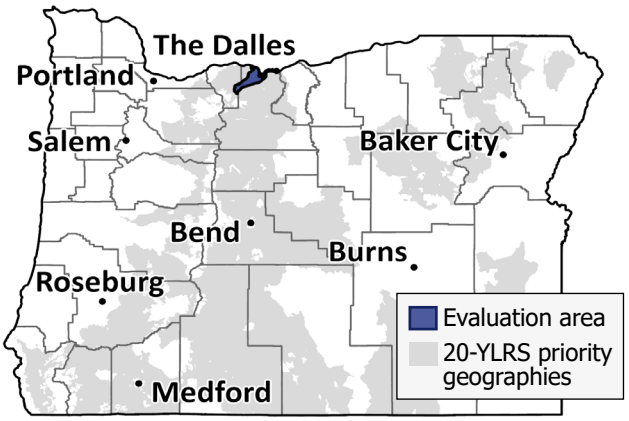
MILL CREEK-COLUMBIA RIVER
LANDSCAPE EVALUATION SUMMARY (2026)

The Oregon Department of Forestry's 20-Year Landscape Resilience Strategy (20-YLRS)[1] identified the Mill Creek-Columbia River watershed as high priority for resilience-based management needs. The 20-YLRS aims to 1) reduce wildfire risk to communities, 2) adapt ecological systems to persist in a changing climate, 3) create functional aquatic and terrestrial ecosystems, and 4) support vibrant local economies. Organized around these four elements, this document presents current conditions, identifies restoration needs, and establishes treatment goals for the Mill Creek-Columbia River watershed (hereafter "evaluation area").[2]

Evaluation area overview



Total acres	Forested acres	Treatment need (acres)
91,232	33,334	12,300

Figure 1. Evaluation area with 20-YLRS priority geographies. Watersheds (USGS, 2023); Counties (BLM, 2023); 20-YLRS Priority geographies (INR, 2023)

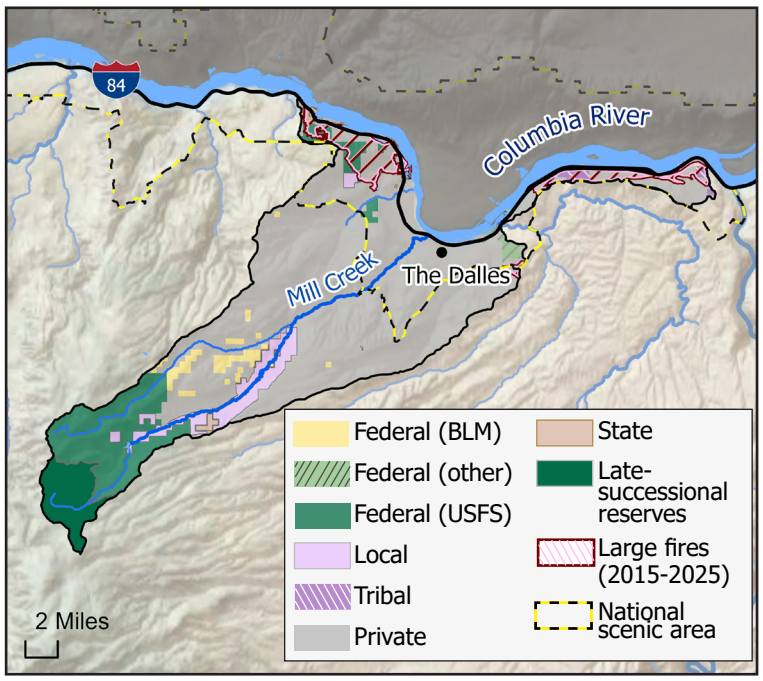


Figure 2. Geographic context. Land ownership (ODF, 2025); Hydrography (USGS, 2023); Highway network (ODOT, 2025); Cities (ODOT, 2024); Large fires (ISU, 2026); National scenic area (CRGC, 2024)

The Mill Creek-Columbia River watershed (Figure 1) is in the Deschutes Basin, and is bisected by Mill Creek, which runs 24 miles from the Cascades into the Columbia River near the city of The Dalles. Elevations in the evaluation area range from 72 to 5,051 feet. The evaluation area runs from the eastern foothills of Mount Hood, onto the Columbia Plateau, and down to the Columbia River. Average annual precipitation ranges from 12 to 64 inches, with the lowest precipitation values occurring in low-elevation areas near the Columbia River and highest precipitation values above 2,000 feet where the evaluation area extends into the Cascade Range.

