



Blue Mountains Forest Plan Revision #301397
Submitted as an Attachment to the Eastside Forest Coalition

I am submitting these comments as a conservation scientist and researcher currently conducting independent studies on the Blue Mountains and Eastern Cascades ecoregion. I have over four decades of research experience, including >350 peer-reviewed articles, 9 co-authored books, and I serve on the editorial board of six scientific journals where I have access to the latest research. Based on my expertise and review of the forest plan revision and pertinent literature, the agencies' forest plan revision for the Blue Mountains (Malheur, Umatilla, Wallowa-Whitman National Forests) is not based on best-available-science (BAS) and would greatly scale up logging and road building in a region that has experienced decades of unsustainable logging as noted in the original research. There has been a history of high-grade logging of large trees, and expansive degradation of old forests supported by an extensive road network that has been accumulating impacts to the region's fish and wildlife for decades. Proposed agency logging would further accelerate losses while increasing the risk of wildfire spillover events to communities as noted. Note – pdfs are provided for source material where available. In cases where open access is not available, the abstracts are provided.

Original research in the Blues shows the Forest Service has caused extensive damages.

- Logging has been extensive and by comparison the Forest Service has protected just ~15% of the region, ranging from ~4-5% protected in the Ochoco and Malheur National Forests to ~21% in the Umatilla and Wallowa-Whitman. The agency needs to support wilderness proposals and protect roadless areas to fill gaps in protected area coverages that are far too low and are necessary to maintain wildlife habitat, water quality, and carbon stores.
- There are ~994,000 ha of irreplaceable mature and old-growth forests; however, only ~11.5% is protected (GAP 1 and GAP 2) with another ~11% in unprotected IRAs (roadless areas). This level of protection is also far too inadequate to maintain clean water, wildlife habitat, fire refugia, and carbon storage
- Total Area Burned and Maximum High Severity Fire levels are generally greatest in Unprotected lands (GAP 3b and GAP 4) compared to protected areas (GAP 1 and 2) and IRAs (GAP 3a). This finding contradicts claims that managed areas – and even more management – is needed to reduce area burning and high severity fire, which has not been the case for the Blues.
- Over 95% of fuel treatments have occurred >1-km from the WUI. This is an extraordinary level of public safety negligence as the most effective way to lower wildfire risks is to harden the structure itself and treat fuels in a narrow zone around structures.
- Decadal logging levels primarily from the 1940s on have accumulated impacts over a wide area with levels as high as 15% on the Malheur National Forest during the 1980s. This amounted to ~107,730 ha of forests logged on just the Malheur during just that decade alone, an extraordinary level of degradation. Hundreds of thousands of additional

hectares have been logged on all four national forests in this region. Additional impacts include road building that has fragmented wildlife habitat, increased fire risks, and caused water quality degradation especially to bull trout and other aquatic organisms. This amount of logging is unsustainable and consequential on top of what the agency is now proposing in the forest plan revision (cumulative impacts).

The forest plan revision is not based on best available science as summarized:

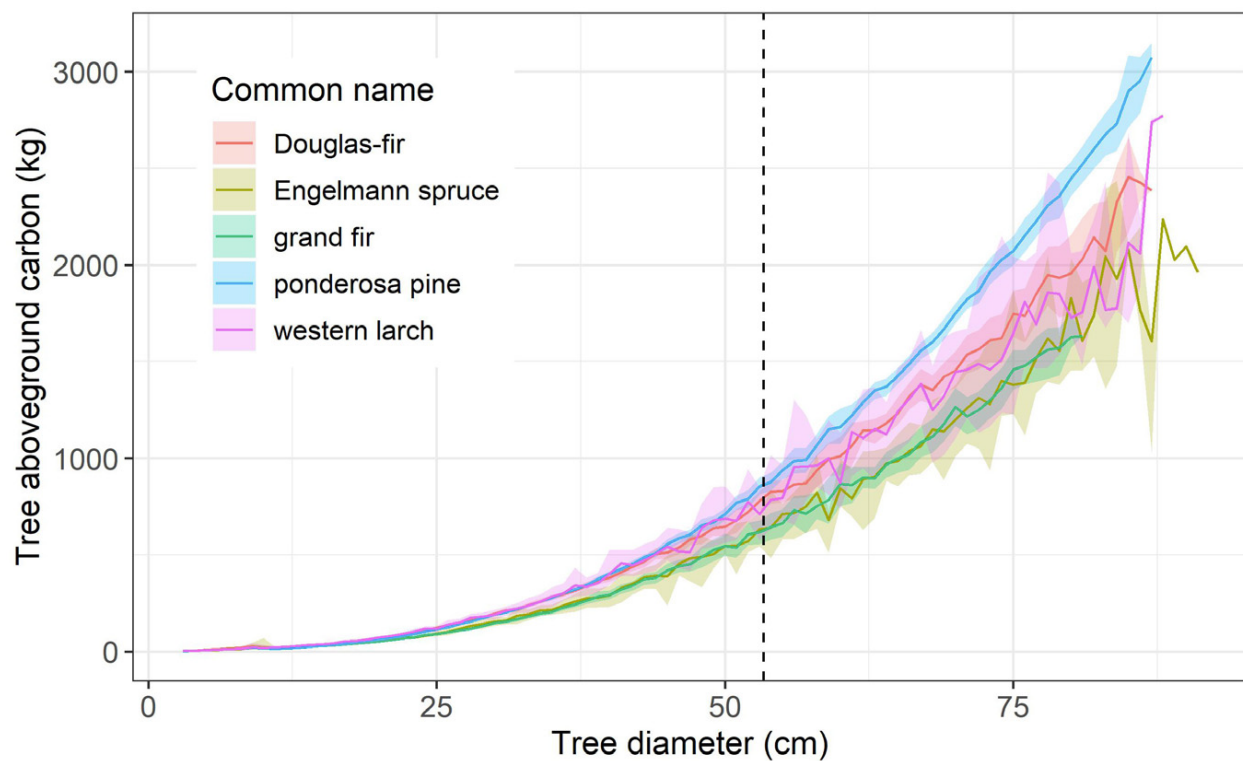
- Removal of the scientifically valid and critically important PACFISH/INFISH Riparian Management Objectives (RMOs) especially the Riparian Conservation Areas will increase harm to aquatic organisms and degrade ecosystem integrity. For decades the RMOs have provided restoration opportunities for watersheds extensively damaged by prior logging, roads, and livestock. Removing the RMOs will degrade water quality conditions and increase stream temperatures impactful to bull-trout which, because of their metapopulation and restricted distributions, require intact watersheds free of such disturbance (Dunham and Rieman 1999 – not open access).

