |
| **11** | 007 | Douglas-fir beetle | *Dendroctonus pseudotsugae* |
| **11** | 009 | Spruce beetle | *Dendroctonus rufipennis* |
| **11** | 012 | Red turpentine beetle | *Dendroctonus valens* |
| **11** | 013 | | *Dryocoetes affaber* |
| **11** | 015 | Western balsam bark beetle | *Dryocoetes confusus* |
| **11** | 016 | | *Dryocoetes sechelti* |
| **11** | 017 | Ash bark beetles | *Hylesinus spp.* |
| **11** | 018 | Native elm bark beetle | *Hylurgopinus rufipes* |
| **11** | 021 | Sixspined ips | *Ips calligraphus* |
| **11** | 022 | Emarginate ips | *Ips emarginatus* |
| **11** | 024 | | *Ips latidens* |
| **11** | 026 | Monterey pine ips | *Ips mexicanus* |
| **11** | 028 | Northern spruce engraver beetle | *Ips perturbatus* |
| **11** | 029 | Pine engraver | *Ips pini* |
| **11** | 030 | Ips engraver beetles | *Ips spp.* |
| **11** | 031 | | *Ips tridens* |
| **11** | 032 | Western ash bark beetle | *Leperisinus californicus* |
| **11** | 034 | | *Orthotomicus caelatus* |
| **11** | 035 | Cedar bark beetles | *Phleosinus spp.* |
| **11** | 036 | Western cedar bark beetle | *Phloeosinus punctatus* |
| **11** | 037 | Tip beetles | *Pityogenes spp.* |
| **11** | 038 | Douglas-fir twig beetle | *Pityophthorus pseudotsugae* |
| **11** | 039 | Twig beetles | *Pityophthorus spp.* |
| **11** | 040 | Foureyed spruce beetle | *Polygraphus rufipennis* |
| **11** | 041 | Fir root bark beetle | *Pseudohylesinum granulatus* |
| **11** | 042 | | *Pseudohylesinus dispar* |
| **11** | 043 | Douglas-fir pole beetle | *Pseudohylesinus nebulosus* |
| **11** | 044 | Silver fir beetle | *Pseudohylesinus sericeus* |
| **11** | 045 | Small European elm bark beetle | *Scolytus multistriatus* |
| **11** | 046 | Spruce engraver | *Scolytus piceae* |
| **11** | 048 | True fir bark beetles | *Scolytus spp.* |
| **11** | 049 | Douglas-fir engraver | *Scolytus unispinosus* |
| **11** | 050 | Fir engraver | *Scolytus ventralis* |
| **11** | 053 | Four-eyed bark beetle | *Polygraphus spp.* |
| **11** | 054 | Hemlock beetle | *Pseudohylesinus tsugae* |
| | | | |
| **Category 12: Defoliators** | | | |

| *Damage Categories, Agents, and Severity Ratings* | | |
|---|---|---|
| **SEVERITY RATING** | | |
| **1** | **Light Defoliation** (1 – 25%) | No topkill |
| **2** | **Light Defoliation** (1 – 25%) | Topkill ≤ 10 percent |
| **3** | **Light Defoliation** (1 – 25%) | Topkill > 10 percent |
| **4** | **Moderate Defoliation** (26 – 75%) | No topkill |
| **5** | **Moderate Defoliation** (26 – 75%) | Topkill ≤ 10 percent |
| **6** | **Moderate Defoliation** (26 – 75%) | Topkill > 10 percent |
| **7** | **Heavy Defoliation** (76 – 100%) | No topkill |
| **8** | **Heavy Defoliation** (76 – 100%) | Topkill ≤ 10 percent |
| **9** | **Heavy Defoliation** (76 – 100%) | Topkill > 10 percent |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **12** | **000** | **Defoliators** | |
| **12** | 001 | Casebearer | |
| **12** | 003 | Looper | |
| **12** | 005 | Sawfly | |
| **12** | 007 | Larger elm leaf beetle | *Monocesta coryli* |
| **12** | 008 | Spanworm | |
| **12** | 011 | Western blackheaded budworm | *Acleris gloverana* |
| **12** | 013 | Whitefly | *Aleyrodoidae* |
| **12** | 014 | Fall cankerworm | *Alsophila pometaria* |
| **12** | 015 | Alder flea beetle | *Altica ambiens* |
| **12** | 016 | Mountain mahogany looper | *Anacamptodes clivinaria profanata* |
| **12** | 018 | Oak worms | *Anisota spp.* |
| **12** | 020 | Western larch sawfly | *Anoplonyx occidens* |
| **12** | 021 | Fruit tree leafroller | *Archips argyrospila* |
| **12** | 022 | Uglynest caterpillar | *Archips cerasivorana* |
| **12** | 023 | Boxelder defoliator | *Archips negundanus* |
| **12** | 030 | Pear sawfly | *Caliroa cerasi* |
| **12** | 033 | Boxelder leafroller | *Caloptilia negundella* |
| **12** | 035 | Spruce webspinning sawfly | *Cephalcia fascipennis* |
| **12** | 036 | Two-year budworm | *Choristoneura biennis* |
| **12** | 037 | Large aspen tortrix | *Choristoneura conflictana* |
| **12** | 039 | Sugar pine tortrix | *Choristoneura lambertiana* |
| **12** | 040 | Western spruce budworm | *Choristoneura occidentalis* |
| **12** | 043 | Aspen leaf beetle | *Chrysomela crotchi* |
| **12** | 044 | Cottonwood leaf beetle | *Chrysomela scripta* |
| **12** | 045 | Leafhopper | *Cicadellidae* |
| **12** | 046 | Poplar tentmaker | *Clostera inclusa* |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **12** | 047 | Larch casebearer | *Coleophora laricella* |
| **12** | 049 | Lodgepole needleminer | *Coleotechnites milleri* |
| **12** | 050 | Ponderosa needleminer | *Coleotechnites spp.* |
| **12** | 051 | Black Hills pandora moth | *Coloradia doris* |
| **12** | 052 | Pandora moth | *Coloradia pandora* |
| **12** | 053 | Sycamore lace bug | *Corythucha ciliata* |
| **12** | 054 | Lace bugs | *Corythucha spp.* |
| **12** | 055 | Oak leaftier | *Croesia semipurpurana* |
| **12** | 058 | Yellownecked caterpillar | *Datana ministra* |
| **12** | 059 | Walkingstick | *Diapheromera femorata* |
| **12** | 060 | Spruce coneworm | *Dioryctria reniculelloides* |
| **12** | 061 | Introduced pine sawfly | *Diprion similis* |
| **12** | 066 | White fir needleminer | *Epinotia meritana* |
| **12** | 071 | Elm leafminer | *Fenusa ulmi* |
| **12** | 072 | Geometrid moth | *Geometridae* |
| **12** | 073 | Leafblotch miner | *Gracillariidae* |
| **12** | 074 | Spotted tussock moth | *Halisidota maculata* |
| **12** | 077 | Brown day moth | *Hemileuca eglanterina* |
| **12** | 082 | Fall webworm | *Hyphantria cunea* |
| **12** | 083 | Hemlock looper | *Lambdina fiscellaria* |
| **12** | 085 | Tent caterpillar moth | *Lasiocampidae* |
| **12** | 086 | Satin moth | *Leucoma salicis* |
| **12** | 087 | Willow leafblotch miner | *Lithocolletis spp.* |
| **12** | 088 | Aspen blotchminer | *Lithocolletis tremuloidiella* |
| **12** | 089 | Gypsy moth | *Lymantria dispar* |
| **12** | 090 | Cottonwood leafminers | *Lyonetia spp.* |
| **12** | 094 | Western tent caterpillar | *Malacosoma californicum* |
| **12** | 096 | Forest tent caterpillar | *Malacosoma disstria* |
| **12** | 098 | Leafcutting bees | *Megachilidae* |
| **12** | 099 | Blister beetle | *Meloidae* |
| **12** | 102 | Willow sawfly | *Nematus spp.* |
| **12** | 104 | Lodgepole sawfly | *Neodiprion burkei* |
| **12** | 106 | Pine infesting sawflies | *Neodiprion fulviceps* |
| **12** | 109 | Ponderosa pine sawfly | *Neodiprion mundus* |
| **12** | 115 | Hemlock sawfly | *Neodiprion tsugae* |
| **12** | 116 | Pine butterfly | *Neophasia menapia* |
| **12** | 117 | False hemlock looper | *Nepytia canosaria* |
| **12** | 118 | California tortoiseshell | *Nymphalis californica* |
| **12** | 120 | Bruce spanworm | *Operophtera bruceata* |
| **12** | 121 | Rusty tussock moth | *Orgyia antiqua* |
| **12** | 122 | Whitemarked tussock moth | *Orgyia leucostigma* |
| **12** | 123 | Douglas-fir tussock moth | *Orgyia pseudotsugata* |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **12** | 124 | Western tussock moth | *Orgyia vetusta* |
| **12** | 125 | Spring cankerworm | *Paleacrita vernata* |
| **12** | 135 | Aspen leafminer | *Phyllocnistis populiella* |
| **12** | 136 | Yellowheaded spruce sawfly | *Pikonema alaskensis* |
| **12** | 137 | Tenlined June beetle | *Polyphylla decemlineata* |
| **12** | 138 | Japanese beetle | *Popillia japonica* |
| **12** | 139 | Larch sawfly | *Pristiphora erichsonii* |
| **12** | 140 | Mountain-ash sawfly | *Pristiphora geniculata* |
| **12** | 141 | Elm leaf beetle | *Pyrrhalta luteola* |
| **12** | 142 | Spearmarked black moth | *Rheumaptera hastata* |
| **12** | 143 | Giant silkworm moth | *Saturniidae* |
| **12** | 144 | Redhumped caterpillar | *Schizura concinna* |
| **12** | 146 | Larch looper | *Semiothisa sexmaculata* |
| **12** | 150 | Spruce needleminer (west) | *Taniva albolineana* |
| **12** | 154 | | *Thyridopteryx ephemeraeformis* |
| **12** | 155 | Leafroller/seed moth | *Tortricidae spp.* |
| **12** | 156 | Willow defoliation | *Tortricidae* |
| **12** | 157 | Euonymus caterpillar | *Yponomeuta spp.* |
| **12** | 159 | Larch bud moth | *Zeiraphera improbana* |
| **12** | 160 | Pine needle sheathminer | *Zelleria haimbachi* |
| **12** | 162 | Cottonwood leaf beetle | *Chrysomela spp.* |
| **12** | 164 | Saddle-backed looper | *Ectropis crepuscularia* |
| **12** | 165 | Leaf roller | *Epinotia solandriana* |
| **12** | 168 | Green-striped looper | *Melanoplophia imitata* |
| **12** | 174 | Pine looper | *Phaeoura mexicanaria* |
| **12** | 176 | | *Zadiprion townsendi* |
| **12** | 177 | Douglas-fir budmoth | *Zeiraphera hesperiana* |
| **12** | 179 | Phantom hemlock looper | *Nepytia phantasmaria* |
| **12** | 180 | Tent caterpillar | *Malacossoma spp.* |
| **12** | 188 | Elm sawfly | *Cimbex americana* |
| **12** | 189 | June Beetles / Leaf Chafers | *Phyllophaga spp.* |

## Category 13: Chewing Insects

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **13** | **000** | **Chewing Insects** | |
| **13** | 001 | Grasshopper | |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **13** | 002 | Shorthorn grasshoppers | *Acrididae* |
| **13** | 005 | Clearwinged grasshopper | *Camnula pellucida* |
| **13** | 006 | Cicadas | *Cicadidae* |
| **13** | 007 | Eurytomids | *Eurytoma spp.* |
| **13** | 008 | Cutworms | *Euxoa excellens* |
| **13** | 010 | Pales weevil | *Hylobius pales* |
| **13** | 012 | Periodical cicada | *Magicicada septendecim* |
| **13** | 013 | Migratory grasshopper | *Melanoplus sanguinipes* |
| **13** | 014 | Valley grasshopper | *Oedaleonotus enigma* |
| **13** | 015 | Strawberry root weevil | *Otiorhyhchus ovatus* |
| **13** | 020 | Northern pitch twig moth | *Petrova albicapitana* |
| **13** | 021 | Ponderosa pine tip moth | *Rhyacionia zozana* |
| **13** | 022 | Pine needle weevil | *Scythropus spp.* |
| **13** | 025 | | *Thrips madronii* |
| **13** | 026 | Ash plant bug | *Tropidosteptes amoenus* |
| **13** | 028 | Pitch-eating weevil | *Pachylobius picivorus* |

## Category 14: Sucking Insects

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **14** | **000** | **Sucking Insects** | |
| **14** | 001 | Scale insect | |
| **14** | 002 | Western larch wooly aphid | *Adelges oregonensis* |
| **14** | 003 | Balsam woolly adelgid | *Adelges piceae* |
| **14** | 004 | Hemlock woolly adelgid | *Adelges tsugae* |
| **14** | 006 | Aphid | *Aphididae* |
| **14** | 008 | Western pine spittlebug | *Aphrophora permutata* |
| **14** | 010 | Spittlebug | *Cercopidae* |
| **14** | 012 | Pine needle scale | *Chionaspis pinifoliae* |
| **14** | 014 | Giant conifer aphids | *Cinara spp.* |
| **14** | 017 | Spruce aphid | *Elatobium abietinum* |
| **14** | 018 | Wooly apple aphid | *Erisoma lanigerum* |
| **14** | 022 | Pine thrips | *Gnophothrips spp.* |
| **14** | 026 | Lecanium scale | *Lecanium spp.* |
| **14** | 028 | Oystershell scale | *Lepidosaphes ulmi* |
| **14** | 029 | Pinyon needle scale | *Matsucoccus acalyptus* |
| **14** | 030 | Ponderosa pine twig scale | *Matsucoccus bisetosus* |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **14** | 035 | Treehoopers | *Membracidae* |
| **14** | 039 | Black pineleaf scale | *Nuculaspis californica* |
| **14** | 040 | Spruce spider mite | *Oligonychus ununquis* |
| **14** | 043 | Maple aphids | *Periphyllus spp.* |
| **14** | 044 | Spruce bud scale | *Physokermes piceae* |
| **14** | 046 | Pine leaf adelgid | *Pineus pinifoliae* |
| **14** | 047 | White pine adelgid | *Pineus spp.* |
| **14** | 048 | Pine bark adelgid | *Pineus strobi* |
| **14** | 049 | Root aphid | *Prociphilus americanus* |
| **14** | 050 | Mealybug | *Pseudococcidae* |
| **14** | 051 | Cottony maple scale | *Pulvinaria innumerabilis* |
| **14** | 052 | Fir mealybug | *Puto cupressi* |
| **14** | 061 | Pine tortoise scale | *Toumeyella parvicornis* |
| **14** | 063 | Birch aphid | *Euceraphis betulae* |
| **14** | 068 | European elm scale | *Gossyparia spuria* |