Land cover in the evaluation area is 28% shrub/scrub, 28% herbaceous, 18% forest, 12% agriculture, 10% developed, and 4% open water.[3]

The Columbia River Gorge National Scenic Area occupies 29,733 acres in the lower portion of the evaluation area. Approximately 14,000 acres in the upper evaluation area are managed by the Mt. Hood National Forest (Table 1). Almost a third of Mt. Hood National Forest lands are late-successional reserves established by the Northwest Forest Plan (Figure 2).

Table 1. Percent land ownership in forested areas (ODF, 2025; Laughlin et al., 2025)

Owner	Percent
U.S. Forest Service	42
Bureau of Land Management	4
Other federal	0
State	1
Local	10
Tribal	0
Private industrial	0
Private non-industrial	43

[1] *More about Oregon's 20-YLRS at: https://www.oregon.gov/odf/documents/aboutodf/20-year-landscape-resiliency-strategy-booklet.pdf*
[2] *This document is part of a series of landscape evaluations. Other evaluations can be found at: https://hdl.handle.net/1794/33453*
[3] *Herbaceous and shrub/scrub land cover classes may include recently disturbed or regenerating forests.*

1 Reduce wildfire risk to communities

Average flame length shows the average expected flame length at a location based on simulated fires across many modeled fire scenarios. Higher values indicate areas where fires are expected to (on average) burn with greater intensity (Figure 3).

In the evaluation area, flame lengths are predominantly in the 0-4 foot range in the areas around the Dalles and the lower portions of Mill Creek, with scattered pockets of moderate flame lengths (6-8 feet) throughout. The higher-elevation forested areas have average flame lengths of greater than 12 feet.

Wildfire risk reduction treatments should focus on protecting The Dalles, surrounding communities, and the adjoining wildland-urban interface, as well as agricultural lands in the eastern portion of the evaluation area. Table 2 summarizes fire history in the evaluation area.

2 Adapt ecological systems to persist in a changing climate

Drought stress has increased in the evaluation area over the past several decades. Dry forest and woodland types have departed from historical conditions including increased density along with increased fuel loading and continuity. Warming exacerbates these conditions by reducing water availability, stressing trees, and increasing susceptibility to disturbances like wildfire, insects, and disease.

Estimates of climate water deficit (CWD), a measure of long-term moisture stress, show the Mill Creek watershed has dried considerably over the last half-century (Figure 4). The 90th percentile CWD was 260 mm in the late 20th century, meaning that 10% of the evaluation area's dry forests experienced water deficits greater than 260 mm. By the early 21st century, 79% of dry forests had water deficits greater than 260 mm. High-elevation areas of lower CWD show higher percent change between the two periods, suggesting that a drier atmosphere takes more moisture from these areas in relative terms.

Trends in declining water availability to trees are likely to continue. Increasing moisture stress could lead to increased mortality, regeneration failures after disturbance, and composition shifts in low-elevation dry forest areas and loss of forest cover. The primary strategies for adapting forests in the evaluation area are reducing competition for resources, shifting composition to more fire- and drought-tolerant species, and reducing fuel loading and continuity of fuels at both stand and landscape scales.

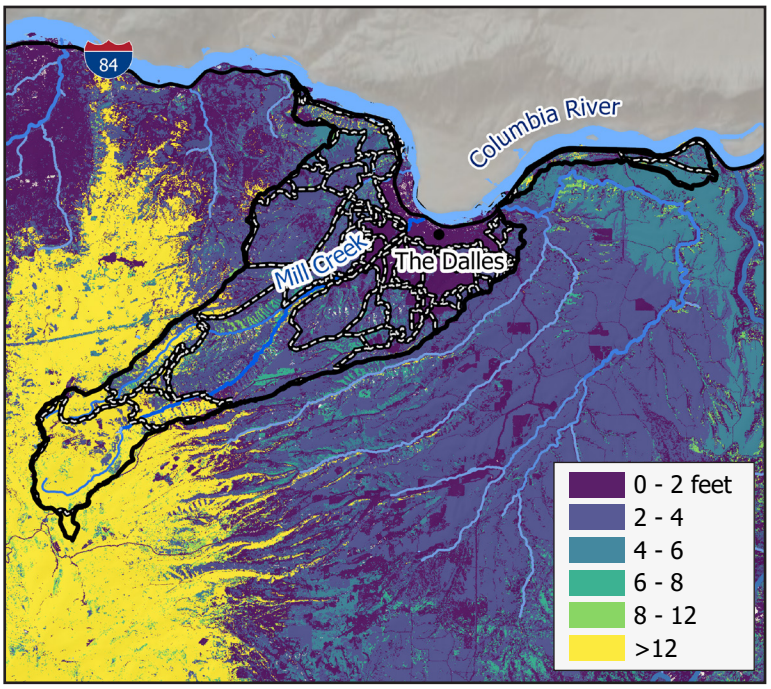


Figure 3. Average flame length (McEvoy et al., 2023), Potential operational delineations (PODs) shown as dotted black and white lines (USFS, 2021)

