

About This File:

This file was created by scanning the printed publication. Misscans identified by the software have been corrected; however, some mistakes may remain.



United States  
Department of  
Agriculture

Forest Service

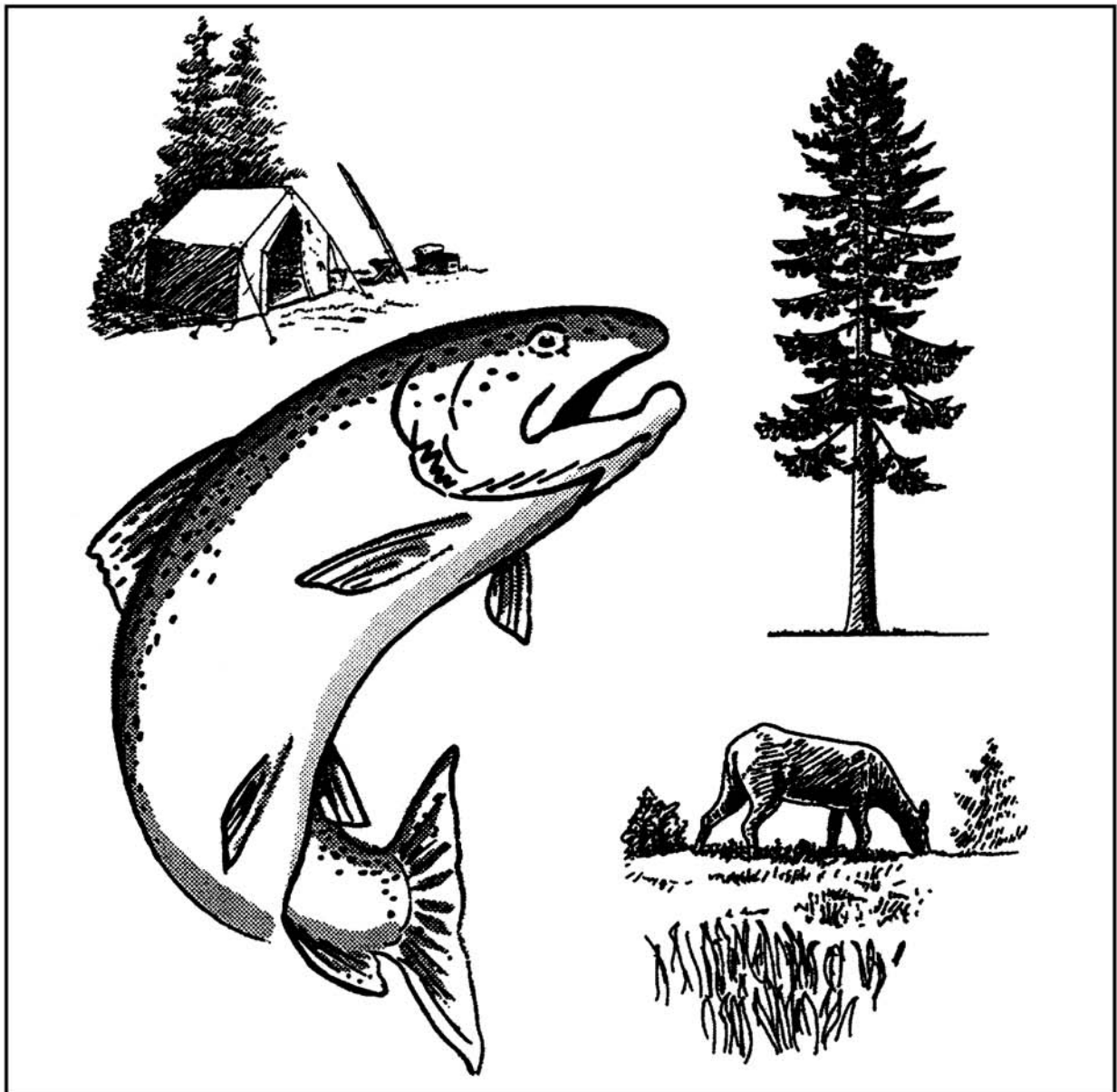
Pacific Northwest  
Research Station

General Technical  
Report  
PNW-GTR-344  
August 1995



# Estimated Economic Impacts on the Timber, Range, and Recreation Programs on NFS and BLM Public Lands From Adopting the Proposed Interim PACFISH Strategy

Natalie A. Bolon, Christopher S. Hansen-Murray, and  
Richard W. Haynes



**Author**

NATALIE A. BOLON was and RICHARD W. HAYNES is a research forester, Pacific Northwest Research Station, P.O. Box 3890, Portland, Oregon 97208-3890; and CHRISTOPHER S. HANSEN-MURRAY is an economist for the Mount Baker-Snoqualmie National Forest and Pacific Northwest Region, Fish, Wildlife and Botany Staff, 21905 64th Ave. W., Mountlake Terrace, WA 98043.

## Abstract

**Bolon, Natalie A.; Hansen-Murray, Christopher S.; Haynes, Richard W. 1995.**

Estimated economic impacts on the timber, range, and recreation programs on NFS and BLM public lands from adopting the proposed interim PACFISH strategy. Gen. Tech. Rep. PNW-GTR-344. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 80 p.

Implications of the interim comprehensive strategy for improved Pacific salmon and steelhead habitat management (PACFISH) were estimated for those Bureau of Land Management (BLM) districts and National Forest System (NFS) lands west of the Rocky Mountains that have anadromous fish. The physical impacts and associated mitigation costs from implementing the PACFISH strategy over the the next decade in Pacific Northwest, Intermountain, Northern, Pacific Southwest, and Alaska Region National Forest and BLM district recreation, range, and timber programs were analyzed with the actual current output as the base. Economic considerations were added to evaluate any change in the perceived ranking of severity among the impacts. Two cases were considered in the analysis: a derived worst case, where a total reduction of the actual current output of the programs in anadromous fish-bearing drainages occurs (giving a minimum value for the programs in those drainages), and a mitigated case where all or part of the loss is mitigated and the cost of doing so is evaluated with two phases, one without economics and the other with it. For the mitigated case without economics, the undiscounted mitigation costs per year for 10 years and the annual physical impacts of implementing the interim direction over the current actual output for the three resource programs (recreation, range, and timber) were estimated. This mitigated case, without economic consideration, showed that on both BLM and NFS land the greatest physical losses occur in the timber programs, whereas the greatest cost overall occurs in the recreation program. Individually, the range program on the BLM lands showed the greater cost. Under an economic analysis, however, the present value of the lost output over time was included as a cost, along with the present value of the mitigation costs. The total of both these costs from the mitigated case would have to be less than the total value of the current program, calculated in the worst case, to maintain an order of efficiency. For both BLM and NFS lands, the recreation and timber programs across drainages containing anadromous fish showed greater value than both types of economics costs. The range program was fairly close in value and cost on NFS lands, but the costs associated with implementing the PACFISH strategy on BLM lands were definitely greater than the value of their range program, which calls into question the efficiency of the latter and possibly the former. The ranking of severity among the programs for the estimated physical impacts and those impacts when economics considerations are added change as well. When lost resources are valued, the BLM lands show the greatest loss in their recreation program rather than in timber. The current recreation programs on both BLM and NFS lands seem significantly more valuable than the other two programs, and the magnitude of difference between the value of the current program and the costs of applying the PACFISH strategy is also significantly greater for recreation.

Keywords: Bureau of Land Management, National Forests, anadromous fish, economic impacts, habitat management, PACFISH, policy analysis, salmon.

## **Contents**

1	<b>Introduction</b>
2	Area of Analysis
4	<b>Methods</b>
5	Data Collection Process
5	Assumptions
13	<b>Results</b>
13	Mitigated Case Without Economics
23	Discussion of Mitigated Case Without Economics
27	Mitigated Case With Economics
30	Worst Case
36	<b>Discussion</b>
36	<b>Conclusions</b>
37	<b>Acknowledgments</b>
37	<b>Literature Cited</b>
38	<b>Appendix 1</b>
38	Information Sent to Field Units

## Introduction

In early 1992, the U.S. Department of Agriculture (USDA), Forest Service, began a process to develop a comprehensive strategy for improved Pacific salmon (*Oncorhynchus* spp.) and steelhead (*O. mykiss*) habitat management on National Forest System (NFS) lands. This process and strategy, now known as PACFISH, was initiated in response to growing concern about the status of anadromous fish stocks in the West. This concern was highlighted by the listing of three anadromous fish stocks in the Snake River basin in 1991 under the Endangered Species Act (ESA; 1973), and by a 1991 report showing over half of the Pacific anadromous fish stocks (outside Alaska) as being at high or moderate risk of extinction or of “special concern” (Nehlsen and others 1991).

In March 1993, the U.S. Department of the Interior, Bureau of Land Management (BLM), joined the PACFISH strategy effort. The scope of the proposed strategy was expanded to include anadromous watersheds on public lands managed by BLM.

The proposed PACFISH strategy, as developed between early 1992 and mid-1993, calls for delineation of riparian habitat conservation areas (RHCAs) along all streams (perennial and intermittent) in watersheds bearing anadromous fish. It specifies riparian management objectives (RMOs) to assure maintenance or restoration of good quality fish habitat in the RHCAs. Extensive standards and guidelines for the management of the RHCAs to meet RMOs are included in the strategy. Watershed analysis and the identification of key watersheds and watershed restoration opportunities are addressed as well, but not as part of this report.

The purpose of this report is twofold. First, the report presents preliminary estimates of cost and resource impacts on timber, range, and recreation programs from implementing the PACFISH strategy.<sup>1</sup> Second, this report shows how the application of economic values to the foregone resource outputs can be used with mitigation costs to assess the value society places on easing output reductions versus accepting the reductions in full.

---

<sup>1</sup> The original resource and cost impact analysis was prepared in response to requests from the Washington offices of both the Forest Service and BLM. In that request, the PACFISH field team was directed to prepare preliminary estimates of implementation costs and resource impacts that may occur if the proposed PACFISH strategy is implemented in anadromous fish watersheds on National Forests and public lands administered by the BLM throughout the Western United States. The actual data collection and analysis for these preliminary estimates was to be carried out by the PACFISH resource opportunity costs group: Chris Hansen-Murray, PACFISH lead economist; Natalie Bolon, research forester, PNW-Portland; and Richard Haynes, Social and Economic Values Program Manager, PNW-Portland. The methods the group used follow those in Haynes and others (1992) to estimate the economic impact of critical habitat designation for salmon in the Columbia and Snake River basins.

## Area of Analysis

The scope of this analysis includes all National Forests and BLM districts west of the Rocky Mountains having watersheds with anadromous fish but that are not in the range of the northern spotted owl (*Strix occidentalis caurina*) (see fig. 1).<sup>2</sup> The Okanogan National Forest is split between the portion within the northern spotted owl range, thus subject to the recommendations of the Forest Ecosystem Management Assessment Team (FEMAT; 1993), and the portion outside the owl range that has watersheds supporting anadromous fish and subject to the proposed PACFISH strategy. Alaska was an exception and is discussed below.