## Category 15: Boring Insects

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **15** | **000** | **Boring Insects** | |
| **15** | 001 | Shoot borer | |
| **15** | 002 | Termite | |
| **15** | 003 | Ponderosa pine bark borer | *Acanthocinus princeps* |
| **15** | 004 | Bronze birch borer | *Agrilus anxius* |
| **15** | 006 | Bronze poplar borer | *Argilus liragus* |
| **15** | 007 | Carpenter bees | *Apidae* |
| **15** | 008 | Flatheaded borer | *Buprestidae* |
| **15** | 009 | Golden buprestid | *Buprestis aurulenta* |
| **15** | 010 | Carpenter ants | *Camponotus spp.* |
| **15** | 011 | Gouty pitch midge | *Cecidomyia piniinopis* |
| **15** | 012 | Shootboring sawflies | *Cephidae* |
| **15** | 013 | Roundheaded borer | *Cerambycidae* |
| **15** | 014 | Flatheaded apple tree borer | *Chrysobothris femorata* |
| **15** | 017 | Pitted ambrosia beetle | *Corthylus punctatissimus* |
| **15** | 018 | Carpenterworm moths | *Cossidae* |
| **15** | 019 | Poplar and willow borer | *Cryptorphynchus lapathi* |
| **15** | 020 | Pine reproduction weevil | *Cylindrocopturus eatoni* |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **15** | 021 | Douglas-fir twig weevil | *Cylindrocopturus furnissi* |
| **15** | 027 | Ponderous borer | *Ergates spiculatus* |
| **15** | 029 | Western pine shoot borer | *Eucosma sonomana* |
| **15** | 030 | Eucosma species | *Eucosma spp.* |
| **15** | 034 | Warren's collar weevil | *Hylobius warreni* |
| **15** | 035 | Powderpost beetle | *Lyctidae* |
| **15** | 036 | Tarnished plant bug | *Lygus lineolaris* |
| **15** | 037 | | *Magdalis spp.* |
| **15** | 038 | White pine bark miner | *Marmara fasciella* |
| **15** | 039 | Locust borer | *Megacyllene robiniae* |
| **15** | 040 | California flathead borer | *Melanophila californica* |
| **15** | 041 | Flatheaded fir borer | *Melanophila drummondi* |
| **15** | 042 | Whitespotted sawyer | *Monochamus scutellatus* |
| **15** | 043 | Redheaded ash borer | *Neoclytus acuminutus* |
| **15** | 045 | Oberea shoot borers | *Oberea spp.* |
| **15** | 048 | | *Pissodes dubius* |
| **15** | 050 | White pine weevil | *Pissodes strobi* |
| **15** | 051 | Lodgepole terminal weevil | *Pissodes terminalis* |
| **15** | 052 | Ambrosia beetles | *Platypus spp.* |
| **15** | 053 | Cottonwood borer | *Plectrodera scalator* |
| **15** | 056 | Ash borer | *Podesesia syringae fraxini* |
| **15** | 057 | Lilac borer | *Podosesia syringae* |
| **15** | 058 | Carpenterworm | *Prionoxystus robiniae* |
| **15** | 059 | Maple shoot borers | *Proterteras spp.* |
| **15** | 060 | Western subterranean termite | *Reticulitermes hesperus* |
| **15** | 063 | European pine shoot moth | *Rhyacionia buoliana* |
| **15** | 064 | Western pine tip moth | *Rhyacionia bushnelli* |
| **15** | 065 | Nantucket pine tip moth | *Rhyacionia frustrana* |
| **15** | 066 | Lodgepole pine tip moth | *Rhyacionia montana* |
| **15** | 067 | Southwestern pine tip moth | *Rhyacionia neomexicana* |
| **15** | 070 | Saperda shoot borer | *Saperda spp.* |
| **15** | 071 | Clearwing moths | *Sesiidae* |
| **15** | 073 | Roundheaded fir borer | *Tetropium abietis* |
| **15** | 074 | Western larch borer | *Tetropium velutinum* |
| **15** | 075 | Western cedar borer | *Trachykele blondeli* |
| **15** | 076 | Douglas-fir pitch moth | *Vespamima novaroensis* |
| **15** | 077 | Sequoia pitch moth | *Vespamima sequoia* |
| **15** | 083 | Ottonwood twig borer | *Gypsonama haimbachiana* |
| **15** | 085 | Banded ash borer | *Neoclytus capraea* |

*Damage Categories, Agents, and Severity Ratings*

## Category 16: Seed / Cone / Flower / Fruit Insects

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **16** | **000** | **Seed / Cone / Flower / Fruit Insects** | |
| **16** | 001 | Douglas-fir cone moth | *Barbara colfaxiana* |
| **16** | 002 | Lodgepole cone beetle | *Conophthorus contortae* |
| **16** | 003 | Limber pine cone beetle | *Conophthorus flexilis* |
| **16** | 004 | Mountain pine cone beetle | *Conophthorus monticolae* |
| **16** | 005 | Ponderosa pine cone beetle | *Conophthorus ponderosae* |
| **16** | 010 | Douglas-fir cone midge | *Contarinia oregonensis* |
| **16** | 011 | Cone scale midge | *Contarinia washingtonensis* |
| **16** | 012 | Pecan | *Curculio spp.* |
| **16** | 015 | Fir coneworm | *Dioryctria abietivorella* |
| **16** | 017 | Pine coneworm | *Dioryctria auranticella* |
| **16** | 019 | Ponderosa twig moth | *Dioryctria ponderosae* |
| **16** | 020 | | *Dioryctria pseudotsugella* |
| **16** | 021 | Dioryctria moths | *Dioryctria spp.* |
| **16** | 022 | Lodgepole cone moth | *Eucosma rescissoriana* |
| **16** | 023 | Seed chalcid | *Eurytomidae* |
| **16** | 025 | Cone maggot | *Hylemya anthracina* |
| **16** | 027 | Ponderosa pine seed worm/moth | *Laspeyresia piperana* |
| **16** | 028 | Spruce seed moth | *Laspeyresia youngana* |
| **16** | 029 | Boxelder bug | *Leptocoris trivittatus* |
| **16** | 031 | Western conifer seed bug | *Leptoglossus occidentalis* |
| **16** | 033 | | *Magastigmus lasiocarpae* |
| **16** | 034 | Spruce seed chalcid | *Magastigmus piceae* |
| **16** | 035 | Ponderosa pine seed chalcid | *Megastigmus albifrons* |
| **16** | 036 | Fir seed chalcid | *Megastigmus pinus* |
| **16** | 037 | Douglas-fir seed chalcid | *Megastigmus spermotrophs* |
| **16** | 040 | Roundheaded cone borer | *Paratimia conicola* |
| **16** | 042 | Coneworm | *Phycitidae* |
| **16** | 043 | Harvester ants | *Pogonomyrmex spp.* |
| **16** | 048 | Coneworm | *Hylemia spp.* |
| **16** | 049 | Prairie tent caterpillar | *Malacosoma lutescens* |

*Damage Categories, Agents, and Severity Ratings*

## Category 17: Gallmaker Insects

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **17** | **000** | **Gallmaker Insects** | |
| **17** | 003 | Cooley spruce gall adelgid | *Adelges cooleyi* |
| **17** | 006 | Gall midge | *Cecidomyiidae* |
| **17** | 007 | Douglas-fir needle gall midge | *Contarinia pseudotsugae* |
| **17** | 008 | Gall mite | *Eriophyidae* |
| **17** | 009 | Spruce gall midge | *Mayetiola piceae* |
| **17** | 013 | Gall aphid | *Phylloxeridae* |
| **17** | 014 | Alder gall mite | *Phytoptus laevis* |
| **17** | 015 | Psyllid | *Psyllidae* |
| **17** | 018 | Gouty pitch midge | *Cedidomyia piniinopsis* |
| **17** | 019 | Spider mites | *Oligonychus spp.* |

## Category 18: Insect Predators

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **18** | **000** | **Insect Predators** | |
| **18** | 001 | Lacewing | |
| **18** | 002 | Blackbellied clerid | *Enoclerus lecontei* |
| **18** | 003 | Redbellied clerid | *Enoclerus sphegeus* |
| **18** | 005 | Western yellowjacket | *Vespula pennsylvanica* |

## Category 19: General Diseases

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **Category** | **Agent** | **Common Name** | **Scientific Name** |
| **19** | **000** | **General Diseases** | |

## Category 20: Biotic Damage

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| **Category** | **Agent** | **Common Name** | **Scientific Name** |
|---|---|---|---|
| **20** | **000** | **Biotic Damage** | |
| **20** | 001 | Damping off | |
| **20** | 002 | Gray mold | *Botrytis cinerea* |

## Category 21: Root / Butt Diseases

**SEVERITY RATING**

| | | |
|---|---|---|
| **1** | **Tree Code** | Tree within 30 feet of other tree with deteriorating crown, other tree with diagnostic symptoms or signs, or other tree killed by root disease |
| **2** | **Tree Code** | Pathogen (sign) or diagnostic symptom detected - no crown deterioration |
| **3** | **Tree Code** | Crown deterioration detected - no diagnostic symptoms or signs |
| **4** | **Tree Code** | Both crown deterioration and diagnostic signs symptoms detected |
| **G0** | **Setting Code** | No evidence of RDS within 50 feet of plot |
| **G1** | **Setting Code** | RDS present within 50 feet of plot, not on plot |
| **G2** | **Setting Code** | Minor evidence of RDS on plot |
| **G3** | **Setting Code** | RDS present; canopy reduction < 20% |
| **G4** | **Setting Code** | RDS present; canopy reduction 20% to < 30% |
| **G5** | **Setting Code** | RDS present; canopy reduction 30% to < 50% |
| **G6** | **Setting Code** | RDS present; canopy reduction 50% to < 75%, most ground area infested |
| **G7** | **Setting Code** | RDS present; canopy reduction ≥ 75% |
| **G8** | **Setting Code** | Entire area infested with RDS; one or very few susceptible overstory trees |
| **G9** | **Setting Code** | Entire area infested with RDS; no susceptible overstory trees present |

| **Category** | **Agent** | **Common Name** | **Scientific Name** |
|---|---|---|---|
| **21** | **000** | **Root / Butt Diseases** | |
| **21** | 001 | Armillaria root disease | *Armillaria spp.* |

| | | | |
|---|---|---|---|
| **21** | 004 | Brown crumbly rot | *Fomitopsis pinicola* |
| **21** | 007 | White mottled rot | *Ganoderma applanatum* |
| **21** | 010 | Annosus root disease | *Heterobasidion annosum* |
| **21** | 012 | Tomentosus root disease | *Inonotus tomentosus* |
| **21** | 014 | Black stain root disease | *Ophiostoma wageneri* |
| **21** | 015 | Schweinitzii butt rot | *Phaeolus schweinitzii* |
| **21** | 017 | Laminated root rot | *Phellinus weirii* |
| **21** | 026 | Yellow pitted rot | *Hericium abietis* |

## Category 22: Stem Decays / Cankers

**SEVERITY RATING**

| | |
|---|---|
| **0** | 0-4% rotten |
| **1** | 5-15% rotten |
| **2** | 16-25% rotten |
| **3** | 26-35% rotten |
| **4** | 36-45% rotten |
| **5** | 46-55% rotten |
| **6** | 56-65% rotten |
| **7** | 66-75% rotten |
| **8** | 76-85% rotten |
| **9** | 86-100% rotten |

Severity codes for Stem Decay and Cankers describe the amount of sawlog volume loss, in terms of cubic feet. For trees smaller than merchantable size, the severity codes are used to record the amount of rotten wood in order to indirectly estimate the sound wood volume yield suitable for pulp or firewood. The percent rotten estimate for these "unmerchantable" trees should thus be made in terms of cubic foot measure. The extent of decay in one-log or smaller trees is estimated directly in cubic foot terms.