Table 2. Fire perimeters summarized from the Historic Fires Database (ISU, 2026) and fire points from Wildland Fire Incident Locations (NIFC, 2026)

Fire history	2000-2010	2011-2019	2020-2025
Acres within burn perimeters	7,779	16,812	4,225
Wildfire ignitions (natural)	6	4	2
Wildfire ignitions (human-caused or unknown cause)	27	18	41

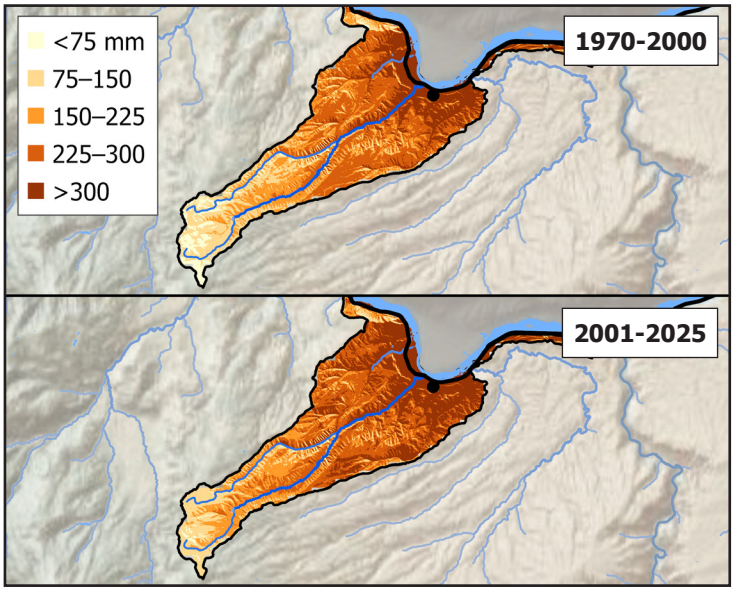


Figure 4. Climate water deficit 1970-2000 shown above and 2001-2025 shown below (University of Oregon, 2026)

3 Create functional aquatic and terrestrial ecosystems

Fuel treatments that aim to return forests to their natural range of variation can improve fish and wildlife habitat by reducing the threat of catastrophic wildfires, which have widespread and long-lasting impacts on terrestrial and aquatic species. These treatments can also create more open canopy, structurally diverse conditions that support a wider array of wildlife than the overly dense, structurally uniform, closed-canopy forests produced by decades of fire suppression. Reducing stand density can also decrease competition and stress on trees, which makes them less vulnerable to insects and disease. By restoring more natural forest conditions, these treatments can create ecosystems that are more diverse and resilient and are better able to support fish and wildlife populations.

Insect and disease risk

Projected warmer average temperatures, lower or inconsistent precipitation, or precipitation as rain rather than snow are primary direct stressors to trees and invite opportunistic beetle pests. Site factors such as steep slopes and poor soils, particularly in more volcanic areas, can exacerbate these hot drought impacts. Even drought-tolerant species, such as pine, are at risk from drought and opportunistic beetle activity. Mitigation and/or prevention of drought and opportunistic beetle activity includes strategies such as density reduction or shifts toward more drought-tolerant seedlots or tree species. Additionally, timely slash management is necessary for prevention of beetle outbreaks in pine. Other stressors that cause reduced growth, vigor, or tree mortality include chronic issues such as exotic balsam woolly adelgid (BWA) established in true fir at high-elevation areas and root diseases. Management for BWA includes avoidance of spread from movement of infected material, and in heavily infected areas, switching to less preferred true fir species or non-*Abies* species. The primary diseases in this area include root diseases such as laminated root rot and *Armillaria* in Douglas-fir and true fir; the latter disease is particularly impactful on stressed trees. General management for root diseases includes switching to non-host species or creating buffer cuts around heavily infested areas to prevent spread (Figure 5).

