United States Department of Agriculture

US Forest Service
Natural Resource Manager (NRM)

# FSVeg Common Stand Exam User Guide Region 8 Appendices

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## Appendix A: Administrative and Proclaimed Forest Codes

Table 1: Region 8 codes

| **Admin Number** | **Administrative Forest Name** | **Proclaimed Number** | **Proclaimed Forest Name** |
| --- | --- | --- | --- |
| 01 | National Forests in Alabama | 03 | William B. Bankhead |
| 01 | National Forests in Alabama | 07 | Conecuh |
| 01 | National Forests in Alabama | 25 | Talladega |
| 01 | National Forests in Alabama | 26 | Tuskegee |
| 02 | Daniel Boone | 31 | Daniel Boone |
| 03 | Chattahoochee – Oconee | 05 | Chattahoochee |
| 03 | Chattahoochee – Oconee | 27 | Oconee |
| 04 | Cherokee | 06 | Cherokee |
| 05 | National Forests in Florida | 01 | Apalachicola |
| 05 | National Forests in Florida | 17 | Ocala |
| 05 | National Forests in Florida | 18 | Osceola |
| 06 | Kisatchie | 15 | Kisatchie |
| 07 | National Forests in Mississippi | 04 | Bienville |
| 07 | National Forests in Mississippi | 10 | Delta |
| 07 | National Forests in Mississippi | 11 | De Soto |
| 07 | National Forests in Mississippi | 13 | Holly Springs |
| 07 | National Forests in Mississippi | 14 | Homochita |
| 07 | National Forests in Mississippi | 28 | Tombigbee |
| 08 | George Washington–Jefferson | 32 | George Washington |
| 08 | George Washington–Jefferson | 33 | Jefferson |
| 09 | Ouachita | 19 | Ouachita |
| 10 | Ozark – St. Francis | 20 | Ozark |
| 10 | Ozark – St. Francis | 29 | St. Francis |
| 11 | National Forests in North Carolina | 08 | Croatan |
| 11 | National Forests in North Carolina | 16 | Nantahala |
| 11 | National Forests in North Carolina | 21 | Pisgah |
| 11 | National Forests in North Carolina | 30 | Uwahrrie |
| 12 | Francis Marion – Sumter | 12 | Francis Marion |
| 12 | Francis Marion – Sumter | 24 | Sumter |
| 13 | National Forests in Texas | 02 | Angelina |
| 13 | National Forests in Texas | 09 | Davy Crockett |
| 13 | National Forests in Texas | 22 | Sabine |
| 13 | National Forests in Texas | 23 | Sam Houston |
| 16 | El Yunque | 34 | El Yunque |
| 36 | Savannah River | 36 | Savannah River |
| 60 | Land Between the Lakes | 35 | Land Between the Lakes |

## Appendix B: District Codes

Table 2: Region 8 codes

| **Forest** | **Code** | **District** |
| --- | --- | --- |
| Alabama | 1 | Bankhead |
| Alabama | 3 | Conecuh |
| Alabama | 4 | Oakmulgee |
| Alabama | 5 | Shoal Creek |
| Alabama | 6 | Talledega |
| Alabama | 7 | Tuskegee |
| Chatahoochee/Oconee | 1 | Armuchee |
| Chatahoochee/Oconee | 2 | Toccoa |
| Chatahoochee/Oconee | 4 | Brasstown |
| Chatahoochee/Oconee | 5 | Talluah |
| Chatahoochee/Oconee | 6 | Chattooga |
| Chatahoochee/Oconee | 7 | Cohutta |
| Chatahoochee/Oconee | 8 | Oconee |
| Cherokee | 1 | Ocoee/Hiwassee |
| Cherokee | 2 | Nolichucky/Unaka |
| Cherokee | 3 | Tellico |
| Cherokee | 4 | Watauga |
| Daniel Boone | 11 | Morehead |
| Daniel Boone | 12 | Stanton |
| Daniel Boone | 13 | Berea |
| Daniel Boone | 14 | London |
| Daniel Boone | 15 | Somerset |
| Daniel Boone | 16 | Stearns |
| Daniel Boone | 17 | Redbird |
| Florida | 1 | Apalachicola |
| Florida | 2 | Lake George |
| Florida | 4 | Osceola |
| Florida | 5 | Seminole |
| Florida | 6 | Wakulla |
| Francis Marion & Sumter | 1 | Enoree/Tyger |
| Francis Marion & Sumter | 2 | Andrew Pickens |
| Francis Marion & Sumter | 3 | Long Cane |
| Francis Marion & Sumter | 5 | Wambaw/Witherbee |
| George Washington Jefferson | 1 | Deerfield |
| George Washington Jefferson | 2 | Dry River |
| George Washington Jefferson | 3 | James River |
| George Washington Jefferson | 4 | Lee |
| George Washington Jefferson | 5 | Pedlar |
| George Washington Jefferson | 6 | Warm Springs |
| George Washington Jefferson | 11 | Blacksburg |
| George Washington Jefferson | 12 | Clinch |
| George Washington Jefferson | 13 | Glenwood |
| George Washington Jefferson | 14 | Mt. Rogers |
| George Washington Jefferson | 15 | New Castle |
| George Washington Jefferson | 16 | Wythe |
| Kisatchie | 1 | Catahoula |
| Kisatchie | 2 | Evangeline/Vernon |
| Kisatchie | 3 | Kisatchie |
| Kisatchie | 4 | Winn |
| Kisatchie | 5 | Caney |
| Land Between the Lakes | 1 | Land Between the Lakes |
| Mississippi | 1 | Bienville |
| Mississippi | 2 | Desoto |
| Mississippi | 4 | Homochitto |
| Mississippi | 5 | Chickasawhay |
| Mississippi | 6 | Delta |
| Mississippi | 7 | Holly Springs |
| Mississippi | 17 | Tombigbee |
| North Carolina | 2 | Cheoah |
| North Carolina | 3 | Croatan |
| North Carolina | 4 | Appalachian |
| North Carolina | 5 | Grandfather |
| North Carolina | 6 | Highlands |
| North Carolina | 7 | Pisgah |
| North Carolina | 9 | Tusquitee |
| North Carolina | 10 | Uwharrie |
| North Carolina | 11 | Wayah |
| Ouchita | 2 | Caddo |
| Ouchita | 3 | Cold Springs |
| Ouchita | 4 | Foursche |
| Ouchita | 5 | Jessieville |
| Ouchita | 6 | Oklahoma |
| Ouchita | 7 | Mena |
| Ouchita | 8 | Oden |
| Ouchita | 9 | Poteau |
| Ouchita | 10 | Womble |
| Ozark St. Francis | 1 | Sylamore |
| Ozark St. Francis | 3 | Big Piney |
| Ozark St. Francis | 4 | Pleasant Hill |
| Ozark St. Francis | 5 | Boston Mountain |
| Ozark St. Francis | 6 | Magazine |
| Ozark St. Francis | 7 | St. Francis |
| Savannah River | 1 | Savannah River |
| Texas | 1 | Angelina |
| Texas | 3 | Davy Crockett |
| Texas | 4 | Sam Houston |
| Texas | 7 | Sabine |
| Texas | 8 | Caddo/LBJ |

## Appendix C: State Codes

Table 3: Region 8 codes

| **Code** | **State** |
| --- | --- |
| AL | Alabama |
| AR | Arkansas |
| FL | Florida |
| GA | Georgia |
| KY | Kentucky |
| LA | Louisiana |
| MS | Mississippi |
| NC | North Carolina |
| OK | Oklahoma |
| PR | Puerto Rico and Virgin Islands |
| SC | South Carolina |
| TN | Tennessee |
| TX | Texas |
| VA | Virginia |
| WV | West Virginia |

## Appendix D: County Codes

Table 4: Alabama County codes

| **Code** | **County** |
| --- | --- |
| 7 | Bibb |
| 15 | Calhoun |
| 21 | Chilton |
| 27 | Clay |
| 29 | Cleburne |
| 39 | Covington |
| 47 | Dallas |
| 53 | Escambia |
| 59 | Franklin |
| 79 | Lawrence |
| 87 | Macon |
| 65 | Rale |
| 105 | Perry |
| 121 | Talledega |
| 125 | Tuscaloosa |
| 133 | Winston |

Table 5: Arkansas county codes

| **Code** | **County** |
| --- | --- |
| 5 | Baxter |
| 7 | Benton |
| 29 | Conway |
| 33 | Crawford |
| 47 | Franklin |
| 51 | Garland |
| 59 | Hot Spring |
| 61 | Howard |
| 71 | Johnson |
| 77 | Lee |
| 83 | Logan |
| 87 | Madison |
| 89 | Marion |
| 97 | Montgomery |
| 101 | Newton |
| 105 | Perry |
| 107 | Phillips |
| 109 | Pike |
| 113 | Polk |
| 115 | Pope |
| 125 | Saline |
| 127 | Scott |
| 129 | Searcy |
| 131 | Sebastian |
| 137 | Stone |
| 141 | Van Buren |
| 143 | Washington |
| 149 | Yell |

Table 6: Florida county codes

| **Code** | **County** |
| --- | --- |
| 3 | Baker |
| 23 | Columbia |
| 37 | Franklin |
| 69 | Lake |
| 73 | Leon |
| 77 | Liberty |
| 83 | Marlon |
| 107 | Putnam |
| 129 | Wakulla |

Table 7: Georgia county codes

| **Code** | **County** |
| --- | --- |
| 11 | Banks |
| 47 | Catoosa |
| 55 | Chattooga |
| 85 | Dawson |
| 111 | Fannin |
| 115 | Floyd |
| 123 | Gilmer |
| 129 | Gordon |
| 133 | Greene |
| 137 | Habersham |
| 159 | Jasper |
| 169 | Jones |
| 211 | Morgan |
| 213 | Murrey |
| 219 | Oconee |
| 237 | Putnam |
| 241 | Rabun |
| 257 | Stephens |
| 281 | Towns |
| 285 | Walker |
| 291 | Union |
| 311 | White |
| 313 | Whitfield |

Table 8: Kentucky county codes

| **Code** | **County** |
| --- | --- |
| 11 | Bath |
| 13 | Bell |
| 51 | Clay |
| 65 | Estill |
| 95 | Harlan |
| 109 | Jackson |
| 125 | Laurel |
| 129 | Lee |
| 131 | Leslie |
| 133 | Letcher |
| 143 | Lyon |
| 147 | McCreary |
| 151 | Madison |
| 165 | Menifee |
| 175 | Morgan |
| 189 | Owsley |
| 195 | Pike |
| 197 | Powell |
| 199 | Pulaski |
| 203 | Rockcastle |
| 205 | Rowan |
| 221 | Trigg |
| 213 | Wayne |
| 235 | Whitley |
| 237 | Wolfe |

Table 9: Louisiana county codes

| **Code** | **County** |
| --- | --- |
| 27 | Claiborne |
| 43 | Grant |
| 69 | Natchitoches |
| 79 | Rapids |
| 115 | Vernon |
| 119 | Webster |
| 127 | Winn |

Table 10: Mississippi county codes

| **Code** | **County** |
| --- | --- |
| 1 | Adams |
| 5 | Amite |
| 9 | Benton |
| 17 | Chickasaw |
| 19 | Choctaw |
| 27 | Claiborne |
| 29 | Copiah |
| 35 | Forrest |
| 37 | Franklin |
| 39 | George |
| 41 | Greene |
| 47 | Harrison |
| 55 | Issaquena |
| 59 | Jackson |
| 61 | Jasper |
| 63 | Jefferson |
| 67 | Jones |
| 71 | Lafayette |
| 85 | Lincoln |
| 91 | Marlon |
| 93 | Marshall |
| 101 | Newton |
| 105 | Oktibbeha |
| 109 | Pearl River |
| 111 | Perry |
| 115 | Pontotoe |
| 123 | Scott |
| 125 | Sharkey |
| 129 | Smith |
| 131 | Stone |
| 139 | Tippah |
| 145 | Union |
| 149 | Warren |
| 153 | Wayne |
| 157 | Wilkinson |
| 159 | Winston |
| 161 | Yalobusha |

Table 11: North Carolina county codes

| **Code** | **County** |
| --- | --- |
| 11 | Avery |
| 21 | Buncombe |
| 23 | Burke |
| 27 | Caldwell |
| 31 | Carteret |
| 39 | Cherokee |
| 43 | Clay |
| 49 | Craven |
| 57 | Davidson |
| 75 | Graham |
| 87 | Haywood |
| 89 | Henderson |
| 99 | Jackson |
| 103 | Jones |
| 111 | McDowell |
| 113 | Macon |
| 115 | Madison |
| 121 | Mitchell |
| 123 | Montgomery |
| 151 | Randolph |
| 173 | Swain |
| 175 | Transylvania |
| 189 | Watuaga |
| 193 | Wilkes |
| 199 | Yancey |

Table 12: Oklahoma county codes

| **Code** | **County** |
| --- | --- |
| 25 | Cimarron |
| 79 | LeFlore |
| 89 | McCurtain |
| 129 | Roger Mills |

