19 Case Studies Examining the Economic Impacts of New Forest Practices Regulations on NIPF Landowners

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Introduction

Regulation of private forestland has been a growing issue in the USA, and concern has increased over the economic impacts of these regulations on rural communities and landowners. This is particularly true in the state of Washington, which has recently strengthened its forest practices laws in response to the listing of salmon under the Endangered Species Act (ESA). Washington's new rules, known as the 'Forests and Fish' rules, include significant new restrictions on timber harvest in riparian areas. These new rules appear to be the most restrictive in the nation. There is concern that they will be an economic burden to private landowners, especially small, non-industrial private forest (NIPF) landowners. There is also concern over the potential disparity of impacts between different landowners in the state. Other states considering similar rule changes may benefit from Washington's experience.

The purpose of this study is to use a series of case studies to examine the economic impacts of Washington's new forest practices regulations on small, NIPF landowners. A Small Business Economic Impact Statement (SBEIS) has already been completed to assess the overall economic impacts of the rules on small landowners and to compare these impacts with those of large, industrial landowners (Perez-Garcia *et al.*, 2001). A county level analysis of impacts has also been done (Lippke *et al.*, 2000), but these studies do not consider site-specific differences. By using a case study approach, this study focuses on the potential range and disparity of impacts between individual landowners with more specificity on cost and management treatments. In addition, this study seeks to reveal best management strategies for small landowners in light of the new rules, and it also assesses the effectiveness of impact mitigation programmes.

Background

The new Forests and Fish rules are based on the recommendations of the Forests and Fish Report (Forests and Fish Report, 1999), which was put together by a caucus of federal and state agencies, industry, NIPF landowners, and Native American tribes, and was designed to meet the requirements of the ESA and the Clean Water Act.

For western Washington, the Forests and Fish rules require a riparian buffer on either side of any potentially fish-bearing stream that extends to one site-potential tree height (SPTH). The SPTH varies from 27 to 61 m, depending on the quality of the site. The riparian buffer is divided into three zones:

1. The *core zone* extends 15 m (50 ft) from the stream, and no harvest is allowed in this zone.
2. The *inner zone* extends from the outer edge of the core zone to 67% of the SPTH for streams less

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than 3 m (10 ft) wide or 75% of the SPTH for streams greater than 3 m (10 ft) wide. Limited harvest is allowed in this zone only if the remaining number of trees, basal area, and proportion of conifer are sufficient to meet Desired Future Conditions (DFC) when the stand is 140 years old. DFC are based on the averaging of tree record data collected and modelled from older riparian stands in Washington State. Whether a stand meets these requirements is determined by growth modelling using the Stand Management Cooperative (SMC) variant of ORGANON (ORGANON Growth and Yield Project, 1995). Harvesting that meets these requirements may be done using one of the following options.

- Option 1: Thinning from below
- Option 2: Leave trees closest to the stream

3. The *outer zone* extends from the outer edge of the inner zone out to the SPTH. Harvest is allowed in this zone as long as 49 conifer ha^{-1} (20 per acre) over 30 cm (12 in) in diameter are retained as 'leave trees'.

In addition to the three-zone buffer for fish-bearing streams, 15 m (50 ft) no-harvest buffers are required around certain portions of perennial, non-fish-bearing streams, and around sensitive sites such as seeps or springs (Emergency Rules: Forest Practices Board, 2000).

The Forests and Fish rules also contain new requirements for forest roads, stream crossings, equipment use and other aspects of forest management, as well as harvesting restrictions on unstable slopes and wetlands. Additional economic impacts that may result from these management constraints are beyond the scope of this initial study.