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **22** | **000** | **Stem Decays / Cankers** | |
| **22** | 001 | Heart rot | |
| **22** | 002 | Stem rot | |
| **22** | 003 | Sap rot | |
| **22** | 006 | Black knot of cherry | *Apiosporina morbosa* |
| **22** | 007 | Atropellis canker | *Atropellis piniphila* |
| **22** | 012 | Black canker of aspen | *Ceratocystis fimbriata* |
| **22** | 024 | Gray-brown saprot | *Cryptoporus volvatus* |
| **22** | 025 | Cryptosphaeria canker of aspen | *Cryptosphaeria populina* |
| **22** | 026 | Cytospora canker of fir | *Cytospora abietis* |
| **22** | 027 | Western red rot | *Dichomitus squalens* |
| **22** | 028 | Rust-red stringy rot | *Echinodontium tinctorium* |
| **22** | 029 | Sooty-bark canker | *Encoelia pruinosa* |
| **22** | 035 | Amelanchier rust | *Gymnosporangium harknessianum* |
| **22** | 036 | Cedar apple rust | *Gymnosporangium juniperi-virginianae* |
| **22** | 038 | Hypoxylon canker of aspen | *Hypoxylon mammatum* |

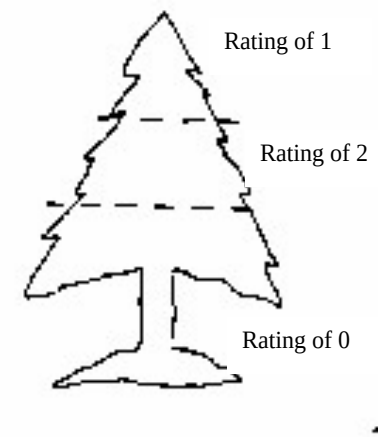
| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **22** | 040 | Sterile conk trunk rot of birch | *Inonotus obliquus* |
| **22** | 047 | Red ring rot | *Phellinus pini* |
| **22** | 048 | Aspen trunk rot | *Phellinus tremulae* |
| **22** | 051 | Phomopsis canker | *Phomopsis spp.* |
| **22** | 057 | Cytospora canker of aspen | *Cytospora chrysosperma* |
| **22** | 059 | Red belt fungus | *Fomitopsis pinicola* |
| **22** | 062 | Brown heartrot | *Fomitopsis Officinalis* |
| **22** | 063 | | *Coniophora puteana* |
| **22** | 064 | Tinder fungus | *Fomes fomentarius* |
| **22** | 065 | Purple conk | *Hirschioporus abietinus* |
| **22** | 066 | | *Leptographium wagnerii* |
| **22** | 067 | | *Phellinus hartigii* |
| **22** | 068 | False tinder fungus | *Phellinus igniarius* |
| **22** | 070 | Yellow cap fungus | *Pholiota spp.* |
| **22** | 071 | Oyster mushroom | *Pleurotus ostreatus* |
| **22** | 074 | Cedar brown pocket rot | *Poria sericeomollis* |
| **22** | 075 | Lanchnellula canker | *Lachnellula flavoirens* |
| **22** | 077 | Phomopsis blight | *Phomopsis juniperovora* |

## Category 23: Parasitic / Epiphytic Plants

**SEVERITY RATING**

| | | |
|---|---|---|
| **1** | **Dwarf Mistletoe Rating** | Hawksworth tree DMR rating 1 |
| **2** | **Dwarf Mistletoe Rating** | Hawksworth tree DMR rating 2 |
| **3** | **Dwarf Mistletoe Rating** | Hawksworth tree DMR rating 3 |
| **4** | **Dwarf Mistletoe Rating** | Hawksworth tree DMR rating 4 |
| **5** | **Dwarf Mistletoe Rating** | Hawksworth tree DMR rating 5 |
| **6** | **Dwarf Mistletoe Rating** | Hawksworth tree DMR rating 6 |
| **7** | **Vine Damage** | Less than 50% of crown exhibiting vine damage |
| **8** | **Vine Damage** | 50% or more of crown exhibiting vine damage |

*Damage Categories, Agents, and Severity Ratings*

| Instructions: Hawksworth Dwarf Mistletoe Rating (DMR) | | Example: |
|---|---|---|
| **Step 1** | Divide live crown into thirds. |  |
| **Step 2** | Rate each third separately. Each third should be given a rating of 0, 1, or 2 as described below.<br>**0** = No visible infections<br>**1** = Light infection (1/2 or less of the total number of branches in the crown-third are infected).<br>**2** = Heavy infection (more than 1/2 of total number of branches in the crown-third are infected). | |
| **Step 3** | Add ratings of thirds to obtain rating for total tree. | The dwarf mistletoe rating for the above tree is **3** (top **1** + middle **2** + bottom **0**). |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **23** | **000** | **Parasitic / Epiphytic Plants** | |
| **23** | 001 | Mistletoe | |
| **23** | 003 | Vine damage | |
| **23** | 006 | Lodgepole pine dwarf mistletoe | *Arceuthobium americanum* |
| **23** | 008 | Western dwarf mistletoe | *Arceuthobium campylopodum* |
| **23** | 009 | Limber pine dwarf mistletoe | *Arceuthobium cyanocarpum* |
| **23** | 011 | Douglas-fir dwarf mistletoe | *Arceuthobium douglasii* |
| **23** | 013 | Larch dwarf mistletoe | *Arceuthobium laricis* |

## Category 24: Decline Complexes / Dieback / Wilts

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **24** | **000** | **Decline Complexes / Dieback / Wilts** | |
| **24** | 004 | Ash decline / yellow | |
| **24** | 022 | Dutch elm disease | *Ceratocystis ulmi* |

*Damage Categories, Agents, and Severity Ratings*

## Category 25: Foliage Diseases

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **25** | **000** | **Foliage Diseases** | |
| **25** | 001 | Blight | |
| **25** | 002 | Broom rust | |
| **25** | 003 | Juniper blights | |
| **25** | 004 | Leaf spots | |
| **25** | 005 | Needlecast | |
| **25** | 006 | Powdery mildew | |
| **25** | 009 | True fir needlecast | |
| **25** | 013 | Large-pored spruce-laborador tea rust | *Chrysomyxa ledicola* |
| **25** | 014 | Ink spot of aspen | *Ciborinia whetzelii* |
| **25** | 015 | Pine needle rust | *Coleosporium spp.* |
| **25** | 019 | Cedar leaf blight | *Didymascella thujina* |
| **25** | 020 | Dogwood anthracnose | *Discula spp.* |
| **25** | 022 | Elytroderma disease | *Elytroderma deformans* |
| **25** | 023 | Fire blight | *Erwinia amylovora* |
| **25** | 027 | Brown felt blight | *Herpotrichia juniperi* |
| **25** | 028 | Larch needle blight | *Hypodermella laricis* |
| **25** | 031 | Spruce needle cast | *Lirula macrospora* |
| **25** | 032 | Fir needle cast | *Lirula spp.* |
| **25** | 033 | White pine needle cast | *Lophodermella arcuata* |
| **25** | 034 | Lophodermella needle cast | *Lophodermella spp.* |
| **25** | 035 | Lophodermium needle cast | *Lophodermium spp.* |
| **25** | 036 | Marssonina blight | *Marssonina populi* |
| **25** | 037 | Melampsora rusts | *Melampsora medusae* |
| **25** | 039 | Larch needle cast | *Meria laricis* |
| **25** | 040 | Dothistroma needle blight | *Mycosphaerella pini* |
| **25** | 041 | Brown felt blight of pines | *Neopeckia coulteri* |
| **25** | 042 | Snow blight | *Phacidum abietis* |
| **25** | 043 | Swiss needle cast | *Phaeocryptopus gaumannii* |
| **25** | 049 | Fir needle rust | *Pucciniastrum spp.* |
| **25** | 050 | Douglas-fir needle cast | *Rhabdocline spp.* |
| **25** | 052 | Rhizophaeria needle cast | *Rhizophaeria spp.* |
| **25** | 054 | Brown spot needle blight | *Scirrhia acicola* |

| | | | |
|---|---|---|---|
| **25** | 056 | Septoria leaf spot and canker | *Septoria musiva* |
| **25** | 058 | Diplodia blight | *Sphaeropsis sapinea* |
| **25** | 061 | Shepherd's crook | *Venturia tremulae* |
| **25** | 062 | Dothistroma needle blight | *Dothistroma septospora* |
| **25** | 064 | Broom rust | *Chrysomyxa arctostaphyli* |
| **25** | 065 | Spruce needle rust | *Chrysomyxa weirii* |
| **25** | 067 | Spruce needle cast | *Lophodermium picea* |
| **25** | 068 | Hardwood leaf rusts | *Melampsora spp.* |
| **25** | 072 | Sirococcus shoot blight | *Sirococcus strobilinus* |
| **25** | 073 | Shepherds crook | *Venturia populina* |
| **25** | 074 | Delphinella shoot blight | *Delphinella abietis* |

## Category 26: Stem Rusts

**SEVERITY RATING**

| | |
|---|---|
| **1** | Branch infections located greater than 2 feet from tree bole |
| **2** | Branch infections located between 6 inches and 2 feet from tree bole |
| **3** | Bole infections or branch infections located within 6 inches of bole |
| **4** | Topkill |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **26** | **000** | **Stem Rusts** | |
| **26** | 001 | White pine blister rust | *Cronartium ribicola* |
| **26** | 002 | Western gall rust | *Peridermium harknessii* |
| **26** | 003 | Stalactiform blister rust | *Cronartium coleosporioides* |
| **26** | 004 | Comandra blister rust | *Cronartium comandrae* |
| **26** | 011 | Bethuli rust | *Peridermium bethuli* |

## Category 27: Broom Rusts

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Common Name | Scientific Name |
|---|---|---|---|
| **27** | **000** | **Broom Rusts** | |
| **27** | 001 | Spruce broom rust | *Chrysomyxa arctostaphyli* |
| **27** | 003 | Juniper broom rust | *Gymnosporangium nidus-avis* |
| **27** | 004 | Fir broom rust | *Melampsorella caryophyllacearum* |

## Category 30: Fire

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Name |
|---|---|---|
| **30** | **000** | **Fire** |
| **30** | 031 | Wildfire |
| **30** | 032 | Human caused fire |
| **30** | 033 | Crown fire damage |
| **30** | 034 | Ground fire damage |

## Category 41: Wild Animals

**SEVERITY RATING**

| | |
|---|---|
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. |

| Category | Agent | Name |
|---|---|---|
| **41** | **000** | **Wild Animals** |
| **41** | 001 | Bear |
| **41** | 002 | Beaver |
| **41** | 003 | Big game (deer) use if you can identiy to 011, 012, or 013 |
| **41** | 004 | Mice or voles |
| **41** | 005 | Pocket gophers |
| **41** | 006 | Porcupines |
| **41** | 007 | Rabbits or hares |
| **41** | 008 | Sapsucker |
| **41** | 009 | Squirrels |
| **41** | 010 | Woodpeckers |
| **41** | 011 | Moose |
| **41** | 012 | Elk |
| **41** | 013 | Deer |
| **41** | 014 | Feral pigs |
| **41** | 015 | Mountain beaver |

## Category 42: Domestic Animals

| *Damage Categories, Agents, and Severity Ratings* | | |
|---|---|---|
| **SEVERITY RATING** | | |
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | |
| **Category** | **Agent** | **Name** |
| **42** | **000** | **Domestic Animals** |
| **42** | 001 | Cattle |
| **42** | 002 | Goats |
| **42** | 003 | Horses |
| **42** | 004 | Sheep |
| | | |
| **Category 50: Abiotic Damage** | | |
| **SEVERITY RATING** | | |
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | |
| **Category** | **Agent** | **Name** |
| **50** | **000** | **Abiotic Damage** |
| **50** | 001 | Air pollutants |
| **50** | 002 | Chemical |
| **50** | 003 | Drought |
| **50** | 004 | Flooding/high water |
| **50** | 005 | Frost |
| **50** | 006 | Hail |
| **50** | 007 | Heat |
| **50** | 008 | Lightning |
| **50** | 009 | Nutrient imbalances |
| **50** | 010 | Radiation |
| **50** | 011 | Snow/ice |
| **50** | 013 | Wind/tornado |
| **50** | 014 | Winter injury |
| **50** | 015 | Avalanche |
| **50** | 016 | Mud/land slide |
| **50** | 018 | Other geologic event |
| **50** | 019 | Mechanical (non-human caused) |
| | | |

| *Damage Categories, Agents, and Severity Ratings* | | |
|---|---|---|
| **Category 60: Competition** | | |
| **SEVERITY RATING** | | |
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | |
| **Category** | **Agent** | **Name** |
| **60** | **000** | **Competition** |
| | | |
| **Category 70: Human Activities** | | |
| **SEVERITY RATING** | | |
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | |
| **Category** | **Agent** | **Name** |
| **70** | **000** | **Human Activities** |
| **70** | 001 | Herbicides |
| **70** | 003 | Imbedded objects |
| **70** | 004 | Improper planting technique |
| **70** | 005 | Land clearing |
| **70** | 006 | Land use conversion |
| **70** | 007 | Logging damage |
| **70** | 008 | Mechanical |
| **70** | 009 | Pesticides |
| **70** | 010 | Roads |
| **70** | 011 | Soil compaction |
| **70** | 012 | Suppression |
| **70** | 013 | Vehicle damage |
| **70** | 014 | Road salt |
| | | |
| **Category 71: Harvest** | | |
| **SEVERITY RATING** | | |
| **1** | **Minor –** tree has reduced growth rate, or some defect associated with product yield. | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **Category** | **Agent** | **Name** | |
| **71** | **000** | **Harvest** | |
| | | | |
| **Category 80: Multi-damage (insect/disease)** | | | |
| **SEVERITY RATING** | | | |
| **1** | **Minor –** tree has some reduced growth rate, or some defect associeated with product yield | | |
| **2** | **Severe –** tree is expected to die within 10 years, or will not yield merchantable sawlog product. | | |
| **Category** | **Agent** | **Name** | |
| **80** | **000** | **Multi-damage (insect/disease)** | |
| **80** | 001 | Aspen defoliation | 12037 = Defoliator/ large aspen tortrix |
| | | | 12096 = Defoliator/ forest tent caterpillar |
| | | | 25036 = Foliage disease/ Marssonina blight |
| | | | 25037 = Foliage disease/ Melampsora rusts |
| **80** | 002 | Subalpine fir mortality | 11015 = Bark beetles/ Western balsam bark beetle |
| | | | 21001 = Root/butt disease/ armillaria root disease |
| | | | 21010 = Root/butt disease/ annosus root disease |
| | | | 50014 = Abiotic damage/ winter injury |
| **Category 90: Unknown** | | | |
| **SEVERITY RATING** | | | |
| **0** | 0 – 9% affected | | |
| **1** | 10 – 19% affected | | |
| **2** | 20 – 29% affected | | |
| **3** | 30 – 39% affected | | |
| **4** | 40 – 49% affected | | |
| **5** | 50 – 59% affected | | |
| **6** | 60 – 69% affected | | |
| **7** | 70 – 79% affected | | |
| **8** | 80 – 89% affected | | |
| **9** | 90 – 100% affected | | |
| **Category** | **Agent** | **Name** | |
| **90** | **000** | **Unknown** | |
| **Category 99: Physical Effects** | | | |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **Category** | **Agent** | **Physical Effects** | **Severity Rating**<br>Note: for items that do not have a severity code listed below, record the **percent** of the tree area affected (eg., percent of height, percent of bole, percent of volume) as specified. |
| **99** | 001 | **Broken or missing top**<br>Record for all species when the break occurs at or above 4.5 feet, for hardwoods, record when the break occurs on the main stem. | **Percent of original height that is missing**<br>For example, if a tree was originally 75 feet high, but 15 feet of the top is broken or missing, enter "20" for the severity code (15/75 = 20%). |
| **99** | 002 | **Dead top**<br>Record for all trees with a dead terminal leader. | **Percent of total tree height that is dead** |
| **99** | 003 | **Limby**<br>Large limbs top to bottom | **Percent of total tree height with many limbs/knots** |
| **99** | 004 | **Forked top**<br>For trees ≥ 5.0-inches DBH, fork must be below 4.0-inch diameter top. Do not record for hardwoods. | **Percent of total tree height above fork** |
| **99** | 006 | **Crook or sweep** | **Percent of total tree height containing thecrook or sweep** |
| **99** | 007 | **Checks, bole cracks** | **Percent of bole affected** |
| **99** | 008 | **Foliage discoloration** | **Percent of foliage discolored** |
| **99** | 009 | **Mortality** | Use for R1 Intensified FIA grid plots only |
| **99** | 010 | **Lack of seed source**<br>For plantation surveys only | If present, code 100% |
| **99** | 011 | **Poor planting stock**<br>For plantation surveys only | If present, code 100% |
| **99** | 012 | **Poor growth** | **1** = minor (reduced growth)<br>**2** = severe (affecting survival) |
| **99** | 013 | **Total board foot volume loss** | **Percent of total board foot volume loss**<br>(only examine the merchantable portion of the tree) |
| **99** | 014 | **Total cubic foot volume loss** | **Percent of total cubic foot volume loss**<br>(only examine the merchantable portion of the tree) |
| **99** | 015 | **Bark removal** | **Percent of tree circumference missing bark** |

