

# CONDUCTING A FOREST BIODIVERSITY ASSESSMENT

**A Guide for Forest Owners and Land Stewards**



Prepared by Northwest Natural Resource Group

In coordination with:

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World Wildlife Fund-Sweden

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## Table of Contents

Background .....	3
Purpose .....	4
Instructions .....	5
Different Forms for Different Forest Types .....	7
Categories on the Field Form .....	10
Summary .....	17
Appendix .....	17

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Northwest Natural Resource Group (NNRG) specializes in working with non-industrial forest landowners, conservation organizations and public entities interested in conservation-based forest stewardship. Northwest Certified Forestry is a non-profit membership and services program developed by NNRG to assist small forest landowners in Oregon and Washington with optimizing the economic and ecological potential of their forestlands. Visit [www.nnrg.org](http://www.nnrg.org) for more information.

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## Background

Forests on private lands of the Pacific Northwest have the potential to provide enhanced protection of biodiversity and water quality through either protection of existing fragments of complex mature forest or through the restoration of younger managed forests. The existence of structurally complex older forests on private lands in Washington and Oregon is rare and declining, even though these forest types are important for supporting native biological diversity. Maintaining biodiversity is important because a larger number of species means a greater variety, which in turn ensures natural sustainability for all life forms that can better withstand and recover from disturbances (e.g. fire, windstorms, harvests). Biodiversity boosts overall ecosystem productivity-from single-celled organisms to the largest beings-all have important roles to play. Forest ecosystems with healthy biodiversity provide a number of ecosystem services, such as:

- Protection of water resources
- Soils formation and protection
- Nutrient storage and recycling
- Pollution breakdown and absorption
- Contribution to climate stability
- Biological resources, such as: food, medicinal resources, wood products
- Maintenance of ecosystems
- Recovery from unpredictable events
- Breeding stocks, population reservoirs
- Diversity in genes, species and ecosystems
- Future resources
- Cultural values
- Recreation and tourism

Forests that support the full level of biodiversity native to the coniferous and mixed hardwood ecosystems of Washington and Oregon share several basic characteristics. These include:

- Large live trees (> 30 in DBH)
- Large live trees with deformities and cavities
- Large standing dead trees
- Large down trees
- A diversity of tree sizes from seedlings to very large trees
- A diversity of native tree and shrub species
- Dead wood

Forest owners who desire to manage for biodiversity can conduct a multitude of activities to promote the diversity of forest structures, species and habitat. Monitoring for existing biodiversity and changes to biodiversity is an important aspect of assessing one's management. Additionally, for forest owners who seek to manage to Forest Stewardship Council™ (FSC®) standards, assessment of environmental impacts and monitoring is fundamental.

## Purpose

This guide describes the Forest Biodiversity Assessment monitoring tool and how to use it in the woods. The Forest Biodiversity Assessment is intended to be an easy-to-use tool for forest owners to observe and identify the components, structures and processes necessary to restore, increase, or sustain forest health. The assessment format is a 1-page document covering 60 criteria that address unique forest types, site-specific information, habitat characteristics and structural elements. **While it is a comprehensive tool, forest owners do not need a deep knowledge of plant and wildlife species or forest ecology to conduct the assessment. Making time to walk through one's forest periodically and record observations on the Forest Biodiversity Assessment field form is all that is needed.** Over time, such walks may enhance a forest owner's familiarity with the woods and thereby inform management goals and actions.

Biodiversity, or biological diversity, can be defined as the variety of life within a particular habitat. In the Pacific Northwest, this includes the trees, plants, fungi, lichens, mosses, insects, other invertebrates, amphibians, lizards, fish, birds and mammals native to our forests and woodlands. Maintaining native biodiversity is an important component of sustainable forest management.<sup>1</sup>

For forest owners who seek to manage to FSC standards, assessment of environmental impacts and monitoring is a central component of management. FSC certification requires forest monitoring on a scale of intensity and frequency appropriate for the level of management operations. Per the FSC forest management standard (6.3.f), managing a forest to FSC standards implies that the forest owner "maintains, enhances or restores habitat components and forest structures in abundance and distribution that could be expected from naturally occurring processes."<sup>2</sup> In the Pacific Northwest, important elements of structure and ecological process include: large living trees, living trees with decay or declining health, snags, well-distributed coarse wood debris and dead woody material, and a diversity of species and structure from forest floor to the top of the highest tree.

For most Northwest Certified Forestry members, an annual walk through the forest that involves taking time to answer the questions on the assessment and recording observations will meet the monitoring requirement of certification. In turn, these monitoring results can inform management activities and contribute to maintaining, enhancing or restoring natural forest conditions.

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<sup>1</sup> As Aldo Leopold once wrote, "To keep every cog and wheel is the first precaution of intelligent tinkering." Leopold, A. 1949. *A Sand County Almanac: And Sketches Here and There*. "Conservation" pp 167-169. Oxford University Press.

<sup>2</sup> FSC-US Forest Management Standard (v1.0). 2010. Available at: <http://us.fsc.org/download.fsc-us-forest-management-standard-v1-0.95.htm>

## Instructions

Pick a day when you can spend at least 30 minutes and up to a few hours walking through all, or part, of your forest. Choose a network of trails or roads, existing monitoring transects, or if the forest is conducive for cross-country exploration, chart any course of feasible travel. Ideally these routes can be revisited periodically in order to make repeat observations that will help you track changes over time. It is a good idea to note the course you will follow on a map, so you can repeat it for future assessments.

The Forest Biodiversity Assessment should be applied with one stand per form, evaluating all 60 questions for a single stand. A stand is a defined area of the forest that is relatively uniform in species composition or age and can be managed as a single unit. Stands vary in size from a ½-acre to more than 100 acres depending on the composition of the forest and scale of management. The stands in your forest are often defined in the forest management or stewardship plan.

Before you enter a specific stand, review the criteria. The 60 observations are posed on 60 rows and grouped to address questions pertaining to site, dynamics, habitat, tree species, tree structure and deadwood. The criteria genres and specific questions will be further explained in this guide (refer to the sections: Different Forms for Different Forest Types and Categories on the Field Form).

Some questions you can answer readily as you enter the forest. Others are best answered by meandering around to gain a better sense of what is present, what has changed over time, which plants are relatively more abundant, etc. Take enough time to observe the forest for each question, but not so much time that making observations is onerous.

### **You'll need:**

- Time: 30 minutes to a few hours.
- Route: A transect or meandering path through the forest that allows you to see most of a stand.
- Equipment:
  - Pencil
  - Printed field form (one per stand of a given forest type)
  - Clipboard or writing surface
  - A map that delineates the stands within your forest
  - Appropriate clothing
  - Supplies to go into the woods



## Recording Observations

In the space to record answers to the questions, responses go into checkboxes “□”. Note that some of the questions have circles “○” within the boxes. **Pay special attention to evaluating the questions that have a corresponding circle; these questions are of particular significance for the type of forest being assessed.** If you can answer a question with a “yes”, check the circle or box. If you find the answer is “no” leave the field blank. Make notes as appropriate to help clarify future monitoring efforts, or to provide information for your management records.