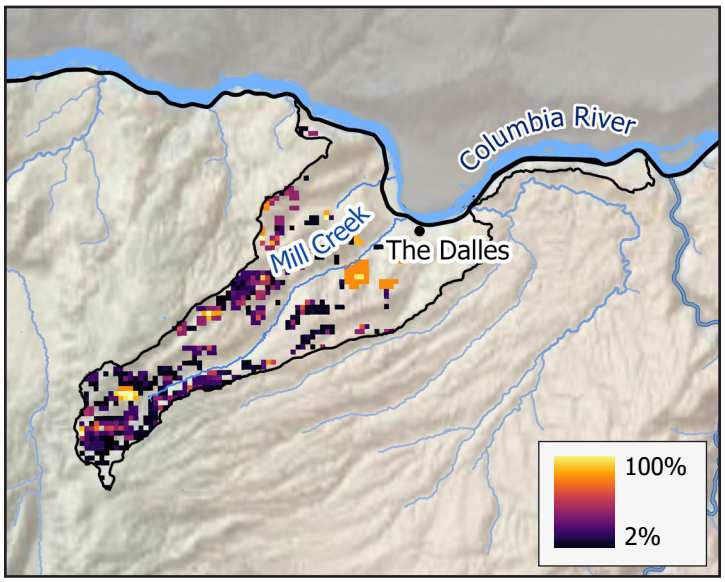


Figure 5. Percent impacted by insect and disease (2015-2025) (ODF, 2026)

Wildlife habitat

The U.S. Fish and Wildlife Service has designated 13,360 acres in the upper portion of the evaluation area as critical habitat for the northern spotted owl *(Strix occidentalis caurina*), and there are 31 miles of National Oceanic and Atmospheric Administration Fisheries steelhead (*Oncorhynchus mykiss*) critical habitat along Mill Creek, Chenoweth Creek, and Threemile Creek (Figure 6). The Columbia River at the confluence with Mill Creek is National Oceanic and Atmospheric Administration Fisheries critical habitat for steelhead, sockeye salmon (*Oncorhynchus nerka*), and Chinook salmon (*Oncorhynchus tshawytscha*). The evaluation area also contains 26 miles of core cold water habitat as designated by the Oregon Department of Environmental Quality.

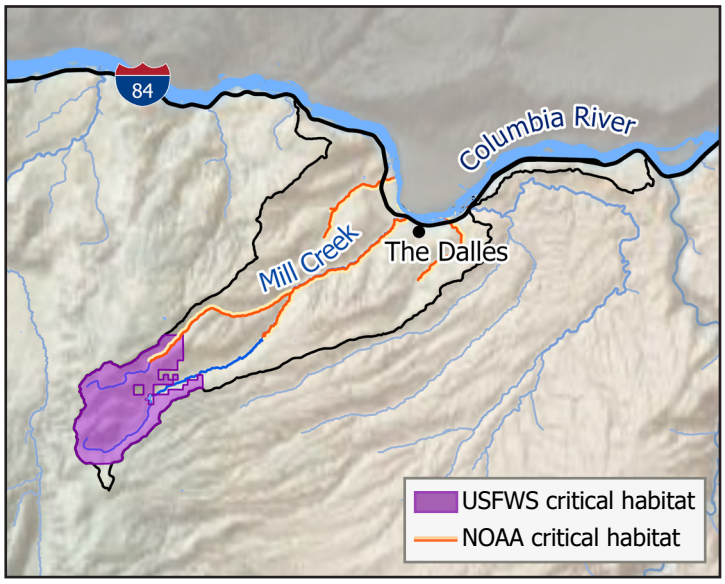


Figure 6. Critical habitat for threatened and endangered species (USFWS, 2026; NOAA, 2025)

Forest types and ecological departure analysis

Table 3 shows acres identified by the Region 6 Ecological Departure Analysis (Laughlin et al., 2025) as needing disturbance, such as fire or thinning, to address departures in forest type and seral class conditions from their historical range of variation (HRV). Current forest type and seral class distributions are shown in Figures 7 and 8, respectively.

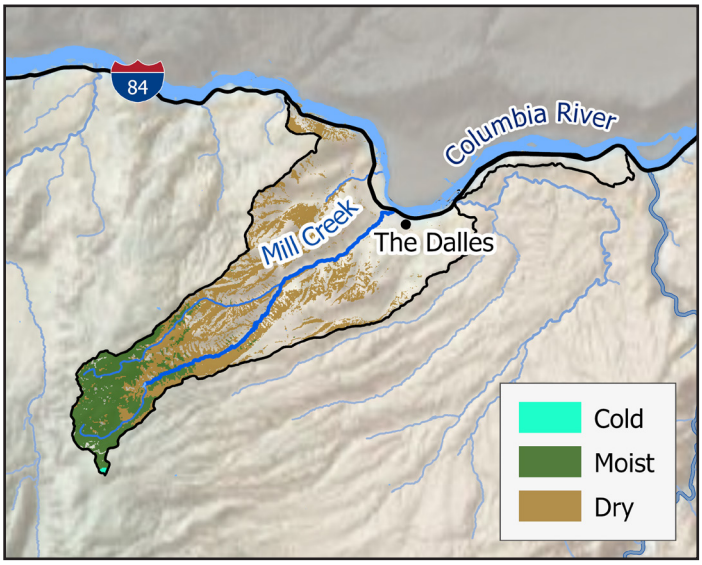


Figure 7. Forest type derived from modified Integrated Landscape Assessment Project Potential Vegetation Types (Laughlin et al., 2025)