| *Damage Categories, Agents, and Severity Ratings* | | | |
|---|---|---|---|
| **99** | 016 | **Foliage loss** | **1** = minor (reduced growth)<br>**2** = severe (affecting survival) |
| **99** | 017 | **Sunscald** | **1** = minor (reduced growth)<br>**2** = severe (affecting survival) |
| **99** | 018 | **Uproot** | NA |
| **99** | 019 | **Scorched foliage** | % of total crown foliage killed by fire |
| **99** | 020 | **Scorched bark** | % of tree circumfrance that has cambium killed by fire |
| **99** | 021 | **Dieback**<br>For plantation surveys only | **1** = minor (reduced growth)<br>**2** = severe (affecting survival) |
| **99** | 022 | **Poor crown form** | **1** = minor (reduced growth)<br>**2** = severe (affecting survival) |
| **99** | 023 | **Severe forking** | NA |
| **99** | 026 | **Open wound** | **Percent of bole/trunk affected**<br>Examine the height and width of the wound.<br>For example, if a tree is 72 feet tall and the wound covers 12 feet of the bole, enter a value of “16” (12/72 = 16%). |
| **99** | 033 | **Damaged shoots, buds, or foliage** | 1 = minor<br>2 = severe |
| **99** | 036 | **Fire scar** | **Percent of bole/trunk affected**<br>Examine the height and width of the wound.<br>For example, if a tree is 72 feet tall and the wound covers 12 feet of the bole, enter a value of “16” (12/72 = 16%). |
| **99** | 037 | **Self-supporting Leaning Tree**<br>Lean angle > 15% | **Percent lean from vertical** |

## Tree Damage Parts:

| *Tree Damage Parts* | |
|---|---|
| **Code** | **Description** |
| UN | Unspecified |
| TO | Top |
| FO | Foliar (Crown) |
| LI | Limb |
| BO | Bole, other than Top or Base |
| BA | Base |
| RO | Roots |
| WT | Whole Tree |
| TT | Top Third of Crown |
| MT | Middle Third of Crown |
| BT | Bottom Third of Crown |

# Appendix S: Down-Woody Materials

There are two recommended methods to inventory dead, down-woody debris:

- **Photo Series Method –** the Photo Series for Quantifying Forest Residues. This method is an estimation technique. The actual data contained in the Photo series tables were obtained by sampling the photo plots using the Planar Intercept method

- **Brown's Protocol Method –** the Planar Intercept Method referenced in the *Handbook for Inventorying Down, Woody Material* by James K. Brown (1974). This method uses data measurements that are accurate to a specific statistical reliability.

Each method requires a different level of training, and the amount of time and expense needed for data collection varies. These methods are described in further detail below.

## Photo Series Method

This method involves making visual comparisons between the on-site fuel condition and the conditions depicted on the photos. The Photo Series is intended to allow fast, easy and inexpensive quantifications of forest residues. Before using a particular Photo Series, become thoroughly familiar with the photo series book. To best understand how the photo series works, conduct several samples utilizing James K. Brown's *Handbook for Inventorying Downed Woody Material*. Actual "hands on" sampling using the Brown method provides the ability to fine-tune ocular estimates. The photo series relies heavily on the estimator's ability to visually compare actual on-the-ground conditions to characteristics on representative photos.

**Sampling Procedures**

Enter the weight (tons/acre) and volume (MBF/acre) by size class by selecting the representative photo based on the instructions found within the photo series. Compare photos to best match the ground conditions being evaluated. Only the dead and down-woody material (twigs, stems, branches, and bolewood) from trees and shrubs is evaluated. Do not allow the live species in the sample area to skew the visual estimate. Since the photo series requires an interpolation of photos to actual conditions, it is helpful to begin by estimating mid-size fuels first before moving to the finer fuels.

## Brown's Protocol Method

### Sampling Procedures

For average amounts of downed debris, about 5 to 6 minutes per sample point is required for the measurements. More time is usually spent in traveling and locating sample points than in making the measurements. If only down-woody material is inventoried, a two-person crew can complete 2O to 4O plots a day, depending on how much debris is present.

### The Sampling Planes

The inventory is based on the planar intersect technique [(1)],[(2)] which has the same theoretical basis as the line intersect technique [(3)]. The planar intersect technique involves counting intersections of woody pieces with vertical sampling planes that resemble guillotines dropped through the downed debris.

### Sampling Plane Height

The sampling plane height (vertical height) is undefined so that all intersections of dead down material are tallied regardless of their height above the ground. Tree boles are considered down if they lean greater than 45 degrees from the perpendicular. Sampling plane lengths vary by size and amount of down-woody material.

### Sampling Plane Length

Length of sampling plane can be varied by users to obtain desired sampling precision. Generally, as fewer sample points are taken, sampling plane lengths should be longer to achieve desired sampling precision.

Sampling plane lengths are horizontal lengths. Slope distance will need to be adjusted to a horizontal distance. If a sampling plane extends beyond the border of the stand, truncate the plane at the stand boundary and project the remaining length along the reverse azimuth from the point center.

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(1) Brown, James K. 1974. Handbook for inventorying downed woody material. USDA For. Serv. Gen. Tech. Rep. INT-16, 24 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

(2) Brown, James K., and Peter J. Roussopoulos. 1974. Eliminating biases in the planner intersect method for estimating volumes of small fuels. For. Sci. 20(4): 350-356.

(3) Van Wagner, C. E. 1968. The line intersect method in forest fuel sampling. For. Sci. 14(1): 20-26.

The table that follows suggests sampling plane lengths and number of sample points needed to obtain specified percent errors (standard error of estimate divided by the mean, expressed as percentage). These recommendations are based on average distributions of naturally fallen down-woody material sampled in the northern Rocky Mountains [4]. The sampling plane lengths can be expected to vary from one-half of the table values, for heavy fuels that are uniformly distributed, to twice the table values, for light and unevenly distributed fuels. For heavy slash, the sampling plane lengths recommended for naturally fallen fuels could be cut in half.

A standard error of estimate within 20 percent of the mean is often considered adequate for fuel appraisal. A smaller percent error may be desirable for planning utilization of down-woody material. Percent errors greater than 35 percent afford poor reliability. If sampling cannot provide at least this level of reliability, it may not be worthwhile.

## Fuel Estimate

Decide whether an estimate of fuels is needed for an individual stand or for several stands together. If fuel quantities are believed to be similar in several stands, then a single estimate is appropriate for appraising fuels in these stands. This is often the case for several adjacent stands in a timber sale area. If fuel estimates are desired for individual stands, then choose a sampling plane length appropriate for the number of sample points planned for the stand. The same sampling plane length should be used throughout each stand or group of stands for which fuel estimates are sought.

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[4] Brown, James K., Rick D. Oberheu, and Cameron M. Johnston. 1982 Handbook for Inventorying surface fuels and biomass in the Interior West. USDA For. Serv. Gen. Tech. Rep. Int-129, 48 p. Intermt. For. and Range Exp. Stn., Ogden, Utah

| Length of Sampling Plane for Percent Errors and Number of Sample Points | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Diameter Class Range** | **Percent Error** | **Number of Sample Points** | | | | | | | |
| | | **5** | **6** | **7** | **8** | **10** | **15** | **20** | **30** |
| | | **Sampling Plane Lengths in Feet** | | | | | | | |
| 0.1 - 1 inch | **15** | 34 | 28 | 24 | 21 | 17 | 11 | 8 | 6 |
| | **20** | 19 | 16 | 14 | 12 | 10 | 6 | 5 | 4 |
| | **25** | 12 | 10 | 9 | 8 | 6 | 4 | 3 | 2 |
| | **30** | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 2 |
| | **35** | 6 | 5 | 5 | 4 | 3 | 2 | 2 | 1 |
| 1 - 3 inches | **15** | 85 | 70 | 60 | 55 | 45 | 30 | 22 | 14 |
| | **20** | 50 | 40 | 35 | 30 | 24 | 16 | 12 | 8 |
| | **25** | 30 | 25 | 22 | 20 | 16 | 10 | 8 | 5 |
| | **30** | 22 | 18 | 15 | 14 | 11 | 7 | 5 | 4 |
| | **35** | 16 | 13 | 11 | 10 | 8 | 5 | 4 | 3 |
| 3+ inches | **15** | 380 | 315 | 270 | 235 | 190 | 125 | 95 | 65 |
| | **20** | 210 | 175 | 150 | 130 | 105 | 70 | 50 | 35 |
| | **25** | 140 | 115 | 100 | 90 | 70 | 50 | 35 | 25 |
| | **30** | 100 | 80 | 70 | 60 | 50 | 35 | 25 | 15 |
| | **35** | 70 | 60 | 50 | 45 | 35 | 25 | 18 | 12 |

Record each Sampling Plane Length once per sample stand (on the Sample Design form). For example, if number of sample points is 20 and desired percent of error is 20%, then record:

**05** for the 0.1- to 1-inch diameter class range

**12** for the 1- to 3-inch diameter class range

**50** for the ≥ 3-inch diameter class range

In medium fuel situations, these sampling planes should provide percent errors of about 20 percent with 20 sample points, and 30 percent with 10 sample points. Unless users specify sampling plane lengths on the field record, the following lengths should be used and are assumed (defaults) in the computer programs:

**Defaults:**

| Fuel Diameter | Sampling Plane Length |
|---|---|
| 3 + inches | 27 feet |
| 1 – 3 inches | 7 feet |
| 0.1 – 1 inch | 7 feet |

## Tally Rules for the Downed Fuel Inventory

**1.** Particles qualifying for tally include downed, dead woody material (twigs, stems, branches, and bolewood) from trees and shrubs. Dead branches attached to boles of standing trees are omitted because they are not downed vegetation. Consider a particle "downed" if it has fallen to the ground, or is severed from its original source of growth. Cones, bark flakes, needles, leaves, grass, and forbs are not counted. Dead woody stems and branches still attached to standing brush and trees are not counted.

**2.** Twigs or branches lying in the litter layer and above are counted. However, they are not counted when the intersection between the central axis of the particle and the sampling plane lies in the duff (forest floor below the litter).

**3.** If the sampling plane intersects the end of a piece, tally only if the central axis is crossed. If the plane exactly intersects the central axis, tally every other such piece.

**4.** Don't tally any particle having a central axis that coincides perfectly with the sampling plane.

**5.** If the sampling plane intersects a curved piece more than once, tally each intersection.

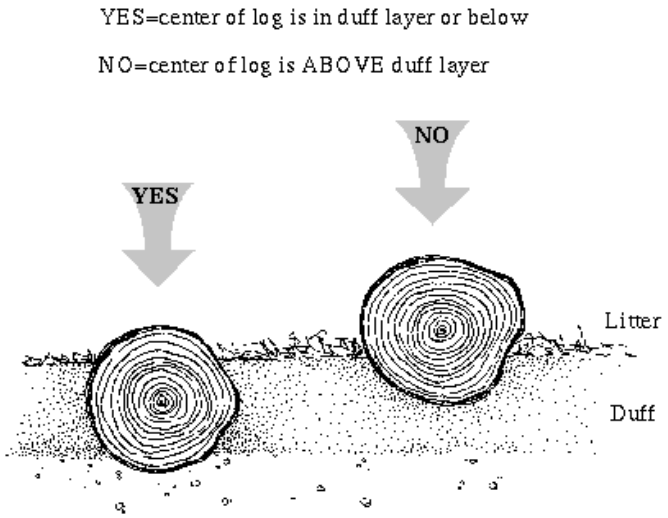
**6.** Tally wood slivers and chunks left after logging. Visually mold these pieces into cylinders to determine size class or diameters.

**7.** Tally uprooted stumps and roots not encased in dirt. For tallying, consider uprooted stumps as tree boles or individual roots, depending on where the sampling planes intersect the stumps. Do not tally undisturbed stumps.

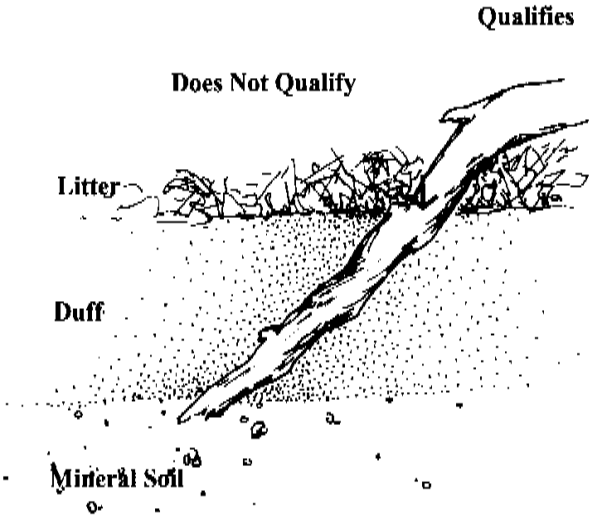
**8.** Tally all intersections of dead tree boles which lean greater than 45 degrees from the perpendicular regardless of the height of these intersections. Do not tally intersections of any standing dead trees which do not lean greater than 45 degrees from the perpendicular even if the point of intersection is within 6 feet of the ground.