Table 13: South Carolina county codes

| **Code** | **County** |
| --- | --- |
| 1 | Aberville |
| 3 | Aiken |
| 11 | Barnwell |
| 15 | Berkeley |
| 19 | Charleston |
| 23 | Chester |
| 37 | Edgefield |
| 39 | Fairfield |
| 47 | Greenwood |
| 59 | Laurens |
| 65 | McCormick |
| 71 | Newberry |
| 73 | Oconee |
| 81 | Saluda |
| 87 | Union |

Table 14: Tennessee county codes

| **Code** | **County** |
| --- | --- |
| 19 | Carter |
| 29 | Cocke |
| 59 | Greene |
| 91 | Johnson |
| 107 | McMinn |
| 123 | Monroe |
| 139 | Polk |
| 161 | Stewart |
| 163 | Sullivan |
| 171 | Unicoi |
| 179 | Washington |

Table 15: Texas county codes

| **Code** | **County** |
| --- | --- |
| 5 | Angelina |
| 111 | Dallam |
| 179 | Gray |
| 211 | Hemphill |
| 225 | Houston |
| 241 | Jasper |
| 339 | Montgomery |
| 347 | Nacogdoches |
| 403 | Sabine |
| 405 | San Augustine |
| 407 | San Jacinto |
| 419 | Shelby |
| 455 | Trinity |

Table 16: Virginia county codes

| **Code** | **County** |
| --- | --- |
| 5 | Alleghany |
| 9 | Amherst |
| 15 | Augusta |
| 17 | Bath |
| 19 | Bedford |
| 21 | Bland |
| 23 | Botetourt |
| 27 | Buchanan |
| 35 | Carroll |
| 45 | Craig |
| 51 | Dickenson |
| 69 | Frederick |
| 71 | Giles |
| 77 | Grayson |
| 91 | Highland |
| 105 | Lee |
| 121 | Montgomery |
| 125 | Nelson |
| 139 | Page |
| 155 | Pulaski |
| 161 | Roanoke |
| 163 | Rockbridge |
| 165 | Rockingham |
| 167 | Russell |
| 169 | Scott |
| 171 | Schenandoah |
| 173 | Smyth |
| 185 | Tazewell |
| 187 | Warren |
| 191 | Washington |
| 195 | Wise |

Table 17: West Virginia county codes

| **Code** | **County** |
| --- | --- |
| 1 | Barbour |
| 23 | Grant |
| 25 | Greenbrier |
| 27 | Hampshire |
| 31 | Hardy |
| 63 | Monroe |
| 67 | Nicholas |
| 71 | Pendleton |
| 75 | Pocahontas |
| 77 | Preston |
| 83 | Randolph |
| 93 | Tucker |
| 101 | Webster |

## Appendix E: Existing Vegetation References & Codes

Table 18: Existing Vegetation References

| **Code** | **Name** | **Author** |
| --- | --- | --- |
| FSHRB | **Forest Service Handbook**. Atlanta, GA, R8 FSH2409.26d. Silvicultural Examination and Prescription Handbook. R8 Amendment No. 2409.26d-93-1. | USDA Forest Service |

Table 19: Existing FSHR8 Vegetation codes

| **Code** | **Description** | **Management Type?** |
| --- | --- | --- |
| 2 | Red pine | Yes |
| 3 | White pine | Yes |
| 4 | White pine – hemlock | No |
| 5 | Hemlock | No |
| 6 | Fraser fir | No |
| 7 | Red spruce – frasier fir | Yes |
| 8 | Hemlock – hardwood | Yes |
| 9 | White pine – cove hardwood | Yes |
| 10 | White pine – upland hardwood | Yes |
| 11 | Easter red cedar – hardwood | No |
| 12 | Shortleaf pine – oak | Yes |
| 13 | Loblolly pine – hardwood | Yes |
| 14 | Slash pine – hardwood | Yes |
| 15 | Pitch pine – oak | Yes |
| 16 | Virginia pine – oak | Yes |
| 17 | Red spruce – northern hardwood | No |
| 18 | Pond pine – hardwood | No |
| 19 | Sand pine – hardwood | No |
| 20 | Table Mountain pine – hardwood | Yes |
| 21 | Longleaf pine | Yes |
| 22 | Slash pine | Yes |
| 23 | Pondcypress | Yes |
| 24 | Baldcypress | Yes |
| 25 | Yellow pine | Yes |
| 26 | Longleaf pine – hardwood | Yes |
| 27 | Longleaf pine – slash pine | No |
| 28 | Shortleaf pine – loblolly pine | No |
| 29 | Loblolly pine – longleaf pine | No |
| 30 | Longleaf pine – shortleaf pine | No |
| 31 | Loblolly pine | Yes |
| 32 | Shortleaf pine | Yes |
| 34 | Sand pine | Yes |
| 35 | Eastern red cedar | Yes |
| 36 | Pond pine | Yes |
| 37 | Spruce pine | No |
| 38 | Pitch pine | Yes |
| 39 | Table Mountain pine | Yes |
| 40 | Hardwood – pond pine | No |
| 41 | Cove hardwood – white pine – hemlock | Yes |
| 42 | Upland hardwoods – white pine | Yes |
| 43 | Oak – Eastern red cedar | No |
| 44 | Southern red oak – yellow pine | Yes |
| 45 | Chestnut oak – scarlet oak – yellow pine | Yes |
| 46 | Bottomland hardwood – yellow pine | Yes |
| 47 | White oak – black oak – yellow pine | Yes |
| 48 | Northern red oak – hickory – yellow pine | Yes |
| 49 | Bear oak – southern scrub oak – yellow pine | Yes |
| 50 | Yellow poplar | Yes |
| 51 | Post oak – black oak | Yes |
| 52 | Chestnut oak | Yes |
| 53 | White oak – northern red oak – hickory | Yes |
| 54 | White oak | Yes |
| 55 | Northern red oak | Yes |
| 56 | Yellow poplar – white oak – northern red oak | Yes |
| 57 | Scrub oak | Yes |
| 58 | Sweetgum – yellow poplar | Yes |
| 59 | Scarlet oak | Yes |
| 60 | Chestnut oak – scarlet oak | Yes |
| 61 | Swamp chestnut oak – cherrybark oak | Yes |
| 62 | Sweetgum – oak | Yes |
| 63 | Sugarberry – American elm – green ash | Yes |
| 64 | Laurel oak – willow oak | Yes |
| 65 | Overcup oak – water hickory | No |
| 66 | Atlantic white cedar | No |
| 67 | Baldcypress – water tupelo | Yes |
| 68 | Sweetbay – swamp tupelo – red maple | Yes |
| 69 | Beech – magnolia | Yes |
| 70 | Black cherry | Yes |
| 71 | Black ash – American elm – red maple | No |
| 72 | River birch – sycamore | Yes |
| 73 | Cottonwood | No |
| 74 | Willow | No |
| 75 | Sycamore – pecan – American elm | Yes |
| 76 | Silver maple – American elm | No |
| 77 | Oak hammock | Yes |
| 78 | American chestnut | No |
| 79 | Slash pine – cypress | No |
| 80 | Upland oak | No |
| 81 | Sugar maple – beech – yellow birch | Yes |
| 82 | Black walnut | No |
| 83 | Black birch | No |
| 84 | Chestnut oak – white oak – scarlet oak | No |
| 85 | White oak – black oak – hickory | No |
| 87 | Red maple | No |
| 88 | Black locust | No |
| 90 | Non-forest | No |
| 97 | Live oak | Yes |
| 98 | Undrained flatwoods | No |
| 99 | Brush species | No |
| 800 | Novaculite Glade (includes talus) | No |
| 801 | Cliff and Talus (sandstone, shale) | No |
| 802 | Glade and Barrens (sandstone, shale) | No |
| 803 | Calcareous Prairie | No |
| 804 | Seep/Spring | No |
| 805 | Montane Oak | No |
| 806 | Ozark Clacareous Glade and Barren (Ozark) | No |
| 807 | Sinkhole and Depression Pond (Ozark) | No |
| 808 | Clacareous Cliff and Talus (Ozark) | No |
| 809 | Prairie and Woodland (Ozark) | No |

The Existing Vegetation type code is a classification of the forest overstory cover type currently existing on the stand. These are codes are also used to identify management type. Existing Vegetation type is based on one or more species of trees that comprise the main crown canopy (i.e., the dominants and co-dominants). These codes generally conform to definitions in “Forest Cover Types of the United States and Canada,” Society of American Foresters (1980) with some notable exceptions. They are divided into four broad groups as follows:

* **Pine Types:** Stands in which 70 percent or more of the basal area of trees with dominant and co-dominant crowns are softwoods, the specific name represents the species comprising the plurality.
* **Pine-Hardwood Types:** Stands in which 51-69 percent of the basal area of trees with dominant and co-dominant crowns are softwood species. Use the type name associated with the softwood species comprising the plurality.
* **Hardwood-Pine Types:** Stands in which 51-69 percent of the basal area of trees with dominant and co-dominant crows are hardwoods. Use the type name associated with the hardwood species comprising the plurality.
* **Hardwood Types:** Stands in which 70 percent or more of the basal area of trees with dominant and co-dominant crowns are hardwoods. Use the type name associated with the hardwood species comprising the plurality.

The SAF cover type classification requires a stand to exceed 80 percent in one species to be considered pure as opposed to the 70 percent threshold used in the Region 8 classification. The SAF cover type classification considers all mixtures of pine and hardwood that have less than 80 percent stocking of one species group as pine hardwood types. The Region 8 approach divides the groups into Pine-Hardwood and Hardwood-Pine.

The percentage of softwood and hardwood in the Region 8 classification applies to the particular mixture of trees at any single sample point. This is not the same as, and should not be confused with intermingling of less-than-stand-size areas of pine type in a hardwood stand or of a hardwood type in a pine stand. These less-than-stand-size areas should be treated as pine inclusions in hardwood stands or hardwood inclusions in pine stands. In heterogeneous areas with neither type being of stand size, forest type should be assigned on the basis of the type occupying the plurality of the area. Such situations should not be assigned a pine-hardwood or hardwood-pine forest type unless individual plot classifications for a plurality of the area are a mixed type.

* **Management Types:** Existing Vegetation codes are used to identify management type. The management type classification reflects the vegetation type that should be produced on the site to best meet the goals and objectives of the Forest Plan. For areas classified as suitable for timber production and allocated to management prescriptions with timber production management emphasis, the management type is the vegetation type that optimizes the productive capability of the site to produce high quality material. These same criteria also apply to all other areas unless the Forest Plan requires occupying the site with another, less productive vegetation type, to meet some other resource goal or objective.

Assigning a Management Type code to a stand implies that you expect the Existing Vegetation type to be this code after the next regeneration. For example, 74 Willow is not an acceptable Management Type because we would not regenerate a stand and expect to see Willow as the resulting Existing Vegetation Type.

Note: CISC used four levels of Management Type. Those levels have been removed from use as of the transition to FSVeg. If this causes a problem for you, please let me know.

-David Belcher

## Appendix F: Potential Vegetation references

Region 8 does not support Potential Vegetation References.

## Appendix G: Potential Vegetation Codes

Region 8 does not support Potential Vegetation Codes.

## Appendix H: Fuel Photo References & Codes

Table 20: Fuel Photo References

| **Code** | **Reference** |
| --- | --- |
| 19 | Ottmar, Roger D. and R.E. Vihnanek. 2000. **Stereo Photo Series for Quantifying Natural Fuels. Volume VI: Longleaf Pine, Pocosin, and Marshgrass Types in the Southeast United States**. PMS 835. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 56 p. |
| 24 | Christine M. Lynch and L.J. Horton. 1983. **Photo Series for Quantifying Forest Residues in Loblolly Pine, Eastern White Pine, Pitch Pine and Virginia Pine**. USDA Forest Service, NA-FR-25. |
| 26 | Eric R. Scholl and Thomas A. Waldrop. 1999. **Photos for Estimating Fuel Loadings Before and After Prescribed Burning in the Upper Coastal Plain of the Southeast**. USDA Forest Service, SRS-26. |
| 29 | Bradford M. Sanders and David H. Van Lear. 1988. P**hotos for Estimating Residue Loadings Before and After Burning in Southern Appalachian Mixed Pine – Hardwood Clearcuts**. USDA Forest Service GTR SE-49. |
| 30 | Wade et. al. 1993. **Photo Series for Estimating Post-Hurricane Residues and Fire Behavior in Southern Pine**. 1993. USDA Forest Service GTR SE-82. |

### Fuel Photo Codes

Table 21: Fuel Photo Codes for Reference 19

| **Code** |
| --- |
| LLP01 |
| LLP02 |
| LLP03 |
| LLP04 |
| LLP05 |
| LLP06 |
| LLP07 |
| LLP08 |
| MG01 |
| MG02 |
| MG03 |
| MG04 |
| MG05 |
| MG06 |
| MG07 |
| MG08 |
| MG09 |
| PS01 |
| PS02 |
| PS03 |
| PS04 |
| PS05 |
| PS06 |
| PW01 |
| PW02 |

Table 22: Fuel Photo Codes for Reference 24

| **Code** |
| --- |
| 1-LL-2-N |
| 2-LL-2-H |
| 3-LL-3-N |
| 4-LL-2-H |
| 5-LL-1-P |
| 6-LL-3-H |
| 7-LL-3-H |
| 8-LL-3-N |
| 9-LL-3-H |
| 1-WP-3-N |
| 2-WP-2-P |
| 3-WP-3-N |
| 4-WP-3-H |
| 5-WP-3-H |
| 6-WP-2-H |
| 7-WP-3-N |
| 1-PP-1-N |
| 2-PP-2-N |
| 3-PP-1-N |
| 4-PP-1-N |
| 5-PP-2-N |
| 6-PP-2-N |
| 7-PP-3-H |
| 1-VP-2-N |
| 2-VP-2-N |
| 3-VP-3-N |
| 4-VP-2-N |