## Evaluating Observations

When all of the questions have been evaluated, total the number of “yes” answers counted in the circles “○” to provide the site and stand totals. Every “yes” contributes equally to the total score as all elements, features and habitats have been assigned the same, basic value.<sup>3</sup> Combined these values give a relative biodiversity total, or score, for a given stand in a given forest. The highest total scores possible are noted on the field forms.

It is important to note that the **Biodiversity Forest Assessment is a qualitative and relative process**; thus the total should be seen as a general estimate of a forest’s biodiversity potential. It is not an absolute measurement.

### The Forest Biodiversity Assessment is intended to:

- Facilitate comparison of the same stand over time
- To make comparisons between different stands within your forest (e.g. to rank the priorities of different stands for management activities)
- Quickly evaluate responses to activities intended to increase forest biodiversity
- Identify natural value-adding elements (e.g. woody debris, berry producing shrubs) that could be introduced to the forest

Results from the Biodiversity Forest Assessment may be used to monitor changes over time or indicate the need for enhancements to increase biodiversity; and therefore the overall stand total or score. **Circles left unmarked during the assessment indicate natural value-adding elements that are currently missing from the stand.** Assessments made prior to forest harvest operations can guide planning and management designed to restore or create future values.

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<sup>3</sup> This, of course, is an over-simplification – in reality there is no way to calculate, no less compare, the ecological functions and values of entities as different as brook, a certain area of rocky outcrops, or a certain cluster of very large trees. In practice however, this causes less problems than it would seem.

For instance, upon completing the form it may be apparent that the understory shrub layer has fewer than three species; thus, indicating an opportunity to plant (forest-type appropriate) berry or mast producing shrubs.

### **Maintain Monitoring Records**

When you are finished conducting the Forest Biodiversity Assessment, consider comparing results from your current field forms with observations and results from previous assessments. Reviewing these records is a means to document changes in the forest and determine if you are achieving management goals over time. It is recommended that you keep the completed forms with your forest management and monitoring files.

### **Different Forms for Different Forest Types**

The field form is a 1-page document covering 60 criteria. Depending on what type of forest you own (i.e. Douglas-fir, oak, Ponderosa, etc.) or what type of stand you are in (i.e. recently harvested, 40-year old trees, 150-year old trees, etc.), not all of the questions directly apply. You will need to select the version of the field form most suitable to the forest type of a given stand. Variations of the field form have been developed for four forest types in the Pacific Northwest, and these forests are broadly described below. Use this information to determine which forms are most suitable for your forest.<sup>4</sup>

#### **The four variations of the field form are available in the**

Appendix and include: Douglas-fir/Mixed coniferous forests west of the Cascades (Form D, D for Douglas-fir), Oak/Douglas-fir or Oak/Pine woodlands (Form O, O for oak), Early seral conditions or young forests (Form E, E for early seral), and Ponderosa and lodgepole pine forests east of the Cascades (Form P, P for Ponderosa).

### **Douglas-fir/Mixed coniferous forests west of the Cascades, or D<sup>5</sup>**

This forest habitat occurs throughout low-elevation western Washington, except on extremely dry or wet sites. In Oregon it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, in the Coast Range, and along the outer coast. This is the most extensive habitat in the lowlands on the west side of the Cascades and is dominated by evergreen conifers, deciduous broadleaf trees, or both. Western hemlock (*Tsuga heterophylla*) and Douglas-fir (*Pseudotsuga menziesii*) are the most characteristic species and one or both are

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<sup>4</sup> Descriptions of these forest or habitat types come from the Northwest Habitat Index <http://www.nwhi.org/index/habdescriptions> and are adapted from *Wildlife-Habitat Relationships in Oregon and Washington*. D. H. Johnson, and T. A. O'Neil (eds). 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR. Last accessed February 2013.

<sup>5</sup> Northwest Habitat Index. 2013. Westside Lowlands Conifer-Hardwood Forest. <http://www.nwhi.org/index/habdescriptions#1>. Last accessed February 2013.

typically present. Most stands are dominated by one or more of the following: Douglas-fir, western hemlock, western redcedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), red alder (*Alnus rubra*), or bigleaf maple (*Acer macrophyllum*).

Late seral stands typically have an abundance of large (>164 ft tall) coniferous trees, a multi-layered canopy structure, large snags, and many large logs on the ground. Whereas stands that are mid-seral (15-60 years), typically have smaller trees, single-storied canopies, and may be dominated by conifers, broadleaf trees, or both.

The forest understory is structurally diverse: evergreen shrubs tend to dominate on nutrient-poor or drier sites; deciduous shrubs, ferns, and/or forbs tend to dominate on relatively nutrient-rich or moist sites. Shrubs may be low (1.6 ft tall), medium-tall (3.3-6.6 ft), or tall (6.6-13.1 ft). Almost all structural stages are represented in the successional sequence within this habitat. Mosses are often a major ground cover. Lichens are abundant in the canopy of old stands.

### **Oak/Douglas-fir - Oak/pine woodlands, or O<sup>6</sup>**

This forest and woodland habitat is primarily found in the Willamette Valley, Puget Lowlands, and Klamath Mountains ecoregions. In the Puget Lowlands, it is common in and around the San Juan Islands and parts of Thurston, Pierce, and Mason counties. In southwestern Oregon, it is now restricted mainly to the valleys of the Rogue and Umpqua rivers. This is a forest or woodland dominated by evergreen conifers, deciduous broadleaf trees, evergreen broadleaf trees, or some mixture of conifers and broadleaf trees. Canopy structure varies from single- to multi-storied.

Understories vary in structure: grasses, shrubs, ferns, or some combination will typically dominate. The canopy is typically dominated by one or more of the following species: Douglas-fir (*Pseudotsuga menziesii*), Oregon white oak (*Quercus garryana*), Pacific madrone (*Arbutus menziesii*), shore pine (*Pinus contorta* var. *contorta*), or California black oak (*Q. kelloggii*). Ponderosa pine (*Pinus ponderosa*) is important in southwestern Oregon and the southern Willamette Valley as a subordinate or co-dominant with oak. Grand fir (*Abies grandis*) is occasionally co-dominant with Douglas-fir in the northern Puget Lowland or in the Willamette Valley.