## Explanatory Figures

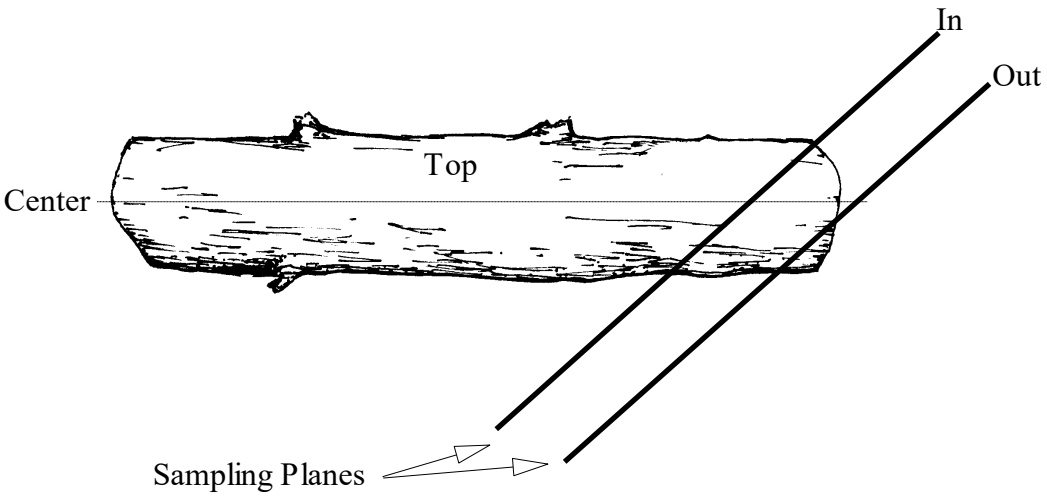
**1.** When stumps, logs, and trees occur at the point of duff measurement, offset 1 foot perpendicular to the right of the sampling plane. Measure through rotten logs whose central axis is in the duff layer.



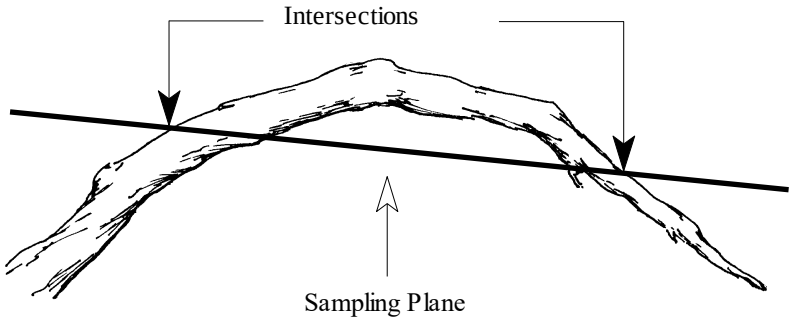

**2.** Twigs or branches lying in the litter layer and above are counted. However, they are not counted when the intersection between the central axis of the particle and the sampling plane lies in the duff (forest floor below the litter).



**3.** If the sampling plane intersects the end of a piece, tally only if the central axis is crossed. If the plane exactly intersects the central axis, tally every other such piece.

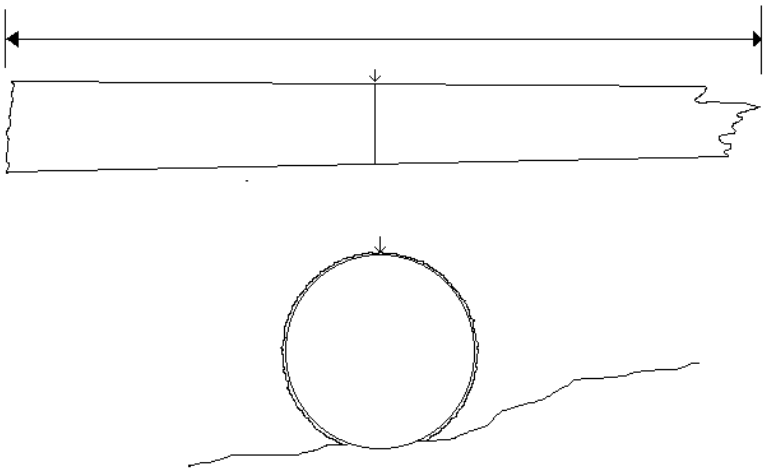



**4.** If the sampling plane intersects a curved piece more than once, tally each intersection.

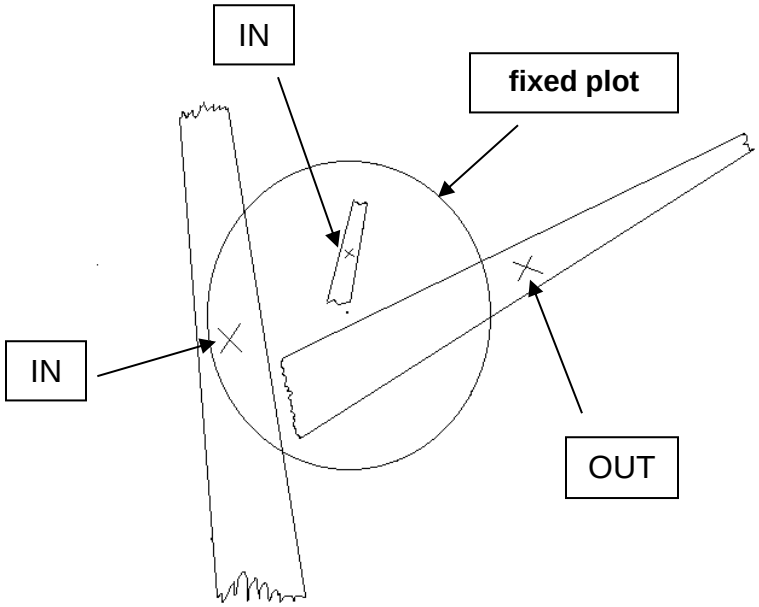


## Determining Tally Pieces on a Fixed Area Plot

If collecting down-woody information on a fixed-area plot, the piece is tallied if the point on the upper most surface of the cylinder, mid-length of the piece, is within the fixed-area plot. To determine the midpoint of a piece, measure the length, in feet, and divide by 2.

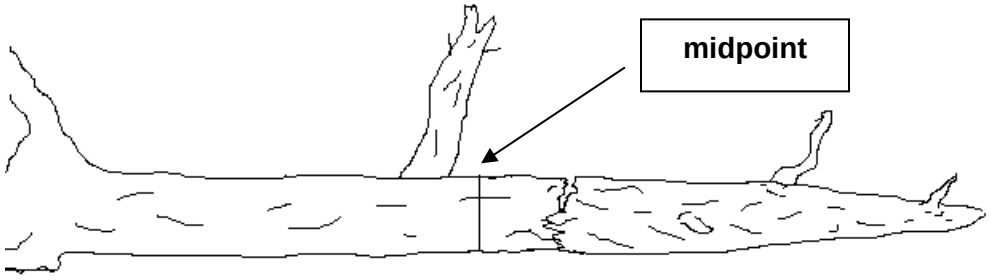


*Midpoint is the uppermost point at the mid-length of the piece.*



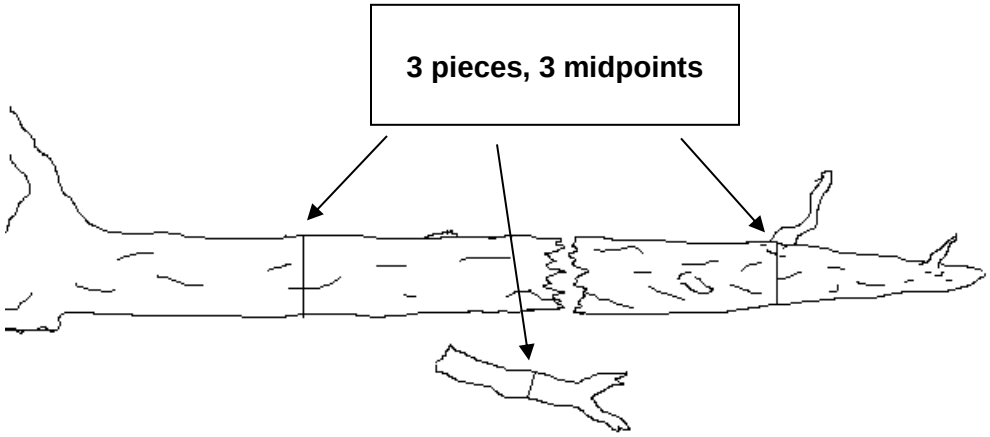

*Position of midpoint of piece on the plot determines tally.*

A down log may be broken into more than one piece. If a log is cracked, broken, or partially cut, but the two parts are still physically touching, then consider the log to be one piece.



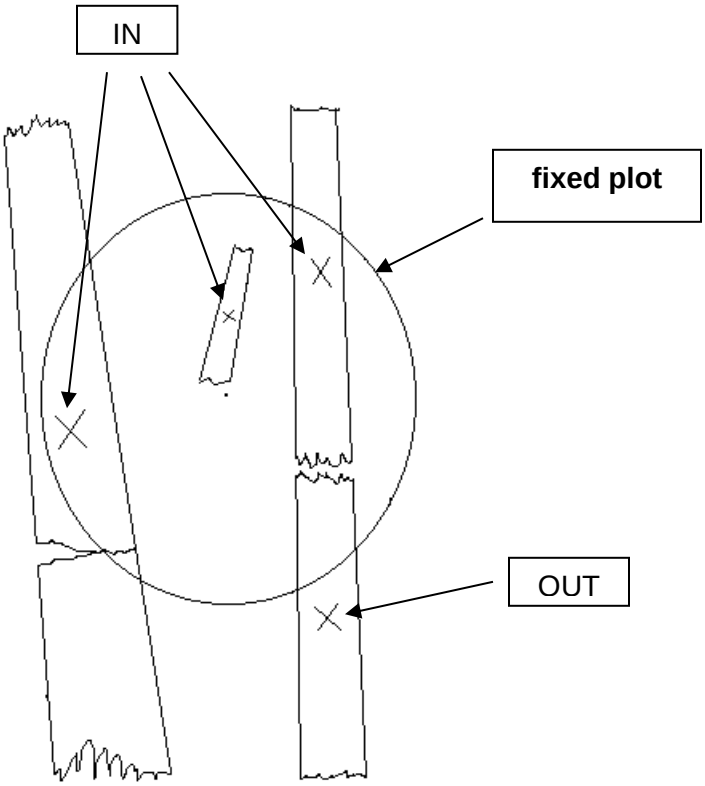

*Midpoint on a one piece log*.

However, if the two or more parts are not physically touching, then consider the parts to be separate pieces, each having their own midpoint. This may affect whether all parts of the down log are within the fixed-radius plot.




*Broken pieces not touching are measured separately*.

(continued on next page)




*Broken pieces have separate midpoints; this can affect which pieces are tallied.*

# Appendix T: Tolerances for Region 1 Common Stand Exam

*Item Numbers listed are in reference to the Region 1 CSE Field Guide.*

## Setting Form – Intensive/Extensive Exam Levels:

| *Setting Form – Intensive/Extensive Exam Levels* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 2.1 | Project Name | No Errors |
| 2.2 | Proclaimed Region | No Errors |
| 2.3 | Proclaimed National Forest | No Errors |
| 2.4 | District | No Errors |
| 2.5 | Location | No Errors |
| 2.6 | Stand Number | No Errors |
| 2.7 | Owner | No Errors |
| 2.8 | State | No Errors |
| 2.9 | County | No Errors |
| 2.10 | Administrative Forest | No Errors |
| 2.11 | Date | No Errors |
| 2.12 | Photo ID | No Errors |
| 2.13 | Examination Level | No Errors |
| 2.14 | Exam Purpose | No Errors |
| 2.15 | Stratum | Specified in Protocol/Contract |
| 2.16 | Existing Vegetation Reference | No Errors |
| 2.17 | Existing Vegetation Composition Type | Specified in Protocol/Contract |
| 2.18 | Potential Vegetation Reference | No Errors |
| 2.19 | Potential Vegetation | No Errors to R1 Habitat Type Group |
| 2.20 | Structure | Specified in Protocol/Contract |
| 2.21 | Setting Capable Growing Area | ± 10 percent |
| 2.22 | Setting Fuel Model | Specified in Protocol/Contract |
| 2.23 | Setting Elevation | ± 100 feet |

| *Setting Form – Intensive/Extensive Exam Levels* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 2.24 | Setting Aspect | ± 45 degrees |
| 2.25 | Setting Slope | ± 10 percent |
| 2.26 | Setting Slope Position | ± 1 class |
| 2.27 | Acres | No Errors |
| 2.28 | Examiner | No Errors |
| 2.29 | Precision Protocol | No Errors |
| 2.30 | Radial Growth Interval | No Errors |
| 2.31 | Radial Growth Interval 2 (NOT used in Region 1) | --- |
| 2.32 | Height Growth Interval | No Errors |
| 2.33 | Fuel Photo Reference | No Errors |
| 2.34 | Setting User Code | Specified in Protocol/Contract |
| 2.35 | Setting Lat/Long Reference Datum | No Errors |
| 2.36 | Magnetic Declination | No Errors |
| 2.37 | Measurement Number (IM) | No Errors |
| 2.38 | Setting Remarks | Specified in Protocol/Contract |
| 2.39 | Setting Damage Category | No Errors |
| 2.40 | Setting Damage Agent | Specified in Protocol/Contract |
| 2.41 | Setting Damage Severity | Specified in Protocol/Contract |
| 2.42 | Species of Management Interest | Specified in Protocol/Contract |
| 2.43-2.44 | Fire Information/Observations | Specified in Protocol/Contract |
| 2.45 | Sketch Map and Traverse Notes | No Errors |

## Sample Design Form – All Exam Levels:

| *Sample Design Form – All Exam Levels* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 3.1 | Form Type | |

| *Sample Design Form – All Exam Levels* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 3.2 | Sample Selection Method Type | No Errors |
| 3.3 | Sample Expansion Factor | No Errors |
| 3.5 | Subpopulation Filter | No Errors |
| 3.6 | Sample Design Remarks | No Errors |
| 3.7 | Selection Criteria Number or Criteria Condition | No Errors |
| 3.8 | Subpopulation Variable | No Errors |
| 3.9 | Subpopulation Minimum Value | No Errors |
| 3.10 | Subpopulation Maximum Value | No Errors |