Dunham and Rieman Abstract: Metapopulation structure of species in fragmented landscapes is ultimately the result of spatial variability in demographic processes. While specific information on demographic parameters is desirable, a more practical approach to studying metapopulations in fragmented landscapes may begin with analyses of species' occurrence in relation to large-scale habitat variability. Here, we analyzed occurrence of stream-living bull trout (*Salvelinus confluentus*) in relation to physical, biotic, and geometrical characteristics of habitats. Bull trout occurrence was analyzed at several spatial (10^x m) scales. Data were from nested sampling of 720 sites (10 m), 179 reaches (10^2 m), and 81 patches ($\geq 10^3$ m) of stream habitats within the Boise River basin of central Idaho. Based on previous findings, patches were defined as stream catchments with suitable conditions for spawning and rearing of bull trout (>1600 m elevation). Patch-scale bull trout occurrence was significantly related to patch area and isolation (stream distance between occupied patches). Lack of spatial autocorrelation between patches indicated that isolation effects were more likely the result of limited interaction among habitats (such as dispersal), rather than of correlated environmental conditions. A third factor, human disturbance in the form of roads, was associated with reduced bull trout occurrence at the patch-scale. Analyses of occurrence among reaches within occupied patches showed bull trout may select larger (>2 m width) stream habitats. Occurrence of bull trout was not associated with nonnative brook trout (*Salvelinus fontinalis*) at large (patch), intermediate (reach), or small (site) spatial scales. Definition of a metapopulation structure for bull trout in the Boise River basin was complicated by uncertainties in the frequency and magnitude of dispersal. From the distribution of patch sizes and isolation among occupied patches, we suggest that the metapopulation is a complex mosaic of several elements found in conceptual models. This complexity poses a challenge to empirical and theoretical attempts to study stream-living bull trout. Future work to define the structure of bull trout metapopulations must relate temporal and spatial patterns of patch occupancy with complex patterns of dispersal that likely interact with habitat spatial structure, life history variability, and the historical context of regional climate changes. Results of this work suggest that conservation of bull trout should involve protection of larger, less isolated, and less disturbed (as indexed by road densities) habitats that may serve as important refugia or sources of recolonization. Bull trout populations in smaller, isolated, and more disturbed habitats may be at risk of extinction. Finally, metapopulation structure implies the existence of suitable, but presently unoccupied habitat, which should be managed carefully to facilitate potential natural recolonization or reintroductions of bull trout.

- Weakened guidelines for large tree protections especially large firs will reduce carbon stocks and impact mature and old-growth forests and legacy trees. The importance of large trees and associated forest structures is detailed in a report by DellaSala and Baker (2020). Their report was a rebuttal to the Forest Service claims (Hessburg et al. 2020; note this is a USFS General Techn Report and the agency should have full access to its own reports without attaching it to my comments) that the science of large trees in this region originally documented by Henjum et al. (1994, see below) and many others since (see below) is no longer valid, which we rejected this assertion in our report. Notably, the importance of large trees whether they are in old forests or persist as legacy cohorts in a matrix of mix seral types are irreplaceable components of a recovering ecosystem that has been supported by the very logging restrictions now weakened (RMOs, Eastside Screens, IRA protections).

“Large Tree Values (all tree species are vital) - Forest raptors, woodpeckers, songbirds, bats, and other small mammals depend on large trees to nest, forage, overwinter, roost, and den. Large trees provide shelter and microclimates for countless invertebrates, epiphytes, herpetofauna, and rare plants. Large trees in riparian areas provide stream-side shading and, when they fall into streams, hiding cover for aquatic species. Large trees store the accumulation of decades to centuries of atmospheric carbon helping to reduce adverse consequences of global overheating. Large trees are essential to nutrient cycling, soil stabilization, and below-ground processes that develop as they mature. Large trees remain in short supply due to a legacy of logging. When logged, large trees release most (up to two-thirds) of their stored carbon to the atmosphere (contributing to global overheating) and their emitted carbon takes decades to centuries to recover, if ever.”
DellaSala and Baker (2020)

- Large tree logging will cause irreparable harm to carbon stocks. Mildrexler et al. (2020) documented that carbon storage increases sharply with tree diameter. Notably, trees >20 in dbh (50 cm) have the most above ground storage (up to 46% of total above ground stores) (see Figure below from their study) and wildlife habitat values for six national forests along the eastern Cascade slopes and Blue Mountains (see Figure below). Despite concerns about excessive overlap and competition between firs and pines, Mildrexler et al. (2023) found that the overlap of large pines and large grand firs was only 8% of 1616 FIA plots in eastside forests. Thus, removing carbon dense large firs and other large conifers will set back recovery of large trees, is needless given the small overlap in firs and pines, will increase logging emissions and further degrade forests.



According to Mildrexler et al. (2020), “once trees attain large stature, each additional DBH increment results in a significant addition to the tree’s total carbon stores, whereas small-diameter trees must effectively ramp up to size before the relationship between DBH and ABG [above ground carbon] results in significant carbon gains. Harvest of large-diameter trees, even focused on specific species (e.g., grand fir) can remove upward of 50% of the large tree ACG from these ecosystems.”

- Eliminating road-density standards in the revised forest plan will impact bull trout (Dunham and Rieman 1999), degrade water quality, damage wildlife habitat, and increase human caused wildfire ignitions. Notably, Balch et al. (2017) reported 84% of all wildfire ignitions nationwide over a two-decade period were caused by people and these fires affected 44% of the total area burned. Ignitions were highest in relation to nearby population areas and roads. Aplet et al. (2026) found that roaded areas had over twice the number of fire ignitions compared to Inventoried Roadless Areas. In the largest sample of fire severity in relation to land-use designations, Bradley et al. (2016) report wildfire severity over a four-decade period was highest in logged and roaded areas compared to areas protected from logging and Inventoried Roadless Areas (IRAs). Importantly, Mildrexler et al. (2026) documented the irreplaceable importance of IRAs for ecosystem integrity and DellaSala et al. (2011) showed the importance of IRAs for water quality. Thus, eliminating IRA protections and increasing roads will have cumulative impacts to myriad forest values.

Old Forests & Large Trees were Historically Abundant and Extensively Logged

The geographical extent of late-seral forests - mature/old growth (MOG) ecosystems in Eastside Forests and the Blues shrank dramatically during the twentieth century. Continued logging of MOG forests and legacy trees will jeopardize recovery underway since adoption of the “Eastside Screens” and the PACFISH/INFISH RMOs. Eastside Forests and the Blue Mountains have

experienced expansive/cumulative logging that has impacted terrestrial and aquatic systems now under additional stressors from more logging, more roads, and climate change.

