UNIVERSITY OF WASHINGTON School of Forest Resources

Economic and Environmental Impact Assessment of Forest Policy: Western Washington

In the last decade forest management policy changes have resulted in large forest reserves to protect critical habitat. Although much habitat protection has been directed toward public lands, economic impacts have been profound. An assessment of the economic and environmental impacts from past and prospective forest management alternatives is essential to judge their effectiveness. A study, sponsored by the University of Washington School of Forest Resources, Center for International Trade in Forest Products (CINTRAFOR), assessed these impacts using seven alternative management scenarios.

Background: Forest management policy changes during the 1990s, with the intent of protecting northern spotted owl, the marbled murrelet, salmon, and bull trout, differentially affected federal, state, and private lands. Efforts to protect the owl and murrelet, which are mostly dependent upon old forest structures, focused first on federal and then state and private lands. The impacts on private lands were considerably smaller given their limited inventory of old forest structures. Harvest levels were reduced by 80% on federal forests and by roughly 40% on state lands, such that today, private lands account for about 85% of the harvest on 60% of the unreserved forestland. Large additions to old forest upland reserves and enlarged no-harvest zones around streams are attempting to protect critical habitat. Economic impacts from these changes have resulted in rural job losses and an increasing disparity between timber rural and urban incomes. The expectation is that future changes driven by salmon protection may be even greater—with much of the impact falling on private forest landowners.

Active management research: Policymakers have generally opted to endorse a management strategy that largely depends on the reservation of certain land types and habitats from active management, following the strategy first adopted on federal lands. However, current research in active management alternatives to improve environmental and habitat conditions may result in strategies that are both more effective at protecting habitat and less costly than reserve strategies. Forest stands are dynamic and ultimately change in structure through growth, natural disturbances, human interventions, and/or management. Assessment of the cumulative effectiveness of past and proposed policies to meet biodiversity and habitat conservation goals can provide a yardstick to measure the environmental/economic impacts under different policy and management approaches.

Simulation of forest management alternatives for riparian protection: Simulations, a method to assess the impacts of policy change, were prepared for a range of regulatory and management alternatives affecting western Washington for the next 200 years. Assessments of critical habitats, biodiversity, harvest levels, and economic impacts demonstrate the environmental/economic tradeoffs among alternatives. For the impacts of riparian management on private lands, current practices are first simulated as a baseline (Case 1). The practical consequences of current regulations result in no-management buffers of 85 ft. along fish bearing class 1-3 streams with the buffers covering about 2-3% of the forestland. Alternatives to increase salmon habitat include enlarged riparian management zones (RMZs) covering both fish bearing and non-fish bearing streams, with either no-management (Case 2) or active biodiversity management within the RMZ (Case 3) to restore riparian functions that existed in pre-European settlement times. The RMZ widths for Cases 2 and 3 shown in Table 1 are 150 ft. on class 1-3 (larger fish bearing) streams, 100 ft. on class 4 streams and 50 ft. on class 5 (generally intermittent and non-fish bearing) streams.

Economic losses associated with the no-management RMZ (Case 2) are substantial. Impacts are shown for: (1) harvest losses which directly affect mill activity, (2) short term and long term rural jobs, (3) net present value (NPV), the measure of economic importance to forestland owners, (4) tax receipts, of interest to the government, and (5) old forest (late seral) structures as an aggregate proxy for environmental effects valued by society. Harvest losses over the first 20 years from no-management within the RMZ (Case 2 compared to Case 1), measured in percentage change, exceed the percentage of total acres in the RMZ, a typical effect of harvest scheduling problems when there is a reduction in mature forests of harvestable age. The first 20-year job and harvest losses in rural communities average 23%–16,500 job losses and 840 million board ft. per year.

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Table 1. Economic and environmental impacts from riparian management alternatives on private lands in Western Washington (5,712,000 private acres, assuming no owl and murrelet protection).

	Case 1	*Case 2*	*Case 3*
(Land Base)	**Current Base**	**No-mgt. RMZ**	**Bio-mgt. RMZ**
Acres Impacted	2.5%	14%	14%
		Change from the Base (Case 1)	
(Mill Impacts)			
Harvest 1-20 years average (mmbf)	3,640	-23%	-17%
Long-term sustained	4,077	-15%	+9%
(Community Impacts)			
Rural Jobs 1-20 years	72,000	-23%	-15%
Long-term sustained	76,500	-10%	+27%
(Landowner Impacts)			
NPV @ 5% $ billions	28.8	-20%	-11%
(Government Impacts)			
State & Local Tax Receipts 1-20 years ($ millions)	821	-23%	-15%
(Societal Environmental Impacts)			
Late Seral Habitat in RMZ (%)		Percent of Riparian Land Base	
Current	1%	1%	1%
By 5th decade	1%	6%	53%
By 10th decade	11%	57%	67%