The following field units were included in this analysis:

Agency and unit	Forest Service Region	State
<b>National Forests:</b>		
Bitterroot*	Northern (1)	Montana
Clearwater*	Northern (1)	Idaho
Nez Perce*	Northern (1)	Idaho
Boise*	Intermountain (4)	Idaho
Challis*	Intermountain (4)	Idaho
Payette*	Intermountain (4)	Idaho
Salmon*	Intermountain (4)	Idaho
Sawtooth*	Intermountain (4)	Idaho
Lassen	Pacific Southwest (5)	California
Los Padres	Pacific Southwest (5)	California
Malheur	Pacific Northwest (6)	Oregon
Ochoco	Pacific Northwest (6)	Oregon
Okanogan (part)	Pacific Northwest (6)	Washington
Umatilla*	Pacific Northwest (6)	Washington and Oregon
Wallowa-Whitman*	Pacific Northwest (6)	Washington and Oregon
Tongass	Alaska (10)	Alaska
<b>BLM districts:</b>		
Ukiah (part)		California
Coeur d'Alene*		Idaho
Salmon*		Idaho
Prineville		Oregon
Vale*		Oregon
Spokane*		Washington

\* = subject to section 7 consultation requirements with the National Marine Fisheries Service (NMFS) because of fish stock listings under ESA.

<sup>2</sup> Federal lands within the range of the northern spotted owl have already been addressed in the report of the Forest Ecosystem Management Assessment Team (1993). Standards and guidelines and riparian management objectives for those Forests and districts within the range of the northern spotted owl have already been recommended by FEMAT and the accompanying Draft Supplemental Environmental Impact Statement (1993). Thus, those units are not included in this analysis.

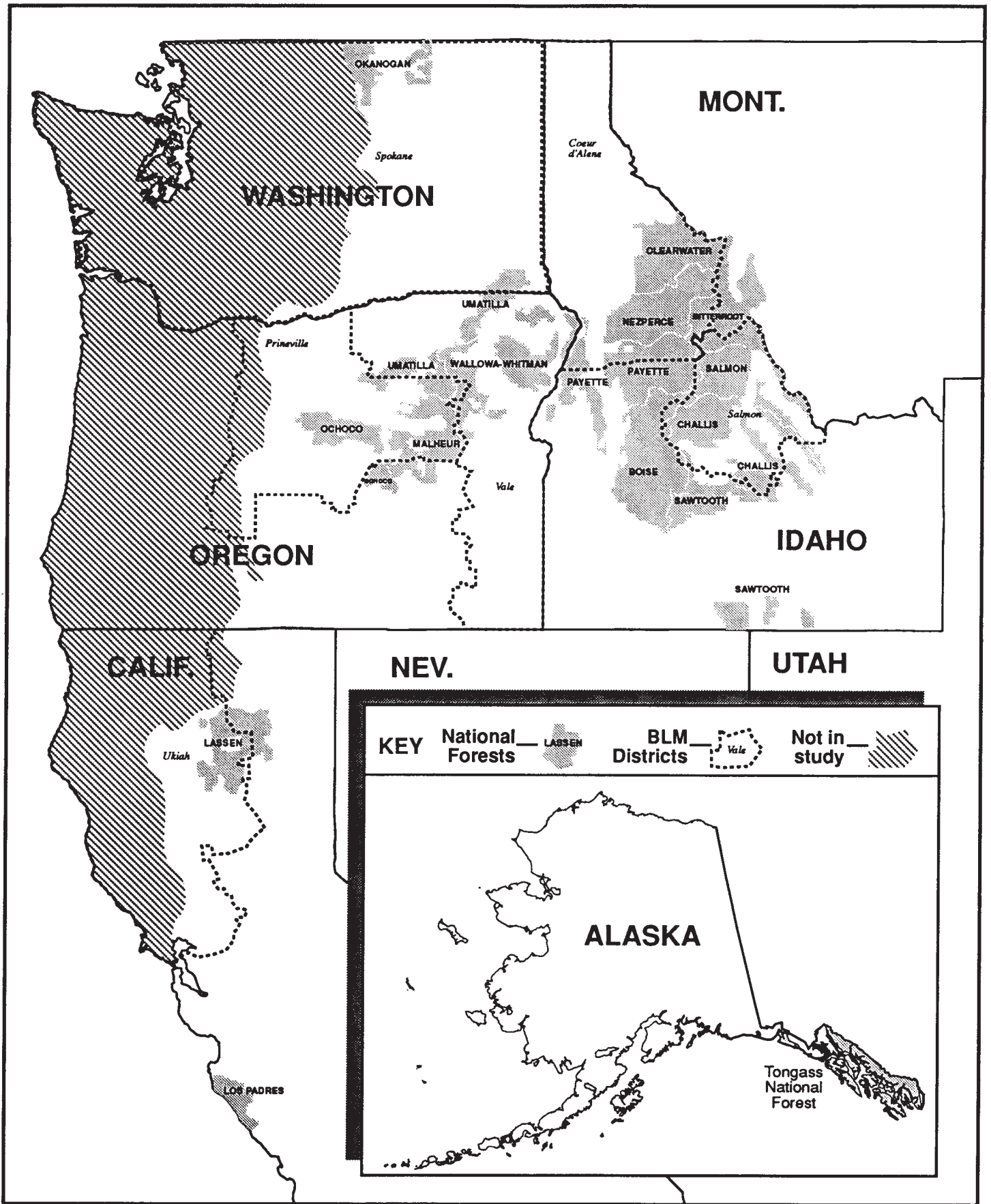


Figure 1—Bureau of Land Management districts and USDA National Forests in the area of analysis.

**Alaska**—The Tongass National Forest is the only unit in Alaska included in this round of preliminary estimates.<sup>3</sup> Several outstanding issues in Alaska need resolution before an impact estimation process can be undertaken for all NFS and BLM lands in Alaska. The anadromous fish stock status report for Alaska was not complete at the time this study was done. Criteria for defining key watersheds were not finalized, partly because of the lack of a definitive stock status report. Therefore, no key watersheds have been identified. Also, the RMOs and standards and guidelines are being reviewed for appropriateness for Alaska watershed conditions, particularly for interior lands and the north.

The Chugach National Forest and the Anchorage, Arctic, Glennallan, Kobuk, and Steese-White BLM districts have anadromous fish watersheds, but until the issues mentioned above are resolved, resource impact estimates will not be made for them. The Tongass National Forest in southeast Alaska has had much more intensive study than the other areas and is in the late stages of revising its original Forest plan; it is included in this analysis.

## Methods

The key concept to this study is incremental change. The goal is to assess as best possible the changes in resource outputs attributable just to the adoption of the PACFISH strategy. Decisions already made and actions already taken that provide some degree of protection or enhancement of anadromous fish stocks and habitat are not directly relevant to the decision of whether to adopt the PACFISH strategy. Some of these actions or decisions are those already in Forest or district resource management plans, and in the Pacific Northwest Regional Forester's implementation of a screening process for timber sales that came out after the PACFISH effort began. Such prior decisions and actions are in place and will continue to have their effect, whether or not the PACFISH strategy is adopted. Our purpose is to identify for decisionmakers what additional economic effects can be expected with adoption of the PACFISH strategy versus what can be expected without its adoption. The methods follow those used in Haynes and others (1992) on the economic impacts of critical habitat designation for salmon in the Columbia and Snake River basins.

The study has two cases: a mitigated case, with two phases, one without economics and the other with it, where all or part of the output reduction is mitigated and the cost of doing so evaluated; and a derived worst case, where the total actual current output for recreation, range, and timber programs in anadromous fish-bearing drainages is valued (giving a gross value for the actual program) then foregone.

The mitigated cases show the effects on output levels of the recreation, range, and timber programs and the associated budget costs to the Federal Government over the next decade for implementing the PACFISH strategy. In the mitigated case without economics, the mitigation costs are undiscounted and the foregone value from any output reduction is not included. In the mitigated case with economics, the present value of the budget costs for mitigating the implementation of the PACFISH

---

<sup>3</sup> The timber output from the Tongass National Forest reflects an agreement made during a technical meeting of PACFISH field team members and Alaska Region managers in Juneau on September 8-9, 1993. The decision was made not to delineate "forested palustrine wetlands" as RHCAs on the Tongass, except those included for high hazard soil considerations. The figures in this report are from September 21, 1993.



strategy are added to the present value of the outputs foregone. The present value of both costs from the mitigated case with economics, would have to be less than the total gross value of the current program (calculated in the worst case) minus the cost to close the program down, to maintain an order of efficiency. The application of economic values to the foregone resource outputs and the present value of the mitigation costs allows assessment of the value society places on easing the output reductions versus accepting the reductions in full.

### **Data Collection Process**

A process with three distinct phases was established to derive the desired data estimates. Each National Forest and BLM district included in the PACFISH strategy area followed at least the basic outline of this process.

1. Identify and delineate watersheds bearing anadromous fish in the unit, both key and nonkey (see discussion of key watersheds in the next section, "Assumptions").
2. Delineate interim boundaries for RHCAs by using the "width in feet" criteria provided, according to stream classification. (For this exercise, delineation was done either by a mapping system or by estimating through analytical models.)
3. Using the proposed standards and guidelines and RMOs, estimate the changes expected to occur in management activity and output levels within the RHCAs for timber, range, and recreation. Estimate the changes from base levels in Forest plans or district resource management plans and from current actual output levels. (Although effects on the road system from applying the standards and guidelines were not specifically reported for this effort, those effects were considered in evaluating changes in the resource outputs.)

This process allowed identification of expected changes in output levels, if the PACFISH strategy were to be adopted, in comparison to field units' current operations. The process also made it possible to display if and how the Forests and districts have had to change their management practices and intensities in response to legal or other constraints since their particular unit-level plans were adopted. For instance, the field units in the Snake River basin currently are operating under much more stringent management requirements than called for by their Forest or district plans because of the listing under the ESA (1973) of the sockeye (*O. nerka* (Walbaum)) and other salmon runs in the basin. They have already experienced concomitant reductions in many activity and output levels, which are identified in this analysis as changes between planned and actual current levels.

The Forests and districts listed above provided data under the format found in the data collection forms in appendix 1. Estimates were requested for the first 10 years and are reported here for 1994 to 2003. The data were summarized for timber, range, and recreation and are shown in the section, "Results."

### **Assumptions**

**Range of anadromous fish**—The location and extent of watersheds with anadromous fish were determined by a group of scientists from the USDA Forest Service, Pacific Northwest Research Station (PNW), in conjunction with input from the field units and Regional and State resource specialists. Range maps for anadromous fish were provided by PNW, unless an entire Forest or district was included in the range. In those cases, such as the Nez Perce National Forest, the unit staff was simply told that their entire unit supported anadromous fish.