Notably, in 1994, Congress commissioned a report by the Eastside Forest Scientific Society Panel led by Henjum et al. Henjum et al. report a 1936 survey (Cowlin et al. 1942) that found:

- Old growth of all forest types made up 89% of sawlog-sized stands and 73% of all commercial forestlands in eastern Oregon and Washington. Originally, a virgin forest of this type ostensibly extended the length of Oregon along the east slopes of the Cascade Range from within a few miles of the summit to the desert's edge. From about 10 miles in width on the north, it ranged to nearly 100 miles on the Klamath Plateau in the south, interrupted only by comparatively small openings of non-forested land. Extensive cutting from Bend south has broken it up with large areas of pine second growth (Cowlin et al. 1942, cited in Henjum et al. 1994). The 1936 inventory in the Blue Mountains (today's Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests) found that forests containing a significant proportion of ponderosa pine occupied about 80% of commercial forestlands..., the great majority of pine forests consisted of old growth (86%). By the mid-1960s, however, the proportion of commercial forests...had dropped to 40% (Bolsinger and Gerger 1975 in Henjum et al. 1994), a loss of half over a 30-year period.
- In the mid-1950s the acreage in sawtimber trees > 21 inches dbh and larger was 2.5 million acres [Blue Mountains], the present inventory [1990s] shows 1.4 million acres – a reduction of 44%. Based on historical documentation and photo interpretation at the time, Henjum et al. (1994) concluded that large (> 21 inches dbh) trees were more prevalent historically compared to contemporary forests, and logging in unprotected areas would have reduced late-seral forests to <10% of the total forest area.
- The Henjum et al report raised serious concerns about risks to old forest associated wildlife species and ecological processes from ongoing logging of large trees. The Eastside Screens were created to allow the large (> 21 inches dbh) tree component time to recover. Henjum et al. (1994) made no reference to preferential logging of any particular species like grand fir at the time. In fact, they specifically mentioned the same high-grading problems existed for large Douglas-fir as pine.
- As summarized in Henjum et al. (1994), size and structure of legacy trees and older forests matter most, composition less so. The ecological integrity of regional forests and large trees were maintained by the interplay between periodic wildfires and climatic processes generally, with wetter periods producing low-severity fire events in dry fire months, and drier periods (extended droughts) producing mixed severity fires resulting in patch mosaics consisting of large and small areas of severely burned forests that regenerate biological legacies and maintain legacy tree cohorts (e.g., see Hessburg et al. 2007, Perry et al. 2011, Baker 2012, Williams and Baker 2012, Odion et al. 2014, Odion et al. 2016 rebuttal to criticisms). Interestingly, Hessburg et al. (2007) reported mixed severity fires were the predominant fire regime in this area yet he seems to have departed from his own findings as noted in Williams et al. (2023) rebuttal to Hagmann et al. (2023) below. Additionally, the high severity component of mixed severity fire systems has been referred to as complex seral forests, which are as biodiverse as old growth if not logged (Swanson et al. 2010). Complex early seral forests are underappreciated by the

Forest Service for their biodiversity and carbon storage as the agency typically conducts postfire logging operations in these forests and that impact needs to be fully analyzed.

Note – Odion et al (2016), Williams and Baker (2012), and Williams and Baker (2014) reported about the preponderance of mixed severity fires in this region and have refuted criticisms of their work by other researchers and the Forest Service. Their responses to criticisms are often ignored by the agency. Baker et al. (2023) in particular reported on the omission of 39 published studies in Hagmann et al. (2021) that overstated the importance of the low-severity fire model in these and other dry forest regions. Critiques of the low-severity fire model need to be fairly analyzed given the Forest Service’s track record of selective use of the literature to fit its logging agenda.

- The historical occurrence of substantial numbers of large trees and extensive older forests reported in the literature (Cowlin et al. 1942 cited in Henjum et al. 1994, Baker 2015 for Eastside and Blue Mountain forests was possible because fire operated at landscape scales on long fire rotation intervals (Baker and Williams 2018, Baker et al. 2013, Williams and Baker 2012) that allowed trees to mature and reach large sizes (Cowlin et al. 1942 cited in Henjum et al. 1994). This literature needs to be considered in old forest historical accounts and landscape scale fire rotations that has allowed old forests to persist at such high amounts in a dry, fire-adapted system.
- Historical accounts in this region show that dry and moist forest types were dominated by large, old trees typically >60 inches dbh with most of the stand volume in the 20 to 44 in dbh class (Henjum et al. 1994). Before the ramp-up of commercial logging, old-growth forests were inventoried to have covered 78% of Eastern Oregon’s ponderosa pine commercial forest area (Cowlin et al. 1942). This inventory was further validated as an estimate of historical old growth by land-survey reconstructions, which found that 76% of ~691,600 acres of dry forests along the eastern slope of the Oregon Cascades would have qualified as old growth in the late-1800s (Baker and Williams 2018).
- Large trees had been extensively logged by the 1980s; however, due to the Eastside screens and other factors (e.g., fire suppression) some of the volume is now filling back in, mainly midsize shade-tolerant trees in the 20+ in dbh range. Rather than maintain the recovery process of large trees of all conifer species that once characterized these forests, the Forest Service now proposes to remove recovering large trees especially shade-tolerant firs believing there is too much competition between firs and pines. To reiterate, Mildrexler et al. (2023) finding that the overlap between large firs and large pines was minimal (8% of 1616 FIA plots).

Commercial Thinning and Postfire Logging Operations Degrade Ecosystem Integrity

The Forest Service typically considers “fuel reduction” treatments involving commercial logging and road building as an inconsequential cost to ecosystems despite evidence to the contrary (DellaSala et al. 2022, DellaSala et al. 2025, Lindenmayer et al. 2026). The agency should consult published literature on the impacts of commercial thinning and postfire logging on elevated fire risks, wildlife habitat degradation, water quality degradation, and carbon stock reductions (see reviews by DellaSala et al. 2025a, Lindenmayer et al. 2026). The Forest Service needs to sufficiently analyze the environmental impacts of plan alternatives on ecosystem integrity as indicated in these published papers.

Post-disturbance logging in particular is one of the most damaging forestry practices (Lindenmayer and Noss 2006) and does not produce comparable ecosystem benefits in maintaining early seral forests compared to the beneficial pulse of biological legacies produced by a severe natural disturbance as contrasted in Table 1. The agency is underestimating logging impacts on complex early seral forests and there is an extensive publication record on how postfire logging increases fine fuels (Donato et al. 2006, contributes to reburn severity (Thompson et al. 2007), is damaging to wildlife (Hutto and Gallo 2008, Hutto et al. 2016, and riparian habitat (Reeves et al. 2006), causes soil losses (Malvar et al. 2016 -not open access), and water quality impacts (Lewis et al. 2018 – not open access).