## Plot Data Form – All Exam Levels:

| *Plot Data Form – All Exam Levels* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 4.1 | Plot Number | No Errors |
| 4.2 | Acquiring GPS Locations: | |
| | • Plot Latitude | • Estimated Horizontal Distance: ± 10 meters (32.8 feet)<br>• Position Error: ± 10 meters (32.8 feet) 85% of the time |
| | • Plot Longitude | |
| 4.3 | Plot Capable Grow Area | Specified in Protocol/Contract |
| 4.4 | Plot Aspect | ± 45 degrees |
| 4.5 | Plot Slope | ± 10 percent |
| 4.6 | Plot Slope Position | ± 1 class |
| 4.7 | Slope Horizontal Shape | Specified in Protocol/Contract |
| 4.8 | Slope Vertical Shape | Specified in Protocol/Contract |
| 4.9 | Plot Elevation | • ± 100 feet (GPS) |
| 4.10 | Plot Existing Vegetation Composition Type | Specified in Protocol/Contract |
| 4.11 | Plot Potential Vegetation | No Errors to R1 Habitat Type Group |
| 4.12 | Plot Fuel Model | Specified in Protocol/Contract |

| *Plot Data Form – All Exam Levels* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 4.13 | Residual Descriptive Code (Fuel Photo Series) | Specified in Protocol/Contract |
| 4.14 | Distance to Seed Wall | ± 100 feet |
| 4.15 | Plot User Code | Specified in Protocol/Contract |
| 4.16 | Plot History | Specified in Protocol/Contract |
| 4.17 | Plot History Date | Specified in Protocol/Contract |
| 4.18 | Plot Narrative/Remarks | Specified in Protocol/Contract |
| 4.19 | Plot Photos | No Errors |

| *Plot Menue: Witness Tree/Navigation Form – All Exam Levels (IM Only)* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 4.20.1 | X/Y Monument Type | No Errors |
| 4.20.2 | X Witness Type | No Errors |
| 4.20.3 | X Tag ID | No Errors |
| 4.20.4 | X/Y Species | No Errors |
| 4.20.5 | X/Y DBH/DRC | No Errors |
| 4.20.6 | X/Y Diameter | ± 0.2 inch per 20 inches of diameter |
| 4.20.7 | X/Y Azimuth | ± 10 degrees |
| 4.20.8 | X/Y Distance | ± 0.2 feet |
| 4.20.9 | X/Y Remarks | No Errors |
| 4.20.10 | Travel Description to this Plot Center | No Errors |
| 4.21.1 | Plot Navigated From | No Errors |
| 4.21.2 | Azimuth from Navigation Plot | No Errors |
| 4.21.3 | Distance from Navigation Plot | No Errors |

## Tree Data Form – Intensive Exam Level:

| *Tree Data Form – Intensive Exam Level* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 5.1 | Plot Number | No Errors |
| 5.2 | Tag ID Number | No Errors |
| 5.3 | Tree Status | No Errors |
| 5.4 | Tree Class | Tree Class Code / Tolerance<br>DE — DE, AC<br>AC — DE, AC, UA<br>UA — AC, UA, RF*<br>RF — RF, UA*<br>RN — RN, UA*<br>SV — SV, US<br>US — SV, US<br>* acceptable code providing damage/severity is consistent with the TREE CLASS definition. |
| 5.5 | Growth Sample (GST) | Specified in Protocol/Contract |
| 5.6 | Tree Species | No Errors |
| 5.7 | Tree Count | Number of Trees on Plot / Diameter (DBH/DRC) / Height or Height Class / Mixed/Extra Tree Tolerance<br>0 — NA — NA — No Errors<br>1 - 5 — -- — ≤ 0.5 feet — ± 2 trees<br>6+ — -- — ≤ 0.5 feet — ± 50%<br>1 - 5 — < 0.5 inches — > 0.5 feet — ± 1 tree<br>6+ — < 0.5 inches — > 0.5 feet — ± 20%<br>1 - 5 — 0.5 in - Breakpoint DBH — All — ± 1 tree<br>6+ — 0.5 in - Breakpoint DBH — All — ± 10%<br>1+ — Breakpoint DBH+ — All — No Errors |
| 5.8 | Number Stems (used only for EXAM PURPOSE 'FI') | Specified in Protocol/Contract |

| *Tree Data Form – Intensive Exam Level* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 5.9 | DBH/DRC | DBH (range):<br>< 0.5 inch — No Errors<br>0.5 – 13.9 inches — ± 0.1 inch<br>14.0 – 23.9 inches — ± 0.2 inch<br>24.0 – 34.9 inches — ± 0.3 inch<br>35.0+ inches — ± 0.5 inch<br>Borderline variable-plot trees — ± 0.1 inch (to determine trees in or out) |
| 5.10 | Height | ± 10 percent of actual standing tree height |
| 5.11 | Height to Crown | ± 10 percent of actual crown height |
| 5.12 | Radial Growth | ± 1/20th inch |
| 5.13 | Radial Growth #2<br>(NOT used in Region 1) | --- |
| 5.14 | Height Growth | trees ≥ 6 feet: ± 1 foot<br>trees < 6 feet: ± 0.1 foot |
| 5.15 | Tree Age | trees < 300 years old: ± 10 percent<br>trees ≥ 300 years old: ± 15 percent |
| 5.16 | Crown Ratio | ± 10 percent |
| 5.17 | Crown Class | ± 1 class |
| 5.18 | Crown Width | ± 10 percent |
| 5.19 | Wildlife Use | Specified in Protocol/Contract |
| 5.20 | Snag Decay Class | ± 1 class |
| 5.21 | Cone Serotiny | Specified in Protocol/Contract |
| 5.22 | Tree Damage Category | See Damage Category tables that follow |
| 5.23 | Tree Damage Agent | (see Damage Category) |
| 5.24 | Tree Damage Part | (see Damage Category) |
| 5.25 | Tree Damage Severity | (see Damage Category) |
| 5.26 | Tree Remarks (additional items): | |
| | • Estimated Age<br>• (IM Only) Azimuth or Distance Change | Recorded when applicable |
| 5.27 | Tree User Code | Specified in Protocol/Contract |
| 5.28 | Tree Treatment Option | Specified in Protocol/Contract |

| *Tree Data Form – Intensive Exam Level* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 5.29 | Tree Distance (IM) | Small-tree plot: ± 0.2 ft<br>Large-tree plot:<br>± 1.0 ft if tree is located more than 1.0' from plot boundary<br>± 0.2 ft if trees is < 1.0' from plot boundary |
| 5.30 | Tree Azimuth (IM) | ± 10 Degrees |

## Damage Category (item 5.22):

| *Damage Category (item 5.22)* | | | |
|---|---|---|---|
| **Code** | **Category** | **Damage Tolerance** | **Severity Tolerance** |
| 11 | Bark Beetles | No misses on live trees with a severity of ≥ 2 | ± 0 |
| 12 | Defoliators | No misses on live trees with a severity of ≥ 3 | ± 1 code |
| 13 | Chewing Insects | No misses on live trees with a severity of 2 | ± 0 |
| 14 | Sucking Insects | No misses on live trees with a severity of 2 | ± 0 |
| 15 | Boring Insects | No misses on weevils (Pissodes) or shoot moths (Eucosma) on live trees | ± 0 |
| 16 | Seed / Cone / Flower / Fruit Insects | No misses of shoot moths (Eucosma) on live trees | ± 0 |
| 17 | Gallmaker Insects | No misses on live trees with a severity of 2 | ± 0 |
| 18 | Insect Predators | No misses on live trees with a severity of 2 | ± 0 |
| 19 | General Disease | No misses on live trees with a severity of 2 | ± 0 |
| 20 | Biotic Damage | No misses on live trees with a severity of 2 | ± 0 |
| 21 | Root/Butt Diseases | No misses on live trees with a severity of ≥ 2 | ± 0 |
| 22 | Stem Decays / Cankers | No misses on live trees with a severity of ≥ 3 | ± 1 code |
| 23 | Parasitic - Mistletoe | No misses on live trees with a severity of ≥ 3 | ± 1 code |
| 24 | Decline Complexes / Dieback / Wilts | No misses on live trees with a severity of 2 | ± 0 |
| 25 | Foliage Diseases | No misses on Elytroderma on live trees | ± 0 |
| 26 | Stem Rusts | No misses on live trees with a severity of ≥ 2 | ± 0 |
| 27 | Broom Rusts | No misses on live trees with a severity of 2 | ± 0 |

| *Damage Category (item 5.22)* | | | |
|---|---|---|---|
| **Code** | **Category** | **Damage Tolerance** | **Severity Tolerance** |
| 30 | Fire | No misses if damage affects > ¼ of the bole circumference, or if an open wound is in contact with the ground | ± 0 |
| 41 | Wild Animals | No misses on live trees with terminal leader damage or with greater than 1/4 of bole circumference affected | ± 0 |
| 42 | Domestic Animals | No misses on live trees with terminal leader damage, or with greater than 1/4 of bole circumference affected | ± 0 |
| 50 | Abiotic Damage | No misses on live trees if wind, snow, or ice bending, breakage, or bole cracks and frost damage to shoots on trees < 1-inch diameter, and lightning on live trees ≥ 5-inch diameter | ± 0 |
| 60 | Competition | No misses on live trees with a severity of 2 | ± 0 |
| 70, 71 | Human Activity, Harvest | No misses on live trees for logging, human activity, or fire if the damage affects > ¼ of the bole circumference, or if an open wound is in contact with the ground | ± 0 |
| 80 | Multi-Damage (Insect/Disease) | No misses on live trees with a severity of 2 | ± 0 |
| 90 | Unknown | No misses on live trees with a severity of 2 (≥ 20 percent) | ± 10 percent |
| 99 | Physical Effects | No misses on live trees with a severity of ≥ 2 (≥ 20 percent) | ± 10 percent |

## Vegetation Composition and Ground Surface Cover Forms:

### Vegetation Composition:

| *Vegetation Composition* | |
|---|---|
| **Item** | **Tolerance** |
| Lifeform | No Errors |
| Canopy Cover | • ± 5 percent for cover ≤ 30%<br>• ± 10 percent for cover > 30% |
| Layer | No Errors |

| *Vegetation Composition* | |
|---|---|
| **Item** | **Tolerance** |
| Species | No Errors |

### Ground Surface Cover (Transects Method):

| *Ground Surface Cover (Transects Method)* | |
|---|---|
| **Item** | **Tolerance** |
| Transect Azimuth | ± 2 degrees |
| Number of Hits per category | ± 10 percent |
| Cover Type Category | No Errors |
| Ground Surface Cover Percent (calculation) | ± 10 percent |

## Down-Woody Materials Form:

| *Down-Woody Materials Form* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| DWM Sample Transect Azimuths | | ± 2 degrees |
| 7.1 | Plot Number | No Errors |
| 7.2 | First Duff | ± 1/2 inch |
| 7.3 | Second Duff | ± 1/2 inch |
| 7.4 | Fuel Depth | ± 20 percent of depth |
| 7.5 | Twig1 (0.01 to 0.24 inch) | ± 40 percent |
| 7.6 | Twig2 (0.25 to 0.99 inch) | ± 30 percent |
| 7.7 | Twig3 (1.00 to 2.99 inches) | ± 20 percent |
| 7.8 | Piece Count | ± 10 percent of total pieces |
| 7.9 | Log Decay Class | ± 1 class |
| 7.10 | Diameter (at point of intersection) | ▪ Pieces < 20-inch diameter: ± 3 inches<br>▪ Pieces ≥ 20-inch diameter: 20 percent |
| 7.11 | Piece Length | ± 10 percent |
| 7.12 | Diameter Large End | ± 1 inch |
| 7.13 | Diameter Small End | ± 1 inch |

## Tree Data Form – Extensive and Quick Plot Exam Levels:

**Note**: For Tree Data items not listed below, refer to tolerance limits listed under "Tree Data Form – Intensive Exam Level."

***Tree Data Form – Extensive and Quick Plot Exam Levels***

| Item No. | Field Name | Tolerance |
|---|---|---|
| 8.7 / 10.7 | Tree Count | Number of Trees on Plot / Diameter (DBH/DRC) / Height or Height Class / Mixed/Extra Tree Tolerance<br>0 / NA / NA / No Errors<br>1 - 10 / -- / ≤ 0.5 feet / ± 5 trees<br>11+ / -- / ≤ 0.5 feet / ± 50%<br>1 - 10 / < 0.5 inches / > 0.5 feet / ± 2 trees<br>11+ / < 0.5 inches / > 0.5 feet / ± 20%<br>1 - 10 / 0.5 in - Breakpoint DBH / All / ± 2 trees<br>11+ / 0.5 in - Breakpoint DBH / All / ± 20%<br>1+ / Breakpoint DBH+ / All / No Errors |
| 8.9 / 10.9 | DBH/DRC | DBH (range):<br>< 0.5 inch: No Errors<br>0.5 – 13.9 inches: ± 1 inch<br>14.0 – 23.9 inches: ± 2 inch<br>24.0 – 34.9 inches: ± 3 inch<br>35.0+ inches: ± 4 inch<br>Borderline variable-plot trees: ± 0.1 inch (to determine trees in or out) |
| 8.10 / 10.10 | Height | ± 20 percent of actual standing tree height |
| 10.12 | Radial Growth | If collected, see intensive exam level tree tolerances |
| 10.14 | Height Growth | If collected, see intensive exam level tree tolerances |
| 10.15 | Tree Age | If collected, see intensive exam level tree tolerances |
| 10.16 | Crown Ratio | ± 10% |
| 5.17 | Crown Class | ± 1 class (Required for Extensive Only) |
| 10.20 | Snag Decay Class | ± 1 class |

## Setting Form – Quick Plot Exam Level:

**Note**: For Setting items not listed below, refer to tolerance limits listed under "Setting Form – Intensive/Extensive Exam Levels."

| *Setting Form – Quick Plot Exam Level* | | |
|---|---|---|
| **Item No.** | **Field Name** | **Tolerance** |
| 9.19 | Potential Vegetation | Accurate to habitat type (series and understory, but exclusive of phase) |
| 9.21 | Setting Capable Growing Area | ± 10 percent |
| 9.24 | Setting Aspect | ± 45 degrees (1 class) |
| 9.25 | Setting Slope | ± 15 percent |

# Appendix U: Fuel Model

The original 13 fuel models are from "**Aids to Determining Fuel Models for Estimating Fire Behavior,**" Hal E. Anderson, INT-122, 1982. The remaining fuel models are from "Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model" by Joe H. Scott and Robert E. Burgan. RMRS –GTR-153. June 2005.