The caucus that drafted the recommendations in the Forests and Fish Report recognized that the new regulations would have a significant economic impact, especially on small landowners. Thus they also recommended several mitigation programmes to lessen the economic burden on small landowners. In response to these recommendations, the Small Forest Landowner Office (SFLO) was established within the Department of Natural Resources (DNR) to help assist small landowners with issues arising from the new regulations. In addition, the Forest Riparian Easement (FRE) programme was established to compensate small landowners for part of the value of their timber that cannot be harvested under the Forests and Fish rules. Eligible small landowners who choose to participate in this programme are paid by the state,[1] at the time of upland harvest, for half of the fair market value of qualifying timber left unharvested in riparian buffers. If the value of the timber required to be left under the rules exceeds 26% of the total value of the timber covered under the forest practices application (FPA), the value in excess of 26% is compensated in full. Only timber left pursuant to the Forests and Fish rules qualifies for easement compensation; additional timber that is left voluntarily by the landowner does not qualify (Proposed Rules: Forest Practices Board, 2000).

Methodology

Participation in this study was voluntary. Small NIPF landowners with riparian holdings were approached and asked to participate in the study. Accordingly, these participants do not represent a statistical sample of the NIPF ownership base in western Washington, nor was that the goal of this project. Of the landowners who volunteered to participate, the first three case studies are presented in this paper. All three are from Lewis County, Washington, which is located along Interstate 5 in southwest Washington between Seattle, Washington and Portland, Oregon.

For each case study, GIS data were obtained or created, including property boundaries, a stand map and stream locations. For each stream, GIS was used to overlay the appropriate riparian buffers on to the stand map. For fish-bearing streams (as classed by the DNR), the buffers were divided into the three zones (core, inner and outer). The inner zone was further divided to represent management Option 2, in which the part of the zone furthest from the stream is harvested, while the remaining part is not. This created a new set of unique polygons that were identified by stand and buffer type. The GIS was then used to calculate the area of each of these polygons, including the upland (non-buffered) areas.

Where recent timber inventory data were not available, sample plots were established in each stand. Data from these sample plots (or from existing inventory where available) were used to create tree lists for each stand that could be used in a growth model. For stands in which the riparian

areas were not consistent with the upland areas, a separate inventory was created for each.

For each stand, a growth model was used to simulate management to the end of the current rotation, when the existing timber would be liquidated. Management was then further simulated for one more full rotation to model how the stands would be managed when starting from bare land. The growth model chosen for use in this study was the SMC variant of ORGANON, in order to be consistent with the model used by the state to predict desired future conditions (DFC).

For each case study, five different scenarios were modelled. The first scenario was the baseline scenario, which represented the riparian harvest restrictions under the previous forest practices regulations. The previous rules specified a range of widths for riparian buffers and the number of leave trees required within those buffers. For modelling purposes this was simplified to an 8 m (25 ft) no-harvest buffer on all fish-bearing streams. This is a good proxy for the economic impact of the previous rules, and it is also consistent with common practice under the previous rules.

The other four scenarios represent four possible management options under the Forests and Fish rules. Each involves a different level of complexity and planning cost, posing potential obstacles for small owners. The second scenario assumes that no harvesting is done in any part of the riparian zone, including the inner and outer zones. The third scenario assumes that harvesting is done in the outer zone, as allowed under the rules, but not in the inner zone. The fourth and fifth scenarios assume that harvesting is done in the outer zone and in the inner zone under Option 1 and Option 2, respectively. These four scenarios were then compared to the baseline scenario to assess the impact of the Forests and Fish rules under different possible management options.

The basic management strategy underlying each of these five scenarios was based on information gathered about the typical management practices and goals of small landowners in the area. This included discussions with the participating landowners. For the three case studies presented here, a 50-year rotation of Douglas-fir was assumed with a single commercial thin and a clearcut harvest. Most of the existing timber inventory was consistent with this management strategy.