Malvar is not open access – here's the Abstract

Research has been undertaken on the hydrological and erosional impact of forest fires, but remarkably little work has been conducted on salvage logging operations that often follow them. We assessed the effects of mechanical salvage logging following wildfire on soil physical properties, ground cover, and runoff and erosion response on a eucalypt stand in Portugal. We compared two levels of mechanical disturbance, skid trails by a wheeled forwarder tractor (“skid_low”) and skid trails by the same tractor followed by a tracked feller-buncher (“skid_high”) with control conditions (no mechanical disturbance). Three plots (16 m²) by level of soil disturbance were installed after a moderate intensity fire and subsequent logging operations, and monitored during the first post-fire year. In two control and two skid_low plots runoff was also measured. Soil bulk density was higher with increasing mechanical disturbance. Soil compaction reduced porosity 7–16%, but as the control porosity was 70%, the reduced porosity still was 60–65%. Soil resistance to penetration significantly increased for the most disturbed area, whereas soil shear strength was significantly reduced in the intermediate disturbance level. Mechanical disturbance did not induce significant effects on soil moisture or ground cover. Initial greater coverage by bare soil in the disturbed plots compared to the control was compensated by a more rapid vegetation recovery in those plots. Annual runoff amount was not higher at the skid-low than at control plots. Absence of runoff difference was due to high soil porosity of 65%, even after tractor trafficking, and a greater surface roughness on the skid_low plots compared to the control. Sediment production increased with increasing soil disturbance. The mean sediment rate was 1.6–3 times greater for the disturbed than the control plots. This increase could be explained by the higher soil compaction and reduced soil shear strength on the mechanically disturbed plots and initial differences in ground cover. Organic matter content of the eroded sediments was higher on the control than the disturbed plots, due to initial higher ash cover on the control plots. Overall, sediment production was significantly related to rainfall intensity and reduced by vegetation regrowth. Sediment rates tend to decrease with time since the initial fire and logging disturbance, highlighting the importance of a rapid implementation of erosion control measures. Specific management practices are needed to minimize the impacts of logging in burnt soils which are already subject to greater erosion risk and soil degradation.

Lewis et al. 2018 – not open access

Abstract

The Battle Creek watershed in northern California was historically important for its Chinook salmon populations, now at remnant levels due to land and water uses. Privately owned portions of the watershed are managed primarily for timber production, which has intensified since 1998, when clearcutting became widespread. Turbidity has been monitored by citizen volunteers at 13 locations in the watershed. Approximately 2000 grab samples were collected in the 5-year analysis period as harvesting progressed, a severe wildfire burned 11,200 ha, and most of the burned area was salvage logged. The data reveal strong associations of turbidity with the

proportion of area harvested in watersheds draining to the measurement sites. Turbidity increased significantly over the measurement period in 10 watersheds and decreased at one. Some of these increases may be due to the influence of wildfire, logging roads and haul roads. However, turbidity continued trending upwards in six burned watersheds that were logged after the fire, while decreasing or remaining the same in two that escaped the fire and post-fire logging. Unusually high turbidity measurements (more than seven times the average value for a given flow condition) were very rare (0.0% of measurements) before the fire but began to appear in the first year after the fire (5.0% of measurements) and were most frequent (11.6% of measurements) in the first 9 months after salvage logging. Results suggest that harvesting contributes to road erosion and that current management practices do not fully protect water quality.

Table 1. Unlogged high severity burn-patches – complex early seral forests – vs. early seral clearcuts. Note, the +/- signs are relative abundances of the various forest quality indicators compared.

 EARLY SERAL QUALITY MATTERS	 HIGH SEVERITY PATCHES	 RECOVERING CLEARCUTS
Legacies	+++ / ++	- / +
Snags	+++ / ++	- / +
Down logs	+++ / ++	- / +
Understory	+++ / ++	+
Heterogeneity	+++ / ++	-
Time in early seral (before canopy closes)	+++ / +	+

Note – the Forest Service typically justifies postfire logging on the false assumption that large dead trees are a fire hazard, which has been refuted in the published literature (DellaSala et al. 2025b).

Ecoregional Conservation Assessment for the Blues (preliminary findings)

Protection Levels are Far Below those Recommended in the Published Literature

For the past several years, we have been conducting a series of peer-reviewed ecoregional conservation assessments (ECA) that span western US forest ecoregions. We are in the process of completing an ECA for the Blues and Eastern Cascades summarized here given the relevance to the forest plan revision.

While most of the Blue Mountains are in federal ownership, <10% overall has been protected from logging, roads, and other land-uses (Table 2). Further, the national forests within the Blues have protected just ~15% of the forested area, ranging from ~4-5% in the Ochoco and Malheur to around 21% in the Umatilla and Wallowa-Whitman (Table 3).

Table 2. Land ownership/management and GAP status in the Blue Mountains. Within each manager category, GAP percentages are calculated relative to that manager’s total area, while the percentages in the Total column and bottom row are relative to the entire ecoregion. GAP categories are derived from PAD-US 4.1, and GAP 3a includes assigned GAP 3 lands within Inventoried Roadless Areas; GAP 3b includes the remaining GAP 3 lands. GAP 4 includes both mapped GAP 4 lands and areas without an assigned GAP status, combined for complete regional reporting. “Other Federal Land” includes federal managers other than the USDA Forest Service and Bureau of Land Management. “Private” includes mapped private lands and lands with unknown or unassigned management; Tribal lands are represented using proclamation boundaries. Totals are calculated before rounding.

Land Management Entity	GAP ha (%)					Total ha (%)
	1	2	3a	3b	4	
USDA Forest Service	376,085 (15.2)	30,839 (1.2)	392,577 (15.9)	1,668,878 (67.6)	<1 (<0.1)	2,468,379 (38.3)
U.S. Bureau of Land Management	14,657 (1.8)	90,814 (11.0)	48 (<0.1)	722,285 (87.3)	<1 (<0.1)	827,803 (12.9)
Other Federal Land	2,842 (55.1)	9 (0.2)	0 (0.0)	2,251 (43.7)	53 (1.0)	5,155 (<0.1)
Tribal	0 (0.0)	1,232 (1.0)	5 (<0.1)	693 (0.5)	125,017 (98.5)	126,947 (2.0)
State	17 (<0.1)	37,255 (61.2)	10 (<0.1)	21,423 (35.2)	2,158 (3.5)	60,862 (0.9)
Local Government, Special District Agency, NGO	18,971 (70.2)	3,537 (13.1)	0 (0.0)	4,160 (15.4)	371 (1.4)	27,039 (0.4)
Private	393 (<0.1)	35,210 (1.2)	789 (<0.1)	12,089 (0.4)	2,872,301 (98.3)	2,920,782 (45.4)
Total ha (%)	412,965 (6.4)	198,895 (3.1)	393,429 (6.1)	2,431,778 (37.8)	2,999,900 (46.6)	6,436,967 (100.0)

Table 3. National Forest and GAP status in the Blue Mountains. Values are in hectares with percentages in parentheses. Each forest row’s GAP percentages use that forest’s study-zone area as the denominator. Total-column percentages show each forest’s share of the combined included study-zone area; bottom-row percentages show the combined area’s distribution among GAP classes. Values are rounded to whole hectares and one decimal percent. GAP 3a is assigned

GAP 3 within inventoried roadless areas; GAP 3b is the remainder. GAP 4 includes explicit GAP 4 and residual lands without protection.