The range of anadromous fish includes portions of a watershed that currently have anadromous fish present at some time during the year; those portions that may support the presence of anadromous fish in the future; and those portions that do not have anadromous fish actually present but are the source of quality water that flows into downstream segments where those fish are present. Watersheds, or portions thereof, that once supported anadromous fish but were permanently cut off by a constructed dam (for example, the Columbia River system above Grand Coulee Dam), or that never supported anadromous fish runs because of major natural barriers, were not included in the range.

Adoption of the PACFISH strategy will have a greater or lesser effect on a unit's resource output levels depending on how much of the unit is actually within its range of anadromous fish. The proportions differ widely among units, from 1 percent of the Vale District to 100 percent of the Nez Perce and Tongass National Forests. These percentages are listed below for each unit (calculations are based on Federal land ownership for the unit and watersheds bearing anadromous fish):

<b>Area</b>	<b>Percent in range of anadromous fish</b>
<b>National Forests:</b>	
Bitterroot	26
Clearwater	45
Nez Perce	100
Boise	17
Challis	83
Payette	77
Salmon	98
Sawtooth	80
Lassen	13
Los Padres	20
Malheur	50
Ochoco	20
Okanogan (part)	3
Umatilla	78
Wallowa-Whitman	59
Tongass	100
<b>BLM districts:</b>	
Ukiah (part)	15
Coeur d'Alene	52
Salmon	83
Prineville	32
Vale	1
Spokane	36

**Key watersheds**—Key watersheds also were defined by PNW with input from field units and Regional and State resource specialists. Key watersheds have been defined and described in various ways, but in general they (1) contain relatively high-quality water and fish habitat or have the potential to provide high-quality habitat through restoration efforts; and (2) contain at-risk stocks of anadromous salmonids or other potentially threatened fish species, anadromous or resident. Although the FEMAT report (1993) specified that key watersheds be at least 6 square miles (3,840 acres) in size, designated key watersheds are in practice much larger—3d to 5th order watersheds ranging from 50,000 to 150,000 acres on average.

In Alaska, the definition and delineation of key watersheds is still in process. Because stocks generally are not in as much immediate peril in Alaska as they are in the lower 48 states, the definition there of key watersheds is likely to encompass the notion of representative habitats to be maintained to keep the stocks in good shape, rather than to focus on restoration of stocks already in trouble. Key watersheds there may run larger than those in the lower 48 because of the topographic scale of the area.

Key watersheds were delineated for all the National Forests outside Alaska and maps were provided to the Forests to use in this analysis process. Such maps were not available for BLM districts when this process was undertaken. Although key watersheds were identified for the BLM districts in the northern spotted owl range during the FEMAT work, their delineation on the districts outside that range is ongoing as this paper goes to press. Therefore, instructions to the BLM districts were to use either the key or nonkey designation for anadromous watersheds shared with an adjacent National Forest, or consider the watershed as key if not shared with a Forest. This latter assumption affected only the determination of RHCA widths around intermittent streams and may have led to a somewhat higher impact estimate in those areas as a result.

The watersheds in the areas covered by an ESA fish stock listing are considered key. Therefore, all watersheds on the Forests and districts in the Snake River basin and in the Sacramento River basin (outside the northern spotted owl range) were defined as key. This affected all the involved Forests and districts in Idaho and Montana, and the Lassen National Forest and Ukiah District in California.

**Baselines**—We had to identify a number of baselines from which this study could operate. These included baselines for current versions of proposed direction, for planning bases against which to assess estimated change, and for cost data.

For direction and general guidance to the Forests and districts, the following documents were provided to the field units (these were draft versions as of July 25, 1993). Appendix 1 contains the entire packet of information sent to field units: a cover letter, data request narrative, data entry instructions, necessary data forms for each resource, as well as the following:

- PACFISH Goals and Riparian Management Objectives
- PACFISH Strategy: Standards & Guidelines
- Riparian Habitat Conservation Areas: Description of Recommended Widths
- PACFISH Strategy: Key Watersheds

To assess incremental changes in output levels attributable to the PACFISH strategy and changes attributable to other causes, it was necessary to specify baselines to measure those changes against. For almost all Forests and districts, the starting baseline was their approved Forest or district resource management plan (also referred to as level 1). The exception was the Tongass National Forest, which used its latest draft revised Forest plan.

The second-stage baseline used by all field units was their actual current operating level, as affected by legal and other constraints acquired since plans were approved (level 2). For Snake River basin field units under section 7 consultation requirements with NMFS, the “current” level was the estimated level they will be operating at when they finish screening ongoing projects, complete watershed analysis, and adjust their management practices accordingly. At this time (summer 1993), they are in a pause as they meet these legal requirements. But that pause does not reflect the long-run levels of their future operations.

The output levels that would result from adopting the PACFISH strategy were estimated by each field unit (level 3). The incremental changes between their planning, or starting, base level and their current level and between their current level and the estimated output levels with the PACFISH strategy are calculated for each resource area and reported under “Results.”

For this preliminary estimate, field units were not asked to report impacts related to their road systems, minerals, or water management programs. Thus, no costs related to road relocations, upgrades, closures, or obliterations are reported, even though they may be substantial. Additional costs for minerals program management and permit administration, and increased costs related to water program management, water intake screening, and other fish protection activities also are not reported.

Finally, costs incurred by private operators or users as a result of implementation of the PACFISH strategy are not given in this report. For example, additional harvest costs absorbed by timber operators or additional range rider or fencing costs that might be required of grazing permittees are not included here.

**Handling ongoing projects**—It was important in estimating impacts to know how to treat ongoing projects; that is, those already awarded and under contract and those being prepared and in some stage of the National Environmental Protection Act (NEPA) process but not yet awarded or under contract. The direction to the field units was to consider that any project already under contract would be screened for long-term, adverse, irreversible effects on fish or fish habitat. If a project was deemed to be high risk, it would be modified or terminated. Otherwise, projects could continue as awarded, even if in the transition period they might not be fully in compliance with the PACFISH strategy standards and guidelines. Projects being prepared, but not yet through the NEPA process with a signed decision, would be modified (or abandoned) as necessary to bring them into full compliance with the PACFISH strategy standards and guidelines.

**Important definitions**—in the process of providing the Forests and districts with enough direction and explanation to carry out this analysis with consistency, specific definitions were developed.

Delineation of interim RHCA widths under the proposed PACFISH strategy requires categorizing streams and wetlands into four groups (see “Riparian Habitat Conservation Areas: Description of Recommended Widths” in appendix 1). The initial group is “fish-bearing streams.” The question was raised whether “fish-bearing” includes just those streams or stream segments with anadromous fish present, or if it includes streams with any coldwater salmonids present (both anadromous fish and resident trout).

The determination made was that the designation “fish-bearing streams,” for the purposes of the PACFISH strategy analysis, includes any stream within the range of anadromous fish that has either anadromous fish or resident trout (or both); in other words, all coldwater salmonids. The definition is consistent with that used for the FEMAT work. This stream category was assigned an interim width of 300 feet on each side of the stream channel for the PACFISH strategy estimation process.

The proposed direction for determining interim RHCA widths, prior to completion of on-site watershed analysis, has several criteria that may be used. The criterion chosen was that giving the greatest boundary width (see “Riparian Habitat Conservation Areas: Description of Recommended Widths” in appendix 1). For purposes of this accelerated estimation process, we asked that Forests and districts use the “feet” width criterion. However, if there were significant known problem areas (for example, highly unstable areas, large wetland areas adjacent to the stream) that would most likely be included within an actual delineation of an RHCA boundary, we suggested including those areas within the RHCA.

For ease of categorizing their streams, we recommended that field units use the following chart:

<b>PACFISH RHCA stream group</b>	<b>Stream class</b>
Fish-bearing streams	Classes I and II
Perennial nonfish-bearing streams	Class III
Seasonal and intermittent nonfish-bearing streams	Class IV

A question was raised by the Alaska Region (Region 10) concerning the appropriate RHCA widths to apply to wetlands. There seemed to be an inconsistency between the PACFISH strategy and option 9 in FEMAT (1993). FEMAT (1993) broke out constructed ponds and reservoirs as a separate category from natural ponds and lakes, giving the former a 150-foot and the latter a 300-foot riparian reserve width.

The decision for this analysis was to use the original PACFISH-strategy-recommended stream or wetland categories and widths, as sent to the field units in the data request package. The reasons were, first, that the PACFISH strategy was not meant to follow option 9 in all aspects; interim RHCA widths were approved at a June 21, 1993, PACFISH strategy meeting. Second, there were inconsistencies between the FEMAT report (1993) and the accompanying Draft Supplemental Environmental Impact Statement (Interagency SEIS Team 1993) concerning interim riparian reserve widths. In sum, for purposes of this analysis, lakes, ponds, and wetlands greater than 1 acre were given a 150-foot RHCA width. Those less than 1 acre were given a 100-foot RHCA width in key watersheds and a 50-foot RHCA width in nonkey watersheds.

#### **Resource-specific assumptions for timber—**

1. Changes in scheduled timber harvest (allowable sale quantity [ASQ] or decadal sustainable harvest level [DSHL]) are reported by unit and not by watershed. The nature of harvest-scheduling models requires that all suitable timber acres available in a unit be run through the model. Changes in available suitable acres affect the calculation for the entire unit, not just the watershed.
2. Concerns that the ASQ or DSHL is unattainable to begin with, in that no more than 60 to 70 percent was ever accomplished, were mostly accounted for by use of the three baselines. The change from plan output (level 1) to actual current output (level 2) accounts for most of the initial difficulty in meeting planned harvest levels. The change from level 2 to estimated output under the PACFISH strategy (level 3) was then used for the analysis of adoption of the PACFISH strategy.

#### **Resource-specific assumptions for range—**

1. Many BLM districts have watersheds supporting anadromous fish that also have large areas of open range in the valley bottoms, either available or currently used for grazing. Based on experience in the Snake River basin section 7 consultation process, those districts have found it difficult to make grazing adjustments only within the riparian reserve strip (as represented by the RHCA) to meet RMOs, without totally eliminating grazing in the watershed. They have found, however, that by looking at the watershed as a whole and adjusting practices within the entire watershed, they can meet RMOs and still have a range program in the watershed. The Forests and districts were given the option of following this watershed-wide approach, though RHCAs are still delineated. The decision was that they should use whichever process provides effective attainment of the RMOs, while maintaining output levels to the degree possible.
2. The issue of program underfunding for range management is not addressed in this report. Although it may be a concern, primarily regarding the update of allotment management plans, it is not relevant to an economic analysis of this type where we are interested in the net (incremental) change in value to society by the gain or loss in the forage supply. Where such costs to overcome underfunding problems were reported by field units, they were removed.