The number of jobs in the long term increases because more intensive management in the early years increases the available harvest and jobs over time. Long term job losses under Case 2 are 10% or 7,500. Harvest losses are reduced under active management using bio-diversity thinnings within the RMZ (Case 3 vs. Case 1), decreasing the first 20-year job losses to 10,800. In the long term, jobs increase rather than decrease as a consequence of the labor intensive thinning to enhance biodiversity, which also produces larger trees with higher quality wood supporting increased value added processing. The NPV loss to private owners for Case 2 is $5.6 billion or 20% (slightly less than the harvest loss), but is reduced to $3.2 billion or 11% under Case 3. Tax receipts are proportional to economic activity, with losses of $185 million per year under Case 2 and $117 million under Case 3. Environmental improvements in Case 2 are very modest until the10th decade, whereas more active management to replicate old forest functionality under Case 3 achieves similar levels by the 5th decade. The 5% increase in riparian acres with late seral structures by the 5th decade under Case 2 costs $1,100 million for each additional 1.0% of late seral riparian acres and under Case 3, $61 million. Using this ratio as a measure of economic efficiency, active management to increase old forest functionality within the RMZ results in an 18-fold improvement.

The simulation suggests near term job losses and NPV reductions in the range of 20% if active management is not allowed (Case 2). However, this only suggest a lower bound since the simulation leaves out many important effects that could substantially increase the costs even more. The RMZ width could be as wide as in the Northwest Forest Plan on federal lands, twice as wide as the illustrated RMZ, a potential doubling of the impact. Unstable slopes could also add another 5-10% of all acres to those in the RMZ, for a 50% increase in economic impact. The addition of protection on unstable slopes and secondary streams results in disconnected harvest units that may not be economically accessible—a substantial increase in management costs. In addition, there are increased costs associated with road, bridge, and culvert improvements. The simulation only estimates the average affect across owners. Some small owners will feel no impact and some will feel almost 100% loss of their economic potential if their lands fall almost entirely in the affected RMZ. Active management within the RMZ offers the potential to grow large trees faster for stream recruitment while maintaining a more diverse understory resulting in a faster restoration of pre-European environmental conditions at a substantially lower cost than no-management zones.

Simulation of forest management alternatives across all forestlands: It is instructive to apply these same active management principles for all owner groups and for upland as well as riparian acres. Case 4 provides a

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Table 2: Economic and environmental impacts from riparian and upland management alternatives in Western Washington (9,429,000 acres across all owners).

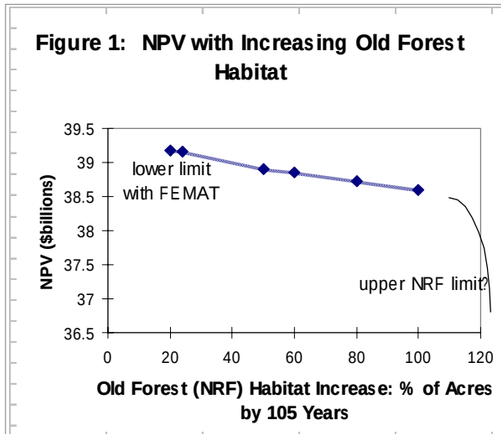
	Case 4 **Commodity Base**	*Case 5* **Proposed Regs** w/ FEMAT	*Case 6* **Bio-mgt** on non-fed	*Case 7* **Bio-mgt all** owners
		Change from Base (Case 4)		
(Mill Impacts)				
Harvest 1-20 yr. ave. (mmbf)	5,831	-31%	-20%	-4%
Long term sustained	6,478	-24%	-10%	-6%
(Community Impacts)				
Rural jobs 1-20 years	134,000	-40%	-29%	-13%
Long term sustained	127,000	-22%	+3%	+11%
(Landowner Impacts)				
NPV @5% $ billions	48.4	-42%	-23%	-11%
Private	27.7	-27%	-11%	-13%
State	11.1	-22%	0%	1%
Federal	9.6	-82%	-82%	-18%
(Government Impacts)				
Tax Receipts 1-20 years ($ millions)	1,485	-38%	-26%	-10%
(Societal Environmental Impacts)				
Late Seral Habitat (%)		Percent of Total Acres in Late Seral		
Current	11	11	11	11
By 5th decade	3	18	22	21
By 10th decade	11	33	60	61