National forest	GAP ha (%)					Total ha (%)
	1	2	3a	3b	4	
Malheur	33,355 (4.6)	6,569 (0.9)	72,970 (10.1)	584,521 (80.9)	25,468 (3.5)	722,882 (27.2)
Ochoco	15,312 (4.1)	6,454 (1.7)	20,888 (5.7)	256,710 (69.5)	69,851 (18.9)	369,215 (13.9)
Umatilla	123,062 (20.6)	4,368 (0.7)	110,537 (18.5)	324,597 (54.2)	36,112 (6.0)	598,675 (22.6)
Wallowa-Whitman	205,733 (21.3)	21,731 (2.3)	188,801 (19.6)	508,899 (52.8)	38,551 (4.0)	963,716 (36.3)
Total included forest land	377,462 (14.2)	39,122 (1.5)	393,196 (14.8)	1,674,726 (63.1)	169,982 (6.4)	2,654,488 (100.0)

Protection levels in the Blues are considered far below published recommendations necessary to maintain biodiversity (Dinerstein et al. 2017). The addition of roadless areas if protected from logging and road building would boost protection levels but they would still be well below what is needed to forestall biodiversity decline. Thus, the agency needs to advance wilderness protection proposals and increase protection for roadless areas to avoid further degradation and increased fire risks from logging. There is no ecological justification for rescinding roadless protections or omitting new wilderness proposals.

Protection of Mature/Old-Growth Forests are Well-Below Recommended Levels

Mature and old-growth forests (MOG) contain irreplaceable repositories of clean water, fish and wildlife habitat, carbon stocks, and recreational opportunities (DellaSala et al. 2022). For this analysis, we updated MOG levels (DellaSala et al. 2022) based on recent fires. Consequently, the Blues contain ~994,000 ha of MOG, which is considerably more than the nearby Eastern Cascades (Table 4). Of this, only ~11.5% is protected with another ~11% in roadless areas within the Blues. This level of protection is far too low to maintain MOG values as noted.

Table 4. Forest structural maturity by GAP after excluding pixels flagged by the supplied 2020–2024 MTBS high-severity mask. Young, Intermediate and Mature are reported separately. Percentages give each GAP class’s share of the retained regional maturity-class total; values are rounded to whole hectares and one decimal percent. This is a mask-based screening scenario, not a direct measurement of current forest extent or loss after a verified baseline date. Other disturbance types and severities are not removed. The prepared forest-maturity dataset reports structural classes Young, Intermediate and Mature; these are not OGSi age classes. Intermediate + Mature is the selected combined reporting footprint. GAP 3a is assigned GAP 3 within inventoried roadless areas; GAP 3b is the remainder. GAP 4 includes residual land under the project reporting convention.

Blue Mountains

Prepared forest maturity class	GAP ha (%)					Total ha
	1	2	3a	3b	4	
Young	55,265 (8.3)	9,155 (1.4)	52,264 (7.9)	341,913 (51.6)	204,356 (30.8)	662,952
Intermediate	74,702 (8.4)	11,626 (1.3)	66,824 (7.5)	499,414 (56.0)	238,736 (26.8)	891,302
Mature	96,764 (9.7)	18,302 (1.8)	106,864 (10.8)	527,254 (53.0)	244,859 (24.6)	994,042

East Cascades

Prepared forest maturity class	GAP ha (%)					Total ha
	1	2	3a	3b	4	
Young	2,550 (0.6)	8,630 (2.1)	5,439 (1.3)	205,301 (50.1)	188,186 (45.9)	410,106
Intermediate	6,431 (1.1)	14,280 (2.3)	12,651 (2.1)	379,309 (62.2)	197,405 (32.4)	610,076
Mature	8,808 (1.6)	18,844 (3.4)	19,864 (3.6)	383,002 (70.0)	116,374 (21.3)	546,892

Total Area Burned is Greater in Unprotected Lands Compared to Protected and Roadless Areas

We cannot overstate the importance of protected areas as fire refugia given the extensive publication record of how these areas burn in lower fire severities (e.g., Bradley et al. 2016 cited above). More specifically, the pattern of more fire in logged areas is prevalent in the Blues as noted in Figure 1. To repeat – logged areas have more area burned than protected and roadless areas in the Blues as in other regions as noted in the published literature.