Table 23: Fuel Photo Codes for Reference 26

| **Code** |
| --- |
| FC1-PRE |
| FC1-POST |
| FC2-PRE |
| FC2-POST |
| FC3-PRE |
| FC3-POST |
| FC4-PRE |
| FC4-POST |
| FC5-PRE |
| FC5-POST |
| FC6-PRE |
| FC6-POST |
| FC7-PRE |
| FC7-POST |
| FC8-PRE |
| FC8-POST |

Table 24: Fuel Photo Codes for Reference 29

| **Code** |
| --- |
| 6A |
| 6B |
| 8A |
| 8B |
| 10A |
| 10B |
| 12A |
| 12B |
| 14A |
| 14B |
| 16A |
| 16B |
| 18A |
| 18B |
| 20A |
| 20B |

Table 25: Fuel Photo Codes for Reference 30

| **Code** |
| --- |
| 1A |
| 1C |
| 1D |
| 2A |
| 2C |
| 2D |
| 3B |
| 3D |

### Region 8 Land Class Codes

| **LandClass** | **Name** | **Suitable** | **Description** |
| --- | --- | --- | --- |
| **000** | **Un-Inventoried** | No | Land in Forest Service Ownership that has not been classified. Usually for new acquisitions or other lands for which no information is available |
| **100** | **Water Area** | No | Areas that are covered by water and not included in the more specific codes below |
| 110 | Natural Lake | No | A naturally occurring area of water of more than one are in size |
| 120 | Reservoir | No | A constructed area of water of more than one acre in size |
| 125 | Pond | No | A natural or construncted area of water of less than one acre in size |
| 130 | Estuary | No | An area where fresh water from a river mixes with salt water from the sea |
| 140 | River  | No | A flowing body of water in a well defined bed or channel. Wider than a stream |
| 150 | Stream | No | A flowing body of water in a well defined bed or channel. Narrower than a river. Most of the streams that we are used to seeing are components of stands and do not get mapped out separately with stand numbers of their own and thus would not be covered by this code. Use this code when a stream is large enough or important enough to be mapped separately as a stand by itself. |
| 160 | Wetlands | No | Areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. These areas are also referred to as swamps, marshes, bogs, and bays. |
| **200** | **Non-Forest Land** | No | Lands developed for non-forest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and power line/pipeline clearing of any width. (Forest land is defined as land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use). 219.3. Use this code for non-forest land not covered by more specific codes below. |
| 210 | Public Park, Cemetery | No | Land containing an officially designated public park or a cemetery |
| 220 | Utility R-O-W | No | Land containing easements or Right-of-way for utility lines |
| 230 | Road and Railroad R-O-W | No | Land occupied by road and/or railroad right-or-way |
| 240 | Special Use | No | Lands that rea under a special user permit |
| 250 | Wildlife Opening | No | Non-forest land used for wildlife purposes |
| 251 | Balds | No | High elevation heaths or grassy areas |
| 260 | Nursery | No | Nursery |
| 265 | Seed Orchard | No | Seed Orchard |
| 270 | Non Forest service | No | Lands within Forest Service boundary that do not belong to Forest Service. May be forested or non-forested. |
| 280 | Mine | No | Strip Mines, well sites, quarries, etc. |
| 290 | Military Use | No | Lands used by or formerly used by military. May contain unexploded ordinance at or near ground surface. May contain shrapnel in trees. |
| 300 | Reserved - Withdrawn | No | Withdrawn from timber production by an acto of Cngress, the Secretary of Agriculture, or the Chief of the Forest Service |
| 310 | Scenic Area | No | Officially designated scenic area |
| 320 | Historic Area | No | Officially designated historic area |
| 330 | Natural Area | No | Officially designated natural area. Includes research natural areas, RNAs |
| 340 | Geological/Archeological Area | No | Officially designated geological/archeological area |
| 350 | Wilderness Area  | No | Officially designated wilderness area |
| 351 | RCW in Wilderness – Active | No | Officially designated wilderness area with RCW currently active |
| 352 | RCW in Wilderness – in active | No | Officially designated wilderness area with RCW previously active |
| 360 | Wild and Scenic River | No | Officially designated wild and scenic river. Includes river corridor |
| 370 | Roadless Area | No | Officially designated roadless area |
| 400 | Deferred - Withdrawn | No | Deferred – withdrawn from timber production pending final action at which time it may be re-classified into the 300 series or some other land class |
| 410 | Scenic Area | No | Scenic area. Pending |
| 420 | Historic Area | No | Historic area. Pending |
| 430 | Natural Area | No | Natural area. Pending |
| 440 | Geological/Archeological Area | No | Geological/Archeological area. Pending |
| 450 | Wilderness Area | No | Wilderness area. Pending |
| 460 | Wild and Scenic River | No | Wild and Scenic River. Includes river corridor. Pending |
| 470 | Roadless Area | No | Roadless area. Pending |
| 500 | Standard Forest Land | Yes | Standard – timber production emphasis |
| 510 | Key Area for Wildlife, Fish, Rare Plants | Yes | A stand lying within an area having a timber production emphasis where wildlife, fish, and rare plants resources area a major management consideration |
| 511 | Contains key area for wildlife, Fish, rare Plants | Yes | Area of standard forest land which contains an inclusion where wildlife, fish, and rare plants resources area major management consideration. |
| 512 | Contains Threatened & endangered Species-Plants | Yes | Area of standard forest land which contains an inclusion where threatened & endangered plants resources are a major management consideration. |
| 513 | Contains Threatened & endangered Species-Animals | Yes | Area of standard forest land which contains an inclusion where threatened & endangered animals resources are a major management consideration. |
| 520 | Open woodland | Yes | Stocking levels are maintained below regional guidelines for fully stocked stands. Stands are open, park-like with emphasis on maintaining a strong herbaceous component. Percent crown closure from all woody vegetation is between 10% and 60% |
| 530 | Low Site Productivity | Yes | n/a |
| 540 | Steep Slopes | Yes | Steep slopes |
| 545 | Sensitive Soils | Yes | Sensitive soils |
| 550 | Needs R-O-W | Yes | Lands needing road access for implementation of management prescriptions |
| 560 | Needs Road  | Yes | Lands needing road construction for implementation of management prescriptions |
| 580 | Military Use | No | Lands used or formerly used by military. May contain unexploded ordinance at or near ground surface. May contain shrapnel in trees.  |
| 590 | RCW Forage for Active Cluster  | Yes | Stand designated as foraging habitat for active RCW cluster |
| 591 | RCW Foraging Stand for Recruitment Cluster | Yes | Stand designated as foraging habitat for RCW recruitment cluster. Note: recruitment clusters are provisioned with artificial cavities. |
| 592 | RCW Foraging Stand for Recruitment Stand | Yes | Stand designated as foraging habitat for RCW recruitment stand. Note: recruitment stands are not provisioned with artificial cavities. |
| 593 | RCW Foraging Stand for Inactive Cluster | Yes | Stand designated as foraging habitat for inactive RCW cluster |
| 594 | RCW Potential Recruitment | Yes | Stand that may be used for recruitment in the future |
| 600 | Special | Yes | Special – Timber production secondary to other resources |
| 620 | Sensitive Plants | Yes | Sensitive plants |
| 630 | Recreation Emphasis | Yes | Recreation emphasis |
| 640 | Visual Emphasis | Yes | Visual emphasis |
| 650 | Wildlife Emphasis | Yes | Wildlife emphasis |
| 660 | Water Emphasis | Yes | Water emphasis |
| 665 | Cultural Resource Emphasis | Yes | Cultural resource emphasis |
| 667 | Wildlife Preserve | Yes | Wildlife preserve |
| 670 | Special Study Area | Yes | Special study area |
| 671 | Growth and Yield Research Plot | Yes | Growth and yield research plot |
| 680 | Progeny Test Plantation | Yes | Progeny test plantation |
| 690 | Military Use | No | Lands used or formerly used by military. May contain unexploded ordinance at or near ground surface. May contain shrapnel in trees. |
| 700 | Lack of Technology | No | Technology is not available t ensure timber production from the land withut irreversible resource damage to soils, productivity, or watershed conditions. |
| 710 | Restocking Not Assured | No | There is not reasonable assurance that the land can be adequately restocked as provided in 219.27©(3). Adequate restocking means that the cut area will contain the minimum number, size, distribution, and species composition of regeneration as specified in the regional silvicultural guides for each forest type 5 years after harvest. |
| 720 | Irreversible Damage | No | Timber production would cause irreversible resource damage to soils, productivity, or watershed conditions. |
| 740 | Response Info Lacking | No | It is not known if timber production can be ensured without irreversible resource damage to soils, productivity, or watershed conditions. |
| 800 | Not Appropriate | No | Land coded in the 800’s series are designated as Not Appropriate for timber production by regional Forester’s decision in approving forest plans |
| 810 | Experimental Forest, Range or Watershed | No | Lands used for research and special study |
| 820 | MIN Level | No | Lands that are unsuitable due to access or existing landscape features. Lands that are difficult and/or exceedingly costly to manage. Minimally productive. If a treatment is applied then a number of mitigating measures must be implemented to protect the resources. Use this code if, when classifying a stand, you think “I would not tough this area with a 10 foot pole”, nothing but big trouble once disturbed, “Why would I want to?” |
| 821 | MIN Level - Steep Slopes | No | MIN level – steep slopes |
| 822 | MIN Level - Inadequate Markets  | No | MIN level – inadequate markets |
| 823 | MIN Level - Inaccessible ROW needed | No | MIN level – In accessible – ROW needed |
| 824 | MIN Level - Sensitive Soils  | No | MIN level – sensitive soils |
| 825 | MIN Level - Low Level Management | No | MIN level – low level management |
| 826 | MIN Level – Physical Barriers | No | MIN level – physical barriers |
| 827 | MIN Level - Road Costs Exceed Values | No | MIN level – road costs exceeds values |
| 828 | MIN Level – Riparian Area | No | MIN level – riparian area |
| 830 | Wildlife Emphasis | No | Wildlife emphasis |
| 832 | Threatened & Endangered Species – Plants | No | Unsuitable forest land with threatened & endangered plant resources |
| 833 | Threatened & Endangered Species – Animals | No | Unsuitable forest land with threatened & endangered animal resources |
| 840 | RCW Cluster Active | No | Area, at least 10acres in size, containing the aggregate of cavity trees + a 200’ buffer in an active cluster |
| 841 | RCW Cluster Inactive | No | Area, at least 10acres in size, containing the aggregate of cavity trees + a 200’ buffer in an inactive cluster |
| 842 | RCW Recruitment Stand | No | Area, at least 10 acres in size, designated for RCW recruitment that has not been provisioned with artificial cavities |
| 843 | RCW Replacement Stand | No | Area, at least 10 acres in size, designated to replace existing active RCW cluster. Sites should be adjacent to or within ¼ mile of active cluster it is replacing. Cavities are not present. |
| 844 | RCW Recruitment Cluster | No | Area, at least 10 acres in size, designated for RCW recruitment that has been provisioned with artificial cavities |
| 846 | Other Rare/Endangered Species | No | Area, ar least 10 acres in size, designated for conservation of rare/endangered species other than RCW |
| 848 | Designated Critical habitat | No | Area, at least 10 acres in size, legally designated as critical habitat. For aquatic designated crtical habitat, the adjacent riparian should also be coded as critical habitat. |
| 850 | Developed Recreation Site | No | Developed recreation site |
| 851 | Un-Developed Recreation Site | No | Un-developed recreation site |
| 852 | Appalachian Trail | No | Appalachian Trail corridor |
| 853 | Other National Recreation Trail | No | Other national Recreation Trail corridor |
| 860 | Administrative Site | No | Land occupied by Forest Service structures such as District offices, work centers, etc. |
| 861 | Undeveloped Administrative Site | No | Land potentially occupied by Forest Service structures such as District offices, work centers, etc. |
| 862 | Summer Home Site | No | Site contains a residential structure owned by Forest Service but rented or leased to public for residential or recreational purposes |
| 870 | Nursery | No | Lands dedicated to production of tree seedlings |
| 871 | Seed Orchards | No | Lands dedicated to the production and collection of tree seed |
| 880 | RARE II Lands under study  | No | Lands removed from the suitable timber base pending evaluation with the roadless Area Review and Evaluation legislated program |
| 890 | Military Use | No | Lands used or formerly used by military. May contain unexploded ordinance at or near ground surface. May contain shrapnel in trees. |
| 891 | Contaminated | No | Lands containing hazardous materials (chemical, nuclear, etc.) |
| 900 | Unproductive | No | Forested land that is incapable of producing a minimum level of growth where the minimum level is set in the forest plan |

## Appendix I: Fixed Radius Plot

A fixed radius plot is used to sample trees that are less than the specified breakpoint diameter. These sample trees are determined to be “in” or “out” at ground line. If the measured distance from plot center to the central axis of the tree at ground line is equal to or less than the fixed plot radius the tree is tallied as a sample tree. If this distance is greater than the fixed plot radius, the tree is not tallied.