| Fuel Model | Fuel Model Code | Fuel Model Name | Fuel Type | Model Set | Fuel 1-Hr | Fuel 10-Hr | Fuel 100-Hr | Fuel Bed Depth |
|---|---|---|---|---|---|---|---|---|
| 1 | | Short grass (1 foot) | Grass and grass-dominated | Anderson | 0.74 | 0 | 0 | 1 |
| 2 | | Timber (grass and understory) | Grass and grass-dominated | Anderson | 2 | 1 | 0.500 | 1 |
| 3 | | Tall grass (2.5 feet) | Grass and grass-dominated | Anderson | 3.01 | 0 | 0 | 2.50 |
| 4 | | Chaparral (6 feet) | Chaparral and shrub fields | Anderson | 5.01 | 4.010 | 2 | 6 |
| 5 | | Brush (2 feet) | Chaparral and shrub fields | Anderson | 1 | 0.500 | 0 | 2 |
| 6 | | Dormant brush, hardwood slash | Chaparral and shrub fields | Anderson | 1.50 | 2.500 | 2 | 2.50 |
| 7 | | Southern rough | Chaparral and shrub fields | Anderson | 1.13 | 1.870 | 1.500 | 2.50 |
| 8 | | Closed timber litter | Timber litter | Anderson | 1.50 | 1 | 2.500 | 0.20 |
| 9 | | Hardwood litter | Timber litter | Anderson | 2.92 | 0.410 | 0.150 | 0.20 |
| 10 | | Timber (litter and understory) | Timber litter | Anderson | 3.01 | 2 | 5.010 | 1 |
| 11 | | Light logging slash | Slash | Anderson | 1.50 | 4.51 | 5.510 | 1 |
| 12 | | Medium logging slash | Slash | Anderson | 4.01 | 14.03 | 16.53 | 2.30 |
| 13 | | Heavy logging slash | Slash | Anderson | 7.01 | 23.04 | 28.05 | 3 |
| 91 | NB1 | Urban/Developed | Nonburnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 92 | NB2 | Snow/Ice | Nonburnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 93 | NB3 | Agricultural | Nonburnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 98 | NB4 | Open Water | Nonburnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 99 | NB5 | Bare Ground | Nonburnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 101 | GR1 | Short, Sparse Dry Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.10 | 0 | 0 | 0.40 |

| Fuel Model | Fuel Model Code | Fuel Model Name | Fuel Type | Model Set | Fuel 1-Hr | Fuel 10-Hr | Fuel 100-Hr | Fuel Bed Depth |
|---|---|---|---|---|---|---|---|---|
| 102 | GR2 | Low Load, Dry Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.10 | 0 | 0 | 1 |
| 103 | GR3 | Low Load, Very Coarse, Humid Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.10 | 0.40 | 0 | 2 |
| 104 | GR4 | Moderate Load, Dry Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.25 | 0 | 0 | 2 |
| 105 | GR5 | Low Load, Humid Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.40 | 0 | 0 | 1.50 |
| 106 | GR6 | Moderate Load, Humid Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.10 | 0 | 0 | 1.50 |
| 107 | GR7 | High Load, Dry Climate Grass (Dynamic) | Grass | Scott and Burgan | 1 | 0 | 0 | 3 |
| 108 | GR8 | High Load, Very Coarse, Humid Climate Grass (Dynamic) | Grass | Scott and Burgan | 0.50 | 1 | 0 | 4 |
| 109 | GR9 | Very High Load, Humid Climate Grass (Dynamic) | Grass | Scott and Burgan | 1 | 1 | 0 | 5 |
| 121 | GS1 | Low Load, Dry Climate Grass-Shrub (Dynamic) | Grass-Shrub | Scott and Burgan | 0.20 | 0 | 0 | 0.90 |
| 122 | GS2 | Moderate Load, Dry Climate Grass-Shrub (Dynamic) | Grass-Shrub | Scott and Burgan | 0.50 | 0.500 | 0 | 1.50 |
| 123 | GS3 | Moderate Load, Humid Climate Grass-Shrub (Dynamic) | Grass-Shrub | Scott and Burgan | 0.30 | 0.250 | 0 | 1.80 |
| 124 | GS4 | High Load, Humid Climate Grass-Shrub (Dynamic) | Grass-Shrub | Scott and Burgan | 1.90 | 0.300 | 0.100 | 2.10 |
| 141 | SH1 | Low Load, Dry Climate Shrub (Dynamic) | Shrub | Scott and Burgan | 0.25 | 0.250 | 0 | 1 |
| 142 | SH2 | Moderate Load, Dry Climate Shrub | Shrub | Scott and Burgan | 1.35 | 2.400 | 0.750 | 1 |
| 143 | SH3 | Moderate Load, Humid Climate Shrub | Shrub | Scott and Burgan | 0.45 | 3 | 0 | 2.40 |
| 144 | SH4 | Low Load, Humid Climate Timber-Shrub | Shrub | Scott and Burgan | 0.85 | 1.150 | 0.200 | 3 |
| 145 | SH5 | High Load, Dry Climate Shrub | Shrub | Scott and Burgan | 3.60 | 2.100 | 0 | 6 |
| 146 | SH6 | Low Load, Humid Climate Shrub | Shrub | Scott and Burgan | 2.90 | 1.450 | 0 | 2 |
| 147 | SH7 | Very High Load, Dry Climate Shrub | Shrub | Scott and Burgan | 3.50 | 5.300 | 2.200 | 6 |
| 148 | SH8 | High Load, Humid Climate Shrub | Shrub | Scott and Burgan | 2.05 | 3.400 | 0.850 | 3 |
| 149 | SH9 | Very High Load, Humid Climate Shrub (Dynamic) | Shrub | Scott and Burgan | 4.50 | 2.450 | 0 | 4.40 |

| Fuel Model | Fuel Model Code | Fuel Model Name | Fuel Type | Model Set | Fuel 1-Hr | Fuel 10-Hr | Fuel 100-Hr | Fuel Bed Depth |
|---|---|---|---|---|---|---|---|---|
| 161 | TU1 | Low Load, Dry Climate Timber-Grass-Shrub (Dynamic) | Timber-Understory | Scott and Burgan | 0.20 | 0.900 | 1.500 | 0.60 |
| 162 | TU2 | Moderate Load, Humid Climate Timber-Shrub | Timber-Understory | Scott and Burgan | 0.95 | 1.800 | 1.250 | 1 |
| 163 | TU3 | Moderate Load, Humid Climate Timber-Grass-Shrub (Dynamic) | Timber-Understory | Scott and Burgan | 1.10 | 0.150 | 0.250 | 1.30 |
| 164 | TU4 | Dwarf Conifer With Understory | Timber-Understory | Scott and Burgan | 4.50 | 0 | 0 | 0.50 |
| 165 | TU5 | Very High Load, Dry Climate Timber-Shrub | Timber-Understory | Scott and Burgan | 4 | 4 | 3 | 1 |
| 181 | TL1 | Low Load Compact Conifer Litter | Timber Litter | Scott and Burgan | 1 | 2.200 | 3.600 | 0.20 |
| 182 | TL2 | Low Load Broadleaf Litter | Timber Litter | Scott and Burgan | 1.40 | 2.300 | 2.200 | 0.200 |
| 183 | TL3 | Moderate Load Conifer Litter | Timber Litter | Scott and Burgan | 0.50 | 2.200 | 2.800 | 0.30 |
| 184 | TL4 | Small Downed Logs | Timber Litter | Scott and Burgan | 0.50 | 1.500 | 4.200 | 0.40 |
| 185 | TL5 | High Load Conifer Litter | Timber Litter | Scott and Burgan | 1.15 | 2.500 | 4.400 | 0.60 |
| 186 | TL6 | Moderate Load Broadleaf Litter | Timber Litter | Scott and Burgan | 2.40 | 1.200 | 1.200 | 0.30 |
| 187 | TL7 | Large Downed Logs | Timber Litter | Scott and Burgan | 0.30 | 1.400 | 8.100 | 0.40 |
| 188 | TL8 | Long-Needle Litter | Timber Litter | Scott and Burgan | 5.80 | 1.400 | 1.100 | 0.30 |
| 189 | TL9 | Very High Load Broadleaf Litter | Timber Litter | Scott and Burgan | 6.65 | 3.300 | 4.150 | 0.60 |
| 201 | SB1 | Low Load Activity Fuel | Slash-Blowdown | Scott and Burgan | 1.50 | 3 | 11 | 1 |
| 202 | SB2 | Moderate Load Activity Fuel or Low Load Blowdown | Slash-Blowdown | Scott and Burgan | 4.50 | 4.250 | 4 | 1 |
| 203 | SB3 | High Load Activity Fuel or Moderate Load Blowdown | Slash-Blowdown | Scott and Burgan | 5.50 | 2.750 | 3 | 1.20 |
| 204 | SB4 | High Load Blowdown | Slash-Blowdown | Scott and Burgan | 5.25 | 3.500 | 5.250 | 2.70 |

| Fuel Model Code | Detailed Description |
|---|---|
| 1 | Contains fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Generally less than one-third of the area contains shrubs or timber. Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations. Annual and perennial grasses are included in this fuel model. |
| 2 | Herbaceous material with litter and dead-down stem wood from the open shrub or timber overstory. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area. Stand may include clumps and may include pinyon-juniper. |

| Fuel Model Code | Detailed Description |
|---|---|
| 3 | Stands are tall, averaging about three feet, but considerable variation may occur. Approximately one-third or more of the stand is considered dead and cured. May include cultivated grains that have not been harvested, tall prairie, and marshland grasses. |
| 4 | Stands of mature shrubs, 6 feet or more tall such as California mixed chaparral, the high pocosin along the east coast, the pine barrens of New Jersey, or the closed jack pine stands of the north-central states. Besides flammable foliage, stand may contain dead woody material. May contain a deep litter layer. |
| 5 | Shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood qualify: laurel, vine maple, alder, or even chaparral, manzanita, or chamise. |
| 6 | The shrubs are older, but not as tall as model 4, nor do they contain as much fuel as model 4. This model covers a broad range of shrub conditions: intermediate stands of chamise, chaparral, oak brush, low pocosin, Alaskan spruce taiga, and shrub tundra. May include hardwood slash that has cured. Pinyon-juniper shrub lands may be represented. |
| 7 | Stands of shrubs are generally between 2 and 6 feet high. Palmetto-galliberry understory, with a pine overstory, are typical. Low pocosin may be represented. Black spruce shrub combinations in Alaska may also be represented. |
| 8 | Contains closed canopy stands of short needle conifers or hardwoods that have leafed out. The compact litter layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present. Representative conifer types are white pine, lodgepole pine, spruce, fir, and larch. |
| 9 | Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Closed stands of long-needled pine like ponderosa, Jeffrey, red pines, or southern pine plantations are grouped in this model. May contain concentrations of dead-down woody material. |
| 10 | Dead-down fuels include quantities of 3-inch or larger limb wood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Any forest type may be considered if heavy down material is present; examples are insect- or disease-ridden stands, wind thrown stands, overmature situations with deadfall, and aged light thinning or partial cut slash. |
| 11 | Contains slash and herbaceous material intermixed with slash. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands, and southern pine harvests are considered. Clearcuts generally produce more slash than represented here. The less than 3-inch material load is less than 12 tons per acre. The greater than 3 inch is represented by not more than 10 pieces, 4 inches in diameter, along a 50 foot transect. |
| 12 | The visual impression is dominated by slash and much of it is less than 3 inches in diameter. The fuels are well distributed. Heavily thinned conifer stands; clearcuts, and medium or heavy partial cuts are represented. The material larger than 3 inches is represented by encountering 11 pieces, 6 inches in diameter along a 50 foot transect. |
| 13 | There is a continuous layer of slash. Large quantities of material larger than 3 inches are present. Clearcuts and heavy partial cuts in mature and over mature stands are depicted where the slash load is dominated by the greater than 3 inch diameter material. Fuels less than 3 inches are generally only 10 percent of the total load. May include situations where the slash still has "red" needles attached. |
| 91 | Land covered by urban and suburban development. The area must not support wildland fire spread. In some cases the area may experience structural fire losses during a wildland fire incident; however, structure ignition in those cases is either house-to-house or by firebrands, neither of which is directly modeled using fire behavior fuel models. If sufficient vegetation surrounds structures such that wildland fire spread is possible, then choose a fuel model appropriate for the wildland vegetation. |
| 92 | Land covered by permanent snow and ice. Areas covered by seasonal snow and ice can be mapped to two different fuels models. |
| 93 | Agricultural land maintained in a nonburnable condition; examples include irrigated annual crops, mowed or tilled orchards, and so forth. However, there are many agricultural areas that are not kept in a non burnable condition. For example, grass is often allowed to grow beneath vines or orchard trees, and wheat or similar crops are allowed to cure before harvest; in those cases use a different fuel model. |
| 98 | Land covered by open bodies of water such as lakes, rivers and oceans. |
| 99 | Land devoid of enough fuel to support wildland fire spread. Such areas include gravel pits, arid deserts with little vegetation, sand dunes, rock outcroppings, beaches and so forth. |

