

1 LATE SUCCESSIONAL MIXED CONIFER FORESTS

2 Late successional mixed conifer forests provide a multi-layered tree canopy, including
3 large-diameter trees, shade-tolerant tree species in the understory, and a high volume of
4 dead wood, such as snags and logs.

5 ECOREGIONS

6 Late successional mixed conifer forests are a Strategy Habitat in the **Blue**
7 **Mountains, Coast Range, East Cascades, Klamath Mountains, and West**
8 **Cascades** ecoregions. A few patches of late successional mix conifer forests can also be
9 found scattered across the fringes of the Willamette Vally ecoregion.

10 CHARACTERISTICS

11 Late successional mixed conifer forests are defined by plant species composition,
12 overstory tree age and size, and the forest structure. While a range of tree ages are present
13 in late successional forests, the predominant stand age is over 150 years. They include
14 characteristics such as a multi-layered tree canopy, shade-tolerant tree species growing in
15 the understory, large-diameter trees, and a high volume of dead wood, such as snags and
16 logs. These characteristics can take hundreds of years without stand replacing
17 disturbance to develop. Historically, fire was the major natural disturbance in all but the
18 wettest areas. Depending on local conditions, fires in the Coast Range and West
19 Cascades conifer forests were of moderate- to high-severity stand replacing events every
20 100 to more than 400 years. These stand replacing events were interspersed with periodic
21 low severity understory burns every 15 to 30 years. This historical fire regime created a
22 complex mosaic of stand structures across the landscape.

23 ECOREGIONAL CHARACTERISTICS

24 **Blue Mountains**

25 The make-up of tree species in late successional mixed conifer forest in the Blue Mountain
26 Ecoregions depends on climate. A mixture of conifer species is found throughout many
27 forest sites in the Blue Mountains ecoregion. Mixed conifer forests can be divided in two
28 subtypes based on environmental temperature and moisture conditions. Douglas-fir and
29 grand fir are the primary late successional tree species in the warmer drier climates of this
30 region. Ponderosa pine and western larch may also be present. The cool mixed conifer type
31 is indicated by the addition of more moisture-demanding and cold-tolerant species, such
32 as subalpine fir and Engelmann spruce, at upper elevations or along streams where cold
33 water-drainage and deep frost eliminate some species. The understory in this ecoregion

34 generally includes huckleberry, serviceberry, oceanspray, snowberry, wild ginger,
35 goldthread, starflower, bead lily, and oak fern.

36 **Coast Range**

37 Late successional mixed conifer forests in the Coast Range are generally predominated by
38 two types of conifer trees: Sitka spruce and Douglas-fir. Sitka spruce forests occur within a
39 narrow fog- and salt-influenced strip along the coast and extend into some valleys. Soils
40 tend to be deep, acidic, and well-drained. Sitka spruce dominates the overstory, but
41 western hemlock, western redcedar, Douglas-fir, big leaf maple, and red alder may be
42 present. The lush understory has salmonberry, vine maple, salal, evergreen huckleberry,
43 sword fern, deer fern, and a high diversity of mosses and lichens. Inland, Douglas-fir
44 forests dominate. Due to high precipitation in both Sitka spruce and Douglas fir forests,
45 fires are rare but do occur in hot, dry, easterly wind conditions after prolonged drought. When
46 these events do occur, they may be high severity fires that are stand replacing events.
47 Other disturbances include small-scale windthrow events and floods driven by
48 atmospheric river storms.

49 **East Cascades**

50 Late successional mixed conifer forests span the eastern slopes of the Cascade
51 Mountains. This habitat contains a wide variety of tree species with Douglas-fir, grand fir,
52 and western hemlock as the most common forest tree species that co-dominate most
53 overstories. Several other conifers may also be present, including western redcedar,
54 western white pine, western larch, ponderosa pine, and lodgepole pine. Undergrowth
55 vegetation in the East Cascades ecoregion includes vine maple, Oregon grape,
56 huckleberry, oxalis, Oregon boxleaf, thimbleberry, manzanita, ceanothus, and twinflower.
57 Many sites once dominated by Douglas-fir and ponderosa pine (formerly maintained by
58 wildfire) may now be dominated by grand fir (a fire sensitive, shade-tolerant species).