Figure 1: Trees “in” and “out” of fixed radius plot



On level ground, the fixed plot radius is determined by holding the measuring tape or pole in a horizontal position from plot center to the central axis of the sample tree. On slopes greater than 9 percent, if a measuring tape or pole cannot be horizontally from plot center to the central axis of the sample tree, the fixed plot radius is corrected for the slope percent by using one of the following methods.

### Method 1

Correct the fixed plot radius for slope percent using the “Circular Plot Radii Corrected for Slope” table and then measuring distances parallel to the ground line. This method always results in a circular plot on the slope. Example – 1/300 acre fixed plot on 50 percent slope. Corrected fixed plot radius is 7.2 feet.

Figure 2: Correcting the fixed plot radius for slope percent



Table 26: Circular Plot Radii Corrected for Slope; plot size in acres

| **Slope %** | **1/300** | **1/100** | **1/50** | **1/20** | **1/10** | **1/5** |
| --- | --- | --- | --- | --- | --- | --- |
| 0-9 | 6.8 | 11.8 | 16.7 | 26.3 | 37.2 | 52.7 |
| 10-17 | 6.8 | 11.8 | 16.7 | 26.5 | 37.4 | 52.9 |
| 18-22 | 6.9 | 11.9 | 16.8 | 26.6 | 37.6 | 53.2 |
| 23-26 | 6.9 | 12.0 | 16.9 | 26.7 | 37.8 | 53.4 |
| 27-30 | 6.9 | 12.0 | 17.0 | 26.9 | 38.0 | 53.7 |
| 31-33 | 7.0 | 12.1 | 17.1 | 27.0 | 38.2 | 54.0 |
| 34-36 | 7.0 | 12.1 | 17.1 | 27.1 | 38.3 | 54.2 |
| 37-39 | 7.0 | 12.2 | 17.2 | 27.2 | 38.5 | 54.5 |
| 40-42 | 7.1 | 12.2 | 17.3 | 27.4 | 38.7 | 54.7 |
| 43-44 | 7.1 | 12.3 | 17.4 | 27.5 | 38.9 | 55.0 |
| 45-47 | 7.1 | 12.3 | 17.5 | 27.6 | 39.1 | 55.2 |
| 48-49 | 7.2 | 12.4 | 17.5 | 27.7 | 39.2 | 55.5 |
| 50-51 | 7.2 | 12.5 | 17.6 | 27.9 | 39.4 | 55.7 |
| 52-53 | 7.2 | 12.5 | 17.7 | 28.0 | 39.6 | 56.0 |
| 54-55 | 7.3 | 12.6 | 17.8 | 28.1 | 39.8 | 56.2 |
| 56-57 | 7.3 | 12.6 | 17.9 | 28.2 | 39.9 | 56.5 |
| 58-59 | 7.3 | 12.7 | 17.9 | 28.4 | 40.1 | 56.7 |
| 60-61 | 7.4 | 12.7 | 18.0 | 28.5 | 40.3 | 57.0 |
| 62-63 | 7.4 | 12.8 | 18.1 | 28.6 | 40.4 | 57.2 |
| 64-65 | 7.4 | 12.8 | 18.2 | 28.7 | 40.6 | 57.4 |
| 66-67 | 7.4 | 12.9 | 18.2 | 28.8 | 40.8 | 57.7 |
| 68-69 | 7.5 | 13.0 | 18.3 | 29.0 | 41.0 | 57.9 |
| 70 | 7.5 | 13.0 | 18.4 | 29.1 | 41.1 | 58.2 |
| 71-72 | 7.5 | 13.1 | 18.5 | 29.2 | 41.3 | 58.4 |
| 73-74 | 7.6 | 13.1 | 18.5 | 29.3 | 41.5 | 58.6 |
| 75 | 7.6 | 13.2 | 18.6 | 29.4 | 41.6 | 58.7 |
| 76-77 | 7.6 | 13.2 | 18.7 | 29.6 | 41.8 | 59.1 |
| 78-79 | 7.7 | 13.3 | 18.8 | 29.7 | 42.0 | 59.3 |
| 80 | 7.7 | 13.3 | 18.8 | 29.8 | 42.1 | 59.6 |
| 81-82 | 7.7 | 13.4 | 18.9 | 29.9 | 42.3 | 59.8 |
| 83 | 7.8 | 13.4 | 19.0 | 30.0 | 42.5 | 60.0 |
| 84-85 | 7.8 | 13.5 | 19.1 | 30.1 | 42.6 | 60.3 |
| 86 | 7.8 | 13.5 | 19.1 | 30.3 | 42.8 | 60.5 |
| 87-88 | 7.8 | 13.6 | 19.2 | 30.4 | 42.9 | 60.7 |
| 89 | 7.9 | 13.6 | 19.3 | 30.5 | 43.1 | 61.0 |
| 90-91 | 7.9 | 13.7 | 19.3 | 30.6 | 43.3 | 61.2 |
| 92 | 7.9 | 13.7 | 19.4 | 30.7 | 43.4 | 61.4 |
| 93-94 | 8.0 | 13.8 | 19.5 | 30.8 | 43.6 | 61.6 |
| 95 | 8.0 | 13.8 | 19.6 | 30.9 | 43.7 | 61.9 |
| 96-97 | 8.0 | 13.9 | 19.6 | 31.0 | 43.9 | 62.1 |
| 98 | 8.0 | 13.9 | 19.7 | 31.2 | 44.1 | 62.3 |
| 99-100 | 8.1 | 14.0 | 19.8 | 31.3 | 44.2 | 62.5 |
| 101 | 8.1 | 14.0 | 19.8 | 31.4 | 44.4 | 62.8 |
| 102 | 8.1 | 14.1 | 19.9 | 31.5 | 44.5 | 63.0 |
| 103-104 | 8.2 | 14.1 | 20.0 | 31.6 | 44.7 | 63.2 |
| 105 | 8.2 | 14.2 | 20.1 | 31.7 | 44.8 | 63.4 |
| 106-107 | 8.2 | 14.2 | 20.1 | 31.8 | 45.0 | 63.6 |
| 108 | 8.2 | 14.3 | 20.2 | 31.9 | 45.1 | 63.8 |
| 109 | 8.3 | 14.3 | 20.3 | 32.0 | 45.3 | 64.1 |
| 110-111 | 8.3 | 14.4 | 20.3 | 32.1 | 45.5 | 64.3 |
| 112 | 8.3 | 14.4 | 20.4 | 32.2 | 45.6 | 64.5 |
| 113 | 8.4 | 14.5 | 20.5 | 32.4 | 45.8 | 64.7 |
| 114-115 | 8.4 | 14.5 | 20.5 | 32.5 | 45.9 | 64.9 |
| 116 | 8.4 | 14.6 | 20.6 | 32.6 | 46.1 | 65.1 |
| 117 | 8.4 | 14.6 | 20.7 | 32.7 | 46.2 | 65.3 |
| 118-119 | 8.5 | 14.7 | 20.7 | 32.8 | 46.4 | 65.6 |
| 120 | 8.5 | 14.7 | 20.8 | 32.9 | 46.5 | 65.8 |
| 121 | 8.5 | 14.8 | 20.9 | 33.0 | 46.7 | 66.0 |
| 122 | 8.5 | 14.8 | 20.9 | 33.1 | 46.8 | 66.2 |
| 123-124 | 8.6 | 14.8 | 21.0 | 33.2 | 47.0 | 66.4 |
| 125 | 8.6 | 14.9 | 21.1 | 33.3 | 47.1 | 66.6 |
| 130 | 8.7 | 15.1 | 21.3 | 33.7 | 47.7 | 67.4 |
| 135 | 8.8 | 15.3 | 21.6 | 34.1 | 48.3 | 68.3 |
| 140 | 8.9 | 15.4 | 21.8 | 34.5 | 48.8 | 69.1 |
| 145 | 9.0 | 15.6 | 22.1 | 34.9 | 49.4 | 69.9 |
| 150 | 9.1 | 15.8 | 22.3 | 35.3 | 50.0 | 70.0 |

### Method 2

Determine the slope limiting distance to borderline trees by using the “Slope Correction Table” (the slope being corrected is the slope from plot center to the tree, not the overall plot slope). Measure the distance parallel to the ground line to the borderline tree. This method always results in an oval on the slope. Following is a list of fixed plot sizes and the specific radius for each.

Table 27: Method 2 plot size/radius slope

| **Plot Size** | **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 |
| 1/20 | 26.3 feet |
| 1/10 | 37.2 feet |
| 1/5 | 52.7 feet |
| 1/4 | 58.9 feet |
| 1/3 | 68.0 feet |
| 1/2 | 83.3 feet |
| 1 | 117.8 feet |

To determine the slope limiting distance, multiply the plot radius for the appropriate plot size by the appropriate slope correction factor.

#### Example 1

1/300 acre fixed plot with a borderline tree on a 45 percent slope. A 1/300-acre plot equals a 6.8-foot radius and the slope correction factor for a 45 percent slope is 1.10. 6.8 x 1.10 = 7.48; thus, a tree on a 1/300 acre fixed plot at a 45 percent slope can be 7.5 feet from plot center.

#### Example 2

The same plot has another borderline tree on a 25 percent slope. The slope correction factor for a 25 percent slope is 1.03. 6.8 x 1.03 = 7.0; thus, a tree on a 1/300 acre fixed plot at a 25 percent slope can be 7.0 feet from plot center.

Figure 3: Plot size radius slope



Table 28: Slope Correction Table

| **Percent of Slope** | **Degree of Slope** | **Correction Factor** |
| --- | --- | --- |
| 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 |
| 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 |
| 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 |
| 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 J: Variable Radius Plot

### Introduction

In or our determination is made at the DBH or DRC of each tree. For information on the theory and mathematics of variable plot cruising, and formulas for determining the plot radius factor for any given BAF, the reader is referred to **Log Scaling and Timber Cruising**, 1973, J.R. Dilworth. OSU Book Stores, Inc., Corvallis, Oregon.

The experienced field person using a wedge prism, angle gauge, or relaskop can quickly tell in which case trees are “in” or “out” on the variable plot. However, 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 deals with the procedures needed to ascertain if these borderline trees should be tallied: the mechanics of using plot radius tables in the field, the associated measurements, and corrections of variable plot radii for slope.

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

In variable plot sampling, the plot radius varies according to the DBH or DRC of each tree. To determine whether a tree is to be sampled requires measurement of its DBH or DRC and its distance from plot center. Table 29, Table 30, Table 31, Table 32, Table 33, Table 34, and Table 35 display limiting distances (the maximum horizontal distance from plot center to the face of the tree at breast height for a tree to be considered “in”) for various tree diameters and commonly used basal area factors (BAF).

Once the DBH or DRC of the borderline tree is taken, the limiting distance is found by entering the table appropriate for the specified BAF. This limiting distance is then compared to the horizontal distance between plot center and the nearest **face of the tree** at breast height. If the measured horizontal distance from plot center is less than or equal to the limiting distance from the table, the tree in question is “in” and is tallied as a sample tree. However, if measured horizontal distance from plot center is greater than the limiting distance, then the tree in question is “out” and is not tallied.

1. Measure the diameter to the nearest tenth of an inch
2. Measure the percent slope from the face of the tree at DBH or DRC to plot center

**If the slope is less than ten percent** look up limiting distance in Tables 1 through 5 or use the BAF correction factors listed in Table 35 below.

Table 29: BAF correction factors

| **Type** | **Correction Factors** |
| --- | --- |
| BAF | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 60 |
| Plot Radius Factor\* | 27.08 | 2.203 | 1.902 | 1.697 | 1.546 | 1.428 | 1.333 | 1.188 | 1.081 |

\* This is a corrected plot radius factor, corrected for determining the limiting distance to the face of the tree. A standard plot radius factor was 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 (0.041666) from the standard plot radius factor.

**Example:**

BAF = 40; DBH = 20.9 inches; Slope = 5%

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

1. **If the slope is greater than ten percent**, first determine the slope correction factor. The slope correction factor and the slope corrected plot radius factor can be obtained by using the formula below or by referring to Table 34. Then, multiply the slope correction factor by the plot radius factor identified in step #3 above to obtain the slope corrected plot radius factor. Finally, multiply the slope corrected plot radius factor by the diameter to obtain the limiting distance.

**Example:**

BAF = 40; DBH = 20.9 inches; Slope = 20%

Slope Correction Factor = SQR (1 + (slope/100)2) = SQR (1 + (20/100)2) = 1.0198

Slope Corrected Plot Radius Factor = Slope Correction Factor \* Plot Radius Factor = 1.0198 \* 1.333 = 1.359

Limiting Distance = Slope Corrected Plot Radius Factor \* DBH = 1.359 \* 20.9 = 28.4 feet

1. Measure the distance from plot center to the face of the tree, nearest plot center, at DBH or DRC. Both the slope measurement and distance measurement must be taken at plot center. If the measured distance is less than the limiting distance, the tree is “in.”

Figure 4: Determining limiting distance on a slope



**Example:**

BAF = 40; DBH = 15.0; Slope = 50%; Slope Distance = 21.0 feet

Referring to Table 34, the Combined Factor for a slope of 50% with a 4- BAF is 1.490.