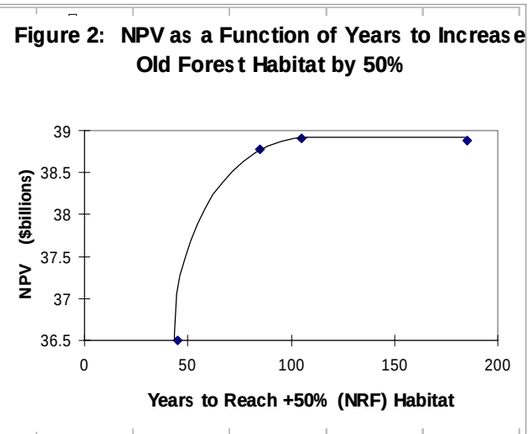
all owners and acres, with the same RMZ protection as Case 1. Case 5 provides a characterization of proposed regulations based on a reserve strategy. It includes the impact of minimum regulations to protect the owl and murrelet, the proposed no-management RMZ along streams for state and private owners (as was shown in Case 2 for private lands) and the Northwest Forest Plan on federal lands. Case 6 simulates active biodiversity management by state and private owners in the uplands and is, like Case 3, in the riparian zones. Case 7 allows active management on 1/3 of federal lands, an aggressive adaptive management approach.

For proposed regulations, (Case 5 compared to Case 4), jobs for the first 20 years decrease 40%, but only 22% in the long term. These losses include the affects of proposed riparian no-management RMZs that were estimated in Case 2, and hence are cumulative effects of prior uplands protection and proposed riparian protection. NPV losses are heavily weighted to federal lands as a consequence of the Forest Plan. The 22% impact on state lands includes protection of habitat within circles around owl sites as well the no-management RMZ. The impacts on private lands are greater, because they lack a surplus of mature acres to harvest as an offset to the exclusion of mature acres for habitat protection.

management alternative (Case 6) are significantly lower than Case 5, while the late seral habitat measures are better. As a result, both upland and riparian environmental measures are achieved at lower cost. Over the long term, the impact on jobs is positive rather than negative, because the higher quality wood from those acres being managed to produce larger trees and habitat supports additional processing and jobs, as does more intensive forest management. Tax receipts in the first 20 years are off 26% or $386 million; compared to 38% and $558 million for the proposed regulations (Case 5). The environmental benefits of Case 6 show a substantial improvement in late seral structures by both the 5th decade and even more so by the 10th decade. The economic efficiency for an additional 1.0 percent of the acres in late seral structures by the 10th decade improves from a $927 million cost under Case 5 to $227 million under Case 6, a four-fold improvement.

If one-third of the federal ownership now under reserve management is opened to active habitat treatments (Case 7), all of the costs are reduced substantially while sustaining the same habitat protection. The rural job losses are reduced to 13%, a gain of 36,000 rural jobs from proposed regulations. The economic efficiency to restore habitat across all owners is doubled over Case 6, for a nine-fold improvement over proposed regulations.





Note: NRF (nesting roosting foraging habitat) is defined by Washington state forest practice rules as the most mature segment of a late seral old forest structure with the largest trees.

Economic sensitivity to increasing levels of habitat protection: Sensitivity analysis by simulations that increase the amount of habitat in the future show that the cost increase to provide additional late seral acres in 100 years is relatively low, about $80 per additional acre or $8 million for a 1% increase in late seral structures (Figure 1). However it is not possible to increase habitat substantially in less than 50 years (Figure 2) and the cost increases as the target year is reduced below 100 years.

Summary: Meeting minimum regulations and expected salmon protection requirements through active habitat management can be achieved with lower costs and job losses than reserve strategies. The private owner loss of $7.4 billion to achieve upland habitat and RMZ protection could be reduced to $3 billion if active habitat management strategies were adopted. An incentive of $150 million per year could offset this asset loss and motivate a management change to increase habitat. The tax loss from the no-management RMZ alone is $185 million per year for the economic activity generated from private land production or $564 million per year with the upland habitat protection on all lands (Case 5). The tax loss from active management, Case 6 compared to Case 5, is reduced by $178 million. This exceeds the incentive cost needed to motivate the more rapid restoration of habitat illustrated in Case 6 while also reducing the losses in rural communities. More active management on federal lands (Case 7) would increase tax receipts by another $237 million excluding federal timber revenues (when compared to Case 6) while further reducing the loses in rural communities. Case studies would likely show higher costs than are reflected in these simulations, but the directional implications of illustrated strategies would not change.

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