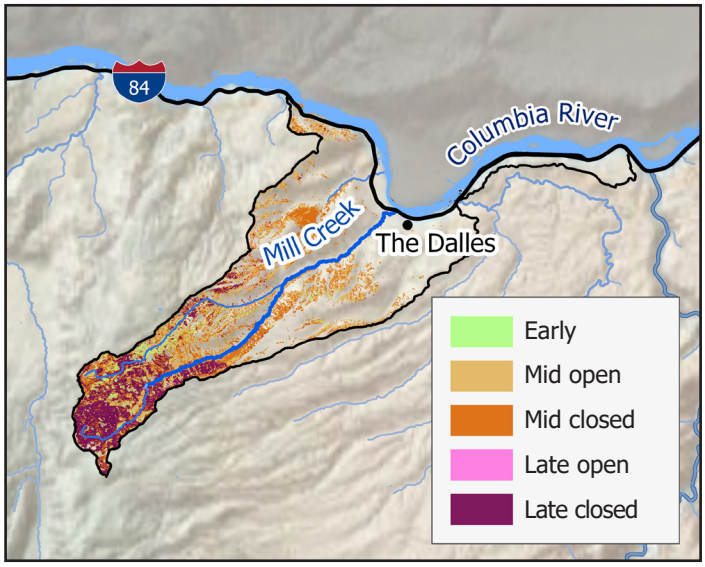


Figure 8. Seral class (Laughlin et al., 2025)

Table 3. Forest type and seral class combinations with departures from historical range of variation (HRV). See methods document for model limitations and historical departures for all forest types and seral classes in the evaluation area

Forest conditions		**HRV departure**	**HRV departure proportional to land ownership**				
Forest type	Seral class	Acres	USFS	BLM	State	Local	Private
Dry	Mid closed	7,647	916	285	90	1,278	5,077
Moist	Late closed	2,233	2,064	13	-	122	34
Dry	Mid open	1,152	162	79	3	103	805
Moist	Mid open	817	649	10	-	54	104
Various*	Various	451	145	24	10	68	204
Total		**12,300**	**3,936**	**411**	**103**	**1,625**	**6,224**

** Various includes dry late closed, cold late closed, cold mid closed, and moist mid closed*

Forest treatment needs

The treatment narrative below summarizes our professional interpretation of the Region 6 Ecological Departure Analysis and implications for management of forest types in the evaluation area.

- **Dry forest**
  The major opportunity for restoration in the Mill Creek-Columbia River watershed is variable density thinning in dry mixed conifer stands of ponderosa pine, Douglas-fir, and white fir to reduce density, remove ladder fuels, and shift species composition to oak and ponderosa pine (Figure 9). An important opportunity is restoration of Oregon white oak and ponderosa pine woodlands by removing encroaching conifers.
- **Moist forest**
  Managers should consider limited non-commercial thinning or thinning from below in Douglas-fir stands to remove younger Douglas-fir and white fir. Managers should also consider non-commercial thinning to create shaded fuel breaks along roads and other potential control features.

Cold forest

There are few cold forests in the evaluation area, and cold forests are not generally recommended for treatment.