Limiting Distance = DBH \* Combined Factor = 15.0 \* 1.490 = 22.35

Since 21.0 is less than or equal to the limiting distance of 22.35 feet, the tree is “in” and is tallied as a sample tree.

#### Measuring “In” or “Out” Down Trees

Down trees are “in” or “out” of the variable plot radius based on where the DBH or DRC now lies, not on where the tree once stood. The distance measurement is taken from plot center to the nearest face of the tree at breast height.

Table 30: BAF 10 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

| **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 | 38.5 | 38.7 | 39.0 | 39.3 | 39.5 | 39.8 | 40.1 | 40.3 |
| 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 | 57.1 | 57.4 | 57.7 | 58.0 | 58.2 | 58.5 | 58.8 | 59.0 | 59.3 |
| 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 | 63.1 | 63.4 | 63.6 | 63.9 | 64.2 | 64.5 | 64.7 |
| 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 | 78.00 | 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 | 120.2 | 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 14.3 \* 2.708 = 38.

Table 31: BAF 20 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

| **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 | 16.8 | 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 | 6.0 | 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 14.3 \* 1.903 = 27.

Table 32: BAF 30 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

| **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 | 40.00 |
| 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 | 64.3 | 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 14.3 \* 1.546 = 22.

Table 33: BAF 40 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

| **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 | 34.8 | 34.9 | 35.1 | 35.2 | 35.3 | 35.5 | 35.6 | 35.7 | 35.9 |
| 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. | 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 | 66.9 | 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 14.3 \* 1.333 = 19.1 feet.

Table 34: BAF 60 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

| **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 | 16.7 | 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 | 35.7 | 35.8 | 35.9 | 36.0 | 36.1 | 36.2 | 36.3 | 36.4 | 36.5 | 36.6 |
| 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 14.3 \* 10.81 = 15.5 feet.

Table 35: Limiting Distances to Face of Tree and Slope Correction Factors for Various Basal Area Factors

This table provides an expanded list of slope correction factors to the face of the tree for use with various basal area factors. To use the table, measure the slope and distance from plot-center to the face of the tree at DBH. To obtain the corrected limiting distance to a tree, multiply the tree’s DBH by the “combined factor” shown under the appropriate BAF heading.

| **Slope** | **Factor** | **5 BAF** | **10 BAF** | **15 BAF** | **20 BAF** | **30 BF** | **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 | 3.489 | 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 | 2.856 | 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 | 1.341 |
| 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 |
| 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 | 4.421 |
| 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 | 2135 | 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 |
| 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 | 1.875 |
| 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 | 2.876 | 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 |
| 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 | 6.370 | 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 |
| 149 | 1.79446 | 6.903 | 4.859 | 3.953 | 3.413 | 2.774 | 2.392 |

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

### Damage Categories

Detailed descriptions and examples of the content in these tables is available using the Insect & Disease Codes links on the [FSVeg Documentation web page](http://fsweb.nris.fs.fed.us/products/FSVeg/documentation.shtml).

Table 36: Damage category codes

| **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 |
| 40 | Animal Damage, Source Unknown |
| 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 Agents

Detailed descriptions and examples of the content in these tables is available using the Insect & Disease Codes links on the [FSVeg Documentation web page](http://fsweb.nris.fs.fed.us/products/FSVeg/documentation.shtml).