59 **Klamath Mountains**

60 Late successional mixed conifer forests in the **Klamath Mountains** ecoregion are
61 characterized by high tree diversity. Douglas-fir is usually dominant. Depending on site
62 characteristics, other canopy trees include white fir, sugar pine, ponderosa pine, and
63 incense cedar. Port-Orford cedar occurs on moist sites, such as riparian areas. Jeffrey pine
64 and knobcone pine occur on serpentine soils. Broadleaf trees, such as tanoak, canyon live
65 oak, golden chinquapin, big leaf and vine maple, and Pacific madrone, may occur in the
66 subcanopy. Understories are mostly dominated by shrubs but can be primarily forbs,
67 grasses, or may be relatively open. However, with an increase in droughts, high instances
68 of Douglas-fir mortality in the Klamath Mountains is quickly shifting the composition of

69 these forests and setting them up for catastrophic wildlife associated with climate change
70 and fire suppression.

71 **West Cascades**

72 Late successional conifer forests are found scattered throughout the **West Cascades**
73 **Ecoregion**. While Douglas -fir dominate these forests, western hemlock is almost always
74 co-dominant and usually dominates the understory. In the absence of stand replacing
75 disturbance, Douglas-fir forests eventually will convert to western hemlock. Other
76 common trees include grand fir and western redcedar in the northern portion of the
77 ecoregion, or incense cedar, sugar pine, white fir, and western redcedar in the southern
78 portion of the ecoregion. The understory has shrub and forb species, such as vine maple,
79 salal, sword fern, Cascade Oregon grape, western rhododendron, huckleberries,
80 twinflower, vanilla leaf, and oxalis.

81 CONSERVATION OVERVIEW

82 Over the last 150 years, both timber harvests and large fires have replaced much of the late
83 successional forests in Oregon with younger forests, contributing to a loss of late
84 successional forests since 1850 of nearly 90. Federal lands contain substantial acreages
85 of mature and late successional forests, but many of these forests occur in a patchwork
86 with the much younger forests that are managed with shorter rotations to generate timber
87 products. The younger forests still maintain their capacity to become older forests, and
88 they can often support many species. However, late successional forests support a wide
89 array of species, many of which require large patches of older or mature forests to survive
90 and may be sensitive to changes in the forest seral stage.

91 The Northwest Forest Plan (**NWFP**) is a comprehensive natural resource planning effort
92 that includes all or part of the Siuslaw, Rogue River-Siskiyou, Mt. Hood, Willamette,
93 Deschutes, Umpqua, and Fremont Winema National Forests in Oregon. The
94 NWFP identifies conservation priorities for species affected by loss and fragmentation of
95 large patches of late successional forests, assessing over 1,000 species. However, all
96 planning efforts are limited by understanding of landscape management and by ecological
97 data availability. Late Successional Reserves established under the NWFP are intended to
98 ensure enough high-quality habitat to sustain identified species. However, many of the
99 federal lands that are designated as Late Successional Reserves do not include forests at
100 the late successional stage, while others are relatively small “checkerboards” of forests
101 embedded in a matrix of private industrial timber lands, particularly in the Coast Range
102 and Klamath Mountains. There is potential for the amount of late successional forests to
103 increase over time, under current state and federal policies. The NWFP is currently in the
104 process of being amended (placeholder for updates).

105 Many of the Late Successional Reserves are in Fire Regime Condition Class II or Condition
106 Class III, where the risk of loss of key ecosystem components is moderate or high
107 (see **Disruption of Disturbance Regimes**). This risk is particularly acute in the Klamath
108 Mountains, East Cascade, and the Southwest section of the Coast Range Ecoregions,
109 where several landscape-scale, high-severity wildfires have impacted wildlife habitat.

110 The Wildfire Crisis Implementation Plan is attempting to address historical fire
111 suppression, exclusion of Indigenous peoples burning practices, and the impacts of recent
112 catastrophic and uncharacteristic wildfires, by recommending a variety of active
113 management techniques for forests to increase fire safety and evaluation of their effects
114 on fire behavior and the effectiveness of suppression. Results of implementing the Wildfire
115 Crisis Implementation Plan and its effects on both public safety and forest habitats are
116 continually being evaluated.

117 In the Coast Range, three-quarters of the ecoregion is in state or private ownership. The
118 Oregon Department of Forestry manages 550,000 acres in the Coast Range ecoregion,
119 primarily in the Clatsop, and Tillamook. The Northwest and Southwest State Forest
120 Management Plans provide management direction for all Board of Forestry Land and
121 Common School Forest Lands. The plans include management strategies for 16 resources,
122 including fish and wildlife, timber, recreation, and water resources. The plans describe
123 long-term desired future conditions, which include older forest structure. Most private
124 forest lands are currently managed intensively for timber values using relatively short
125 rotations, which will limit future development of late successional habitats in many areas.
126 The Department of State Lands will be managing the Elliott State Forest as a research
127 forest.