For each scenario, three economic values were calculated based on the Faustmann economic model: timber value (TV), bare land or soil expectation value (SEV) and total forest value (FV). Timber value is the net present value (NPV) of all costs and revenues associated with harvesting the existing timber according to Eqn 1. Bare land value is the NPV of all costs and revenues associated with producing the subsequent rotation (starting with bare land) an infinite number of times according to Eqn 2. For both timber value and bare land value, a 5% discount rate was used. Forest value is simply the composite of timber value and bare land value as shown in Eqn 3 (Faustmann, 1849). All values are quoted pre-tax (timber and capital gains) to maintain consistent treatment for comparison across owners.

To calculate harvest revenues, average 1999 log prices for the region (Arbor-Pacific Forestry Services and Resource Information Systems, 2000) were applied to the harvest volumes given by the growth model. The harvest volumes were divided into sorts based on the age of the stand (Stinson, 2000a). Logging and haul costs, planting costs, and annual administrative costs were also based on Stinson (2000a).

$$TV_0 = \frac{CT_n}{(1+i)^n} + \frac{H_r}{(1+i)^r} - \frac{a\left((1+i)^r - 1\right) - i(SEV)\left((1+i)^r - 1\right)}{i(1+i)^r} \quad (1)$$

where: CT_n = net commercial thin revenue at year n (where applicable), H_r = net harvest revenue at year r (end of current rotation), a = annual administrative cost, and i = discount rate.

Note that the first term represents discounted net commercial thin revenue, the second term represents discounted net harvest revenue, and the last term represents discounted annual costs and annual land rent until the end of the current rotation.

$$SEV = \frac{P(1+i)^R + CT_N(1+i)^{(R-N)} + H_R}{(1+i)^R - 1} - \frac{a}{i} \quad (2)$$

where: P = planting cost, CT_N = net commercial thin revenue at year N, H_R = net harvest revenue at year R, a = annual cost, and i = discount rate.

$$FV = TV + SEV \quad (3)$$

Results

Case Study A

Case Study A comprises 13.2 ha (32.7 acres). Of the total property, 64% (8.5 ha) is contained in riparian buffers under the Forests and Fish rules, compared with 12% under the baseline. The timber value, bare land value and total forest value for each scenario are displayed in Table 19.1. If no harvest is done in the riparian zone, the forest value declines from $91,156 to $15,534 (83%). The forest value only declines to $58,175 (36%) if harvest is done in both the outer and inner zone under Option 1. Bare land value becomes negative for all four scenarios under the Forests and Fish rules.

Case Study B

Case Study B comprises 62.2 ha (153.8 acres). Of the total property for this case study, 50% (31.0 ha) is contained in riparian buffers under the Forests and Fish rules, compared with 7% under the baseline. The values for each scenario are displayed in Table 19.2. With no harvest in the riparian zone, forest value declines by 45% from $1,259,036 to $692,469. The forest value declines to $917,707 (27% below the baseline value) if harvest is done in both the outer and inner zone under Option 2. Bare land value is positive for all scenarios, although it is significantly reduced under the Forests and Fish rules.

Case Study C

Case Study C comprises 27.2 ha (67.1 acres). 51% (13.9 ha) of the property is contained in riparian buffers under the Forests and Fish rules, compared with 11% under the baseline. The values for each scenario are displayed in Table 19.3. Like cases A and B, the forest value declines significantly (57%) if no riparian harvest is done, but the drop is much less (34%) if harvesting is done in the outer and inner zones under Option 2. Bare land value is negative under the first three Forests and Fish scenarios, but it becomes positive again under Option 2.

The loss in forest value for each landowner under the Forests and Fish scenarios as a

Table 19.1. Timber value, bare land value (SEV) and total forest value by scenario for Case Study A. All values are significantly lower under the Forests and Fish rules compared to the baseline scenario. SEV is particularly sensitive to the new rules.

Scenario	Timber value (TV)	Bare land value (SEV)	Total forest value (FV)
Baseline	$76,883	$14,274	$91,157
Forests/Fish with no riparian harvest	$25,579	($10,045)	$15,534
Forests/Fish with harvest in outer zone	$47,454	($5,531)	$41,923
Forests/Fish with inner/outer zone harvest Option 1	$63,706	($5,531)	$58,175
Forests/Fish with inner/outer zone harvest Option 2	$58,909	($3,306)	$55,603

Table 19.2. Timber value, bare land value (SEV) and total forest value by scenario for Case Study B. All values are significantly lower under the Forests and Fish rules compared to the basline scenario. SEV is particularly sensitive to the new rules.