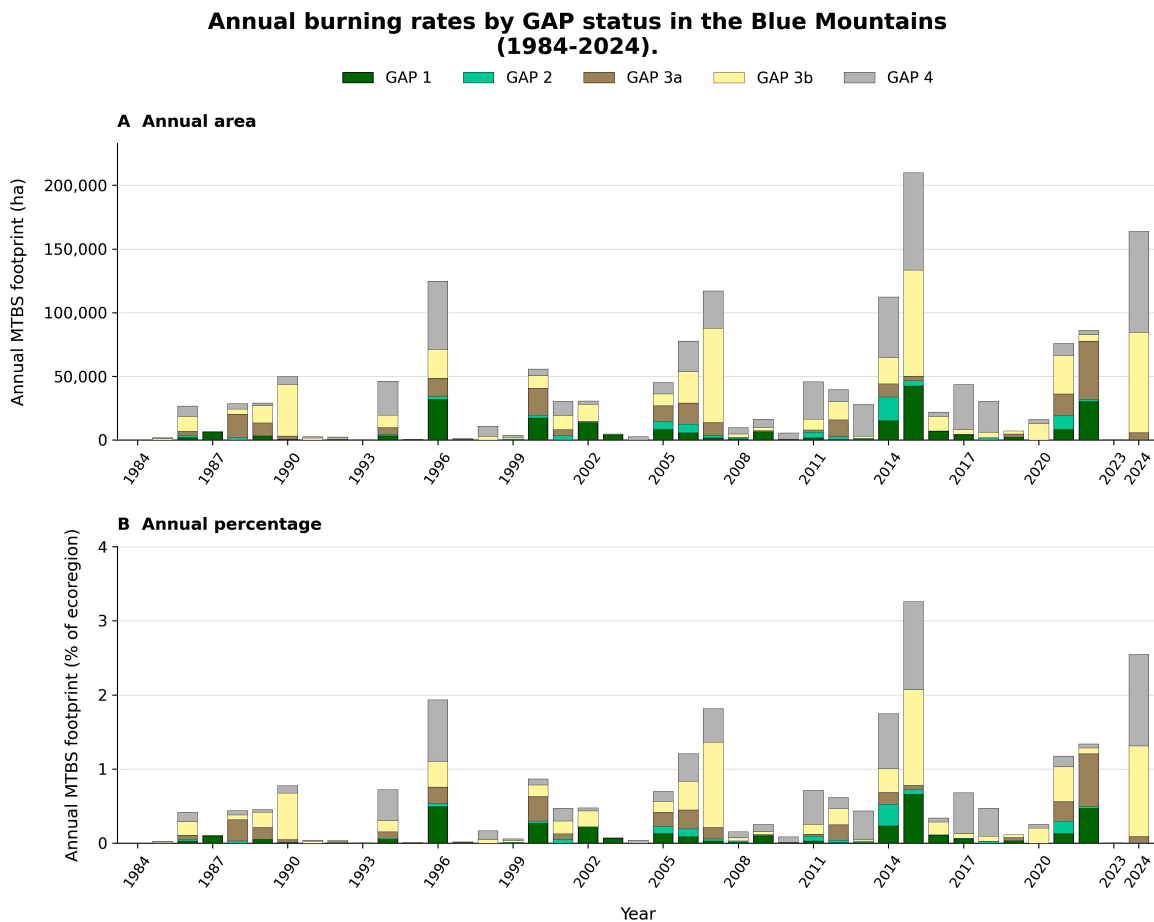


Figure 1. Annual burning rates by GAP status in the Blue Mountains (1984-2024). Stacked bars show the annual MTBS fire footprint by GAP status, expressed as (A) hectares and (B) percentage of the total ecoregion area. Each color shows the area within a particular GAP category included in that year's MTBS fire footprint. Adding the colored segments gives the total footprint for that year across the ecoregion. In panel B, each segment expresses that same area as a percentage of the entire ecoregion, not as a percentage of the individual GAP category's area. The annual MTBS fire footprint includes mapped areas classified as unburned-to-low, low, moderate, or high severity, together with unprocessed areas where severity could not be determined. Only areas within MTBS incident boundaries classified as Wildfire, Wildland Fire Use, or Unknown are included; prescribed-fire incidents and increased-greenness observations are excluded. The footprint therefore includes low-impact or potentially unburned patches within mapped fire areas and does not represent uniformly burned land. Locations affected by fire in more than one year contribute to the mapped fire footprint in each of those years; each location is counted only once within a year. GAP categories reflect current land assignments applied across the entire record, rather than protection status at the time of each fire.

Maximum High Severity Fire is Greater in Unprotected Lands in the Blues

In addition to the total area burned, maximum high severity fire area is generally highest in forest and woodland areas unprotected from logging (Table 5). For instance, high severity was greatest in GAP 3b (managed, 17.6%) followed by GAP 1 (16.2%, protected), GAP 4 (9.7%, managed), GAP 3a (IRAs, 9.1%), and GAP 2 (protected, 6.6%). We note that there are much higher totals for high severity in managed lands (18,348 ha) vs. protected areas (1,934 ha) and IRAs (1113 ha) over the time period investigated even though some of the percentages are close given differences in burn perimeter sizes.

Table 5. Maximum MTBS fire severity (1984–2024) within selected BPS forest settings in the Blue Mountains Ecoregion, by GAP status. Values are hectares, with percentages in parentheses. Selected forest settings comprise the 11 LANDFIRE Biophysical Settings (BPS) systems assigned in supplementary Table S1 of DellaSala et al. (2026) to dry mixed-conifer forest and woodland, mesic mixed-conifer forest and woodland, dry Douglas-fir forest and woodland, and ponderosa pine forest, woodland and savanna. BPS represents potential vegetation settings, rather than current forest cover. Percentages within each GAP column describe the share of that GAP category’s included MTBS fire footprint within the selected forest settings in each severity class, and sum to approximately 100% down each column. Percentages in the final column describe each severity class’s share of the combined included forest fire footprint across all GAP categories. Percentages in the final row describe each GAP category’s share of that combined footprint. The bottom-right value is the total included forest fire footprint in hectares; it is not the entire area of the selected forests or the ecoregion. Each 30 m location is represented once using its highest included MTBS severity class during 1984–2024. Unburned-to-low and unprocessed-only cells are included in footprint denominators; MTBS class 5 (increased greenness) is excluded. GAP 3a comprises assigned GAP 3 land within inventoried roadless areas, and GAP 3b comprises the remaining GAP 3 land. GAP 4 includes explicit GAP 4 and residual land without an assigned GAP code under the project’s reporting convention. Hectares are rounded to whole numbers and percentages to one decimal place; rounded values may not sum exactly. Small positive values are displayed as <1 ha or <0.1%. This table corresponds to Table 6 in DellaSala et al. (2026). The forest selection follows Table S1 exactly, but does not include the paper’s additional LANDFIRE Existing Vegetation Type adjustment for agricultural and developed areas. This analysis uses standard MTBS thematic severity classes for 1984–2024, rather than the paper’s RdNBR classification for 1985–2023.

Fire severity	GAP ha (%)					Total ha (%)
	1	2	3a	3b	4	
Unprocessed only	2 (<0.1)	3 (<0.1)	31 (0.2)	187 (0.2)	169 (0.4)	391 (0.3)
Unburned to low	1,913 (18.4)	674 (17.9)	2,094 (17.1)	14,154 (17.7)	5,532 (12.7)	24,367 (16.2)
Low	4,464 (43.0)	2,003 (53.2)	6,838 (55.8)	35,341 (44.1)	23,253 (53.5)	71,898 (47.9)
Moderate	2,328 (22.4)	833 (22.1)	2,175 (17.8)	16,302 (20.3)	10,289 (23.7)	31,926 (21.3)
High	1,684 (16.2)	250 (6.6)	1,113 (9.1)	14,129 (17.6)	4,219 (9.7)	21,395 (14.3)
Total ha (%)	10,390 (6.9)	3,763 (2.5)	12,250 (8.2)	80,113 (53.4)	43,462 (29.0)	149,977

Over 95% of fuel treatments in the Blues has been >1-km from the WUI

Contrary to claims that fuel reductions are needed to reduce risks of wildfire spillover events to communities, the Forest Service has been preoccupied with treatments far removed from the built environment (Table 6). This represents an astonishing neglect for public safety by the agency’s back-country logging activities, particularly given published research shows the greatest wildfire protection benefits to communities come from hardening the structure itself and a narrow treatment zone around it (Law et al. 2023, Calkin et al. 2023). Importantly, most

wildfire spillover events in Oregon are due to human-caused fire ignitions on private lands where logging and road building is highest and this increased risk needs to be analyzed in the forest plan (Downing et al. 2022).