Table 37: Damage agent codes

| **Category** | **Agent** | **Common Name** | **Scientific Name** |
| --- | --- | --- | --- |
| **10** | **000** | **General insects** | **n/a** |
| 10 | 001 | Thrips | n/a |
| 10 | 002 | Tip moth | n/a |
| 10 | 003 | Wasp | n/a |
| 10 | 007 | Clerid beetle | Cleridae |
| 10 | 008 | Weevil | Curculionidae |
| 10 | 011 | Ant | Formicidae |
| 10 | 017 | Bagworm moth | Psychidae |
| 10 | 019 | Scarab | Scarabaeidae |
| 10 | 023 | Wood wasps | Siricidae spp. |
| **11** | **000** | **Bark beetles** | **n/a** |
| 11 | 001 | Roundheaded pine beetle | Dendroctonus adjunctus |
| 11 | 002 | Western pine beetle | Dendroctonus brevicomis |
| 11 | 004 | Jeffrey pine beetle | Dendroctonus jeffreyi |
| 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 | 015 | Western balsam bark beetle | Dryocoetes confuses |
| 11 | 016 | Unknown | Dryocoetes sechelti |
| 11 | 019 | Pinon ips | Ips confuses |
| 11 | 021 | Sixspined ips | Ips calligraphus |
| 11 | 022 | Emarginated ips | Ips emarginatus |
| 11 | 025 | Arizona five-spined ips | Ips lecontei |
| 11 | 029 | Pine engraver | Ips pini |
| 11 | 030 | Ips engraver beetles | Ips spp/ |
| 11 | 031 | Unknown | Ips tridens |
| 11 | 032 | Western ash bark beetle | Leperisinus californicus |
| 11 | 035 | Cedar bark beetle | Phloeosinus 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 | Four-eyed spruce beetle | Polygraphus rufipennis |
| 11 | 041 | Fir root bark beetle | Pseudohylesinum granulates |
| 11 | 043 | Douglas-fir pole beetle | Pseudohylesinus nebulosus |
| 11 | 045 | Small European elm bark beetle | Scolytus multistriatus |
| 11 | 046 | Spruce engraver | Scolytus piceae |
| 11 | 048 | True fir bark beetle | Scolytus spp. |
| 11 | 049 | Douglas-fir engraver | Scolytus unispinosus |
| 11 | 050 | Fir engraver | Scolytus ventralis |
| 11 | 055 | Spruce ips | Ips pilifrons |
| 11 | 056 | Mexican pine beetle | Dendroctonus mexicanus |
| **12** | **000** | **Defoliators** | **n/a** |
| 12 | 001 | Casebearer | n/a |
| 12 | 002 | Leaftier | n/a |
| 12 | 003 | Looper | n/a |
| 12 | 004 | Needleminer | n/a |
| 12 | 005 | Sawfly | n/a |
| 12 | 006 | Skeletonizer | n/a |
| 12 | 009 | Webworm | n/a |
| 12 | 011 | Western blackheaded budworm | Acleris gloverana |
| 12 | 013 | Whitefly | Aleyrodoidae |
| 12 | 014 | Fall cankerworm | Alsophila pometaria |
| 12 | 016 | Mountain mahogany looper | Anacamptodes clivinaria profanata |
| 12 | 020 | Western larch sawfly | Anoplonyx occidens |
| 12 | 023 | Boxelder defoliator | Archips negundanus |
| 12 | 024 | Oak leafroller | Archips semiferana |
| 12 | 025 | Birch sawfly | Arge pectoralis |
| 12 | 033 | Boxelder leafroller | Caloptilia negundella |
| 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 | 047 | Larch casebearer | Coleophora laricella |
| 12 | 049 | Lodgepole needleminer | Coleotechnites milleri |
| 12 | 050 | Ponderosa needleminer | Coleotechnites spp. |
| 12 | 052 | Pandora moth | Coloradia Pandora |
| 12 | 056 | Dusky birch sawfly | Croesus latitarus |
| 12 | 060 | Spruce coneworm | Dioryctria reniculelloides |
| 12 | 066 | White fir needleminer | Epinotia meritana |
| 12 | 069 | Pine needleminer | Exoteleia pinifoliella |
| 12 | 072 | Geometrid moth | Geometridae |
| 12 | 073 | Leafblotch miner | Gracillariidae |
| 12 | 074 | Spotted tussock moth | Halisidota maculate |
| 12 | 077 | Brown day moth | Hemileuca eglanterina |
| 12 | 082 | Fall webworm | Hyphantria cunea |
| 12 | 084 | Unknown | Lambdina punctate |
| 12 | 087 | Willow leafblotch miner | Lithocolletis spp. |
| 12 | 089 | Gypsy moth | Lymantria dispar |
| 12 | 094 | Western tent caterpillar | Malacosoma californicum |
| 12 | 096 | Forest tent caterpillar | Malacosoma disstria |
| 12 | 099 | Blister beetle | Meloidae |
| 12 | 116 | Pine butterfly | Neophasia menapia |
| 12 | 121 | Rusty tussock moth | Orgyia antiqua |
| 12 | 123 | Douglas-fir tussock moth | Orgyia pseudotsugata |
| 12 | 124 | Western tussock moth | Orgyia vetusta |
| 12 | 125 | Spring cankerworm | Paleacrita vernata |
| 12 | 128 | Pine tussock moth | Parorygia grisefacta |
| 12 | 135 | Aspen leafminer | Phyllocnistis populiella |
| 12 | 139 | Larch sawfly | Pristiphora erichsonii |
| 12 | 140 | Mountain-ash sawfly | Pristiphora geniculate |
| 12 | 141 | Elm leaf beetle | Prrhalta luetola |
| 12 | 143 | Giant silkworm moth | Saturniidae |
| 12 | 144 | Redhumped caterpillar | Schizura concinna |
| 12 | 150 | Spruce needleminer (west) | Taniva albolineana |
| 12 | 155 | Leafroller/seed moth | Torticidae |
| 12 | 156 | Willow defoliation | Tortricidae |
| 12 | 160 | Pine needle sheathminer | Zelleria haimbachi |
| 12 | 178 | Western oak looper | Lambdina discellaria somniaria |
| 12 | 181 | Tent Ceterpillar | Malacosoma spp. |
| 12 | 190 | Hickory tussock moth | Halisidota caryae |
| 12 | 191 | Pin oak sawfly | Caliroa lineata |
| 12 | 192 | Palmerworm | Dichomeris ligulella |
| 12 | 193 | Pitch pine looper | Lambdina athasaria pellucidaria |
| 12 | 194 | Red pine sawfly | Neodiprion annulus annulus |
| 12 | 195 | Pine tip moth | Argyrotaenia pinatubana |
| 12 | 196 | Baldcypress leafroller | Archips goyerana |
| 12 | 197 | Winter moth | Operophtera |
| 12 | 198 | Basswood thrip | Neohydatothrips |
| 12 | 199 | Noctuid moth | Xylomyges simplex (walker) |
| 12 | 200 | Pyralid moth | Palpita magniferalis |
| **13** | **000** | **Chewing insects** | **n/a** |
| 13 | 001 | Grasshopper | n/a |
| 13 | 006 | Cicadas | Cicadidae |
| 13 | 008 | Cutworms | Euxoa excellens |
| 13 | 021 | Ponderosa pine tip moth | Rhyacionia zozana |
| 13 | 022 | Pine needle weevil | Scythropus spp. |
| 13 | 030 | Adana tip moth | Rhyacionia adana |
| **14** | **000** | **Sucking insects** | **n/a** |
| 14 | 001 | Scale insect | n/a |
| 14 | 002 | Western larch wooly aphid | Adelges oregonensis |
| 14 | 003 | Balsam woolly adelgid | Adelges piceae |
| 14 | 006 | Aphid | Aphididae |
| 14 | 008 | Western pine spittlebug | Aphrophora permutata |
| 14 | 012 | Pine needle scale | Chionaspis pinifoliae |
| 14 | 014 | Giant conifer aphid | Cinara spp. |
| 14 | 017 | Spruce aphid | Elatobium anetinum |
| 14 | 018 | Woolly apple aphid | Eriosoma lanigerum |
| 14 | 024 | Honeysuckle aphid | Hyadaphis tataricae |
| 14 | 026 | Lecanium scale | Lecanium spp. |
| 14 | 028 | Oystershell scale | Lepidosaphes ulmi |
| 14 | 029 | Pinyon needle scale | Matsucoccus acalyptus |
| 14 | 035 | Treehoppers | Membracidae |
| 14 | 039 | Black pineleaf scale | Nuculaspis California |
| 14 | 040 | Spruce spider mite | Oligonychus ununquis |
| 14 | 043 | Maple aphid | Periphyllus spp. |
| 14 | 050 | Mealybug | Pseudococcidae |
| 14 | 054 | Spruce mealybug | Puto sandini |
| 14 | 069 | Elm scurfy scale | Chionaspis Americana |
| **15** | **000** | **Boring insects** | **n/a** |
| 15 | 001 | Shoot borer | n/a |
| 15 | 002 | Termite | n/a |
| 15 | 003 | Ponderosa pine bark borer | Acanthocinus princeps |
| 15 | 004 | Bronze birch borer | Agrilus anxius |
| 15 | 006 | Bronze poplar borer | Agrilus 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 | 013 | Roundheaded borer | Cermbycidae |
| 15 | 018 | Carpenterworm moth | Cossidae |
| 15 | 019 | Poplar and willow borer | Cryptorphynchus lapathi |
| 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 | 035 | Powderpost beetle | Lyctidae |
| 15 | 039 | Locust borer | Megacycllene robiniae |
| 15 | 041 | Flatheaded fir borer | Melanophila drummondi |
| 15 | 042 | Whitespotted sawyer | Monochamus scutellatus |
| 15 | 044 | Western ash borer | Neoclytus conjunctus |
| 15 | 050 | White pine weevil | Pissodes radiatae |
| 15 | 051 | Lodgepole terminal weevil | Pissodes terminalis |
| 15 | 052 | Ambrosia beetles | Platypus spp. |
| 15 | 057 | Lilac borer | Podosesia syringae |
| 15 | 060 | Western subterranean termite | Reticulitermes Hesperus |
| 15 | 064 | Western pine tip moth | Rhyacionia bushnelli |
| 15 | 068 | Poplar borer | Saperda calcarata |
| 15 | 070 | Saperda shoot borer | Saperda spp. |
| 15 | 071 | Clearwing moths | Sesiidae |
| 15 | 073 | Roundheaded fir borer | Tetropium abietis |
| 15 | 076 | Douglas-fir pitch moth | Vespamima novaroensis |
| 15 | 077 | Sequoia pitch moth | Vespamima sequoia |
| 15 | 087 | Emerald ash borer | Agrilus planipennis |
| **16** | **000** | **Seed/Cone/Flower/Fruit Insects** | **n/a** |
| 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 oregonesis |
| 16 | 015 | Fir coneworm | Dioryctria abietivorella |
| 16 | 017 | Pine cone worm | Dioryctria merkeli |
| 16 | 019 | Ponderosa twig moth | Dioryctria ponderosae |
| 16 | 020 | Unknown | 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 | 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 | 042 | Coneworm | Phycitidae |
| 16 | 043 | Harvester ants | Pogonomyrmex spp. |
| 16 | 049 | Prairie tent caterpillar | Malacosoma lutescens |
| 16 | 050 | Jack pine tip beetle | Conophthorus banksianae |
| **17** | **000** | **Gallmarker insects** | **n/a** |
| 17 | 003 | Cooley spruce gall adelgid | Adelges cooleyi |
| 17 | 007 | Douglas-fir needle gall midge | Contarinia pseudotsugae |
| 17 | 010 | Hackberry nipplegall maker | Pachypsylla celtidismamma |
| 17 | 013 | Gall aphid | Phylloxeridae |
| 17 | 018 | Gouty pitch midge | Cedidomyia piniinopsis |
| 17 | 019 | Spider mites | Oligonychus spp. |
| **18** | **000** | **Insect predators** | **n/a** |
| 18 | 001 | Lacewing | n/a |
| 18 | 002 | Blackbellied clerid | Enoclerus lecontei |
| 18 | 003 | Redbellied clerid | Enoclerus sphegeus |
| 18 | 004 | Unknown | Formica rufa |
| 18 | 005 | Western yellowjacket | Vespula pennsylvanica |
| **19** | **000** | **General diseases** | **n/a** |
| **20** | **000** | **Biotic damage** | **n/a** |
| 20 | 001 | Damping off | n/a |
| 20 | 002 | Gray mold | Botrytis cinerea |
| **21** | **000** | **Root/butt diseases** | **n/a** |
| 21 | 001 | Armillaria root disease | Amillaria spp. |
| 21 | 004 | Brown crumbly rot | Fomitopsis pinicola |
| 21 | 007 | White mottled rot | Ganoderma applanatum |
| 21 | 008 | Ganoderma rot of hardwoods | Ganoderma lucidum |
| 21 | 009 | Ganoderma rot of conifers | Ganoderma tsugae |
| 21 | 010 | Annosus root disease | Heterobasidian annosum |
| 21 | 012 | Tomentosus root disease | Inonotus tomentosus |
| 21 | 013 | Charcoal root rot | Macrophomina phaseolina |
| 21 | 014 | Black stain root disease | Ophiostoma wageneri |
| 21 | 015 | Schweinitzii butt rot | Phaeolus schweinitzii |
| 21 | 018 | Phytophthora root rot | Phytophthora cinnamomi |
| 21 | 022 | Pythium root rot | Pythium spp. |
| 21 | 024 | Crown gall | Agrobacterium timefaciens |
| 21 | 027 | Brown cubical rot | Laetiporus sulphureus |
| **22** | **000** | **Stem decays/cankers** | **n/a** |
| 22 | 006 | Black knot of cherry | Apiosporina morbosa |
| 22 | 007 | Atropellis canker | Atropellis piniphila |
| 22 | 012 | Black canker of aspen | Ceratocystis fimbriata |
| 22 | 025 | Cryptosphaeria canker of aspen | Cryptosphaeria populina |
| 22 | 026 | Cytospora canker of fir | Cytospora abietis |
| 22 | 028 | Rust-red stringy rot | Echinodontium tinctorium |
| 22 | 029 | Sooty-bark canker | Encoelia pruinosa |
| 22 | 034 | Scleroderris canker | Gremmeniella abietina |
| 22 | 035 | Amelanchier rust | Gymnosporangium harknessianum |
| 22 | 036 | Cedar apple rust | Gymnosporangium juniper-virginianae |
| 22 | 038 | Hypoxylon canker of aspen | Hypoxylon mammatum |
| 22 | 047 | Red ring rot | Phellinus pini |
| 22 | 048 | Aspen trunk rot | Phellinus tremulae |
| 22 | 057 | Cytospora canker of aspen | Cytospora chrysosperma |
| 22 | 058 | Dothichiza canker | Dothichiza populae |
| 22 | 059 | Red belt fungus | Fomitopsis pinicola |
| 22 | 060 | Leucocytospora canker of spruce | Leucocytospora kunzei |
| 22 | 061 | Sooty bark canker | Phibalis singular |
| 22 | 064 | Tinder fungus | Fomes formntarius |
| 22 | 066 | Pinyon black stain | Leptographium wagnerii |
| 22 | 068 | False tinder fungus | Phellinus igniarius |
| 22 | 071 | Oyster mushroom | Pleurotus ostreatus |
| 22 | 074 | Cedar brown pocket rot | Poria serceomollis |
| 22 | 075 | Lachnellula canker | Lachnellula flavovirens |
| 22 | 076 | Strumella canker | Strumella coryneoidea |
| 22 | 077 | Phomopsis blight | Phomopsis juniperovora |
| 22 | 078 | Fusarium canker of yellow poplar | Fusarium solani |
| 22 | 079 | Sterile conk of maple and beech | Inonotus glomeratus |
| 22 | 080 | Canker of spruce | Aleurodiscus spp. |
| 22 | 081 | Birch conk | Piptoporus betulinusai |
| 22 | 082 | Canker | Discocainia treleasei |
| **23** | **000** | **Parasitic** | **Epiphytic plants** |
| 23 | 005 | White fir dwarf mistletoe | Arceuthobium abietinum f. sp. Concoloris |
| 23 | 006 | Lodgepole pine dwarf mistletoe | Arceuthobium americanum |
| 23 | 008 | Western dwarf mistletoe | Arceuthobium compylopodum |
| 23 | 009 | Limber pine dwarf mistletoe | Arceuthobium cyanocarpum |
| 23 | 010 | Pinyon dwarf mistletoe | Arceuthobium divaricatum |
| 23 | 011 | Douglas-fir dwarf mistletoe | Arceuthobium douglasii |
| 23 | 013 | Larch dwarf mistletoe | Arceuthobium laricis |
| 23 | 017 | Southwestern dwarf mistletoe | Arceuthobium vaginatum subsp. Crytopodum |
| 23 | 021 | Red fir dwarf mistletoe | Arceuthobium abietinum f. sp. Pauciflorum |
| 23 | 022 | Juniper true mistletoe | Phoradendron junipeum |
| **24** | **000** | **Decline complexes/ dieback/wilts** | **n/a** |
| 24 | 004 | Ash decline/yellows | n/a |
| 24 | 011 | Larch decline | n/a |
| 24 | 017 | True fir pest complex | n/a |
| 24 | 018 | Western X disease | n/a |
| 24 | 019 | Pinewood nematode | Bursaphelenchus xylophilus |
| 24 | 030 | Elm phloem necrosis | Mycoplasma |
| **25** | **000** | **Foliage diseases** | **n/a** |
| 25 | 009 | True fir needlecast | n/a |
| 25 | 011 | Cercospora blight of juniper | Cercospora sequoia |
| 25 | 014 | Ink spot of aspen | Ciborinia whetzelii |
| 25 | 015 | Pine needle rust | Coleosporium spp. |
| 25 | 022 | Elytroderma disease  | Elytroderma deformans |
| 25 | 027 | Brown felt blight | Herpotrichia juniper |
| 25 | 029 | Hardwood anthracnose | Kabatiella apocrypta |
| 25 | 031 | Spruce needle cast | Lirula macrospora |
| 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 | Marssonia populi |
| 25 | 037 | Melampsora rusts | Melampsora medusa |
| 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 | 050 | Douglas-fir needle cast | Rhabdocline spp. |
| 25 | 055 | Septoria leaf spot | Septoria alnifolia |
| 25 | 056 | Septoria leaf spot and canker | Septoria musiva |
| 25 | 057 | Sirococcus tip blight | Sirococcus conigenus |
| 25 | 058 | Diplodia blight | Sphaeropsis sapinea |
| 25 | 059 | Leaf blister of oak | Taphrina caerulescens |
| 25 | 060 | Venturia leaf blight of maple | Venturia acerina |
| 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 | Lophodermium picea |
| 25 | 067 | Spruce needle cast | Lophodermium picea |
| 25 | 068 | Hardwood leaf rust | Rhizosphaera pini |
| 25 | 071 | Spruce needle cast | Rhizosphaera pini |
| 25 | 073 | Shepards crook | Ventirua populina |
| 25 | 074 | Delphinella shoot blight | Delphinella abietis |
| 25 | 075 | Tar spot | Rhytisma acerinum |
| **26** | **000** | **Stem rusts** | **n/a** |
| 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 | 005 | Pinyon blister rust | Cronartium occidentale |
| 26 | 011 | Bethuli rust | Peridermium bethuli |
| 26 | 012 | Limb rust | Peridermium filamentosum |
| 26 | 013 | Southern cone rust | Cronartium strobilinum |
| **27** | **000** | **Broom rusts** | **n/a** |
| 27 | 001 | Spruce broom rust | Chrysomyxa arctostaphyll |
| 27 | 002 | Incense cedar broom rust | Gymnosporangium libocedri |
| 27 | 003 | Juniper broom rust | Gymnosporangium nidus-avis |
| 27 | 004 | Fir broom rust | Melampsorella caryophyllacearum |
| **30** | **000** | **Fire** | **n/a** |
| 30 | 031 | Wild-fire | n/a |
| 30 | 032 | Human caused fire | n/a |
| 30 | 033 | Crown fire damage | n/a |
| 30 | 034 | Ground fire damage | n/a |
| **40** | **000** | **Animal damage, source unknown** | **n/a** |
| **41** | **000** | **Wild animals** | **n/a** |
| 41 | 001 | Bear | n/a |
| 41 | 002 | Beaver | n/a |
| 41 | 003 | Big game (deer) | n/a |
| 41 | 004 | Mice or voles | n/a |
| 41 | 005 | Pocket gophers | n/a |
| 41 | 006 | Porcupines | n/a |
| 41 | 007 | Rabbits or hares | n/a |
| 41 | 008 | Sapsucker | n/a |
| 41 | 009 | Squirrels | n/a |
| 41 | 010 | Woodpeckers | n/a |
| 41 | 011 | Moose | n/a |
| 41 | 012 | Elk | n/a |
| 41 | 013 | Deer | n/a |
| 41 | 014 | Feral pigs | n/a |
| 41 | 015 | Mountain beaver | n/a |
| 41 | 016 | Deer or elk | n/a |
| 41 | 017 | Earthworm | Lumbricidae |
| **42** | **000** | **Domestic animals** | **n/a** |
| 42 | 001 | Cattle | n/a |
| 42 | 002 | Goats | n/a |
| 42 | 003 | Horses | n/a |
| 42 | 004 | Sheep | n/a |
| **50** | **000** | **Abiotic damage** | **n/a** |
| 50 | 001 | Air pollutants | n/a |
| 50 | 002 | Chemical | n/a |
| 50 | 003 | Drought | n/a |
| 50 | 004 | Flooding/high water | n/a |
| 50 | 005 | Frost | n/a |
| 50 | 006 | Hail | n/a |
| 50 | 007 | Heat | n/a |
| 50 | 008 | Lightning | n/a |
| 50 | 009 | Nutrient imbalances | n/a |
| 50 | 010 | Radiation | n/a |
| 50 | 011 | Snow/ice | n/a |
| 50 | 013 | Wind-tornado | n/a |
| 50 | 014 | Winter injury | n/a |
| 50 | 015 | Avalanche | n/a |
| 50 | 016 | Mud-land slide | n/a |
| 50 | 017 | Volcano | n/a |
| 50 | 018 | Other geologic events | n/a |
| 50 | 019 | Mechanical (non-human caused) | n/a |
| **60** | **000** | **Competition** | **n/a** |
| **70** | **000** | **Human activities** | **n/a** |
| 70 | 001 | Herbicides | n/a |
| 70 | 003 | Imbedded objects | n/a |
| 70 | 004 | Improper planting technique | n/a |
| 70 | 005 | Land clearing | n/a |
| 70 | 006 | Land use conversion | n/a |
| 70 | 007 | Logging damage | n/a |
| 70 | 008 | Mechanical | n/a |
| 70 | 009 | Pesticides | n/a |
| 70 | 010 | Roads | n/a |
| 70 | 011 | Soil compaction | n/a |
| 70 | 012 | Suppression | n/a |
| 70 | 013 | Vehicle damage | n/a |
| 70 | 014 | Road salt | n/a |
| **71** | **000** | **Harvest** | **n/a** |
| **80** | **000** | **Multi-damage (insect/disease)** | **n/a** |
| 80 | 001 | Aspen defoliation | n/a |
| 80 | 002 | Subalpine fir mortality | n/a |
| 80 | 004 | Pinion pine decline | n/a |
| **90** | **000** | **Unknown** | **n/a** |
| **99** | **000** | **Physical effects** | **n/a** |
| 99 | 001 | Broken or top missing | n/a |
| 99 | 002 | Dead top | n/a |
| 99 | 003 | Limby (large limbs top to ground) | n/a |
| 99 | 004 | Forked top | n/a |
| 99 | 005 | Forked below merch top | n/a |
| 99 | 006 | Crook or sweep | n/a |
| 99 | 007 | Checks, bole cracks | n/a |
| 99 | 008 | Foliage discoloration | n/a |
| 99 | 009 | Mortality (for plantation surveys only) | n/a |
| 99 | 010 | Lack of seed source or dieback (for plantation surveys only) | n/a |
| 99 | 011 | Pour planting stock (for plantation surveys only) | n/a |
| 99 | 012 | Poor growth/fading/foliage is yellowing and loss of needles is occurring | n/a |
| 99 | 013 | Total board foot volume loss | n/a |
| 99 | 014 | Total cubic foot volume loss | n/a |
| 99 | 015 | Bark removal | n/a |
| 99 | 016 | Foliage loss | n/a |
| 99 | 017 | Sunscald | n/a |
| 99 | 018 | Uproot | n/a |
| 99 | 019 | Scorched foliage | n/a |
| 99 | 020 | Scorched bark | n/a |
| 99 | 021 | Dieback (for plantation surveys only) | n/a |
| 99 | 022 | Poor crown form | n/a |
| 99 | 023 | Severe forking | n/a |
| 99 | 026 | Open wound | n/a |
| 99 | 031 | Broken or dead branches | n/a |
| 99 | 033 | Damaged shoots, buds, or foliage (for plantation surveys only) | n/a |
| 99 | 034 | Excessively deformed sapling | n/a |
| 99 | 036 | Fire scar | n/a |
| 99 | 037 | Leaning tree | >15% and self-supporting |
| 99 | 038 | Charred bark | Not recorded unless cambium is killed from heating |