Deciduous shrubs that commonly dominate or co-dominate the understory are oceanspray (*Holodiscus discolor*), baldhip rose (*Rosa gymnocarpa*), poison-oak (*Toxicodendron diversiloba*),

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<sup>6</sup> Northwest Habitat Index. 2013. Westside Oak and Dry Douglas-fir Forest and Woodlands. <http://www.nwhi.org/index/habdescriptions#2>. Last accessed February 2013.



serviceberry (*Amelanchier alnifolia*), beaked hazel (*Corylus cornuta*), trailing blackberry (*Rubus ursinus*), Indian plum (*Oemleria cerasiformis*), snowberries (*Symphoricarpos albus* and *s. mollis*), wedge-leaf ceanothus (*Ceanothus cuneatus*), and oval-leaf viburnum (*Viburnum ellipticum*).

### Young forests or early seral reference conditions, or E

These are forests that have been recently harvested or have had a natural stand replacing disturbance such as a windstorm, ice storm or fire that has removed all or nearly all of the canopy cover. After natural disturbances, these areas are often characterized by various amounts of dead or dying standing trees (snags) and fallen trees (downed wood), damaged but surviving trees, and some minor areas that escaped disturbance. Most harvesting sites are classified in this category, and, where planned and executed to mimic a certain amount of naturally occurring elements, such areas can maintain a high level of biodiversity. Commercially managed forests in which even-aged harvest (e.g. clear-cuts) is employed on stands are classified as early seral; depending on the management plan, these stands may have less dying or downed wood.

### Ponderosa and lodgepole pine forests east of the Cascades, or P<sup>7</sup>

Ponderosa pine-Douglas-fir woodland habitats occur along the lower eastern slope of the Cascades, the Okanogan Highlands, and in the Blue Mountains. This habitat generally occurs on the driest sites supporting conifers in the Pacific Northwest. It is widespread and variable, appearing on moderate to steep slopes in canyons, foothills, and on plateaus or plains near mountains. Ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) are the most common evergreen trees in this habitat. The deciduous conifer, western larch (*Larix occidentalis*), can be a co-dominant with the evergreen conifers in the Blue Mountains of Oregon, but seldom as a canopy dominant. Grand fir (*Abies grandis*) may be frequent in the undergrowth on more productive sites giving stands a multilayer structure.

The undergrowth can include dense stands of shrubs or, more often, be dominated by grasses, sedges, and/or forbs. Some Douglas-fir and ponderosa pine stands have a tall to medium-tall deciduous shrub layer of mallowleaf ninebark (*Physocarpus malvaceus*) or common snowberry (*Symphoricarpos albus*). Grand fir seedlings or saplings may be present in the undergrowth.

Pumice soils support a shrub layer represented by green-leaf or white-leaf manzanita (*Arctostaphylos patula* or *A. viscida*). Short shrubs, pinemat manzanita (*Arctostaphylos nevadensis*) and kinnikinnick (*A. uva-ursi*) are found across the range of this habitat. Antelope bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), black sagebrush (*A.*

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<sup>7</sup> Northwest Habitat Index. 2013. Ponderosa Pine Forest and Woodlands.  
<http://www.nwhi.org/index/habdescriptions#7>. Last accessed February 2013.

*nova*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and in southern Oregon, curl-leaf mountain mahogany (*Cercocarpus ledifolius*) often grow with Douglas-fir, ponderosa pine and/or Oregon white oak, which typically have a bunchgrass and shrub-steppe ground cover. In natural conditions, new trees, germinated in pulses after each fire, add to the survivors and create multiple age pine forests.

## Categories on the Field Form

This section describes the assessment categories and questions found on the Forest Biodiversity Assessment field form. The first 30 questions (1-30, the left part of the field form) address general site features, site history and disturbance, and habitats, together with indicators of dynamic processes and previous site history. The second 30 questions (31-60, the right part of the field form) address stand characteristics, which include the composition of species and size of trees, tree structure and deadwood. The criteria from the field form are noted in **bold font**, while the explanations of the criteria are noted in *italic font*.

### Category 1: Topography & Site Characteristics

In forest ecology, a site is defined as a distinctive kind of land with specific characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.<sup>8</sup> Important aspects of site include aspect (north, east, south or west-facing), slope angle, topography, and included here, unique presence of rocky structure.

**1. Site on SE - SW facing slope steeper than 20 % (1:5)**-*The intent is to note potentially higher fire danger in wetter forest types (south facing slopes are often drier).*

**2. Site on NE - NW facing slope steeper than 20 % (1:5)**-*The intent is to note potentially lower fire potential sites within drier forest types that serve as a refuge (north facing slopes are often wetter).*

**3. Forested slope steeper than 60 % (3:5)**-*Steeper slopes have greater potential for mass failure and sliding.*

**4. Conspicuous gorge or ravine**-*Gorges and ravines are unique sites within a landscape and are a unique habitat.*

**5. Conspicuous cliff, scree or talus slope**-*Slopes of loose rocks, rocks may be golf ball-sized to bowling ball-size.*

**6. Large boulder(s) or rocky outcrop(s)**-*Boulder piles and rocky outcrops may provide unique habitat for lichens, mosses, other plants, and animals.*

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<sup>8</sup> Natural Resource Conservation Service. 2013. Ecological Site Information System <http://esis.sc.egov.usda.gov/ESIS/>. Last accessed February 2013.

## Category 2: Forest Dynamics

Dynamics or changes are the underlying physical and biological forces that shape and change the composition and structure of a forest. Changes occur on many scales of size and time, from a woodpecker creating a cavity in a snag to a windstorm creating a gap by knocking down several trees to an entire stand. Forests that are dynamic and continue their ecological processes exhibit an important quality known as resilience. Areas of change within a forest are important spots for increased diversity.

**7. Several small canopy gaps (< 0.25 ac)**-*These gaps can be created by management or natural processes. Gaps release additional light, space, nutrients and water resources to adjacent trees and understory vegetation and attract different wildlife species.*

**8. Medium canopy gap(s) (0.25-1 ac)**-*These gaps can be created by management or natural processes. Note, 1 acre is a little smaller than an American football field, minus the end-zones. Gaps release additional light, space, nutrients and water resources to adjacent trees and understory vegetation and attract different wildlife species. Gaps in the 0.25 to 0.5 acre size range have been known to occur as a result of natural processes like root rot pockets, ice storms, or the death of a few large trees in close proximity in western Washington and Oregon forests. Their presence helps account for plant and small mammal diversity that is native to these forests (Carey et al., 1999).*

**9. Larger canopy opening(s) created by wind or fire (1-5 ac)**-*Generally naturally created, however management can mimic this as long as some standing trees and woody debris (biomass) is retained.*

**10. Open or semi-open canopy**-*Created by management or natural. When looking up, trees make up about 50 percent of the canopy.*

**11. Numerous naturally regenerating tree saplings**-*Saplings generally have stems less than 1" diameter and are less than 6 feet tall. Note, this is in the context of small gaps in an intact forest, not meant to be applied to regeneration in a plantation created by clear-cut.*

**12. Ground vegetation very patchy and heterogeneous**-*Understory plants and shrub layer are patchy and of multiple species.*