Table 6. Fuel-treatment footprint by distance to mapped 2020 Wildland–Urban Interface in the Blue Mountains. Values are hectares with percentages in parentheses for BLM, USFS and Combined. Each percentage uses the corresponding agency’s total regional treatment footprint. Values are rounded to whole hectares and one decimal percent. Selected USFS and BLM treatment records were completed during 2005–2024. Areas represent land treated at least once; overlapping treatment records are not summed. The Combined footprint is the spatial union of both agencies. Distances are measured from mapped 2020 WUI; the 0–250 m band includes land inside WUI. Agency WUI designations come from treatment records, independently of the mapped WUI. Overlapping Yes and No designations mean different treatment records at the same location carry different agency labels, within or across agencies.

Distance to Wildland–Urban Interface	BLM ha (%)	USFS ha (%)	Combined ha (%)
0–250 m	1,410 (1.6%)	4,615 (1.3%)	6,024 (1.4%)
>250–500 m	721 (0.8%)	3,677 (1.0%)	4,397 (1.0%)
>500–750 m	405 (0.4%)	3,954 (1.1%)	4,359 (1.0%)
>750–1,000 m	332 (0.4%)	4,257 (1.2%)	4,590 (1.0%)
>1,000 m	87,499 (96.8%)	337,505 (95.3%)	424,979 (95.6%)
Total ha	90,367	354,008	444,349

Decadal Logging Levels in the Blues have had Extensive Cumulative Impacts

Logging levels have had a long and damaging history in this region, peaking in the 1980s with the highest levels on the Malheur (see Figure 2, Figure 3, Table 7).

FACTS Timber Harvest by National Forest

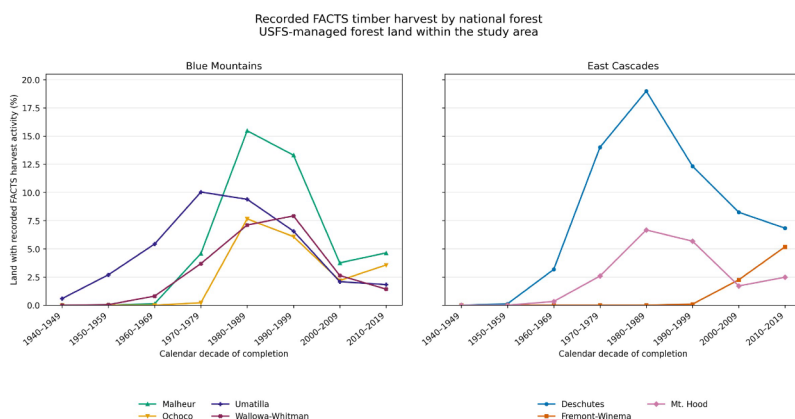


Figure 2. Logging rates within the Blue Mountains and nearby Eastern Cascades, including national forest lands.

Decadal logging levels have accumulated over an extensive area with levels as high as 15% in the Malheur during the 1980s. This amounts to ~107,730 ha of logged area in just the Malheur during that decade, an extraordinary level of degradation. And this damage is not tied to the Malheur only as logging in the thousands of hectares is noted in each of the national forests in the Blues during each of the decades analyzed, representing cumulative impacts across a wide area (Figure 3). The addition of roads to access logged areas represents even more impacts not analyzed here but covered extensively in the literature (see Ibisch et al. 2016 and supplemental for review of road impacts and roadless importance).

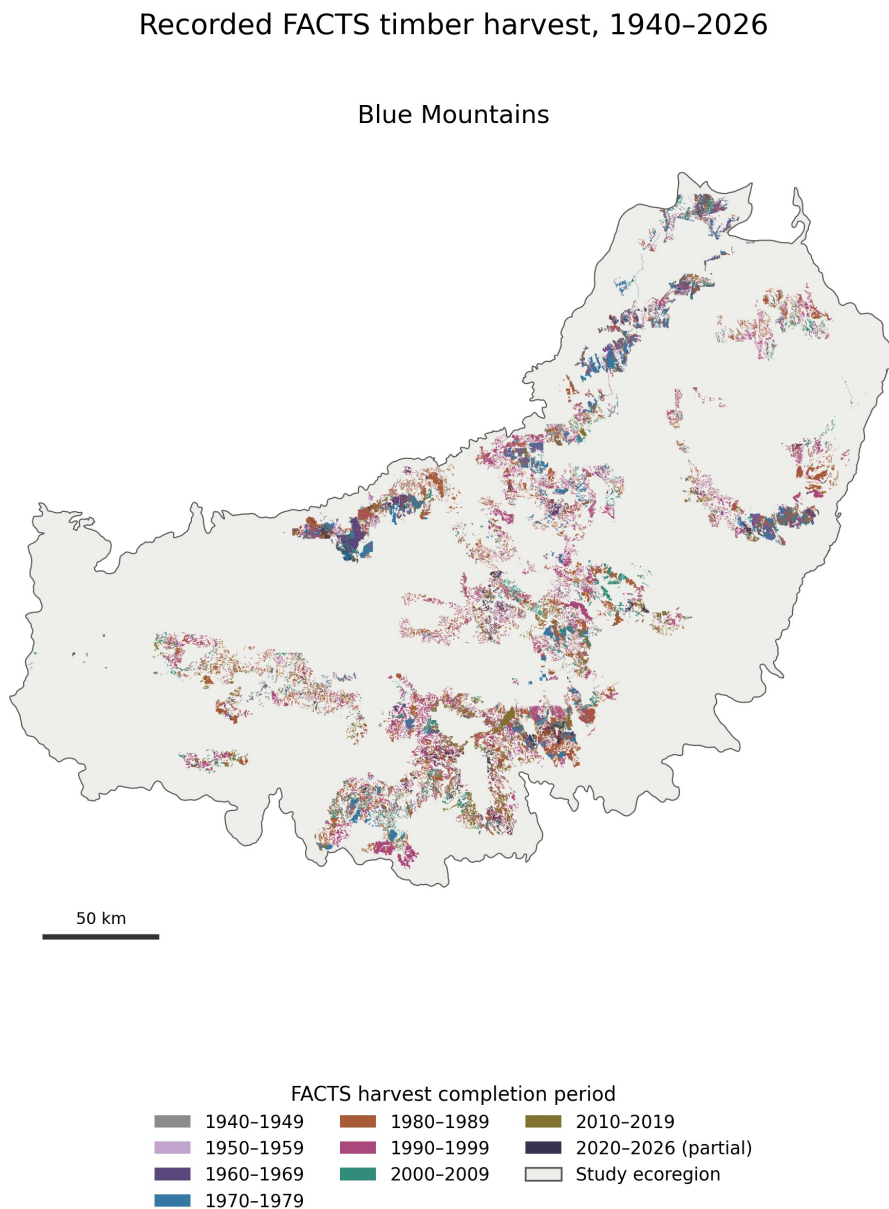


Figure 3. Cumulative logging impacts in the Blue Mountains by decade showing extensive fragmentation and degradation throughout the region. These cumulative impacts need to be analyzed by the agency including road impacts (not shown here).