### Damage Severity Ratings

Table 38: Damage severity rating codes

| **Category** | **Severity** | **Description** |
| --- | --- | --- |
| **10** | **n/a** | **General insects** |
| 10 | 1 | Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR <20% of branches affected, OR <50% of bole with visible larval galleries |
| 10 | 2 | Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead, OR 50% or more of bole with visible larval galleries |
| **11** | **n/a** | **Bark beetles** |
| 11 | 1 | Unsuccessful bole attach: pitchout and beetle brood absent |
| 11 | 2 | Strip attacks: galleries and brood present |
| 11 | 3 | Successful current bole attack |
| 11 | 4 | Topkill |
| 11 | 5 | Successful attack last year |
| 11 | 6 | Older dead |
| **12** | **n/a** | **Defoliators** |
| 12 | 1 | Light defoliation (1-25%), no topkill |
| 12 | 2 | Light defoliation (1-25%), topkill ≤10% |
| 12 | 3 | Light defoliation (1-25%), topkill >10% |
| 12 | 4 | Moderate defoliation (26-75%), no topkill |
| 12 | 5 | Moderate defoliation (26-75%), topkill ≤10% |
| 12 | 6 | Moderate defoliation (26-75%), topkill >10% |
| 12 | 7 | Heavy defoliation (76-100%), no topkill |
| 12 | 8 | Heavy defoliation (76-100%), topkill ≤10% |
| 12 | 9 | Heavy defoliation (76-100%), topkill >10% |
| **13** | **n/a** | **Chewing insects** |
| 13 | 1 | Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR <20% of branches affected |
| 13 | 2 | Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead |
| **14** | **n/a** | **Sucking insects** |
| 14 | 1 | Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR <20% of branches affected |
| 14 | 2 | Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead |
| **15** | **n/a** | **Boring insects** |
| 15 | 1 | Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR <20% of branches affected |
| 15 | 2 | Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead |
| **16** | **n/a** | **Seed/cone/flower/fruit insects** |
| 16 | 1 | Minor |
| 16 | 2 | Severe |
| **17** | **n/a** | **Gallmaker insects** |
| 17 | 1 | Minor |
| 17 | 2 | Severe |
| **18** | **n/a** | **Insect predators** |
| 18 | 1 | Minor |
| 18 | 2 | Severe |
| **19** | **n/a** | **General diseases** |
| 19 | 1 | Minor |
| 19 | 2 | Severe |
| **20** | **n/a** | **Biotic damage** |
| 20 | 1 | Minor |
| 20 | 2 | Severe |
| **21** | **n/a** | **Root/butt diseases** |
| 21 | 1 | (for individual trees) Tree within 30 feet of tree with deteriorating crown, tree with diagnostic symptoms or signs, or tree killed by root disease |
| 21 | 2 | (for individual trees) Pathogen (sign) or diagnostic symptom detected – no crown deterioration |
| 21 | 3 | (for individual trees) Crown deterioration detected – no diagnostic symptom or signs |
| 21 | 4 | (for individual trees) Both crown deterioration and diagnostic signs symptoms detected |
| 21 | 5 | (for individual trees) Bleeding present on bole |
| 21 | 6 | (for individual trees) Bleeding present on bole and adjacent mortality present |
| 21 | 7 | (for individual trees) Laboratory confirmed Sudden Oak Death |
| 21 | G2 | (for setting level) Minor evidence of RDS on plot |
| 21 | G3 | (for setting level) RDS present, canopy reduction less than 20% |
| 21 | G4 | (for setting level) RDS present, canopy reduction 20-30% |
| 21 | G5 | (for setting level) RDS present, canopy reduction 30-50% |
| 21 | G6 | (for setting level) RDS present, canopy reduction 50-75%, most ground area infested |
| 21 | G7 | (for setting level) RDS present, 76+% canopy reduction |
| 21 | G8 | (for setting level) Entire area infested with RDS, one or very few susceptible overstory trees |
| 21 | G9 | (for setting level) Entire area infested with RDA, no susceptible overstory trees present |
| **22** | **n/a** | **Stem decay/canker** |
| 22 | 0 | 0-4% rotten |
| 22 | 1 | 5-15% rotten |
| 22 | 2 | 16-25% rotten |
| 22 | 3 | 26-35% rotten |
| 22 | 4 | 36-45% rotten |
| 22 | 5 | 46-55% rotten |
| 22 | 6 | 56-65% rotten |
| 22 | 7 | 66-75% rotten |
| 22 | 8 | 76-85% rotten |
| 22 | 9 | 86-100% rotten |
| **23** | **n/a** | **Parasitic/epiphytic plants** |
| 23 | 1 | Hawksworth tree DMR rating = 1; light infection |
| 23 | 2 | Hawksworth tree DMR rating = 2; light infection |
| 23 | 3 | Hawksworth tree DMR rating = 3; medium infection |
| 23 | 4 | Hawksworth tree DMR rating = 4; medium infection |
| 23 | 5 | Hawksworth tree DMR rating = 5; heavy infection |
| 23 | 6 | Hawksworth tree DMR rating = 6; heavy infection |
| 23 | 7 | Vine damage: less than 50% of crown involved |
| 23 | 8 | Vine damage: 50% or more of crown involved |
| **24** | **n/a** | **Decline complexes/diebacks/wilts** |
| 24 | 1 | Minor: minor crown symptoms |
| 24 | 2 | Severe: severe crown symptoms |
| **25** | **n/a** | **Foliage diseases** |
| 25 | 1 | Minor: <20% of foliage affected or <20% of crown in brooms |
| 25 | 2 | Severe: >20% of foliage affected or >20% of crown in brooms |
| **26** | **n/a** | **Rust Stems** |
| 26 | 1 | Branch infections located greater than 2 feet from tree bole |
| 26 | 2 | Branch infections located between 6 inches and 2 feet from tree bole |
| 26 | 3 | Bole infections or branch infections located within 6 inches of bole |
| 26 | 4 | Topkill |
| **27** | **n/a** | **Broom rusts** |
| 27 | 1 | Minor: <20% of crown in brooms |
| 27 | 2 | Severe: >20% of crown in brooms |
| **30** | **n/a** | **Fire** |
| 30 | 1 | Minor: <20% of crown affected |
| 30 | 2 | Severe: >20% of crown affected or any damage to the bole |
| **40** | **n/a** | **Animal damage, source unknown** |
| 40 | 1 | Minor |
| 40 | 2 | Severe |
| **41** | **n/a** | **Wild animals** |
| 41 | 1 | Minor: <20% of crown affected, bole damage is <50% circumference |
| 41 | 2 | Severe: >20% of crown affected, bole damage is >50% circumference, upper 1/3 of crown is killed |
| 41 | 5 | Earthworms are present |
| 41 | 6 | Earthworms are absent |
| **50** | **n/a** | **Abiotic damage** |
| 50 | 1 | Minor: <20% of crown affected, bole damage is <50% circumference |
| 50 | 2 | Severe: >20% of crown affected, bole damage is >50% circumference, upper 1/3 of crown is killed |
| **60** | **n/a** | **Competition** |
| 60 | 1 | Minor: tree slightly deformed and has some lie, terminal growth |
| 60 | 2 | Severe: tree extremely deformed or has no live terminal, growth severely reduced relative to neighbors |
| **70** | **n/a** | **Human activities** |
| 70 | 1 | Minor |
| 70 | 2 | Severe |
| **71** | **n/a** | **Harvest** |
| 71 | 1 | Minor |
| 71 | 2 | Severe |
| **80** | **n/a** | **Multi-damage (insect/disease)** |
| 80 | 1 | Minor |
| 80 | 2 | Severe |
| **90** | **n/a** | **Unknown** |
| 90 | 0 | 0 – 9% affected |
| 90 | 1 | 10 – 19% affected |
| 90 | 2 | 20 – 29% affected |
| 90 | 3 | 30 – 39% affected |
| 90 | 4 | 40 – 49% affected |
| 90 | 5 | 50 – 59% affected |
| 90 | 6 | 60 – 69% affected |
| 90 | 7 | 70 – 79% affected |
| 90 | 8 | 80 – 89% affected |
| 90 | 9 | 90 – 100% affected |
| **99** | **n/a** | **Physical effects** |
| 99 | 001 | Broken top |
| 99 | 002 | Dead top |

Table 39: Category 99 damage severity rating codes

| **Category** | **Severity** | **Description** | **Actual percent of tree affected** |
| --- | --- | --- | --- |
| **99** | **n/a** | **Physical effects** | **n/a** |
| **99** | **001** | **Broken top** | **% of original height that is missing; for example, if a tree was originally 100 feet high, but 15 feet of the top is broken or missing; enter “15” in the severity code** |
| **99** | **002** | **Dead top** | **% of total tree height that is dead** |
| **99** | **003** | **Limby (large limbs top to bottom)** | **% of total tree height with many limbs/knots** |
| **99** | **004** | **Forked top** | **% of total tree height above fork** |
| **99** | **005** | **Forked below merch top** | **% of the total length of the bole affected** |
| **99** | **006** | **Crook or sweep** | **% of total tree height, which contains the crook or sweep** |
| **99** | **007** | **Checks, bole cracks** | **% of total tree height, which contains a crack or check** |
| **99** | **008** | **Foliage discoloration** | **% of foliage discolored** |
| **99** | **009** | **Mortality** | **1 = dead tree** |
| **99** | **010** | **Lack of seed source** | **If present, 100%** |
| **99** | **011** | **Poor planting stock source** | **If present, 100%** |
| **99** | **012** | **Poor growth** | **1 = minor (reduced growth); 2 = severe (affecting survival)** |
| **99** | **013** | **Total board foot volume loss** | **%of total board foot volume loss** |
| **99** | **014** | **Total cubic foot volume loss** | **% of total cubic foot volume loss** |
| **99** | **015** | **Bark removal** | **% of tree circumference missing bark** |
| **99** | **016** | **Foliage loss** | **1 = minor; 2 = severe** |
| **99** | **017** | **Sunscald** | **1 = minor; 2 = severe** |
| **99** | **018** | **Uproot** | **1 = uprooted** |
| **99** | **019** | **Scorched foliage** | **% of foliage scorched** |
| **99** | **020** | **Scorched bark** | **% of bark scorched** |
| **99** | **021** | **Dieback source** | **1 = minor; 2 = severe** |
| **99** | **022** | **Poor crown form** | **1 = minor; 2 = severe** |
| **99** | **023** | **Severe forking** | **% of bole with forks** |
| **99** | **026** | **Open wound** | **% of bole or trunk affected using the height and width of the wound; for example, if a tree is 100 feet tall and the wound covers 15 feet of the bole, enter a value of ”15”** |
| **99** | **031** | **Broken or dead branches** | **% of branches broken or dead** |
| **99** | **033** | **Damage shoots, buds, or foliage source** | **1 = minor; 2 = severe** |
| **99** | **034** | **Excessively deformed sapling** | **% of sapling deformed** |
| **99** | **036** | **Fire scar** | **% of bole covered by fire scar** |
| **99** | **037** | **Leaning tree** | **% lean from vertical** |
| **99** | **038** | **Charred bark** | **Not recorded unless cambium is killed from heating** |