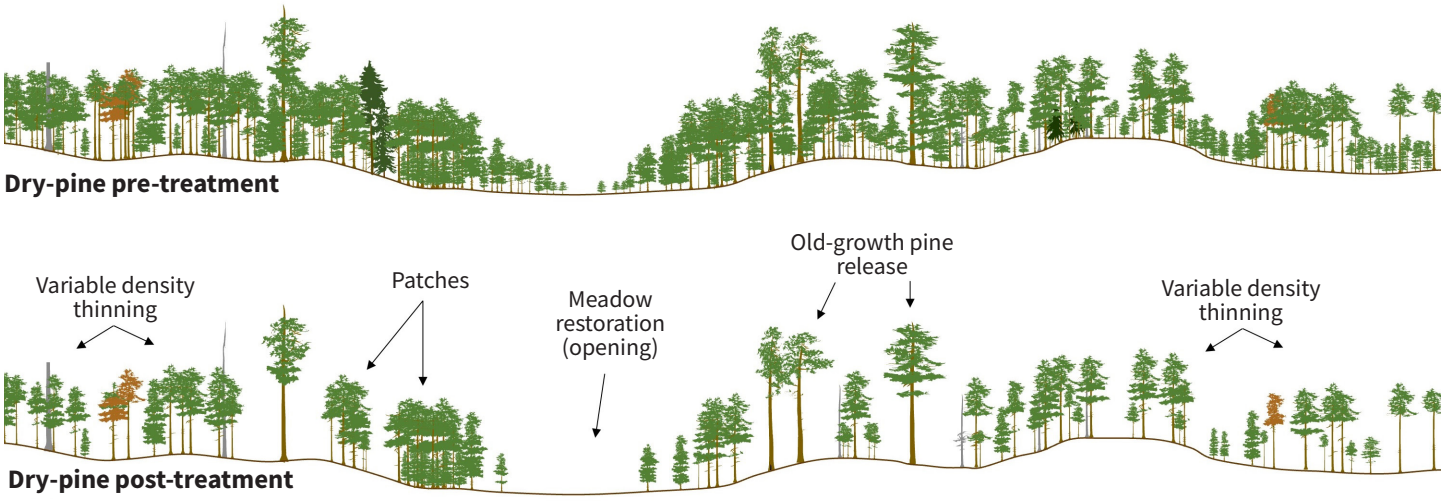


Figure 9. Model of dry mixed conifer variable density thinning

Presence of old trees

Historical logging has removed significant numbers of old trees. Removal of encroaching Douglas-fir and white fir in the vicinity of oaks and pines is an important strategy to conserve remaining dry forest old growth (Figure 10).

Tree density

Forest density significantly exceeds historical conditions in dry forests and some moist forests and poses a significant threat to survival of old trees as climate water deficit increases.

Fire return interval

Unpublished fire history research in nearby areas indicates mean fire return intervals of 4-10 years in oak and pine woodlands increasing to 10-25 years in dry mixed conifer forests and 20-100 years in moist forests.

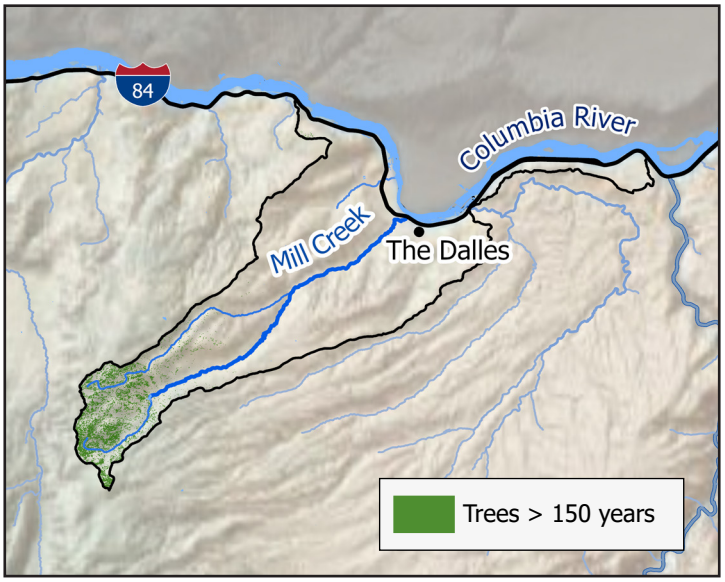


Figure 10. Old trees (LEMMA, 2021)



Variable density thinning and prescribed fire in dry mixed conifer stands in eastern Oregon. Photo: James D. Johnston

4 Support vibrant local economies

Socioeconomic context

The Mill Creek-Columbia River watershed is located within Wasco County and adjacent to Hood River County. The total population in these two counties in 2020 was 50,647 (Table 4). Twenty-six percent of residents were considered low-income, which is slightly lower than the statewide percentage of 27%. Compared to the state of Oregon overall, the area had a slightly larger proportion of residents under age 18 (22%) and ages 65 and older (20%). In contrast, there was a smaller share of residents ages 25-44 (25%). Workforce non-participation was 36%, which was lower than the statewide average of 38%.

Restoration treatments in the evaluation area were slightly more costly than Oregon's 20-YLRS priority geographies, ranking in the 63rd percentile for estimated restoration costs. At the 74th percentile, the evaluation area had higher revenue potential compared to other 20-YLRS priority geographies in the state. The evaluation area also ranked in the 71st percentile for contractor capacity (Figure 11).