Table 7. Recorded FACTS timber-harvest footprint by national forest in the Blue Mountains, for complete calendar decades from 1940–1949 through 2010–2019. The reporting scope is USFS-managed land within administrative national-forest boundaries, restricted to the combined study area. Percentages divide the unique recorded harvest footprint by the corresponding full reporting-area hectares; no forest-cover mask is applied. These are period activity percentages, not annual rates, timber volume or verified forest loss. Each national forest is reported once under its assigned regional group, combining its portions within the Blue Mountains and East Cascades study ecoregions. Deschutes is assigned to East Cascades and Ochoco to Blue Mountains. Land outside the combined study area is excluded. Eligible FACTS records describe recorded timber-harvest activity and may not capture every harvest. Overlapping eligible harvest polygons count once within a period; a location may occur in more than one period.

National forest	Land area (ha)	1940–1949 ha (%)	1950–1959 ha (%)	1960–1969 ha (%)	1970–1979 ha (%)	1980–1989 ha (%)	1990–1999 ha (%)	2000–2009 ha (%)	2010–2019 ha (%)
Malheur	696,555	0 (0.0)	0 (0.0)	912 (0.1)	31,903 (4.6)	107,730 (15.5)	92,652 (13.3)	26,112 (3.7)	32,275 (4.6)
Ochoco	294,723	0 (0.0)	0 (0.0)	0 (0.0)	634 (0.2)	22,545 (7.6)	17,907 (6.1)	6,441 (2.2)	10,493 (3.6)
Umatilla	560,918	3,255 (0.6)	15,088 (2.7)	30,424 (5.4)	56,263 (10.0)	52,658 (9.4)	36,828 (6.6)	11,691 (2.1)	10,231 (1.8)
Wallowa-Whitman	914,642	0 (0.0)	389 (<0.1)	7,348 (0.8)	33,703 (3.7)	65,016 (7.1)	72,397 (7.9)	24,063 (2.6)	12,988 (1.4)

Note – timber harvest activity categories in all analysis include multiple removal types.

Harvest Activity Categories in our AOIs in the FACTS Dataset

ACTIVITY_NAME	count	ha	ACTIVITY_NAME	count	ha
Commercial Thin	13839	304066.10	Shelterwood Preparatory Cut (EA/NRH/NFH)	78	2856.54
Group Selection Method (UA/RH/FH)	516	5019.19	Shelterwood Removal Cut (EA/NRH/FH)	2280	45511.04
Harvest Without Restocking	5	37.13	Shelterwood Removal Cut (w/ leave trees) (EA/NRH/FH)	184	3505.68
Improvement Cut	3228	71041.63	Shelterwood Staged Removal Cut (EA/NRH/NFH)	106	2737.52
Liberation Cut	28	28.91	Single Tree Selection Method (UA/RH/FH)	4737	187926.80
Overstory Removal Cut (from advanced regeneration) (EA/RH/FH)	7120	169798.49	Special Products Removal	141	2436.88
Patch Clearcut (EA/RH/FH)	1487	10712.58	Stand Clearcut (EA/RH/FH)	7550	80750.34
Patch Clearcut (w/ leave trees) (EA/RH/FH)	1925	16588.05	Stand Clearcut (w/ leave trees) (EA/RH/FH)	787	8960.30
Permanent Land Clearing	12	143.72	Two-aged Coppice Cut (w/res) (2A/RH/FH)	8	199.75
Salvage Cut (intermediate treatment, not regeneration)	4433	122828.46	Two-aged Patch Clearcut (w/res) (2A/RH/FH)	9	59.17
Sanitation Cut	2124	48134.82	Two-aged Preparatory Cut (w/res) (2A/NRH/NFH)	506	39645.66
Seed-tree Final Cut (EA/NRH/FH)	416	9751.93	Two-aged Seed-tree Seed and Removal Cut (w/res) (2A/RH/FH)	1133	18319.40
Seed-tree Preparatory Cut (EA/NRH/NFH)	6	21.83	Two-aged Shelterwood Establishment Cut (w/res) (2A/RH/NFH)	649	9416.30
Seed-tree Removal Cut (w/ leave trees) (EA/NRH/FH)	53	754.43	Two-aged Shelterwood Establishment and Removal Cut (w/ res) (2A/RH/FH)	6	77.38
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	2978	34378.87	Two-aged Shelterwood Final Removal Cut (w/res) (2A/NRH/FH)	34	705.45
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	3714	47343.79	Two-aged Stand Clearcut (w/res) (2A/RH/FH)	114	2047.30

CONCLUSIONS

The Blue Mountains Ecoregion was identified by the World Wildlife Fund in 1999 as an area of continental biodiversity significance. Historically old forests and large tree cohorts were far more

abundant with logging beginning to take a toll on the region at least in the 1940s, peaking in the 1980s, and continuing today with even more logging proposed by the agency. The ecoregion is consequently threatened by logging and road building that are amplifying climate change impacts, including elevating fire risks from too many roads and too much logging as clearly noted in our findings and the published literature. Historic high-grade logging of large trees, logging of MOG forests, and road building has resulted in a highly degraded region where there but a few remaining intact (roadless areas) and natural areas (e.g., old forests, complex early seral) within a sea of human activity that has been consequential to a broad suite of forest values.

Further logging proposed in the forest plan along with reductions in forest protection policies may result in cascading ecological effects that jeopardize forest values and increase risks to communities as the agency has been negligent in its public safety responsibilities by logging in the backcountry. The forest plan revision should protect all large trees (>20 in dbh), increase overall levels of protection to at least 30% of the total ecoregion (up from 10%) and include protection of all remaining old forests, roadless areas, and complex early seral forests while concentrating fuel reduction closest to homes and by updating its transportation planning framework to increase seasonal road closures and road obliteration for restoration and fire risk reduction benefits. For these reasons, none of the plan revision alternatives are based on BAS as each would further degrade ecosystem integrity in an area that was making recovery progress (large trees, MOG) due to logging and road building restrictions that are now at risk.

Our findings will be submitted to a peer-reviewed journal for future publication.