### Tree Parts

Table 40: Tree part codes

| **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 L: Accuracy Standards

Table 41: Settings Measurements

| **Field** | **Tolerance** |
| --- | --- |
| Project Name | No errors |
| Region | No errors |
| Proclaimed Forest | No errors |
| District | No errors |
| Location | No errors |
| Stand Number | No errors |
| Ownership | No errors |
| State | No errors |
| County | No errors |
| Administrative Forest | No errors |
| Date | No errors |
| Photo ID | No errors |
| Exam Level | No errors |
| Exam Purpose | No errors |
| Stratum | No errors |
| Existing Vegetation Composition Type | No errors |
| Potential Vegetation Reference | No errors |
| Potential Vegetation | No errors |
| Structure | No errors |
| Capable Growing Area | ± 10 percent |
| Fuel Model | No errors |
| Elevation | ± 2 contour intervals |
| Aspect | ± 45 degrees |
| Slope | ± 10 percent |
| Slope Position | ± 1 class |
| Acres | No errors |
| Radial Growth Interval | No errors |
| Radial Growth Interval #2 | No errors |
| Height Growth Interval | No errors |
| Fuel Photo Reference | No errors |
| Precision Protocol | No errors |
| Examiner | No errors |
| Stand Remarks | No errors |
| Damage Category | No errors |
| Damage Agent | No errors |
| Damage Severity | No errors |
| Species of Management Interest | No errors |
| Sketch Map and Traverse Notes | n/a |

Table 42: Sample Design Criteria

| **Field** | **Tolerance** |
| --- | --- |
| Form Type | n/a |
| Selection Method Type | No errors |
| Sample Expansion Factor | No errors |
| Plots Installed | No errors |
| Sub-population Filter | No errors |
| Starting Azimuth | No errors |
| Sample Design Remarks | No errors |
| Selection Criteria Number | No errors |
| Sub-pop Variable | No errors |
| Sub-pop Minimum Value | No errors |
| Sub-pop Maximum Value | No errors |

Table 43: Plot Data

| **Field** | **Tolerance** |
| --- | --- |
| Plot Number | No errors |
| Plot Latitude | No errors |
| Plot Longitude | No errors |
| Capable Grow Area | ± 10 percent |
| Plot Aspect | ± 45 |
| Plot Scope | ± 10 percent |
| Slope Position | ± 1 class |
| Slope Horizontal Shape | ± 1 class |
| Slope Vertical Shape | ± 1 class |
| Plot Elevation | ± 2 contour intervals |
| Existing Vegetation | No errors |
| Potential Vegetation | Accurate to series understory union and phases |
| Plot History | No errors |
| Plot History Date | Year required in field 12 is other than code 10 or blank |
| Fuel Model | No errors |
| Residual Descriptive Code | No errors |
| Distance to Seed Wall | ± 100 feet |
| Plot Remarks | n/a |

Table 44: Tree Data

| **Field** | **Tolerance** |
| --- | --- |
| Plot Number | No errors |
| Tag ID Number | No errors |
| Tree Status | No errors allowed in recognizing and coding down trees |
| Site/Growth Trees | No errors |
| Tree Species | No errors |
| Tree Count | See specifics in Table 45 |
| Number Stems | No errors |
| DBH/DRC Intensive Exam | See specifics in Table 46 |
| DBH/DRC Extensive Exam | See specifics in Table 47 |
| DBH/DRC Quick Exam | See specifics in Table 48 |
| Height | 10 percent |
| Height to Crown | 10 percent |
| Radial Growth | 1/20th inch |
| Radial Growth #2 | 1/20th inch |
| Height Growth | See specifics in Table 49 |
| Tree Age | 10 percent (based on actual tree ring count at breast height for trees ≥ 3.0” DBH otherwise based on total age recorded) |
| Crown Ratio | 10 percent |
| Crown Class | No errors |
| Crown Width | No errors |
| Wildlife Use | No errors |
| Log/Snag Decay | No errors |
| Cone Seronity | No errors |
| Damage Category | No errors, specifics listed in Table 50 |
| Damage Agent | No errors |
| Damage Part | No errors |
| Damage Severity | No errors |
| Tree Remarks | n/a |

Table 45: Tree Data, Tree Count

| **Height Range** | **Diameter Range** | **Trees on Point** | **Tolerance** |
| --- | --- | --- | --- |
| \*All | All | 0 | 0 trees |
| ≤ 0.5 feet | All | 1-5 | ± 2 trees |
| ≤ 0.5 feet | All | 6+ | ± 50 percent |
| > 0.5 feet | < 0.5 in. | 1-5 | ± 1 tree |
| > 0.5 feet | < 0.5 in. | 6+ | ± 20 percent |
| All | .5” – breakpoint DBH | 1-5 | ± 1 tree |
| All | .5” – breakpoint DBH | 6+ | ± 10 percent |
| All | Breakpoint DBH + | 1+ | 0 trees |

\* There is no tolerance for recording a tree when none are actually present in any of the above size classes. The recording of a fixed plot tree when none are present will result in a single discrepancy. The recording of a variable plot tree when none are present will result in an unacceptable unit.

Group criteria are standardized to facilitate stand exam contract inspection and payment. However, distinguishing characteristics other than tree class, species, and size class may warrant individual tree recording or more refined grouping criteria. Such characteristics include: age, crown ratio, crown class, or incident of damage.

Table 46: Tree Data, DBH/DRC Intensive Exam

| **Tolerance** | **Diameter** |
| --- | --- |
| No errors | <.5 inch |
| ± .1 inch | .5 inch – 13.9 inches |
| ± .2 inch | 14.0 inches – 23.9 inches |
| ± .3 inch | 24.0 inches – 34.9 inches |
| ± .5 inch | 35.0 inches + |
| ± .1 inch | Borderline variable plot trees |
| ± .1 inch | Estimated DRC |

Table 47: Tree Data, DBH/DRC Extensive Exam

| **Tolerance** | **Diameter** |
| --- | --- |
| ± 1 inch | ≤ 20 inches |
| ± 5% of diameter | > 20 inches |

Table 48: Tree Data, DBH/DRC Quick Exam

| **Tolerance** | **Diameter** |
| --- | --- |
| ± 2 inches | ≤ 20 inches |
| ± 10% of diameter | > 20 inches |

Table 49: Tree Data, Height Growth

| **Tolerance** | **Diameter** |
| --- | --- |
| ± 1 foot | Trees > 6 feet |
| ± 0.1 foot | Trees ≤ 6 feet |

Table 50: Tree Data, Damage Category

| **Damage Category** | **Damage Category Description** | **Tolerance** |
| --- | --- | --- |
| 11 | Bark Beetles | No misses on live trees with a severity of 2 or greater |
| 12 | Defoliators | No misses on live trees with a severity of 3 or greater |
| 13-17 | Other Insects | No misses of shoot moths or weevils on live trees |
| 21 | Root/Butt Diseases | No misses on live trees with a severity of 2 or greater |
| 22 | Stem Decays/Cankers | No misses on live trees with a severity of 3 or greater |
| 25 | Foliage Diseases | No misses on Elytroderma on live trees |
| 41-42 | Animal Damage | No misses on live trees with terminal leader damage or with greater than ¼ of bole circumference affected |
| 50 | Abiotic Damage | No misses on wind, snow, or ice bending, breakage, or bole cracks and frost damage to shoots on trees less than 1-inch diameter and lightning |
| 70 | Human Damage | No misses on live trees for logging damage or fire if the damage affects greater than ¼ of the bole circumference or if an open wound is in contact with the ground |

Table 51: Ground Surface Cover

| **Field** | **Tolerance** |
| --- | --- |
| Plot Number | No errors |
| Cover Type | No errors |
| Cover Percent | ± 10 percent |

Table 52: Vegetation Composition

| **Field** | **Tolerance** |
| --- | --- |
| Plot Number | No errors |
| Live/Dead | No errors |
| Layer | No errors |
| Life form | No errors |
| Species | No error in species-level identification for dominant, common, or community type indicator plants; no plant name can be repeated within a layer |
| Minimum Height | ± 10 percent of height |
| Average Height | ± 10 percent of height |
| Maximum Height | ± 10 percent of height |
| Canopy Cover | ± 10 percent |
| Average Diameter | No errors |
| Maturity | No errors |
| Cover Remarks | n/a |
| User Field | n/a |

Table 53: Down Woody

| **Field** | **Tolerance** |
| --- | --- |
| Plot Number | No errors |
| First Duff | ± ½ inch |
| Second Duff | ± ½ inch |
| Fuel Depth | No errors |
| Twigs 0 – .24 | ± 40 percent |
| Twigs .25 - .99 | ± 30 percent |
| Twigs 1.0 – 2.99 | ± 20 percent |
| Volume 1 | n/a |
| Weight 1 | n/a |
| Volume 2 | n/a |
| Weight 2 | n/a |
| Volume 3 | n/a |
| Weight 3 | n/a |
| Volume 4 | n/a |
| Weight 4 | n/a |
| Piece Count | No missed pieces |
| Decay Class | No errors |
| Diameter | ± 1 inch on measurements |
| Piece Length | No errors |

## Appendix M: Glossary of Terms

Table 54: Glossary

| **Term** | **Definition** |
| --- | --- |
| 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; forbs and grasses are measure 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 that supports a full, live crown. For trees that have uneven length crowns, occularly 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 tis 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 three 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. |
| 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 at breast height (4.5 feet), outside bark, of the tree bole, 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, this refers to points above the earth’s surface. |
| Fuel Bed | The fuel bed is accumulation of dead, woody residue on the forest floor. It begins at the top of the duff layer and above. It includes litter, dead limb wood, and bole wood 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 bae of the object being referenced. |
| Group Tally | A count of one or more items of the same type or species and recorded as a single line entry. |
| 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 that 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.The object is “IN” if the measured distance is equal to or less than the subplot radius.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 area 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. |
| 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. |

## Appendix N: Fuel Models

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.

Table 55: Fuel Models

| **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 | n/a | Short grass (1 foot) | Grass and grass-dominated | Original 13 | 0.74 | 0 | 0 | 1 |
| 2 | n/a | Timber (grass and understory) | Grass and grass-dominated | Original 13 | 2 | 1 | 0.500 | 1 |
| 3 | n/a | Tall grass (2.5 feet) | Grass and grass-dominated | Original 13 | 3.01 | 0 | 0 | 2.50 |
| 4 | n/a | Chaparral (6 feet) | Chaparral and shrub fields | Original 13 | 5.01 | 4.010 | 2 | 6 |
| 5 | n/a | Brush (2 feet) | Chaparral and shrub fields | Original 13 | 1 | 0.500 | 0 | 2 |
| 6 | n/a | Dormant brush, hardwood slash | Chaparral and shrub fields | Original 13 | 1.50 | 2.500 | 2 | 2.50 |
| 7 | n/a | Southern rough | Chaparral and shrub fields | Original 13 | 1.13 | 1.870 | 1.500 | 2.50 |
| 8 | n/a | Closed timber litter | Timber litter | Original 13 | 1.50 | 1 | 2.500 | 0.20 |
| 9 | n/a | Hardwood litter | Timber litter | Original 13 | 2.92 | 0.410 | 0.150 | 0.20 |
| 10 | n/a | Timber (litter and understory) | Timber litter | Original 13 | 3.01 | 2 | 5.010 | 1 |
| 11 | n/a | Light logging slash | Slash | Original 13 | 1.50 | 4.51 | 5.510 | 1 |
| 12 | n/a | Medium logging slash | Slash | Original 13 | 4.01 | 14.03 | 16.53 | 2.30 |
| 13 | n/a | Heavy logging slash | Slash | Original 13 | 7.01 | 23.04 | 28.05 | 3 |
| 91 | NB1 | Urban/ Developed | Non-burnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 92 | NB2 | Snow/Ice | Non-burnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 93 | NB3 | Agricultural | Non-burnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 98 | NB4 | Open Water | Non-burnable | Scott and Burgan | 0 | 0 | 0 | 0 |
| 99 | NB5 | Bare Ground | Non-burnable | 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 |
| 102 | GR2 | Low Load, Dry Climate (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 | 3.5 | 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 |
| 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-Grass-Shrub (Dynamic) | 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 | High Load Activity Fuel or Moderate 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 |

Table 56: Detailed Descriptions of the Fuel Models

| **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 many include clumps and may include pinyon-juniper. |
| 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 contains 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 been 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, over-mature 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 60 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 fuel models. |
| 93 | Agricultural land maintained in a non-burnable 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 and 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. |
| 101 | The primary carrier of fire in 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 compared 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 more mostly cured. |
| 121 | The primary carrier of fire is grass and shrubs combined. Shrubs are about 1 foot height, 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 shrub 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 is 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 heave 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 to 6 feet tall; some herbaceous fuel may be present. Spread rate is high; flame length is very high. |
| 161 | The primary carrier of furl is low load of grass and/or shrub with litter. Spread rate is low; flame length is low. |
| 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 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 loads, 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 is 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 downed 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 is total, fuelbed is not compacted, most foliage and fine fuel still attached to blowdown. Spread rate is very high; flame length very high. |