**13. Exotic shrubs and trees absent or nearly absent**-*Isolated individuals or few occurrences.*

**14. Trees with bark charred by recent fire**-*Evidence of fire on trees is the important component. Other indicators of recent fire can suffice. May be indicative of historical context of a fire on landscape.*

**15. Living tree(s) with wounds or scars from fire**-*Burn marks or cat faces at the base of trees. May be indicative of historical context of a fire on landscape.*

**16. Living tree(s) with wounds or scars from more than one fire-***Burn marks or cat faces at the base of trees. May be indicative of historical context of a unique fire regime.*

**17. Numerous trees or tree tops broken by ice or snow-***Broken-top trees provide habitat for many bird and small mammal species, and also provide entry points for fungi and insects.*

**18. Tree(s) felled by beaver or areas inundated by beaver-***Beaver dams were once a widespread feature in Pacific Northwest forests. Their modification of the environment provides habitat for numerous other species.*

### **Category 3: Habitat in the Forest**

Habitat is the place or environment where a plant or animal naturally or normally lives and grows. It provides an organism with the space, food, water and shelter required for survival and reproduction. Forests provide important habitat types and features for plants and wildlife, but sometimes it is the unique feature *within* the forest that provides a higher degree of biodiversity. The following habitat features may support plant and wildlife species that are locally unique. For purposes of answering the questions in the field form, these special habitats should be checked “yes” if they exceed 0.25 acres in size (that is, approximately one-fourth of an American football field, minus the end-zone).

**19. Conspicuous bald(s)-***Balds may be prairie or lighter vegetation on rocky surface or soil.*

**20. Open or semi-open prairie, native grassland or meadow area-***Not on a rocky bald.*

**21. Forested wetland area-***Forested wetland is defined as at least 30% canopy cover with soil submerged in water for an extended amount of time. Often found near western red cedar or Sitka spruce stands.*

**22. Open wetland area-***Less than 30% canopy cover with soils submerged in water for an extended amount of time.*

**23. Forested spring or seep area-***Seeps occur where groundwater is flowing and is confined by hard, impermeable substrate.*

**24. Riparian forest-***Any existing forested streamside.*

**25. Streambed with substantial amounts of large woody debris-***Large woody debris slows stream flow and creates riffles and pools that are important resting habitat for fish and other aquatic species.*

**26. Stream with section(s) of cascades-***Small waterfalls or steep streams are important habitat for amphibians.*

**27. Streambed with section(s) of cobble or gravel-***Streambeds with diverse substrate provide spawning habitat for different fish species.*

**28. Large hollow and internally decayed tree(s)**-*Are important structures for wildlife dens and resting areas.*

**29. Trees(s) with twig nests**-*Collections of large or fine twigs are used by birds and tree-living small mammals as resting and nesting structures. They are important structures for wildlife and birds for resting and rearing young.*

**30. Nesting holes in trees or snags**-*Are important structures for wildlife and birds.*

#### **Category 4: Trees**

In the tree section of the field form, the series of criteria questions are preceded either by “several” or by “substantial amounts” and refer to averages per acre. While “several” denotes an average of more than two per acre, “substantial amounts of” represents a higher threshold, even if it is difficult to relate it to an absolute number. “Substantial amounts” should be interpreted as significant occurrences of a certain element, that is, you should be able to notice the element when assessing the stand without specifically looking for it. Another way to think about it is that the feature is very easy to notice.

**31. Some native nut, berry or fruit trees or shrubs**-*These are forage species for wildlife. Species include crab apple, cherry, hazelnut, huckleberry, blueberry, dogwood, oaks, and vine maple. Shrubs may be low (1.6 ft tall), medium-tall (3.3-6.6 ft), or tall (6.6-13.1 ft). At least 2-4 shrubs/trees per acre.*

**32. Numerous native nut, berry or fruit trees or shrubs**-*These are forage species for wildlife. Species include crab apple, cherry, hazelnut, huckleberry, blueberry, dogwood, oaks, and vine maple. Shrubs may be low (1.6 ft tall), medium-tall (3.3-6.6 ft), or tall (6.6-13.1 ft). More than 4 shrubs/trees per acre.*

**33. Canopy composed of 3 or more tree species**-*Diverse canopy composition, thus a single individual of different species may not count. Canopy trees are among the tallest, dominant trees in the stand.*

**34. Canopy composed of 5 or more tree species**

**35. Numerous hardwood trees > 10" dbh**-*dbh = diameter at breast height, measured at 4 feet 6 inches above the ground.*

**36. Some hardwood trees > 20" dbh**

**37. Numerous trees > 20" dbh**

**38. Some trees > 30" dbh**

**39. Numerous trees > 30" dbh**

**40. Some > 40" dbh**

## Category 5: Forest Structure

Structure is the physical arrangement of various pieces of an ecosystem, such as the spacing of trees in the forest. In the Pacific Northwest, important structures of forests include big trees (greater than 4-feet in diameter), large snags or standing dead trees, large fallen trees on the forest floor and a multi-layered or continuous canopy.

- **Big trees** bring energy into the forest, including the soil, through photosynthesis. Each tree stores many tons of organic material and nutrients, which are eventually recycled back into the ecosystem. Individual big trees with deep canopies hold a tremendous variety of lichens, fungus, and insect species, some found only in the specialized environment of the canopy. Big trees are also the source of large snags and large fallen trees.
- **Snags** are formed when trees succumb to disease (root or heart rots), are killed by lightning, or their tops are broken off by windstorms or ice storms, or insect damage. They are important nesting and forage habitat for cavity users. West of the Cascades in Oregon and Washington, 39 species of birds and 14 species of mammals depend on cavity trees for their survival. Terrestrial amphibians, small mammals, and birds also depend on large coarse woody debris for protection and foraging for insects, fungi, and seeds.

Snags fall into two primary decay class categories (*Figure: Snags and Downed Logs*):

1. Hard snags, with the bark is still intact and with firm heart and sapwoods, and
2. Soft snags, which may have some bark remaining but with the wood beginning to soften.

Downed logs fall into four primary categories based on their decay class (*Figure: Snags and Downed Logs*):

Class 1, bark is still intact and heart and sapwood is still firm

Class 2, log is in contact with ground; bark is beginning to deteriorate and inner wood is soft.