Table 4. Socioeconomic characteristics (U.S. Census Bureau, Decennial Census, 2020 [Table P12]; American Community Survey 5-Year Estimates, 2020-2024 [Tables B23025, C17002])

	Evaluation area counties	State of Oregon	Location quotient[i]
Total population	50,647	4,237,256	-
Low-income population	13,099 (26%)	1,140,423 (27%)	0.96
Population under 18	11,302 (22%)	866,604 (20%)	1.09
Population age 25-44	12,575 (25%)	1,159,452 (27%)	0.91
Population age 65+	10,085 (20%)	795,108 (19%)	1.06
Workforce non-participation rate[ii]	36%	38%	0.96

[i] *Location quotients above 1 mean that the value is higher for the selected counties than the state mean; LQs below 1 mean that the value is lower than the state mean.*

[ii] *Represents the percentage of the labor force-eligible population that is neither employed nor actively seeking employment. High non-participation rates may reflect factors such as retirement and discouragement from seeking work.*

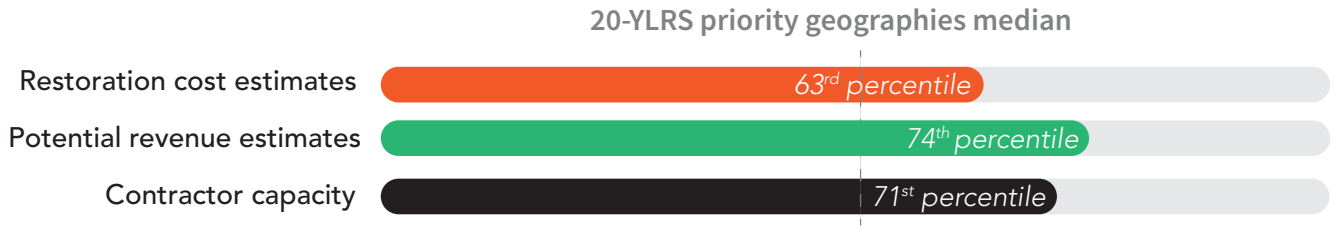


Figure 11. Percentile ranking for potential revenue, cost, and contractor capacity. Percentile rankings show the evaluation area as compared to all other 20-YLRS priority geographies in the state. The 50th percentile line represents the 20-YLRS priority geographies median

Restoration cost estimates

We calculated a restoration cost index that incorporates haul distances to timber processing facilities, watershed slopes, and road density. The composite cost index is the mean of location quotients for those three variables.

Timber processing facilities

Distance to timber processing facilities is a major expense for restoration contractors. The mean drive time to timber processing facilities within the Mill Creek-Columbia River watershed was approximately 50 minutes, which is about one minute shorter than the mean across all 20-YLRS priority geographies (Figure 12). Nearby timber processing facilities include SDS Lumber Co. and Meyers Custom Lumber in Bingen, WA; WKO Sawmill in Carson, WA; Oregon Log Home Company in Maupin, OR; and Western Forest Products in Vancouver, WA.

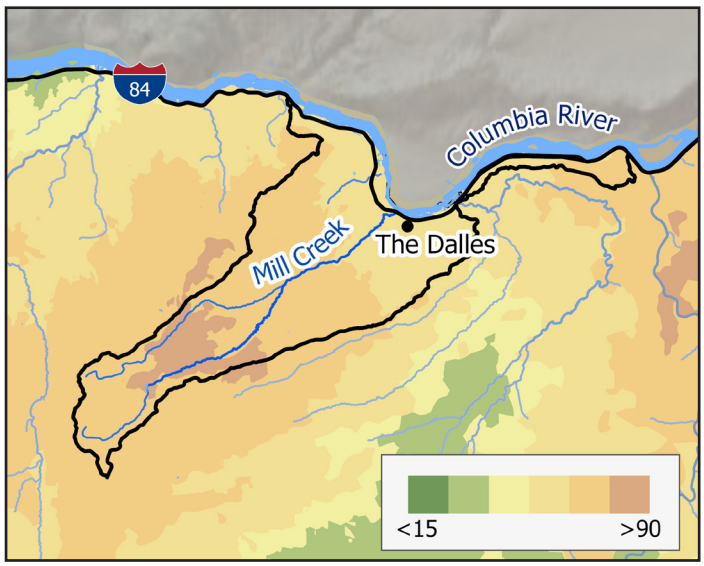


Figure 12. Drive time in minutes to nearest timber processing facility (BBER, 2026; ODF, 2025)

Slope and road density

Forest slopes and road access are important considerations for estimating costs of restoration treatments. Slopes greater than 40 percent require more costly specialized equipment. Slopes greater than 65 percent present even more challenges. Areas with lower density of roads are logistically challenging, as logs and other biomass must be transported longer distances to areas accessible by log trucks.