### **Resource-specific assumptions for recreation—**

1. Seasonal or permanent closure of developed or dispersed sites; relocation of sites and facilities; and a combination of education, monitoring, and law enforcement were all assumed to be possible results of applying the PACFISH strategy RMOs and standards and guidelines. Closures could be mitigated, at some cost or if alternative sites were available, by relocating sites or opening new areas to compensate for those closed. Lack of alternative sites or substitute areas results in the loss of recreation use.
2. For analytical purposes, increases in recreation use resulting from normal population-related growth or other external changes in demand were disregarded. This assumption was applied when measuring the change from actual current output levels to usage levels with adoption of the PACFISH strategy. This gave a clear estimate of the effect of the changes from the PACFISH strategy alone.
3. The issues of marginal versus nonmarginal changes and of substitution have surfaced regarding which price to use for recreation activities: zero, the market clearing price, or the market clearing price plus consumer surplus. When considering gains, the appropriate assumption is that the gain will be for the marginal user. If the use is already at a zero marginal cost as is the case for unrationed Federal lands, then theoretically, all possible users are already participating. When recreation opportunities are reduced, however, the average or high marginal willingness-to-pay user may as easily be eliminated as the low or zero marginal willingness-to-pay user. Therefore, it is appropriate to value losses at a positive value, representing an average user, rather than at a zero marginal value. Market clearing price plus consumer surplus was used owing to a lack of site-specific data that could have allowed us to differentiate between marginal and nonmarginal changes.

If there are readily available substitute recreational sites, people will go there instead. In many cases, such as in pleasure driving, dispersed picnicking, and berry picking, the supply is greater than the demand, so a loss of recreational opportunity in one area may have a zero value when the people can easily and inexpensively go nearby. Most of the recreational opportunities lost due to the PACFISH strategy are not the type having readily available substitutes, however, especially along the east side of the Cascade Range and in the Snake River basin, where water-oriented recreation is in high demand (for example, camps next to water for camping, hunting, and other related activities, swimming, boating, fishing, and so forth).

**Costs—**All costs in this study are reported in 1993 dollars. They represent the average annual cost for the next decade but, in many cases, will be greater in the first 2 years of the decade. Therefore, the economic analysis adjusts the administration and mitigation costs for years one and two by weighing them 10 percent more than the average annual costs in the remaining 8 years of the decade (see “Economic Effects”).

The costs reported here are only those incremental costs in the timber, range, and recreation programs that would be incurred by the Federal Government to apply the PACFISH strategy on the ground. These include additional program administration costs; site and facility modification, closure, or reconstruction costs; additional monitoring, enforcement, and education costs; and other mitigation<sup>4</sup> costs incurred.

Not included in this report are watershed analysis or restoration costs. These costs actually are attributable to all resource programs the field unit has, not just the three we evaluated. Allotment management plan update costs, NEPA costs, and other inventory or planning costs, unless specifically associated with those mitigation activities such as site relocation required by the implementation of the PACFISH strategy, also are not included. General administration (GA) and other overhead costs are not included, because they are considered fixed costs. Changes in fixed costs are occurring in all field units for various reasons; at this time, there is no way to separate those that might be associated with adopting the PACFISH strategy from those resulting from other major changes affecting field units.

**Prices and values**—Range and recreation prices for this analysis were taken from the 1990 Resource Planning Act (RPA) program of the USDA Forest Service (1991)<sup>5</sup> and include real price appreciation rates (net of inflation) of 0.6 and 0.3 percent per year, respectively.<sup>6</sup> These appreciation rates were included in this analysis to reflect increasing scarcity throughout the decade for 1994-2003. The values for timber were estimated from the 1993 RPA timber assessment update (Haynes and others 1995) which uses the same methodology as was used for the 1990 RPA timber assessment (Haynes 1990). Real price appreciation for timber was not needed because individual predicted prices for each future year were used, thereby including it. The typical Federal land management real discount rate of 4 percent was used.

---

<sup>4</sup> "Mitigation" refers to management practices undertaken to maintain output levels to the degree possible, while still meeting the RMOs and standards and guidelines. For instance, streamside campsites can be moved and reconstructed, rather than closed. This maintains the recreational use opportunity (camping), but at a cost. To eliminate adverse livestock impacts in the riparian area, fencing or additional range riders can be used, rather than just moving the livestock out of the watershed altogether. This maintains at least some of the animal unit months, but at a cost.

<sup>5</sup> As required by the Forest and Rangeland Renewable Resources Planning Act (1974).

<sup>6</sup> The mitigation costs were reported by the field units in 1993 dollars. The prices applied to the foregone timber and range output were converted to 1993 real dollars by averaging the monthly Producer Price Index (PPI) for finished goods, January through September 1993. The all urban consumers Consumer Price Index (CPI-U) averaged over the same time period was applied to the foregone recreation output. The PPI and CPI data came from the Economic Report of the President (U.S. Government Printing Office 1993) and by fax from the U.S. Department of Labor, Bureau of Labor Statistics, San Francisco, CA.



## Results

The results reported here are based on the interim RHCA widths and PACFISH strategy standards and guidelines that would be used by field units if the proposed PACFISH strategy were adopted. The estimates provided by the field units were made on a broad scale. In actuality every subwatershed, stretch of stream, and site will be different and thus will require a somewhat unique application of the PACFISH strategy and mitigating measures and will yield a different response. The results reported here do not reflect changes that might occur in RHCA boundaries or standards and guidelines from completion of formal watershed analysis, which will take into account some of the site-specific differences.

All figures reported for range and recreation in this section are for those watersheds with anadromous fish; they do not include output levels from other watersheds within the unit. Thus, for some units, the figures shown below for planned actual output levels will be less than those found in the original plans or in current monitoring or attainment reports. Timber figures, however, are for the entire district or Forest and not by watershed, because the nature of harvest-scheduling models requires that all suitable timber acres available in a unit be run through the model. The uncertainty around the true distribution of the suitable timber causes a bias in the results. Timber figures in the worst case have been adjusted to represent drainages bearing anadromous fish as discussed below in "Worst Case."

Since the district and Forest plan projections originally were done, several factors have developed that are responsible for the reduction from planned levels to their current actual output levels. Listing under the Endangered Species Act of fish stocks in the Snake River basin and increased concern over forest health issues are two major causes for these changes. The changes from original planned levels (level 1) to actual current output levels (level 2) are reported as the first step of the estimation process. The second step reported is the estimated change from current actual output levels (level 2) to those levels that would be experienced if the PACFISH strategy was adopted (level 3).

Field units were not asked to report impacts related to their road systems, minerals, or water management programs. Thus, no costs related to transportation system road relocations, upgrades, closures, or obliterations are reported, even though they may be substantial. The mitigation costs reported are therefore conservative and would be substantially larger if changes to road systems had been included.

### Mitigated Case Without Economics

**Timber outputs**—from the respective plans, BLM districtwide DSHL projections for the six districts totaled 17.4 million board feet in log scale per year, and Forest-wide ASQ projections for the 16 Forests 1,679.6 million board feet in log scale per year (table 1). The districts' combined actual current output is 16.1 million board feet, while the Forests produce 1,141.6 million board feet per year. Adoption of the proposed PACFISH strategy interim direction would result in additional reductions in ASQ from actual current levels, about 13 percent (down 2.1 million board feet) for the districts and about 24 percent (down 269.45 million board feet) for the Forests (tables 2 and 3). By designating RHCAs, slightly over 1.5 million acres of suitable commercial timberland would be removed from the timber base currently managed by the two agencies (table 4).

*Text continues on page 20*

**Table 1—Summary of BLM district and National Forest data on timber resources for determining the impact of applying the PACFISH strategy, average annual data, 1994-2003**

Forest or district	Total district or Forest ASQ/DSHL from plan <sup>a</sup> (level 1)	Actual current district or Forest ASQ/DSHL with constraints <sup>b</sup> (level 2)	Total district or Forest ASQ/DSHL under PACFISH strategy (with mitigation) <sup>c</sup> (level 3)	Cost to apply the PACFISH strategy (with mitigation) <sup>d</sup>
	----- Million board feet -----			1993 dollars
Idaho, continued				
BLM districts:				
Washington—				
Spokane	4.00	3.00	2.50	39,000
Oregon—				
Prineville	3.21	3.21	2.73	10,000
Vale	2.40	2.40	1.65	20,000
California—				
Ukiah	.25	.25	.25	0
Idaho—				
Salmon	1.85	1.54	1.47	19,000
Coeur d’Alene	5.70	5.70	5.40	47,360
Total BLM districts	17.41	16.10	14.00	135,360
National Forests:				
Washington—				
Okanogan	63.30	28.00	27.20	0
Oregon—				
Malheur	211.00	130.00	100.00	1,307,250
Ochoco	115.00	80.00	77.50	50,000
Umatilla	124.00	55.00	55.00	483,000
Wallowa-Whitman	141.00	49.50	47.3	0
California—				
Lassen	96.00	75.00	73.00	96,800
Los Padres	0	0	0	0
Idaho—				
Boise	85.00	83.90	83.40	292,800
Challis	3.00	0	0	25,000
Payette	86.00	86.00	82.30	228,000
Salmon	21.10	17.70	17.70	18,600
Sawtooth	1.50	1.50	.75	27,560

**Table 1—Summary of BLM district and National Forest data on timber resources for determining the impact of applying the PACFISH strategy, average annual data, 1994-2003 (continued)**

Forest or district	Total district or Forest ASQ/DSHL from plan <sup>a</sup> (level 1)	Actual current district or Forest ASQ/DSHL with constraints <sup>b</sup> (level 2)	Total district or Forest ASQ/DSHL under PACFISH strategy (with mitigation) <sup>c</sup> (level 3)	Cost to apply the PACFISH strategy (with mitigation) <sup>d</sup>
	----- Million board feet -----			1993 dollars
Idaho, continued				
Nez Perce	108.00	45.00	38.00	173,000
Clearwater	173.30	60.00	40.00	108,000
Montana—				
Bitterroot	33.40	12.00	12.00	0
Alaska—				
Tongass	418.00	418.00	218.00	<sup>d</sup>
<hr/>				
Total National Forests	1,679.60	1,141.60	872.15	2,810,010
Total BLM districts and National Forests	1,697.01	1,157.70	886.15	2,945,370

<sup>a</sup> Based on data from the 1st decade of the plan; the base used was as agreed upon with PNW Research Station. ASQ=allowable sale quantity as used by Forest Service, DSHL=Decadal sustainable harvest level as used by BLM.

<sup>b</sup> Total output expected from district or Forest given any considerations for ESA listing and section 7 consultation, special management requirements for other fish and wildlife species taken on since plan approval, consistent underfunding compared to budgets required to implement plan levels, and so forth. If year-to-year output fluctuated significantly, the average of the most recent 2 to 3 years was used.

<sup>c</sup> Output, with current actual as base, from district or Forest if the PACFISH strategy is applied and mitigation measures are used to minimize any reductions in output.

<sup>d</sup> Cost to Government in 1993 dollars, with plan funding levels as base, of applying the PACFISH strategy with mitigation measures, to lessen the reductions in output while still meeting the plan and PACFISH strategy standards and guidelines on the district or Forest (include administration, program management, and so forth). Also includes any other costs of applying the PACFISH strategy in 1993 dollars. The Tongass National Forest would experience an ultimate cost savings of \$10 million, net of any increased costs due to applying the PACFISH strategy standards and guidelines for timber. This figure was not included as it was the only cost savings reported.