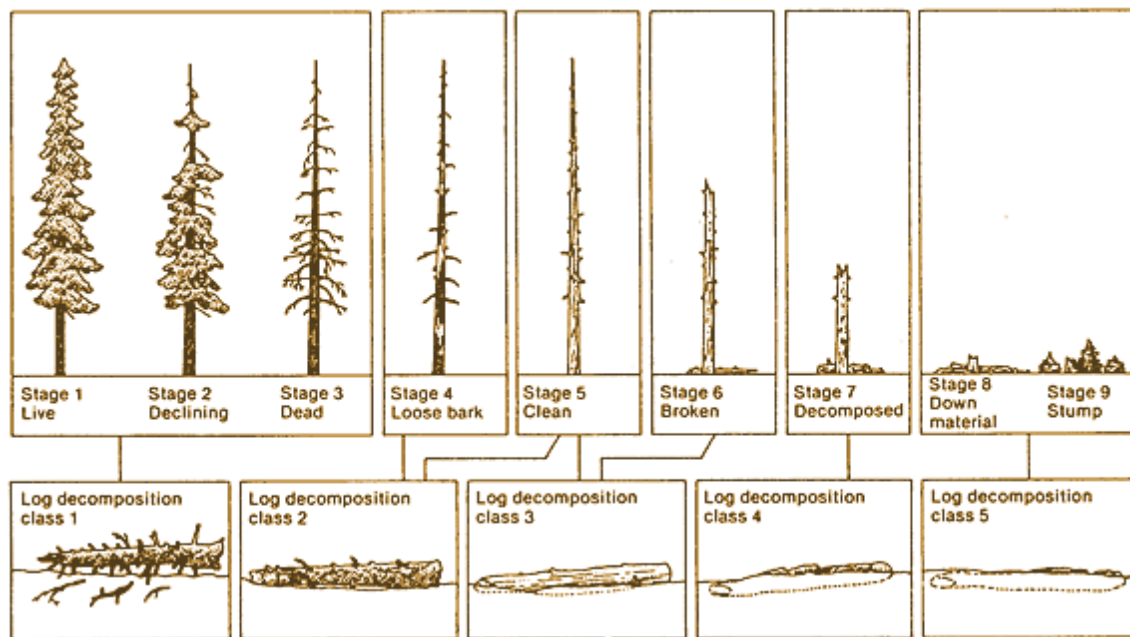
Class 3, log is in contact with ground; bark has completely fallen off and log is beginning to become incorporated into the forest floor

Class 4, log is partially buried and wood is very soft

Class 5, log is barely distinguishable from surrounding forest floor



**Figure: Snags and Downed Logs**



- **Fallen trees** decay on the forest floor and are important habitat and create travel corridors for invertebrates, amphibians and small mammals. Such deadwood is also an important surface for mosses, mushrooms and serves as nurse logs for young trees to grow above the plant and animal competition of the forest floor. About 150 species of birds, mammals, and amphibians depend on large snags and fallen trees.
- **Continuous canopy layers** occur where large trees have big branches and deep crowns that allow light and spaces resources to be occupied by smaller trees. Shrubs, plant understory and moss layers provide other layers and represent vertical structural and species diversity.<sup>9</sup>

**41. Substantial amounts of understory and sub-canopy trees-***This is the vertical complexity in the forest. The layers of understory and sub-canopy habitat connect the forest floor to the canopy. Species are not addressed here; this question pertains to tree structures, not tree species.*

**42. Canopy and sub-canopy trees of different diameters-***Looking for trees and shrubs representing different age- or size-classes. This type of canopy is typically found in forests with trees of several age classes.*

**43. Some large (veteran) trees from previous forest generation(s)-***Legacy trees older than the rest of the stand.*

<sup>9</sup> United States Forest Service. 2005. Main structures of old-growth forests.

<http://www.fs.fed.us/pnw/forests/west-cascade/douglas-fir/mature/structures.shtml>. Last accessed February 2013.

- 44. Numerous large (veteran) trees from previous generation(s)-***Many large legacy trees.*
- 45. Forest area(s) remaining or retained after fire, storm or logging-***Remaining trees and structure after a disturbance may serve as a lifeboat for other species to establish, providing seed source, food, cover, and intact soil for a new generation to establish-post disturbance.*
- 46. Some trees with thick branches or stem forks-***Trees with diverse structures become more prevalent as a tree ages and it withstands more disturbances.*
- 47. Some tree trunks and branches covered by mosses and lichens**

### **Category 6: Dead Trees, Snags and Down Logs**

In the Pacific Northwest, dead trees are as important as living trees to the forest community. Deadwood is any standing dead (snag) or downed tree. These trees provide critical habitat by providing food and shelter for wildlife, protecting soil, enriching soil through decay. Standing and fallen dead wood is an important structural component of healthy forests.

- 48. Some standing dead or dying trees or snags > 10" dbh-***Standing dead and decadent trees or snags, at least 2-4 trees/acre.*
- 49. Some sun-exposed standing dead or dying trees or snags > 10" dbh-***Standing dead and decadent trees or snags, at least 2-4 trees in a gap exposed to different light resources.*
- 50. Some standing dead or dying trees or snags > 20" dbh-***Standing dead and decadent trees or snags, at least 2-4 trees/acre.*
- 51. Numerous standing dead or dying trees or snags > 20" dbh-***Standing dead and decadent trees or snags, more than 4 trees/acre.*
- 52. Some standing dead or dying trees or snags > 30" dbh**
- 53. Some down logs > 20" at mid-log-***At least 2-4 logs/acre.*
- 54. Some down logs > 20" in open sun-exposed conditions-***At least 2-4 logs/acre.*
- 55. Some down logs > 30" at mid-log-***At least 2-4 logs/acre.*
- 56. Some down logs > 40" at mid-log-***At least 2-4 logs/acre.*
- 57. Down logs in various stages of decay-***From "hard to kick" to "crumbles when kicked". At least 2-4 logs/acre in various stages of decay.*
- 58. Some down logs covered by mosses**
- 59. Some trees, snags or logs with shelf fungi**
- 60. Signs of woodpecker activity-***Living trees and snags with evidence of excavation.*

## Summary

Maintenance of natural biological diversity is a fundamental aspect of sustainable forest management. The Forest Biodiversity Assessment is a monitoring tool to observe and understand changes in your forest through time and management activities. This methodology is primarily intended as a tool to identify areas in the forest landscape that contain, or has the potential to contain, high biological values. These areas serve as focus points of conservation and restoration efforts.

Finally, field assessments fulfill an important educational function. Everyone that regularly uses this method of forest biodiversity assessment learns to identify and pay attention to elements and habitats necessary to sustain forest biodiversity. This in turn helps to develop a dynamic approach to nature and the processes that affect the forest landscape. To ask the relevant questions is often as important as getting exact answers - as in many other cases, the path is as important as the goal.

## Appendix

The four variations of the field form are:

- Douglas-fir/Mixed coniferous forests west of the Cascades (Form D, D for Douglas-fir)
- Oak/Douglas-fir or Oak/Pine woodlands (Form O, O for oak)
- Early seral conditions or young forests (Form E, E for early seral)
- Ponderosa and lodgepole pine forests east of the Cascades (Form P, P for Ponderosa)

These forms are available at [nnrg.org/ecosystem-services](http://nnrg.org/ecosystem-services).