Scenario	Timber value (TV)	Bare land value (SEV)	Total forest value (FV)
Baseline	$1,129,652	$129,384	$1,259,036
Forests/Fish with no riparian harvest	$677,567	$14,902	$692,469
Forests/Fish with harvest in outer zone	$838,785	$37,852	$876,638
Forests/Fish with inner/outer zone harvest Option 1	$863,682	$37,852	$901,534
Forests/Fish with inner/outer zone harvest Option 2	$870,863	$46,845	$917,707

percentage of the baseline is shown in Fig. 19.1. If none of the landowners chose to manage in the riparian zone, the economic losses as a percentage of the baseline would range from 83% (Case Study A) to 45% (Case Study B). If management is done to the full extent allowed under the new rules (Option 1 or Option 2), the minimum range of economic losses is 36% (Case Study A) to 27% (Case Study B). Both the magnitude of losses and the disparity of losses between cases studies can be reduced by managing in the riparian zone.

For all three case studies, the landowners would be eligible to receive compensation under the FRE programme. Figure 19.2 shows the percentage loss in forest value under each scenario if the NPV of cash payments for Forest Riparian Easements is considered. The FRE programme potentially reduces the minimum range of economic losses from 27% (Case Study A) to 15% (Case Study B).

Discussion

These case studies illustrate several important things about the economic impacts of Washington's new forest practices rules. First of all, the case studies show that small, NIPF landowners face potentially large economic impacts and a potentially large disparity of impacts from the new rules, depending on how they choose to manage their property. The results indicate, however, that both the magnitude and the disparity of losses can be reduced substantially by managing in both the inner and outer portions of the riparian zone to the full extent allowed by the rules. Interestingly, according to the Small Forest Landowner Office (SFLO), most of the NIPF landowners who have submitted Forest Practices Applications under the new rules have chosen to not do any management in the riparian zone (S.D. Stinson, Olympia, Washington, 2000, personal communication). It is

Table 19.3. Timber value, bare land value (SEV) and total forest value by scenario for Case Study C. All values are significantly lower under the Forests and Fish rules compared to the baseline scenario. SEV is particularly sensitive to the new rules.

Scenario	Timber value (TV)	Bare land value (SEV)	Total forest value (FV)
Baseline	$59,774	$18,955	$78,729
Forests/Fish with no riparian harvest	$39,362	($5,395)	$33,966
Forests/Fish with harvest in outer zone	$46,235	($1,150)	$45,085
Forests/Fish with inner/outer zone harvest Option 1	$48,022	($1,150)	$46,872
Forests/Fish with inner/outer zone harvest Option 2	$49,889	$2,216	$52,105