Eighty-two percent of slopes within the Mill Creek-Columbia River watershed were below thresholds requiring specialized logging equipment (i.e., 40%; Figures 13 and 14). In terms of treatment costs, the proportion of steeper slopes relative to all 20-YLRS priority geographies is about 12 percent below average. Road density analysis suggests that the evaluation area is above the mean for all priority geographies.

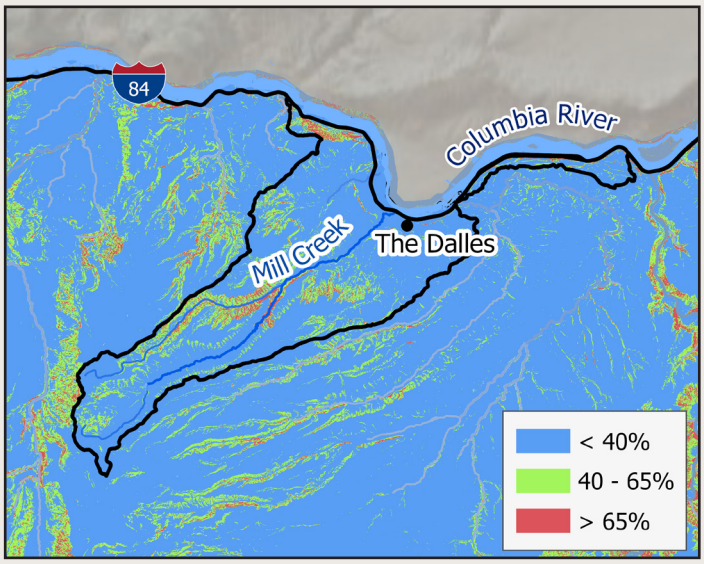


Figure 13. Percent slope for Mill Creek-Columbia River watershed (ODF, 2023)

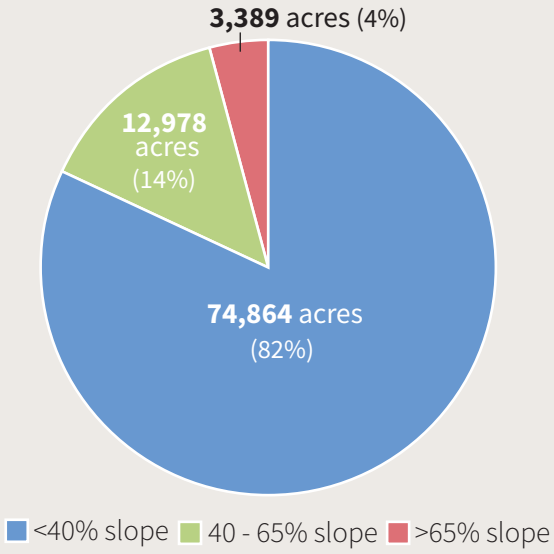


Figure 14. Total acres and proportion for percent slope classes (as shown in Figure 13)

Potential revenue estimates

Median revenue from commercial treatments during the 2017-2023 period was $2,053 per acre, ranking in the 74th percentile (Table 5). This suggests that expected revenues from commercial treatments in the evaluation area could be higher relative to all Oregon 20-YLRS National Forest priority geographies, which had a median revenue of $357 per acre and median volume of 7.0 MBF per acre.

Table 5. Median per acre revenue, median per acre volume, and revenue percentile rank for Mill Creek-Columbia River watershed commercial treatments (TIM, 2023; FACTS, 2023)

Median revenue per acre	Median volume per acre (MBF)	Revenue percentile rank
$2,053	14.6	74

Contractor capacity

A total of 110 Oregon businesses with federal intensive forestry work contracts between 2017 and 2023 were located within a 130-minute drive of the evaluation area. A 130-minute drive is the median drive time for Oregon contractors to 20-YLRS priority geographies. Considering all 20-YLRS priority geographies, contractor capacity for the evaluation area is about 34 percent higher than average, ranking in the 71st percentile.

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Questions? Contact:
Kyle Sullivan
Federal Forest Restoration Program Lead
kyle.m.sullivan@odf.oregon.gov

CONTRIBUTORS | Christine Buhl, Michael R. Coughlan, Sean Gordon, Robert Hoyer, James D. Johnston, Myrica McCune, Sean McKenzie, Stephanie A. Schneider, Harold Stevens, Kyle Sullivan

DESIGN | Marissa Sorlie

METHODS | https://hdl.handle.net/1794/33482