## Form D – Douglas-fir/Mixed coniferous forests

### FOREST BIODIVERSITY ASSESSMENT

Douglas-fir/Mixed coniferous forests west of the Cascades - Pacific Northwest Version 1.0

Date: \_\_\_\_\_ Stand: \_\_\_\_\_

TOPOGRAPHY & SITE CHARACTERISTICS	D
1. Site on SE - SW facing slope steeper than 20 % (1:5)	<input type="radio"/>
2. Site on NE - NW facing slope steeper than 20 % (1:5)	<input type="radio"/>
3. Forested slope steeper than 60 % (3:5)	<input type="radio"/>
4. Conspicuous gorge or ravine	<input type="radio"/>
5. Conspicuous cliff, scree or talus slope	<input type="radio"/>
6. Large boulder(s) or rocky outcrop(s)	<input type="radio"/>
FOREST DYNAMICS	
7. Small (< 0.25 ac) canopy gaps	<input type="radio"/>
8. Medium (0.25-1 ac) canopy gap(s)	<input type="radio"/>
9. Larger (1-5 ac) canopy opening(s) created by wind or fire	<input type="radio"/>
10. Open or semi-open canopy	<input type="radio"/>
11. Numerous naturally regenerating tree saplings	<input type="radio"/>
12. Ground vegetation very patchy and heterogeneous	<input type="radio"/>
13. Exotic shrubs and trees absent or nearly absent	<input type="radio"/>
14. Trees with bark charred by recent fire	<input type="radio"/>
15. Living tree(s) with wounds or scars from fire	<input type="radio"/>
16. Living tree(s) with wounds or scars from more than one fire	<input type="radio"/>
17. Numerous trees or tree tops broken by ice or snow	<input type="radio"/>
18. Tree(s) felled by beaver or areas inundated by beaver	<input type="radio"/>
HABITAT IN THE FOREST	
19. Conspicuous bald(s)	<input type="radio"/>
20. Open or semi-open prairie, native grassland or meadow area	<input type="radio"/>
21. Forested wetland area	<input type="radio"/>
22. Open wetland area	<input type="radio"/>
23. Forested spring or seep area	<input type="radio"/>
24. Riparian forest	<input type="radio"/>
25. Streambed with substantial amounts of large woody debris	<input type="radio"/>
26. Stream with section(s) of cascades	<input type="radio"/>
27. Streambed with section(s) of cobble or gravel	<input type="radio"/>
28. Large hollow and internally decayed tree(s)	<input type="radio"/>
29. Tree(s) with twig nests	<input type="radio"/>
30. Nesting holes in trees or snags	<input type="radio"/>

Site total

Highest possible site total 24

TREES	D
31. Some (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
32. Numerous (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
33. Canopy composed of 3 or more tree species	<input type="radio"/>
34. Canopy composed of 5 or more tree species	<input type="radio"/>
35. Numerous hardwood trees > 10" dbh	<input type="radio"/>
36. Some hardwood trees > 20" dbh	<input type="radio"/>
37. Numerous trees > 20" dbh	<input type="radio"/>
38. Some trees > 30" dbh	<input type="radio"/>
39. Numerous trees > 30" dbh	<input type="radio"/>
40. Some trees > 40" dbh	<input type="radio"/>
FOREST STRUCTURE	
41. Substantial amounts of understory and subcanopy trees	<input type="radio"/>
42. Canopy and sub-canopy trees of different diameters	<input type="radio"/>
43. Some large (veteran) trees from previous forest generation(s)	<input type="radio"/>
44. Numerous large (veteran) trees from previous forest generation(s)	<input type="radio"/>
45. Forest area(s) remaining or retained after fire, storm or logging	<input type="radio"/>
46. Some trees with thick branches or stem forks	<input type="radio"/>
47. Some tree trunks and branches covered by mosses and lichens	<input type="radio"/>
DEAD TREES, SNAGS AND DOWN LOGS	
48. Some standing dead or dying trees or snags > 10" dbh	<input type="radio"/>
49. Some standing sun-exposed dead or dying trees or snags > 10" dbh	<input type="radio"/>
50. Some standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
51. Numerous standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
52. Some standing dead or dying trees or snags > 30" dbh	<input type="radio"/>
53. Some down logs > 20" diameter at mid-log	<input type="radio"/>
54. Some sun-exposed down logs > 20" diameter at mid-log	<input type="radio"/>
55. Some down logs > 30" diameter at mid-log	<input type="radio"/>
56. Some down logs > 40" diameter at mid-log	<input type="radio"/>
57. Down logs in various different stages of decay	<input type="radio"/>
58. Some down logs covered by mosses	<input type="radio"/>
59. Some trees, snags or logs with shelf fungi	<input type="radio"/>
60. Signs of woodpecker foraging on trees, snags or logs	<input type="radio"/>

Stand total

SITE & STAND TOTAL

Highest possible stand total 24

Highest possible combined total 48

D = Douglas-fir/Mixed coniferous forests west of the Cascades

O = Oak/Douglas-fir - Oak/pine woodlands

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E = Early seral reference condition

P = Ponderosa and Lodgepole pine forests east of the Cascades

## Form O – Oak woodlands

### FOREST BIODIVERSITY ASSESSMENT

Oak/Douglas-fir and Oak/pine woodlands - Pacific Northwest Version 1.0

Date: \_\_\_\_\_ Stand: \_\_\_\_\_

TOPOGRAPHY & SITE CHARACTERISTICS	
1. Site on SE - SW facing slope steeper than 20 % (1:5)	<input type="radio"/>
2. Site on NE - NW facing slope steeper than 20 % (1:5)	<input type="radio"/>
3. Forested slope steeper than 60 % (3:5)	<input type="radio"/>
4. Conspicuous gorge or ravine	<input type="radio"/>
5. Conspicuous cliff, scree or talus slope	<input type="radio"/>
6. Large boulder(s) or rocky outcrop(s)	<input type="radio"/>
FOREST DYNAMICS	
7. Small (< 0.25 ac) canopy gaps	<input type="radio"/>
8. Medium (0.25-1 ac) canopy gap(s)	<input type="radio"/>
9. Larger (1-5 ac) canopy opening(s) created by wind or fire	<input type="radio"/>
10. Open or semi-open canopy	<input type="radio"/>
11. Numerous naturally regenerating tree saplings	<input type="radio"/>
12. Ground vegetation very patchy and heterogeneous	<input type="radio"/>
13. Exotic shrubs and trees absent or nearly absent	<input type="radio"/>
14. Trees with bark charred by recent fire	<input type="radio"/>
15. Living tree(s) with wounds or scars from fire	<input type="radio"/>
16. Living tree(s) with wounds or scars from more than one fire	<input type="radio"/>
17. Numerous trees or tree tops broken by ice or snow	<input type="radio"/>
18. Tree(s) felled by beaver or areas inundated by beaver	<input type="radio"/>
HABITAT IN THE FOREST	
19. Conspicuous bald(s)	<input type="radio"/>
20. Open or semi-open prairie, native grassland or meadow area	<input type="radio"/>
21. Forested wetland area	<input type="radio"/>
22. Open wetland area	<input type="radio"/>
23. Forested spring or seep area	<input type="radio"/>
24. Riparian forest	<input type="radio"/>
25. Streambed with substantial amounts of large woody debris	<input type="radio"/>
26. Stream with section(s) of cascades	<input type="radio"/>
27. Streambed with section(s) of cobble or gravel	<input type="radio"/>
28. Large hollow and internally decayed tree(s)	<input type="radio"/>
29. Tree(s) with twig nests	<input type="radio"/>
30. Nesting holes in trees or snags	<input type="radio"/>
Site total	<input type="text"/>
Highest possible site total	21