| Fuel Model Code | Detailed Description |
|---|---|
| 101 | The primary carrier of fire is sparse grass, though small amounts of fine fuel may be present. The grass is generally short, either naturally or by grazing, and may be sparse or discontinuous. The moisture extraction is indicative of a dry climate fuelbed, but may also be applied in high-extinction moisture fuelbeds because in both cases predicted spread rate and flame length are low compare to other grass models. |
| 102 | The primary carrier of fire is grass, though small amounts of fine dead fuel may be present. Load is greater than 101, and fuelbed may be more continuous. Shrubs, if present, do not affect fire behavior. |
| 103 | The primary carrier of fire is continuous, coarse, humid-climate grass. Grass and herb fuel load is relatively light; fuelbed depth is about 2 feet. Shrubs are not present in significant quantity to affect fire behavior. |
| 104 | The primary carrier of fire is continuous, dry-climate grass. Load and depth are greater than 102; fuelbed depth is about 2 feet. |
| 105 | The primary carrier of fire is humid-climate grass. Load is greater than 103 but depth is lower, about 1-2 feet. |
| 106 | The primary carrier of fire is continuous humid-climate grass. Load is greater than 105 but depth is about the same. Grass is less coarse than 105. |
| 107 | The primary carrier of fire is continuous dry-climate grass. Load and depth are greater than 104. Grass is about 3 feet tall. |
| 108 | The primary carrier of fire is continuous, very coarse, humid-climate grass. Load and depth are greater than 106. Spread rate and flame length can be extreme if grass is fully cured. |
| 109 | The primary carrier of fire is dense, tall, humid-climate grass. Load and depth are greater than 108, about 6 feet tall. Spread rate and flame length can be extreme if grass is fully or mostly cured. |
| 121 | The primary carrier of fire is grass and shrubs combined. Shrubs are about 1 foot high, grass load is low. Spread rate is moderate; flame length is low. Moisture of extinction is low. |
| 122 | The primary carrier of fire is grass and shrubs combined. Shrubs are 1 to 3 feet high, grass load is moderate. Spread rate is high; flame length moderate. Moisture of extinction is low. |
| 123 | The primary carrier of fire is grass and shrubs combined. Moderate grass/shrub load, average grass/shrub depth less than 2 feet. Spread rate is high; flame length moderate. Moisture of extinction is high. |
| 124 | The primary carrier of fire is grass and shrubs combined. Heavy grass/shrub load, depth greater than 2 feet. Spread rate high; flame length very high. Moisture of extinction is high. |
| 141 | The primary carrier of fire is woody shrubs and shrub litter. Low shrub fuel load, fuelbed about 1 foot; some grass may be present. Spread rate is very low; flame length very low. |
| 142 | The primary carrier of fire is woody shrubs and shrub litter. Moderate fuel load (higher than 141), depth about 1 foot, no grass fuel present. Spread rate is very low; flame length low. |
| 143 | The primary carrier of fire is woody shrubs and shrub litter. Moderate shrub load, possibly with pine overstory or herbaceous fuel, fuel bed depth 2 to 3 feet. Spread rate is low; flame length low. |
| 144 | The primary carrier of fire is woody shrubs and shrub litter. Low to moderate shrub and litter load, possibly with pine overstory, fuel bed depth about 3 feet. Spread rate is high; flame length moderate. |
| 145 | The primary carrier of fire is woody shrubs and shrub litter. Heavy shrub load, depth 4-6 feet. Spread rate very high; flame length very high. Moisture of extinction is high. |
| 146 | The primary carrier of fire is woody shrubs and shrub litter. Dense shrubs, little or no herbaceous fuel, fuelbed depth about 2 feet. Spread rate is high; flame length high. |
| 147 | The primary carrier of fire is woody shrubs and shrub litter. Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than 146, but flame length similar. Spread rate is high, flame length is very high. |
| 148 | The primary carrier of fire is woody shrubs and shrub litter. Dense shrubs, little or no herbaceous fuel, fuelbed depth about 3 feet. Spread rate is high; flame length high. |
| 149 | The primary carrier of fire is woody shrubs and shrub litter. Dense, finely branched shrubs with significant fine dead fuel, about 4-6 feet tall; some herbaceous fuel may be present. Spread rate is high; flame length very high. |
| 161 | The primary carrier of fire is low load of grass and/or shrub with litter. Spread rate is low; flame length is low. |

| Fuel Model Code | Detailed Description |
|---|---|
| 162 | The primary carrier of fire is moderate litter load with shrub component. High extinction moisture. Spread rate is moderate; flame length is low. |
| 163 | The primary carrier of fire is moderate forest litter with grass and shrub components. High extinction moisture. Spread rate is high; flame length is moderate. |
| 164 | The primary carrier of fire is short conifer trees with grass or moss understory. Spread rate is moderate; flame length is moderate. |
| 165 | The primary carrier of fire is heavy forest litter with a shrub or small tree understory. Spread rate is moderate; flame length is moderate. |
| 181 | The primary carrier of fire is compact forest litter. Light to moderate load, fuels 1 to 2 inches deep. May be used to represent a recently burned forest. Spread rate is very low; flame length is very low. |
| 182 | The primary carrier of fire is broadleaf (hardwood) litter. Low load, compact broadleaf litter. Spread rate is very low; flame length is very low. |
| 183 | The primary carrier of fire is moderate load conifer litter, light load of coarse fuels. Spread rate is very low; flame length low. |
| 184 | The primary carrier of fire is moderate load of fine litter and coarse fuels. Includes small diameter downed logs. Spread rate is low; flame length low |
| 185 | The primary carrier of fire is high load of fine litter; light slash or mortality fuel. Spread rate is low; flame length low. |
| 186 | The primary carrier of fire is moderate load broadleaf litter, less compact than 182. Spread rate is very moderate; flame length is low. |
| 187 | The primary carrier of fire is heavy load of forest litter, includes large diameter downed logs. Spread rate low; flame length low. |
| 188 | The primary carrier of fire is moderate load long-needle pine litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low. |
| 189 | The primary carrier of fire is very high load, fluffy broadleaf litter. This can also be used to represent heavy needle-drape. Spread rate is very moderate; flame length moderate. |
| 201 | The primary carrier of fire is light dead and down activity fuel. Fine fuel load is 10 to 20 t/ac weighted towards fuels 1 to 3 inch diameter class; depth is less than 1 foot. Spread rate is moderate; flame length moderate. |
| 202 | The primary carrier of fire is moderate dead and down activity fuel or light blowdown. Fine fuel load is 7 to 12 t/ac, evenly distributed across 0 to 0.25, 0.25 to 1, and 1 to 3 inch diameter classes, depth is about 1 foot. Blowdown is scattered, with many trees still standing. Spread rate is moderate; flame length moderate. |
| 203 | The primary carrier of fire is heavy dead and down activity fuel or moderate blowdown. Fine fuel load is 7 to 12 t/ac, weighted toward 0 to 0.25 inch diameter class, depth is more than 1 foot. Blowdown is moderate; trees compacted to near the ground. Spread rate is high; flame length high. |
| 204 | The primary carrier of fire is heavy blowdown fuel. Blowdown id total, fuelbed is not compacted, most foliage and fine fuel still attached to blowdown. Spread rate is very high; flame length very high. |

# Appendix V: Glossary of Terms

| *Glossary of Terms* | |
|---|---|
| **Aspect** | A position facing or commanding a given direction; exposure. Aspect is the compass direction of the prevailing slope with respect to true north. |
| **Azimuth** | A horizontal angular measure from true north to an object of interest. |
| **Basal Area** | The cross-sectional area of the stem or stems of a plant, or of all plants in a stand, generally expressed as square units per unit area. For trees, measured at 4.5 feet above ground, for forbs and grasses, measured at the root crown. |
| **Bole Length** | The straight-line distance measured parallel to the main bole of a tree, from its base to its tip. |
| **Breast Height** | A point located on the uphill side of the main stem, by measuring 4.5 feet along the uphill side of the bole from ground level or the predominant root collar. Preclude slight, non-compacted litter accumulations when establishing breast height. |
| **CALVEG** | Classification and Assessment with LANDSAT of Visible Ecological Groupings. It is a California wide system for classifying vegetative and non-vegetative cover types. The primary cover type relates to life form and uses a 3-character alpha code. |
| **Canopy Cover** | The percent of a fixed area covered by the crown of an individual plant species, or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included. |
| **Compacted Live Crown Ratio** | The percent of the total height of the tree which supports a full, live crown. For trees that have uneven length crowns, ocularly transfer lower branches to fill holes in the upper portions of the crown, until a full, even crown is created. |
| **Compartment** | A land area, usually between 3,000 and 8,000 acres, easily identified on the ground by physical features. A compartment is comparable in size to a sub-watershed, or landscape management unit. It is used as a convenience for maintaining stand records and planning vegetation management projects. |
| **Crown Class** | The relative position of the tree or shrub crown with respect to the competing vegetation around it. Crown class for each tree or shrub is judged in the context of its immediate environment, that is, those trees or shrubs which are competing for sunlight with the subject tree or shrub. |
| **Crown Length** | The vertical distance from the top of the leader to the base of the crown, measured to the lowest live branch-whorl with live branches in at least 3 quadrants, and continuous with the main crown. |
| **Crown Ratio** | The ratio of compacted live-crown length to bole length. Lengths are measured parallel to the bole from the base of the tree to the tip. |

| *Glossary of Terms* | |
|---|---|
| **DEM** | Digital Elevation Model. USGS geographic elevation data distributed in raster form. Digital representation of the shape of the earth's surface. Typically digital elevation data consists of arrays of values that represent topographic elevations measured at equal intervals on the Earth's surface. |
| **Diameter** | The length of a straight-line segment passing through the center of an item and terminating at its periphery. |
| **Diameter at Breast Height (DBH)** | A measure of the tree bole at breast height (4.5 feet), outside bark, perpendicular to the tree bole. |
| **Diameter at Root Collar (DRC)** | The straight line passing through the center of a cross section of a bole measured at the root collar of a shrub or tree. |
| **Down Log** | Stem material (conifer or hardwood) that is lying on the ground. If a stem material is leaning more than 45 degrees from vertical, is not self-supporting, and/or in contact with the ground, it is considered a down log. |
| **Down Woody Material** | Woody pieces of trees and shrubs that have been uprooted (no longer supporting growth) or severed from their root system, not self supporting, and are lying on the ground. |
| **Duff Layer** | Duff is the fermentation and humus layer of the forest floor. It does not include the freshly cast material in the litter layer. The top of the duff is where needles, leaves, and other cast-off vegetative material have noticeably begun to decompose. Individual particles usually will be bound by fungi mycelium. When moss is present, the top of the duff is just below the green portion of the moss. The bottom of the duff is the start of the soil ("A" horizon). |
| **Elevation** | Vertical distance from a datum, usually mean sea level, to a point or object on the earth’s surface. Not to be confused with altitude, a reference to points above the earth’s surface. |
| **Fuel Bed** | The fuel bed is the accumulation of dead, woody residue on the forest floor. It begins at the top of the duff layer and above. It includes litter, dead limbwood and bolewood from tree species, as well as dead material from shrub, herbaceous, and grass species. |
| **Fuel Model** | Mathematical descriptions of fuel properties (e.g., fuel load and fuel depth) that are used as inputs to calculations of fire danger indices and fire behavior potential. |
| **GPS** | Global Positioning System. A network of radio-emitting satellites deployed by the U.S. Department of Defense. Ground-based GPS receivers can automatically derive accurate surface coordinates for all kinds of GIS, mapping, and surveying data collection. |
| **Ground Level** | The forest floor, made up by soil and duff layer. It does not include unincorporated woody debris that may rise above the ground line. In reference to a point of measure, it is the highest point of the ground touching the base of the object being referenced. |
| **Group Talley** | A count of one or more items of the same type or species and recorded as a single line entry. |

| *Glossary of Terms* | |
|---|---|
| **Growth** | A measure of the increase in growth layers for a specified time frame. |
| **Height Growth** | The increase in height over a set period of time. |
| **Intersect Diameter** | Measurement of diameter at a point where the sampling plane intersects the geometric center of the object being tallied. No adjustment is made for stem irregularities at the point of intersection. |
| **Lean (Tree)** | The deflection from vertical, > 15 degrees of a straight line passing through the geometric center of the base and top of the main stem. |
| **Length** | The measurement of the extent of something along its greatest dimension. |
| **Life Form** | Species and individuals that are grouped into classes on the basis of their similarities in structure and function. A growth form which displays an obvious relationship to important environmental factors. |
| **Limiting Distance** | A comparative measurement between the subplot radius and the distance from the subplot center to the center of the object. The comparison is used to determine whether the object is IN or OUT of the fixed-area subplot.<br>**IN** - The object is "in" if the measured distance is equal to or less than the subplot radius.<br>**OUT** - The object is "out" if the measured distance is greater than the subplot radius. |
| **Live Crown Length** | The straight-line distance measured parallel to the main bole of a tree, from the top of the live crown to the base of the live crown. |
| **Ownership** | The identification of the legal owner/administrator on both the surface and subsurface estates. |
| **Plant Species** | The major subdivision of a genus or subgenus of a plant being described or measured. |
| **Plot Configuration** | The size and shape of the sampling unit (plot) and the spatial arrangement of subplots within that unit. |
| **Plot** | A sub-sample of a plot or stand exam. This is the unit on which data are recorded to individual trees, snags, logs, understory vegetation, and fuels. Data can be collected on either a fixed-radius or variable-radius area. |
| **Proclaimed Forest** | Units of the National Forest System as originally proclaimed or designated by Congress. |
| **Quadratic Mean Diameter** | The diameter of the tree of average basal area. |
| **Radial Growth Increment** | The increase in tree radius over a period of time at breast height, or occasionally at the base. |
| **Random Sample** | Any method of sample selection based on the theory of probability (degree of certainty). At any stage of the operation of selection, the probability of any set of units being selected must be known. It is the only method that can provide a measure of precision of the estimate. |

| *Glossary of Terms* | |
|---|---|
| **Reconciliation Code** | A code used to reflect the status of an individually tallied item with regards to previous surveys. |
| **Slope** | A deviation from the horizontal. |
| **Species** | A code that represents a fundamental category of taxonomic classification of an organism. |
| **Stand** | A spatially continuous group of trees and associated vegetation having similar structures and growing under similar soil and climatic conditions. |
| **Stand Exam Grid** | Basic data collection method for stand exams. It consists of a set of plots, separated by equal distances on a grid pattern. The lines of the grid (transects) are oriented in cardinal directions. There is a predetermined distance between plots. The number of transects and grid plots will vary depending upon the size and shape of the stand. |
| **Stratified Sample** | A method of sampling forest resources where stands or polygons of similar properties are lumped into strata. This improves the efficiency of an inventory by reducing the variability within a given population. The less variability there is within a strata, the fewer samples will need to be taken to achieve a statistically valid result. |
| **Stratum** | A group of stands within a condition class; similar characteristics such as forest type, tree-size class, and canopy density. |
| **Stump** | The woody base of a tree remaining in contact with the soil after the trunk or main stem has been severed at a point less than 4.5 feet above ground height (measured on the uphill side). |
| **Tree** | A woody perennial plant, typically large, with a single well-defined stem carrying a more or less definite crown. |
| **Tree Age** | Total age of the above ground stem of a tree (not age of the root stock or the total age from seed). Total age is usually the annual ring count to the pith of the tree at breast height plus an estimate of the number of years it took the tree to reach breast height. |