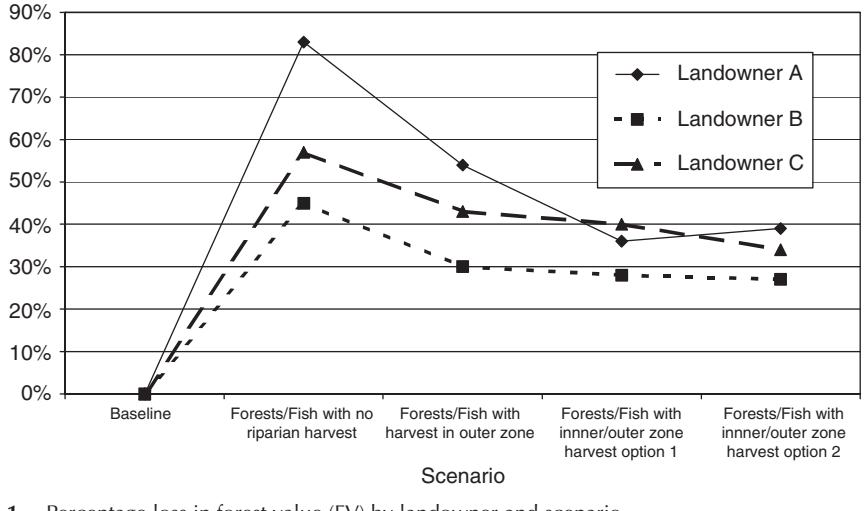

Fig. 19.1. Percentage loss in forest value (FV) by landowner and scenario.

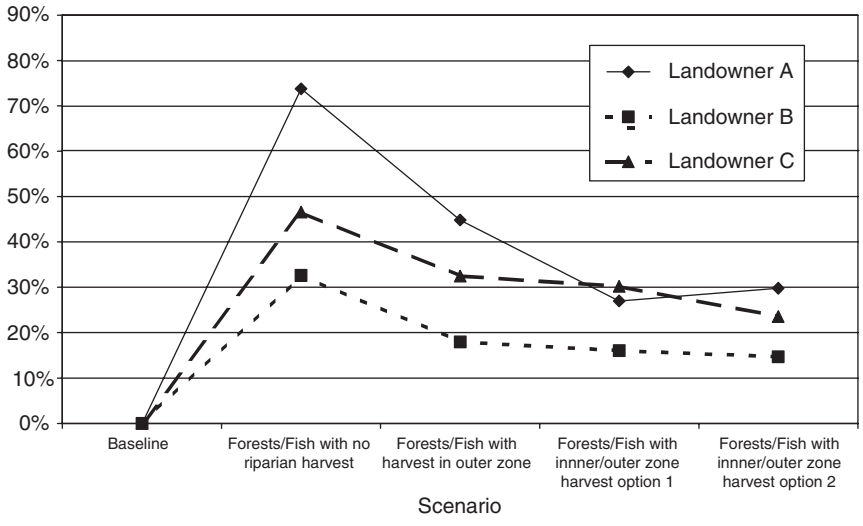

Fig. 19.2. Percentage loss in forest value (FV) with Forest Riparian Easement (FRE).

uncertain why small landowners are tending to choose the management option under which they experience the highest economic impacts. It may be an indication that harvesting in the riparian zone is more cost-prohibitive than our results imply. If the extra costs of entering the riparian zone outweigh the benefits, not harvesting at all in the riparian zone may indeed be the best option economically. Another hypothesis is that some landowners are willing to offer more resource protection than the minimum requirements under the new rules. It may also be simply some initial uncertainty about the new rules and that riparian harvests will increase over time as harvesters and landowners become more familiar with the rules. These are all merely hypotheses though, and more study will be needed for any definitive answers

A point that should also be considered regarding riparian management is that these three case studies are all on very productive sites. Thus, a lot of value can be removed from the inner zone, and it will still be able to meet DFC. For other parts of the state that are not as productive or for properties in which the riparian zone is not well-stocked with conifers, landowners may not be able to do much or any harvesting in the inner zone. For such cases there would not be the same potential to mitigate losses by managing in the riparian zone as there is for these three case studies.

The results of these case studies show that the losses in forest value are due not only to the reduced value of the standing timber that can be harvested but also to reduced bare land values. With Case Study A, for instance, the bare land value drops below zero for all four scenarios under the Forests and Fish rules using a 5% discount rate. This indicates that growing timber on this property cannot achieve a 5% rate of return under the Forests and Fish rules. Land values may stay positive if a lower discount rate is assumed, though the percentage decline would still be substantial. For landowners who have a minimum acceptable rate of return, however, negative SEV values could indicate that timber production is no longer the best use for their land given the new rules. Depending on what other values they associate with their property besides timber revenue, this could motivate land-use conversion for some landowners. NIPF lands in western Washington tend to interface with urbanizing areas, and NIPF land-use conversion to development use is a growing concern (Stinson, 2000b).