D = Douglas-fir/Mixed coniferous forests west of the Cascades  
 O = Oak/Douglas-fir - Oak/pine woodlands  
 © FSC US, NNRG, Drakenberg / Lindhe 2012

TREES	
31. Some (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
32. Numerous (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
33. Canopy composed of 3 or more tree species	<input type="radio"/>
34. Canopy composed of 5 or more tree species	<input type="radio"/>
35. Numerous hardwood trees > 10" dbh	<input type="radio"/>
36. Some hardwood trees > 20" dbh	<input type="radio"/>
37. Numerous trees > 20" dbh	<input type="radio"/>
38. Some trees > 30" dbh	<input type="radio"/>
39. Numerous trees > 30" dbh	<input type="radio"/>
40. Some trees > 40" dbh	<input type="radio"/>
FOREST STRUCTURE	
41. Substantial amounts of understory and subcanopy trees	<input type="radio"/>
42. Canopy and sub-canopy trees of different diameters	<input type="radio"/>
43. Some large (veteran) trees from previous forest generation(s)	<input type="radio"/>
44. Numerous large (veteran) trees from previous forest generation(s)	<input type="radio"/>
45. Forest area(s) remaining or retained after fire, storm or logging	<input type="radio"/>
46. Some trees with thick branches or stem forks	<input type="radio"/>
47. Some tree trunks and branches covered by mosses and lichens	<input type="radio"/>
DEAD TREES, SNAGS AND DOWN LOGS	
48. Some standing dead or dying trees or snags > 10" dbh	<input type="radio"/>
49. Some standing sun-exposed dead or dying trees or snags > 10" dbh	<input type="radio"/>
50. Some standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
51. Numerous standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
52. Some standing dead or dying trees or snags > 30" dbh	<input type="radio"/>
53. Some down logs > 20" diameter at mid-log	<input type="radio"/>
54. Some sun-exposed down logs > 20" diameter at mid-log	<input type="radio"/>
55. Some down logs > 30" diameter at mid-log	<input type="radio"/>
56. Some down logs > 40" diameter at mid-log	<input type="radio"/>
57. Down logs in various different stages of decay	<input type="radio"/>
58. Some down logs covered by mosses	<input type="radio"/>
59. Some trees, snags or logs with shelf fungi	<input type="radio"/>
60. Signs of woodpecker foraging on trees, snags or logs	<input type="radio"/>
Stand total	<input type="text"/>
SITE & STAND TOTAL	<input type="text"/>
Highest possible stand total	18
Highest possible combined total	35

E = Early seral reference condition  
 P = Ponderosa and Lodgepole pine forests east of the Cascades



## Form E – Early seral conditions or young forests

### FOREST BIODIVERSITY ASSESSMENT

Early seral or young stands - Pacific Northwest Version 1.0

Date: \_\_\_\_\_ Stand: \_\_\_\_\_

TOPOGRAPHY & SITE CHARACTERISTICS	E
1. Site on SE - SW facing slope steeper than 20 % (1:5)	<input type="radio"/>
2. Site on NE - NW facing slope steeper than 20 % (1:5)	<input type="radio"/>
3. Forested slope steeper than 60 % (3:5)	<input type="radio"/>
4. Conspicuous gorge or ravine	<input type="radio"/>
5. Conspicuous cliff, scree or talus slope	<input type="radio"/>
6. Large boulder(s) or rocky outcrop(s)	<input type="radio"/>
<b>FOREST DYNAMICS</b>	
7. Small (< 0.25 ac) canopy gaps	<input type="radio"/>
8. Medium (0.25-1 ac) canopy gap(s)	<input type="radio"/>
9. Larger (1-5 ac) canopy opening(s) created by wind or fire	<input type="radio"/>
10. Open or semi-open canopy	<input type="radio"/>
11. Numerous naturally regenerating tree saplings	<input type="radio"/>
12. Ground vegetation very patchy and heterogeneous	<input type="radio"/>
13. Exotic shrubs and trees absent or nearly absent	<input type="radio"/>
14. Trees with bark charred by recent fire	<input type="radio"/>
15. Living tree(s) with wounds or scars from fire	<input type="radio"/>
16. Living tree(s) with wounds or scars from more than one fire	<input type="radio"/>
17. Numerous trees or tree tops broken by ice or snow	<input type="radio"/>
18. Tree(s) felled by beaver or areas inundated by beaver	<input type="radio"/>
<b>HABITAT IN THE FOREST</b>	
19. Conspicuous bald(s)	<input type="radio"/>
20. Open or semi-open prairie, native grassland or meadow area	<input type="radio"/>
21. Forested wetland area	<input type="radio"/>
22. Open wetland area	<input type="radio"/>
23. Forested spring or seep area	<input type="radio"/>
24. Riparian forest	<input type="radio"/>
25. Streambed with substantial amounts of large woody debris	<input type="radio"/>
26. Stream with section(s) of cascades	<input type="radio"/>
27. Streambed with section(s) of cobble or gravel	<input type="radio"/>
28. Large hollow and internally decayed tree(s)	<input type="radio"/>
29. Tree(s) with twig nests	<input type="radio"/>
30. Nesting holes in trees or snags	<input type="radio"/>
Site total	
Highest possible site total	19