**Table 2—Net decrease in timber, range, and recreation outputs from applying the PACFISH strategy, average annual data, 1994-2003**

Forest or district	Timber		Range		Recreation	
	Net decrease from total district or Forest plan output to current output (level 1-2)	Net decrease from current district or Forest output to output under PACFISH (level 2-3)	Net decrease from district or Forest plan output per anadromous fish-bearing watershed to current output (level 1-2) <sup>a</sup>	Net decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)	Net decrease from District or Forest plan output per anadromous fish-bearing watershed to Current output (level 1-2) <sup>a</sup>	Net decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)
	<i>Million board feet</i>		<i>Animal unit months</i>		<i>Recreational visitor days</i>	
<b>BLM districts:</b>						
Washington—						
Spokane	1.00	0.50	0	733	0	0
Oregon—						
Prineville	0	.48	0	0	-154,900	25,000
Vale	0	.75	0	0	0	0
California—						
Ukiah	0	0	0	0	NA	NA
Idaho—						
Salmon	.31	.07	5,174	1,015	3,900	0
Coeur d'Alene	0	.30	0	599	NA	25,823
Total BLM districts	1.31	2.10	5,174	2,387	-151,000	50,823
<b>National Forests:</b>						
Washington—						
Okanogan	35.30	.80	0	630	6,220	6,200
Oregon—						
Malheur	81.00	30.00	5,000	5,000	12,500	36,000
Ochoco	35.00	2.50	1,300	800	0	0
Umatilla	69.00	0	8,153	886	998,518	0
Wallowa-Whitman	91.50	2.20	24,933	5,426	150,000	250,000
California—						
Lassen	21.00	2.00	877	750	44,916	0
Los Padres	0	0	60	360	0	118,360
Idaho—						
Boise	1.10	.50	2,508	0	58,383	73,575
Challis	3.00	0	3,895	4,057	1,635,500	0
Payette	0	3.70	-1,200	5,200	-40,000	0
Salmon	3.40	0	7,000	0	0	0
Sawtooth	0	.75	2,510	0	111,000	0
Nez Perce	63.00	7.00	17,500	2,550	0	0
Clearwater	113.30	20.00	100	0	NA	23,200

**Table 2—Net decrease in timber, range, and recreation outputs from applying the PACFISH strategy, average annual data, 1994-2003 (continued)**

Forest or district	Timber		Range		Recreation	
	Net decrease from total district or Forest plan output to current output (level 1-2)	Net decrease from current district or Forest output to output under PACFISH (level 2-3)	Net decrease from district or Forest plan output per anadromous fish-bearing watershed to current output (level 1-2) <sup>a</sup>	Net decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)	Net decrease from District or Forest plan output per anadromous fish-bearing watershed to Current output (level 1-2) <sup>a</sup>	Net decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)
	<i>Million board feet</i>		<i>Animal unit months</i>		<i>Recreational visitor days</i>	
Montana— Bitterroot	21.40	0	0	0	NA	0
Alaska— Tongass	0	200.00	0	0	0	0
Total National Forests	538.00	269.45	72,636	25,659	2,976,037	507,335
Total, BLM Districts and National Forests	539.31	271.55	77,810	28,046	2,825,037	558,158
Total for decade	5,393.10	2,715.50	778,100	280,460	28,250,370	5,581,580

NA = not available.

<sup>a</sup> Negative numbers reflect that actual output was greater than the plan projected due to increased demand for range or recreational opportunities. Subtotals may not match the difference between levels 1 and 2 as reported in the table 7 summary for recreation because some field units were not able to supply plan level recreational outputs.

**Table 3—Net percent decrease in timber, range, and recreation outputs<sup>a</sup> from applying the PACFISH strategy**

	Timber		Range		Recreation	
	Net percent decrease from total district or Forest plan output to current output (level 1-2)	Net percent decrease from current district or Forest output to output under PACFISH (level 2-3)	Net percent decrease from district or Forest plan output per anadromous fish-bearing watershed to current output (level 1-2)	Net percent decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)	Net percent decrease from district or Forest plan output per anadromous fish-bearing watershed to current output (level 1-2)	Net percent decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)
Forest or district						
BLM districts <sup>b</sup>	7.52	13.04	5.19	2.52	-57.84	2.12
National Forests <sup>c</sup>	32.03	23.60	16.87	7.17	18.01	4.10
Both BLM districts and National Forests <sup>d</sup>	31.78	23.46	14.67	6.20	11.05	3.78

<sup>a</sup> Uses output reported as "Total BLM districts" on tables 1, 6, and 7.

<sup>b</sup> Uses output reported as "Total National Forests" on tables 1, 6, and 7.

<sup>c</sup> Uses output reported as "Total, BLM districts and National Forests" on tables 1, 6, and 7.

<sup>d</sup> Uses output reported as, Total, BLM districts and National Forests" in table 1, 6, and 7.

**Table 4—Suitable or commercial timberland acres within riparian habitat conservation areas removed from the suitable base due to the PACFISH strategy standards and guidelines**

Forest or district	Suitable or commercial timberland acres
	<i>Acres</i>
BLM districts:	
Washington—	
Spokane	5,000
Oregon—	
Prineville	1,345
Vale	1,100
California—	
Ukiah	500
Idaho—	
Salmon	2,200
Coeur d'Alene	1,940
Total BLM districts	12,085
National Forests:	
Washington—	
Okanogan	11,300
Oregon—	
Malheur	30,200
Ochoco	8,500
Umatilla	101,800
Wallowa-Whitman	78,100
California—	
Lassen	12,081
Los Padres	0
Idaho—	
Boise	4,866
Challis	28,731
Payette	30,000
Salmon	6,663
Sawtooth	1,928
Nez Perce	292,000
Clearwater	158,317
Montana—	
Bitterroot	0
Alaska—	
Tongass	767,000
Total National Forests	1,531,486
Total, BLM districts and National Forests	1,543,571

Many field units had difficulty estimating the effect of the PACFISH strategy on actual planned timber sales (as opposed to planned decadal harvest levels) due to uncertainty over the screening process and the ability to modify projects. The following results, therefore, are not all inclusive or definitive. Five planned sales amounting to 0.5 million board feet are reported for BLM that would be cancelled because they cannot be mitigated to meet the PACFISH strategy and guidelines, primarily in the Spokane District (table 5). Forty-five such sales, amounting to a little over 47 million board feet, are reported for the Forests—primarily in the Clearwater, Sawtooth, and Boise National Forests. Fifteen sales in the Nez Perce and Lassen National Forests could be moved outside the RHCAs without a change in size. A total of 72 sales would need to be moved outside the RHCA and modified in size; 69 of these are in the Malheur, Ochoco, Sawtooth, and Boise National Forests and 3 were from the Coeur d’Alene District of the BLM.

**Timber costs**—The cost to apply the PACFISH strategy standards and guidelines for timber to BLM district lands was estimated to be about \$135,000 per year for 10 years (table 1). The cost estimate for the Forests was about \$2.8 million per year, not including the Tongass National Forest.<sup>7</sup>The costs consisted primarily of increased sales planning and administration costs for preparing sales outside the RHCAs so sales would meet upslope management objectives and not impact the RHCAs negatively.

**Range outputs**—The projections in the plan of annual livestock use in drainages supporting anadromous fish for the 6 districts and 16 Forests were 99,768 animal unit months and 430,536 animal unit months, respectively (table 6). Combined actual current output for the districts is 94,594 animal unit months per year; the Forests produce 357,900 animal unit months annually. Adoption of the proposed PACFISH strategy interim direction would result in additional reductions in livestock use, from actual current levels, of about 2.5 percent (down 2,387 animal unit months) for the districts, and about 7.2 percent (down 25,659 animal unit months) for the Forests (tables 2 and 3).

**Range costs**—The cost to apply the PACFISH strategy standards and guidelines for range on BLM district lands was estimated to be about \$932,000 per year for 10 years (table 6). The cost estimate for the Forests was about \$1.7 million per year. The costs consist of increased administration costs, cultural surveys, biological evaluations, associated NEPA, monitoring, relocating or constructing water developments, and the labor and equipment needed for fencing of critical or entire riparian areas to meet riparian management objectives. Costs to update allotment management plan were not included, as plan updates are not required by the PACFISH strategy. Grazing practices can be adjusted without prior updating of the plans.

---

<sup>7</sup> The Tongass National Forest forecast cost savings in the timber program of about \$10 million per year that would be realized after a period of time if their ASQ came down by about 48 percent, as was estimated. These cost savings would occur even after accounting for increased timber management and harvest costs experienced by application of RHCAs and PACFISH standards and guidelines in those areas still in the suitable base. The yearly \$10 million would not all be realized immediately, as downsizing the organization would take some time. The Tongass estimated cost savings are reported in this footnote rather than in the table. If they were reported in table 1, a net cost savings across all reported timber programs of over \$5 million annually would have been indicated by the totals, when in reality this would come from just one Forest.



**Table 5—The effect of the PACFISH strategy on planned timber sales in the riparian habitat conservation areas in the next decade**

Forest or district	Timber sales <sup>a</sup>					
	Cancelled		Moved to outside the RHCA		Moved to outside the RHCA and modified	
	<i>Number</i>	<i>Volume million board feet</i>	<i>Number</i>	<i>Volume million board feet</i>	<i>Number</i>	<i>Volume million board feet</i>
<b>BLM districts:</b>						
Washington—						
Spokane	5	0.5	0	0	0	0
Oregon—						
Prineville	0	0	0	0	0	0
Vale	0	0	0	0	0	0
California—						
Ukiah	0	0	0	0	0	0
Idaho—						
Salmon	0	0	0	0	0	0
Coeur d'Alene	0	0	0	0	3	1.2
<b>Total BLM districts</b>	<b>5</b>	<b>0.5</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.2</b>
<b>National Forests:</b>						
Washington—						
Okanogan	0	0	0	0	0	0
Oregon—						
Malheur	0	0	0	0	25	43
Ochoco	0	0	0	0	30	0.4
Umatilla	0	0	0	0	0	0
Wallowa-Whitman	0	0	0	0	0	0
California—						
Lassen	0	0	3	6	0	0
Los Padres	0	0	0	0	0	0
Idaho—						
Boise	3	23	0	0	4	14
Challis	0	0	0	0	0	0
Payette	0	0	0	0	0	0
Salmon	0	0	0	0	0	0
Sawtooth	20	.4	0	0	10	.2
Nez Perce	0	0	12	NA	0	0
Clearwater	22	24	0	0	0	0
Montana—						
Bitterroot	0	0	0	0	0	0
Alaska—						
Tongass	NA	NA	NA	NA	NA	NA
<b>Total National Forests</b>	<b>45</b>	<b>47.4</b>	<b>15</b>	<b>6</b>	<b>69</b>	<b>57.6</b>
<b>Total, BLM districts and National Forests</b>	<b>50</b>	<b>47.9</b>	<b>15</b>	<b>6</b>	<b>72</b>	<b>58.8</b>

NA = not available.