These case studies also illustrate the effectiveness of the FRE programme for mitigating economic losses. For all three case studies, an FRE reduced the overall economic impact by 9–12%. It is important to note, though, that landowners are only compensated for the minimum timber required to be left standing under the rules. Thus landowners who choose not to harvest at all in the riparian zone are compensated as if they harvested in both the outer and inner zone. It is also important to note that the easement represents

a one-time cash payment at the time of harvest, so it does nothing to improve bare land values. It is too early to determine what percentage of NIPF landowners will take advantage of this programme.

The results of these case studies show the economic impacts of Washington's new forest practices regulations to be not only more severe than the previous regulations, but also more severe than regulations in other regions. Lickwar *et al.* (1992), for instance, found that implementing Best Management Practices (BMP) in the Southeast to protect water quality only reduced gross harvest revenue by 2.9%. Another study in the Lower Wisconsin State Riverway found that new requirements did not significantly decrease and may even increase (depending on the baseline used) net present values for landowners (Stier and Martin, 1997). Similarly, Kittredge *et al.* (1999) found little impact from forest practices regulations when they compared regulations in two states in the Northeast.

Of these three studies from other regions, only Lickwar *et al.* (1992) involved riparian buffers, and the restrictions were much less stringent than with the Forests and Fish rules. Thus the restrictive buffer requirements of the Forests and Fish rules may set Washington apart from other states and regions in terms of the economic impacts of forest practices regulations. This is consistent with a study done on national forests in the Midwest, which found leaving buffer strips to be the most expensive practice to protect water quality, resulting in a net revenue reduction of over 26% (Ellefson and Miles, 1985).

While these rules and their impacts are unique to the state of Washington, other states are facing similar issues. Forest practices regulations have become increasingly stricter in the West over the past few decades (Cubbage, 1995). The East has also seen trends towards increasing state and local regulation of private forestry, and those trends are predicted to continue (Cubbage and Siegel, 1988). If regulations do indeed continue to increase, especially if they involve riparian buffers, landowners in other states can expect to be faced with larger economic impacts. Washington's rules represent an important starting point for understanding the ability to reduce impacts through public cost-sharing programmes like the FRE.

It is important to note that the economic losses illustrated in these case studies represent only the losses that are directly attributed to harvest restrictions in riparian buffers. Other aspects of the Forests and Fish rules, such as increased harvesting costs, increased road building and maintenance costs, and unstable slopes, are not covered in these case studies. There is also the issue of areas that are fragmented by the buffers and made economically unviable to harvest. In light of this, the economic impacts described in this chapter should be looked at as only a part of the overall impact of the Forests and Fish rules on small, NIPF landowners.

In the future, we hope to add more case studies that include other regions of the state as well as other factors that might impact the results. Additional case studies should help give a better idea of the range and disparity of economic impacts that small, NIPF landowners are experiencing throughout the state and how to mitigate those impacts. We will also examine the option for landowners to develop alternative plans that might provide equivalent habitat protection at a lower cost.

Conclusions

The three case studies presented in this chapter indicate that there is a significant potential for economic losses for small, NIPF landowners under the Forests and Fish rules. The case studies also indicate that there is a substantial disparity of losses between individual landowners. The magnitude and disparity of these losses may be reduced by managing in the riparian zone to the full extent allowed under the rules, though most NIPF landowners so far have chosen not to. Bare land values appear to be particularly sensitive to the rules. With acceptable rates of return, negative land values may support increased rates of land-use conversion by NIPF landowners. Finally, the economic losses described in this chapter represent only a proportion of the total economic losses from the new rules. More case studies, which include other parts of the state and other potential contributing factors, need to be done in order to gain a more complete understanding of impacts and landowner best practices.

Endnote

[1] The adequacy and permanence of state funding for this programme is uncertain.

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