TREES	E
31. Some (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
32. Numerous (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
33. Canopy composed of 3 or more tree species	<input type="radio"/>
34. Canopy composed of 5 or more tree species	<input type="radio"/>
35. Numerous hardwood trees > 10" dbh	<input type="radio"/>
36. Some hardwood trees > 20" dbh	<input type="radio"/>
37. Numerous trees > 20" dbh	<input type="radio"/>
38. Some trees > 30" dbh	<input type="radio"/>
39. Numerous trees > 30" dbh	<input type="radio"/>
40. Some trees > 40" dbh	<input type="radio"/>
<b>FOREST STRUCTURE</b>	
41. Substantial amounts of understory and subcanopy trees	<input type="radio"/>
42. Canopy and sub-canopy trees of different diameters	<input type="radio"/>
43. Some large (veteran) trees from previous forest generation(s)	<input type="radio"/>
44. Numerous large (veteran) trees from previous forest generation(s)	<input type="radio"/>
45. Forest area(s) remaining or retained after fire, storm or logging	<input type="radio"/>
46. Some trees with thick branches or stem forks	<input type="radio"/>
47. Some tree trunks and branches covered by mosses and lichens	<input type="radio"/>
<b>DEAD TREES, SNAGS AND DOWN LOGS</b>	
48. Some standing dead or dying trees or snags > 10" dbh	<input type="radio"/>
49. Some standing sun-exposed dead or dying trees or snags > 10" dbh	<input type="radio"/>
50. Some standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
51. Numerous standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
52. Some standing dead or dying trees or snags > 30" dbh	<input type="radio"/>
53. Some down logs > 20" diameter at mid-log	<input type="radio"/>
54. Some sun-exposed down logs > 20" diameter at mid-log	<input type="radio"/>
55. Some down logs > 30" diameter at mid-log	<input type="radio"/>
56. Some down logs > 40" diameter at mid-log	<input type="radio"/>
57. Down logs in various different stages of decay	<input type="radio"/>
58. Some down logs covered by mosses	<input type="radio"/>
59. Some trees, snags or logs with shelf fungi	<input type="radio"/>
60. Signs of woodpecker foraging on trees, snags or logs	<input type="radio"/>
Stand total	
SITE & STAND TOTAL	
Highest possible stand total	21
Highest possible combined total	40

D = Douglas-fir/Mixed coniferous forests west of the Cascades  
 O = Oak/Douglas-fir - Oak/pine woodlands  
 © FSC US, NNRG, Drakenberg / Lindhe 2012

E = Early seral reference condition  
 P = Ponderosa and Lodgepole pine forests east of the Cascades



## Form P – Ponderosa and lodgepole pine forests

### FOREST BIODIVERSITY ASSESSMENT

Ponderosa forests - Pacific Northwest Version 1.0

Date: \_\_\_\_\_ Stand: \_\_\_\_\_

TOPOGRAPHY & SITE CHARACTERISTICS	P
1. Site on SE - SW facing slope steeper than 20 % (1:5)	<input type="radio"/>
2. Site on NE - NW facing slope steeper than 20 % (1:5)	<input type="radio"/>
3. Forested slope steeper than 60 % (3:5)	<input type="radio"/>
4. Conspicuous gorge or ravine	<input type="radio"/>
5. Conspicuous cliff, scree or talus slope	<input type="radio"/>
6. Large boulder(s) or rocky outcrop(s)	<input type="radio"/>
<b>FOREST DYNAMICS</b>	
7. Small (< 0.25 ac) canopy gaps	<input type="radio"/>
8. Medium (0.25-1 ac) canopy gap(s)	<input type="radio"/>
9. Larger (1-5 ac) canopy opening(s) created by wind or fire	<input type="radio"/>
10. Open or semi-open canopy	<input type="radio"/>
11. Numerous naturally regenerating tree saplings	<input type="radio"/>
12. Ground vegetation very patchy and heterogeneous	<input type="radio"/>
13. Exotic shrubs and trees absent or nearly absent	<input type="radio"/>
14. Trees with bark charred by recent fire	<input type="radio"/>
15. Living tree(s) with wounds or scars from fire	<input type="radio"/>
16. Living tree(s) with wounds or scars from more than one fire	<input type="radio"/>
17. Numerous trees or tree tops broken by ice or snow	<input type="radio"/>
18. Tree(s) felled by beaver or areas inundated by beaver	<input type="radio"/>
<b>HABITAT IN THE FOREST</b>	
19. Conspicuous bald(s)	<input type="radio"/>
20. Open or semi-open prairie, native grassland or meadow area	<input type="radio"/>
21. Forested wetland area	<input type="radio"/>
22. Open wetland area	<input type="radio"/>
23. Forested spring or seep area	<input type="radio"/>
24. Riparian forest	<input type="radio"/>
25. Streambed with substantial amounts of large woody debris	<input type="radio"/>
26. Stream with section(s) of cascades	<input type="radio"/>
27. Streambed with section(s) of cobble or gravel	<input type="radio"/>
28. Large hollow and internally decayed tree(s)	<input type="radio"/>
29. Tree(s) with twig nests	<input type="radio"/>
30. Nesting holes in trees or snags	<input type="radio"/>

Site total

Highest possible site total 26

D = Douglas-fir/Mixed coniferous forests west of the Cascades

O = Oak/Douglas-fir - Oak/pine woodlands

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TREES	P
31. Some (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
32. Numerous (native) nut-, berry- or fleshy fruit trees or shrubs	<input type="radio"/>
33. Canopy composed of 3 or more tree species	<input type="radio"/>
34. Canopy composed of 5 or more tree species	<input type="radio"/>
35. Numerous hardwood trees > 10" dbh	<input type="radio"/>
36. Some hardwood trees > 20" dbh	<input type="radio"/>
37. Numerous trees > 20" dbh	<input type="radio"/>
38. Some trees > 30" dbh	<input type="radio"/>
39. Numerous trees > 30" dbh	<input type="radio"/>
40. Some trees > 40" dbh	<input type="radio"/>
<b>FOREST STRUCTURE</b>	
41. Substantial amounts of understory and subcanopy trees	<input type="radio"/>
42. Canopy and sub-canopy trees of different diameters	<input type="radio"/>
43. Some large (veteran) trees from previous forest generation(s)	<input type="radio"/>
44. Numerous large (veteran) trees from previous forest generation(s)	<input type="radio"/>
45. Forest area(s) remaining or retained after fire, storm or logging	<input type="radio"/>
46. Some trees with thick branches or stem forks	<input type="radio"/>
47. Some tree trunks and branches covered by mosses and lichens	<input type="radio"/>
<b>DEAD TREES, SNAGS AND DOWN LOGS</b>	
48. Some standing dead or dying trees or snags > 10" dbh	<input type="radio"/>
49. Some standing sun-exposed dead or dying trees or snags > 10" dbh	<input type="radio"/>
50. Some standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
51. Numerous standing dead or dying trees or snags > 20" dbh	<input type="radio"/>
52. Some standing dead or dying trees or snags > 30" dbh	<input type="radio"/>
53. Some down logs > 20" diameter at mid-log	<input type="radio"/>
54. Some sun-exposed down logs > 20" diameter at mid-log	<input type="radio"/>
55. Some down logs > 30" diameter at mid-log	<input type="radio"/>
56. Some down logs > 40" diameter at mid-log	<input type="radio"/>
57. Down logs in various different stages of decay	<input type="radio"/>
58. Some down logs covered by mosses	<input type="radio"/>
59. Some trees, snags or logs with shelf fungi	<input type="radio"/>
60. Signs of woodpecker foraging on trees, snags or logs	<input type="radio"/>

Stand total

SITE & STAND TOTAL

Highest possible stand total 17

Highest possible combined total 43

E = Early seral reference condition

P = Ponderosa and Lodgepole pine forests east of the Cascades