<sup>a</sup> Many field units had difficulty estimating the effect of the PACFISH strategy on planned timber sales due to uncertainty over the screening process and the ability to modify projects. The following results, therefore, are not all inclusive or decisive.

**Table 6—Summary of BLM district and National Forest data for range resources in anadromous fish-bearing drainages for use in determining the impact of applying the PACFISH strategy, average annual data, 1994-2003**

Forest or district	District or Forest plan output per anadromous fish-bearing watershed <sup>a</sup> (level 1)	Actual current output with constraints <sup>b</sup> (level 2)	Output under the PACFISH Strategy (with mitigation) <sup>c</sup> (level 3)	Cost to apply the PACFISH strategy (with mitigation) <sup>d</sup>
	----- Animal unit months -----			1993 dollars
<b>BLM districts:</b>				
Washington—				
Spokane	10,917	10,917	10,144	135,000
Oregon—				
Prineville	29,899	29,899	29,899	360,000
Vale	6,900	6,900	6,900	117,000
California—				
Ukiah	1,150	1,150	1,150	0
Idaho—				
Salmon	38,966	33,792	32,777	169,725
Coeur d'Alene	11,936	11,936	11,337	150,000
<hr/>				
Total BLM districts	99,768	94,594	92,207	931,725
<b>National Forests:</b>				
Washington—				
Okanogan	8,084	8,084	7,454	35,500
Oregon—				
Malheur	52,000	47,000	42,000	223,000
Ochoco	8,700	7,400	6,600	40,000
Umatilla	37,703	29,550	28,664	611,900
Wallowa-Whitman	133,530	108,597	103,171	152,900
California—				
Lassen	3,927	3,050	2,300	60,000
Los Padres	4,190	4,130	3,770	20,000
Idaho—				
Boise	12,685	10,177	10,177	50,000
Challis	29,559	25,664	21,607	214,000
Payette	16,100	17,300	12,100	66,700
Salmon	55,000	48,000	48,000	31,000
Sawtooth	18,710	16,200	16,200	90,000
Nez Perce	43,000	25,500	22,950	40,000
Clearwater	7,225	7,125	7,125	61,312
Montana—				
Bitterroot	123	123	123	0
Alaska—				
Tongass	0	0	0	0
<hr/>				
Total National Forests	430,536	357,900	332,241	1,696,312
Total, BLM districts and National Forests	530,304	452,494	424,448	2,628,037

<sup>a</sup> Based on data from the 1st decade of the plan; the base used was as agreed upon with PNW Research Station.

<sup>b</sup> Total output expected from district or Forest given any considerations for ESA listing and section 7 consultation, special management requirements for other fish and wildlife species taken on since plan approval, consistent underfunding compared to budgets required to implement plan levels, and so forth. If year-to-year output fluctuated significantly, the average of the most recent 2 to 3 years was used.

<sup>c</sup> Output, with current actual as base, from district or Forest if the PACFISH strategy is applied and mitigation measures were used to minimize any reductions in output.

<sup>d</sup> Cost to Government in 1993 dollars, with plan funding levels as base, of applying the PACFISH strategy with mitigation measures, to lessen the reductions in output while still meeting the plan and PACFISH strategy standards and guidelines on the district or Forest (include administration, program management, and so forth).

## Discussion of Mitigated Case Without Economics

**Recreation outputs**—Recreational visitor day<sup>8</sup> projections in drainages bearing anadromous fish for those districts and Forests that had recreation projections in their plans were 1,521,845 per year and 15,075,468 per year, respectively (table 7).<sup>9</sup> Combined actual current output for the districts is about 2,402,100 recreation visitor days annually; the Forests have about 12,360,800 recreation visitor days per year. Adoption of the proposed PACFISH strategy interim direction would result in a reduction in annual recreation visitor days, from current actual levels, of about 2.1 percent (down about 50,800) for the districts, and about 4.1 percent (down about 507,300) for the Forests (tables 2 and 3). The types of recreational activities affected include camping, hiking, viewing by auto, fishing, and boating (see table 8). Hunting use would be indirectly affected through expected closure of streamside campsites.

**Recreation costs**—The cost to apply the PACFISH strategy standards and guidelines for recreation within BLM districts was estimated to be about \$816,000 per year for 10 years (table 7). The cost estimate for the Forests was somewhat over \$4.8 million per year. The costs were primarily for redesigning, relocating, hardening, and closing or seasonally closing developed and dispersed campsites and trails to control erosion and visitor use. Additional costs included maintenance, education, and enforcement.

**Output reductions and costs**—Among the three resource programs on BLM and NFS lands combined, timber would have the greatest percentage of loss (about 23.5 percent) from implementation of the PACFISH strategy, but it would incur the lowest implementation cost (\$2.9 million annually). The greatest implementation cost would be incurred for recreation (\$5.7 million annually), which would have a concomitant 3.8 percent decline in total recreational visitor days—the lowest percentage of decrease among the three resource areas. This likely is because recreation use is more dispersed across a Forest or district; thus, not as concentrated an effect occurs from implementation of the PACFISH strategy standards and guidelines. Range implementation costs would be just over \$2.6 million, with a 6.7-percent decrease in animal unit months.

The Forests and districts already involved in the section 7 consultation process in the Snake River basin generally would be affected less than those outside the area. Those units already have made a number of adjustments in their programs.

The Tongass National Forest reported by far the largest decrease in the timber program: almost 74 percent of the estimated total reduction in scheduled timber harvest would come from the Tongass. The total percentage of loss for all units drops from 23.5 percent to 9.7 percent when the Tongass National Forest is removed from the calculation.

---

<sup>8</sup> A recreational visitor day is a standardized 12-hour visitor day; for example, three 4-hour days of fishing equals one 12-hour recreational visitor day.

<sup>9</sup> One BLM district and two Forests did not have recreation use projections in their original plans.

**Table 7—Summary of BLM district and National Forest data for recreation resources in anadromous fish-bearing drainages for use in determining the impact of applying the PACFISH strategy, average annual data, 1994-2003**

Forest or district	District or Forest plan output per anadromous fish-bearing watershed <sup>a</sup> (level 1)	Actual current output with constraints <sup>b</sup> (level 2)	Output under the PACFISH Strategy (with mitigation) <sup>c</sup> (level 3)	Cost to apply the PACFISH strategy (with mitigation) <sup>d</sup>
----- <i>Recreational visitor days</i> -----				<i>1993 dollars</i>
BLM district:				
Washington—				
Spokane	892,000	892,000	892,000	174,000
Oregon—				
Prineville	396,100	551,000	526,000	155,000
Vale	24,000	24,000	24,000	
California—				
Ukiah	NA	NA	NA	
Idaho—				
Salmon	209,745	205,845	205,845	60,000
Coeur d'Alene	NA	729,248	703,425	320,000
<b>Total BLM districts</b>	<b>1,521,845</b>	<b>2,402,093</b>	<b>2,351,270</b>	<b>814,000</b>
National Forests:				
Washington—				
Okanogan	62,220	56,000	49,800	99,000
Oregon—				
Malheur	248,500	236,000	200,000	1,075,000
Ochoco	427,000	427,000	427,000	61,000
Umatilla	2,032,681	1,034,163	1,034,163	1,235,650
Wallowa-Whitman	925,000	775,000	525,000	561,000
California—				
Lassen	88,416	43,500	43,500	10,700
Los Padres	1,758,400	1,758,400	1,640,040	750,000
Idaho—				
Boise	472,244	413,861	340,286	150,088
Challis	2,084,300	448,800	448,800	50,000
Payette	320,000	360,000	360,000	50,000
Salmon	670,000	670,000	670,000	63,000
Sawtooth	1,050,000	940,000	940,000	100,000
Nez Perce	264,707	264,707	264,707	421,500
Clearwater	NA	230,000	206,800	39,500
Montana—				
Bitterroot	NA	31,350	31,350	2,295
Alaska—				
Tongass	4,672,000	4,672,000	4,672,000	180,000
<b>Total National Forests</b>	<b>15,075,468</b>	<b>12,360,781</b>	<b>11,853,446</b>	<b>4,848,733</b>
<b>Total, BLM districts and National Forests</b>	<b>16,597,313</b>	<b>14,762,874</b>	<b>14,204,716</b>	<b>5,662,733</b>

NA = not available.

<sup>a</sup> Based on data from the 1st decade of the plan; the base used was as agreed upon with PNW Research Station.

<sup>b</sup> Total output expected from district or Forest given any considerations for ESA listing and section 7 consultation, special management requirements for other fish and wildlife species taken on since plan approval, consistent underfunding compared to budgets required to implement plan levels, and so forth. If year-to-year output fluctuated significantly, the average of the most recent 2 to 3 years was used.

<sup>c</sup> Output, with current actual as base, from district or Forest if the PACFISH strategy is applied and mitigation measures were used to minimize any reductions in output.

<sup>d</sup> Cost to Government in 1993 dollars, with plan funding levels as base, of applying the PACFISH strategy with mitigation measures, to lessen the reductions in output while still meeting the plan and PACFISH strategy standards and guidelines on the district or Forest (include administration, program management, and so forth).