128 The Private Forest Accord (PFA) is an agreement that aims to protect fish and amphibians
129 in Oregon's forests, including old-growth forests. The PFA includes new standards for
130 forest roads, culverts, and stream buffers, as well as a grant program to fund conservation
131 projects.

132 In the SW Cascades, white firs in overstocked stands are often full of disease, putting large
133 ponderosa pines at risk for large wildfire. They are a remnant of fire suppression, exclusion
134 of Indigenous peoples burning practices, and past logging practices. Removing these
135 patches will help create more early seral openings for the benefits of deer and elk and
136 provide a greater mosaic of habitats across the landscape.

137 Late successional mixed conifer forests are particularly important for wildlife, mosses, and
138 lichens. Depending on the ecoregion, **Species of Greatest Conservation**
139 **Need** associated with late successional conifer forests include **ringtail, fisher, Pacific**
140 **marten, red tree vole, Marbled Murrelet, Northern Spotted Owl, Oregon slender**
141 **salamander**, and many others.

142 LIMITING FACTORS AND RECOMMENDED APPROACHES

143 **Limiting Factor: Loss of Structural Habitat Elements**

144 Where historical stands were perpetuated for 200 to more than 1,000 years, commercial
145 forestlands are now commonly harvested every 60 years or less, which limits the
146 maintenance and future recruitment of late-successional characteristics. In addition, the
147 number of large-diameter snags and logs has been reduced over time through wildfire and
148 timber harvest.

149 **Recommended Approach**

150 Develop programs, incentives, and market-based approaches to encourage longer
151 rotations and strategically located large-diameter tree tracts. Where feasible, maintain
152 structural elements, such as large-diameter tall trees, snags, and logs. Create snags from
153 green trees or high-cut stumps where maintaining snags is not feasible or where snag
154 management goals are not being met. Maintain forest stand structures on private industrial
155 forest lands, and provide technical assistance to landowners to leave large, downed wood,
156 green trees, or snags in the upland portion of harvested forests, as well as along riparian
157 areas, to provide benefits for a diversity of wildlife and fish.

158 **Limiting Factor: Loss of Late Successional Stand Size and Connectivity**

159 Late successional forest stands have been greatly reduced in size and connectivity,
160 particularly at lower elevations. This can impact species that are highly adapted to late
161 successional conditions, require large tracts of intact habitats, and/or species that have
162 limited ability to move over long distances to find new suitable areas. It also allows edge
163 species to compete with ones adapted to extensive interior forest habitat.

164 **Recommended Approach**

165 Maintain existing plans to protect and develop late successional habitat. Use active
166 management to accelerate development of late successional structural characteristics in
167 key areas to expand existing patches into larger areas; these will provide greater blocks of
168 habitat for species with large area requirements or those that require interior forest habitat
169 and are vulnerable to “edge effects”. Continue to carefully plan forest practices to
170 maintain connectivity (KCI: **Barriers to Animal Movement**), particularly when species
171 vulnerable to fragmentation are present. ODFW has mapped [Priority Wildlife Connectivity](#)
172 [Areas \(PWCAs\)](#) to provide information on places across the landscape with the highest
173 overall value for facilitating wildlife movement.

174

175 Seek opportunities to coordinate management of public and private lands (e.g., All-Lands
176 Approach) whenever possible to address conservation needs. Use voluntary conservation
177 tools, such as financial incentives and forest certification to achieve conservation goals on
178 private lands. Recognize that a diversity of forest types and ages should be considered to
179 support wildlife habitat connectivity and ecosystem services at a landscape scale.

180 Historically, late successional coniferous forests throughout Oregon were an element of a
181 shifting mosaic of forest types and ages across the landscape.

182 HABITAT CHANGE TRENDS ANALYSIS

183

184 In the absence of active management (e.g. replanting with Douglas-fir) late successional
185 conifer forests often succeed to deciduous or mixed deciduous-conifer forests after
186 disturbance, especially on the west side of the state. These forests are primarily dominated
187 by red alder and bigleaf maple. A comparison of the total area of west-side deciduous and
188 mixed conifer-deciduous forests in 1851, 1998, and 2016, and change in total area
189 between timepoints, indicates a massive 232% increase in deciduous forests between
190 1851 and 1998 likely reflecting a shift towards earlier successional forests following
191 logging.

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194 REFERENCES

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201 RESOURCES FOR MORE INFORMATION

202 [**Northwest Forest Plan**](#)

203 [**Status and Trends of Late Successional and Old Growth Forests**](#)