**Table 8—Estimated loss of recreation output in anadromous fish-bearing drainages every year for 10 years, by activity type due to the PACFISH strategy standards and guidelines, average annual 1994-2003**

Forest or district	Camp	Picnic	View- auto	Hunt	Trail/ hike	Winter sports	Swim	Fish	Resort	Boat- motor	Boat- nonmotor
<i>Number of recreational visitor days lost per year</i>											
BLM districts:											
Washington—											
Spokane	0	0	0	0	0	0	0	0	0	0	0
Oregon—											
Prineville	12,500	0	0	0	0	0	0	6,250	0	0	6,250
Vale	0	0	0	0	0	0	0	0	0	0	0
California—											
Ukiah	0	0	0	0	0	0	0	0	0	0	0
Idaho—											
Salmon	0	0	0	0	0	0	0	0	0	0	0
Coeur d'Alene	16,600	0	7,117	116	0	83	0	0	0	0	0
<hr/>											
Total BLM districts	29,100	0	7,117	116	0	83	0	6,250	0	0	6,250
National Forests:											
Washington—											
Okanogan	3,600	0	0	1,300	1,300	0	0	0	0	0	
Oregon—											
Malheur	21,600	1,800	1,800	5,400	3,600	0	0	1,800	0	0	0
Ochoco	0	0	0	0	0	0	0	0	0	0	0
Umatilla	0	0	0	0	0	0	0	0	0	0	0
Wallowa-Whitman	110,750	10,000	18,000	17,000	31,500	12,000	2,250	19,000	500	15,000	14,000
California—											
Lassen	0	0	0	0	0	0	0	0	0	0	0
Los Padres	57,481	7,869	8,800	0	15,000	0	27,530	4,980	0	0	0
Idaho—											
Boise	37,787	0	9,069	0	18,894	0	0	9,825	0	0	0
Challis	0	0	0	0	0	0	0	0	0	0	0
Payette	0	0	0	0	0	0	0	0	0	0	0
Salmon	0	0	0	0	0	0	0	0	0	0	0
Sawtooth	0	0	0	0	0	0	0	0	0	0	0
Nez Perce	0	0	0	0	0	0	0	0	0	0	0
Clearwater	15,800	0	0	0	5,800	0	0	1,600	0	0	
Montana—											
Bitterroot	0	0	0	0	0	0	0	0	0	0	0
Alaska—											
Tongass	0	0	0	0	0	0	0	0	0	0	0
<hr/>											
Total National Forests	247,018	19,669	37,669	23,700	76,094	12,000	29,780	37,205	500	15,000	14,000
Total, BLM districts and National Forests	276,118	19,669	44,786	23,816	76,094	12,083	29,780	43,455	500	15,000	20,250

The BLM districts, under the PACFISH strategy, have just over one-quarter of the animal unit month output that the National Forests do in watersheds bearing anadromous fish, yet would spend well over half the amount the Forest Service would to maintain the remainder of their range outputs. Costs include those required to administer the range program and to maintain program levels to the degree possible, while still meeting the PACFISH strategy standards and guidelines and RMOs. The average expected implementation cost for range for the districts is just over \$10 per animal unit month, compared to slightly over \$5 for the National Forests.

There are several reasons for these higher BLM costs. First, BLM land ownership patterns are scattered compared to NFS lands. This scattered ownership pattern causes substantially higher administrative costs, in both physically accessing Federal land and developing effective management plans with adjacent landowners. This situation is particularly apparent in the Spokane, Coeur d'Alene, and Vale Districts. Second, BLM typically has more individual permittees to work with in a given area than does the Forest Service. Third, because BLM-administered land is generally lower elevation and drier land, cattle tend to congregate in riparian areas more than they do on typical National Forest land. This makes it much more difficult to meet the PACFISH strategy goals and objectives through rest-rotation and livestock herding methods. Thus, BLM land also may require more riparian pasture fencing than will NFS land. Fencing is initially much more expensive than rest-rotation or livestock herding.

Large decreases in recreation use are seen for the Wallowa-Whitman, Los Padres, and Boise National Forests if the PACFISH strategy is adopted. These three Forests account for almost 80 percent of the total estimated decrease in recreation visitor days. In the recreation program, the BLM districts have about 20 percent of the recreation visitor days that the National Forests have and would spend about 17 percent of what the Forest Service would spend to maintain their recreation programs. The PACFISH strategy implementation costs with mitigation for the BLM districts are about \$0.35 per recreation visitor day compared to about \$0.41 for the National Forests.

**Study limitations**—The above portion of the analysis sets boundaries around the expected effects on resource output levels from applying the PACFISH strategy and the costs of doing so. Because of the short response time available, field units were not asked to make specific cost-effectiveness assessments of alternative ways to mitigate resource losses. Some units estimated they would be able to mitigate all losses, particularly in range and recreation, but did so at significant cost. Others reported they would not try to mitigate all losses because it would be too expensive.

The resource output reductions foregone and the associated implementation costs give a fair representation of the outer bound of costs required to provide a fairly high level of mitigation. The lower bound of costs could be calculated, whereby few if any mitigation costs were incurred, but most or all resource use in the watersheds would be foregone. Within those bounds are alternative tradeoff points between resource loss and cost. Unfortunately, we were not able to get the lower bound for this study, but alternative approaches are available. The application of economic values, as reported in the next section, can help to make the assessment of those tradeoffs.

It seemed to be generally more difficult for Forests and districts to estimate cost changes than to estimate changes in output levels. There are a great number of unknowns at this point about the short- and long-term effects of applying the PACFISH strategy. Costs of modifying projects, relocating sites and facilities, additional NEPA and monitoring requirements, and so forth are very difficult to determine.

Although this analysis did not ask for specific costs and effects related to roads, many field units expected to incur significant costs for relocating, reconstructing, closing (seasonally or permanently), or obliterating existing roads. Trail relocation costs were included, however, and were a significant factor in the recreation program costs.

It was difficult in many cases for Forests and districts to calculate their current base of acres suitable for scheduled timber harvest. Most, however, knew their original planning levels. Many have not formally recalculated or screened those acres since having to change management practices in response to developments occurring after their plans were completed. Thus, the calculation of suitable acres likely to be withdrawn under the PACFISH strategy, as compared to actual current output levels, is only an estimate (table 4).

#### **Mitigated Case With Economics**

An economic evaluation of the estimated changes in resource outputs leads to some different conclusions about the relative resource impacts of implementing the PACFISH strategy. Economic values, when applied to the resource output changes, may well indicate different relative changes in these resource areas and highlight issues that otherwise may have been overlooked if not made explicit.

This section focuses on the opportunity costs of the reported output reductions along with the associated management and mitigation costs, so that a more complete picture of the cost of applying the PACFISH strategy can be determined.

Although the reductions from actual current output from implementation of the PACFISH strategy have already been reported in the section "Mitigated Case Without Economics" and in table 2, they are shown again in table 9 beside the present value of the output that is lost. The foregone output for timber, range, and recreation occurs annually throughout the decade; when unit values are applied, the result is an opportunity cost foregone.

By implementing the PACFISH strategy, the BLM districts forego almost \$4.5 million in timber value and the National Forests \$279.7 million (\$144.5 million of which is from the Tongass National Forest, see table 9). The loss of animal unit months in anadromous fish-bearing drainages is valued at slightly over \$124,000 across the BLM districts and over \$1.1 million for the National Forests. The opportunity costs of the lost recreational visitor days on the BLM districts and National Forests are over \$13 million and \$126.6 million, respectively. If management chooses to implement the PACFISH strategy, then the value of the habitat protected for salmon and the potentially enhanced productivity of anadromous fish (or that productivity not lost) is worth at least the sum of the output values foregone. This does not yet include the discounted mitigation costs.

**Table 9—Net decrease and value foregone in timber, range, and recreation outputs in moving from current actual output to output under the PACFISH strategy standards and guidelines in the mitigated case with economics 1994-2003**

Forest or district	Timber		Range		Recreation	
	Net annual decrease from district or Forest current output to output under PACFISH (level 2-3)	Present value foregone using market clearing RPA prices at 4% <sup>a</sup>	Net annual decrease from current output per anadromous watershed to output under PACFISH (level 2-3)	Present value foregone using market clearing RPA prices at 4% <sup>b</sup>	Net annual decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)	Present value foregone using market RPA prices at 4% <sup>c</sup>
	<i>Million board feet</i>	<i>1993 dollars</i>	<i>Animal unit months</i>	<i>1993 dollars</i>	<i>Recreational visitor days</i>	<i>1993 dollars</i>
Idaho, continued—						
BLM district:						
Washington—			773	33,531	0	0
Spokane	0.50	1,114,681	773	33,531	0	0
Oregon—						
Prineville	.48	1,070,094	0	0	25,000	10,577,351
Vale	.75	1,672,022	0	0	0	0
California—						
Ukiah	0	0	0	0	NA	NA
Idaho—						
Salmon	.07	113,313	1,015	56,995	0	0
Coeur d'Alene	.30	485,626	599	33,636	25,823	2,695,668
<b>Total BLM districts</b>	<b>2.10</b>	<b>4,455,736</b>	<b>2,387</b>	<b>124,162</b>	<b>50,823</b>	<b>13,273,019</b>
National Forests:						
Washington—						
Okanogan	.80	1,783,490	630	27,328	6,200	1,444,735
Oregon—						
Malheur	30.00	66,880,861	5,000	216,892	36,000	9,310,937
Ochoco	2.50	5,573,405	800	34,703	0	0
Umatilla	0	0	886	38,433	0	0
Wallowa-Whitman	2.20	4,904,596	5,426	235,371	250,000	70,768,479
California—						
Lassen	2.00	4,362,650	750	33,843	0	0
Los Padres	0	0	360	16,245	118,360	24,059,231
Idaho—						
Boise	.50	809,376	0	0	73,575	17,010,379
Challis	0	0	4,057	166,294	0	0



**Table 9—Net decrease and value foregone in timber, range, and recreation outputs in moving from current actual output to output under the PACFISH strategy standards and guidelines in the mitigated case with economics 1994-2003 (continued)**

Forest or district	Timber		Range		Recreation	
	Net annual decrease from district or Forest current output to output under PACFISH (level 2-3)	Present value foregone using market clearing RPA prices at 4% <sup>a</sup>	Net annual decrease from current output per anadromous watershed to output under PACFISH (level 2-3)	Present value foregone using market clearing RPA prices at 4% <sup>b</sup>	Net annual decrease from current output per anadromous fish-bearing watershed to output under PACFISH (level 2-3)	Present value foregone using market RPA prices at 4% <sup>c</sup>
	<i>Million board feet</i>	<i>1993 dollars</i>	<i>Animal unit months</i>	<i>1993 dollars</i>	<i>Recreational visitor days</i>	<i>1993 dollars</i>
Idaho, continued—						
Payette	3.70	5,989,385	5,200	213,145	0	0
Salmon	0	0	0	0	0	0
Sawtooth	.75	1,214,064	0	0	0	0
Nez Perce	7.00	11,331,268	2,550	143,190	0	0
Clearwater	0	32,375,052	0	0	23,200	4,044,492
Montana—						
Bitterroot	0	0	0	0	0	0
Alaska—						
Tongass	200.00	144,470,247	0	0	0	0
<b>Total National Forests</b>	<b>269.45</b>	<b>279,694,394</b>	<b>25,659</b>	<b>1,125,444</b>	<b>507,335</b>	<b>126,638,253</b>
<b>Total, BLM districts and National Forests</b>	<b>271.55</b>	<b>284,150,130</b>	<b>28,046</b>	<b>1,249,606</b>	<b>558,158</b>	<b>139,911,272</b>

NA = not available.

<sup>a</sup> Prices used to calculate timber value foregone were from the 1993 RPA timber assessment; annual prices from 1994 to 2003 were predicted by TAMM (given in 1982 dollars). The prices were applied to the annual timber output foregone; each year was discounted at 4 percent. Values were converted from 1982 to 1993 dollars using the producer price index for finished goods (PPI=124.9 for January to September 1993, 100.0 for 1982).

<sup>b</sup> Prices used to calculate the range value foregone are fair market rental values from the 1990 RPA program and were \$6.11 for the Northern Region, \$4.46 for the Intermountain Region, \$4.91 for the Pacific Southwest Region, and \$4.72 for the Pacific Northwest Region (1989 dollars). These prices were converted to 1993 dollars by using the producer price index for finished goods (PPI=124.9 average from January to September 1993, 113.6 in 1989) and were applied to the change in output. The formula for calculating the present value for a 10-year annuity at 4 percent was then applied.

<sup>c</sup> Prices for each of the various recreation activities listed in table 8 are from the 1990 RPA program and were applied to the change in output by activity. The product was converted to 1993 dollars by using the consumer price index for all items (CPI-U=144.0 average from January to September 1993, 124.0 in 1989) and a 10-year annuity at 4 percent was applied.

The annual administration and mitigation costs in years one and two were increased by 10 percent to reflect that more of the costs would actually occur in the early years of implementation; the other eight years account equally for the remainder of the decadal cost. The result of taking the present value of this adjusted timing of costs is shown in table 10 as is the present value foregone from table 9. The present value of mitigating for timber outputs over the next decade is \$1.1 million for BLM districts and almost \$23 million for National Forests. To mitigate for range, the cost is about \$7.6 million for the BLM and just over \$13.8 million for the NFS. Recreation mitigation would cost BLM about \$6.6 million and NFS close to \$39.5 million. In other words, this is the amount of money it would take to mitigate management actions and maintain the highest level of output while still meeting the PACFISH strategy standards and guidelines.

### **Worst Case**

The more accurate cost of adopting the PACFISH strategy includes the value foregone from the lost output as well as the cost to implement and mitigate the strategy (see table 10).

We generally can compare each resource program's opportunity and mitigation costs to the value of the actual current output in anadromous fish-bearing drainages to see if mitigation is worthwhile or if it is more cost efficient to shut down the program. This implies that the total cost of implementing PACFISH must be cheaper than shutting down the programs, and that the cost to shut them down would have to equal the difference between the gross value of the current program and the total cost of implementing PACFISH before the efficiency of those programs is questioned. This type of worst case scenario is consistent with being enjoined, as has occurred recently in several court cases.

By applying the same unit prices we used for the lost output to the actual current output (see tables 1, 6, 7, and 11), we can place a gross value on those parts of the programs bearing anadromous fish. The worst case is analyzed across the entire anadromous fish-bearing drainage and not just within the RHCAs. We do this even though the PACFISH strategy standards and guidelines call for changes in management primarily within the RHCA, because the changes also impact upslope management actions outside the RHCA such that normal operating procedures within the drainage are effectively precluded. Timber output was reported Forest- or district-wide and not by anadromous fish-bearing drainage, as was the case for the range and recreation data. Therefore, the actual current output for timber was multiplied by the percentage of the Forest or district in the range of anadromous fish (see "Assumptions") to give an estimate of the output in just those drainages supporting anadromous fish. Although this estimate assumes equal distribution of the suitable landbase for timber across the Forest or district, it at least gives an estimate for a basic comparison to the costs of implementing the PACFISH strategy as a means of evaluating efficiency.

For recreation, an assumption had to be made concerning what type of activities the actual current output includes. The assumption was based on data given by those field units experiencing recreational losses in anadromous drainages (see table 8). For purposes of this study, the following bundle of goods was assumed: 50 percent camping, 15 percent trail use, 10 percent viewing by auto, 10 percent fishing, 5 percent swimming, 5 percent hunting, and 5 percent nonmotor boating.

**Table 10—Present value of the mitigation and administration costs and value foregone from applying the PACFISH strategy in the mitigated case with economics at 4 percent and a 10-year horizon, 1994-2003**

Forest or district	Timber		Range		Recreation	
	Present value of mitigation costs <sup>a</sup>	Present value foregone from table 9	Present value of mitigation costs <sup>a</sup>	Present value foregone from table 9	Present value of mitigation costs <sup>a</sup>	Present value foregone from table 9
<i>1993 dollars</i>						
BLM districts:						
Washington—						
Spokane	317,612	1,114,681	1,099,425	33,531	1,417,037	0
Oregon—						
Prineville	81,439	1,070,094	2,931,8000	0	1,262,303	10,577,351
Vale	162,878	1,672,022	952,835	0	40,719	0
California—						
Ukiah	0	0	0	0	814,389	NA
Idaho—						
Salmon	154,734	113,313	1,382,222	56,995	488,633	0
Coeur d'Alene	385,695	485,626	1,221,584	33,636	2,606,045	2,695,668
Total BLM districts	1,102,358	4,455,736	7,587,866	124,162	6,629,126	13,273,019
National Forests:						
Washington—						
Okanogan	0	1,783,490	289,108	27,328	806,245	1,444,735
Oregon—						
Malheur	10,646,100	66,880,861	1,816,087	216,892	8,754,682	9,310,937
Ochoco	407,195	5,573,405	325,756	34,703	496,777	0
Umatilla	3,933,499	0	4,983,246	38,433	10,062,998	0
Wallowa-Whitman	0	4,904,596	1,245,201	235,371	4,568,722	70,768,479
California—						
Lassen	788,329	4,362,650	488,633	33,843	87,140	0
Los Padres	0	0	162,878	16,245	6,107,918	24,059,231
Idaho—						
Boise	2,384,531	809,376	407,195	0	1,222,300	17,010,379
Challis	203,597	0	1,742,792	166,294	407,195	0
Payette	1,856,807	5,989,385	543,197	213,145	407,195	0
Salmon	151,476	0	252,461	0	513,065	0
Sawtooth	224,446	1,214,064	732,950	0	814,389	0
Nez Perce	1,408,893	11,331,268	325,756	143,190	3,432,650	0
Clearwater	879,540	32,375,052	499,318	0	321,684	4,044,492

**Table 10—Present value of the mitigation and administration costs and value foregone from applying the PACFISH strategy in the mitigated case with economics at 4 percent and a 10-year horizon 1994-2003 (continued)**

Forest or district	Timber		Range		Recreation	
	Present value of mitigation costs <sup>a</sup>	Present value foregone from table 9	Present value of mitigation costs <sup>a</sup>	Present value foregone from table 9	Present value of mitigation costs <sup>a</sup>	Present value foregone from table 9
	<i>1993 dollars</i>					
Montana— Bitterroot	0	0	0	0	18,690	0
Alaska— Tongass	<sup>b</sup>	144,470,247	0	0	1,465,900	0
Total National Forests	22,884,413	279,694,394	13,814,578	1,125,444	39,487,550	126,638,523
Total, BLM districts and National Forests	23,986,771	284,150,130	21,402,444	1,249,606	46,116,676	139,911,272

NA = not available.

<sup>a</sup> Mitigation costs were assumed to be 10 percent greater in years 1 and 2 than in the remaining 8 years of the decade.

<sup>b</sup> The Tongass National Forest would experience an ultimate cost savings of \$10 million, net of any increased costs, due to applying the PACFISH strategy standards and guidelines for timber. This figure was not included as it was the only cost savings reported and would give misleading totals.

The result is shown in table 11. The actual current timber programs of the BLM districts and NFS under the worst case have a gross value of \$11.7 million and slightly over \$948.3 million, respectively. The range programs show a gross value of about \$4.2 million and \$15.7 million, respectively, whereas the recreation programs have a gross current output value of \$626.5 million and almost \$3 billion, respectively (of which \$1 million is attributable to the Tongass National Forest).

The type of economic analysis done here allows initial individual comparisons among districts or Forests. The cost to shut a program down would have to be greater than the difference between the total cost of implementing the PACFISH strategy (tables 9, 10, and 11) and the gross value of the current program (table 11) before not shutting down would be a viable alternative. The range program is the only program to show a large difference; four out of the six BLM districts show both costs as greater than the gross value of their range program in anadromous fish-bearing drainages (Spokane, Prineville, Vale, and Coeur d'Alene Districts), while one other is so close (within about \$3,000) that it is questionable as well (Salmon District). The National Forests do not escape this issue either; 6 of the 16 Forests have range mitigation costs greater than the worth of their range program in anadromous fish-bearing drainages (Ochoco, Umatilla, Lassen, Challis, Sawtooth, and Clearwater National Forests), while one other is within about \$10,000 and is thus questionable as well (Boise National Forest).

**Table 11—Worst case scenario where the actual current output within anadromous fish-bearing drainages for each program is valued and foregone at 4 percent and a 10-year horizon, 1994-2003<sup>a</sup>**

Forest or district	Timber		Range		Recreation	
	Adjusted annual actual current output w/constraints (level 2) <sup>a</sup>	Present value foregone using market clearing RPA prices at 4% <sup>b</sup>	Annual actual current output w/constraints (level 2)	Present value foregone using market clearing RPA prices at 4% <sup>c</sup>	Annual actual current output w/constraints (level 2)	Present value foregone using market clearing RPA prices at 4% <sup>d</sup>
<b>BLM district:</b>						
Washington—						
Spokane	1.08	2,407,711	10,917	473,561	892,000	247,759,757
Oregon—						
Prineville	1.03	2,290,001	29,899	1,296,968	551,000	153,044,424
Vale	0.02	53,505	6,900	299,310	24,000	6,666,182
California—						
Ukiah	.04	81,800	1,150	51,893	NA	NA
Idaho—						
Salmon	1.28	2,069,090	33,792	1,385,114	205,845	48,219,886
Coeur d'Alene	2.96	4,797,983	11,936	670,241	729,248	170,828,806
<b>Total BLM districts</b>	<b>6.41</b>	<b>11,700,090</b>	<b>94,594</b>	<b>4,177,087</b>	<b>2,402,093</b>	<b>626,519,055</b>
<b>National Forests:</b>						
Washington—						
Okanogan	0.84	1,872,664	8,084	350,670	56,000	15,554,424
Oregon—						
Malheur	65.00	144,908,531	47,000	2,038,781	236,000	65,550,788
Ochoco	16.00	35,669,792	7,400	320,999	427,000	118,602,484
Umatilla	42.90	95,639,631	29,550	1,281,829	1,034,163	287,246,607
Wallowa-Whitman	29.21	65,108,518	108,597	4,710,754	775,000	215,262,120
California—						
Lassen	9.75	21,267,920	3,050	137,630	43,500	12,020,067
Los Padres	0	0	4,130	186,364	1,758,400	485,887,015
Idaho—						
Boise	14.26	23,088,269	10,177	417,149	413,861	96,948,337
Challis	0	0	25,664	1,051,952	448,800	105,132,915
Payette	66.22	107,193,799	17,300	709,116	360,000	84,331,215
Salmon	17.35	28,078,883	48,000	1,967,491	670,000	156,949,762
Sawtooth	1.20	1,942,503	16,200	664,028	940,000	220,198,174
Nez Perce	45.00	72,843,868	25,500	1,431,899	264,707	64,286,372
Clearwater	27.00	43,706,321	7,125	400,089	230,000	55,857,479

**Table 11—Worst case scenario where the actual current output within anadromous fish-bearing drainages for each program is valued and foregone at 4 percent and a 10-year horizon 1994-2003<sup>a</sup> (continued)**

Forest or district	Timber		Range		Recreation	
	Adjusted annual actual current output w/constraints (level 2) <sup>a</sup>	Present value foregone using market clearing RPA prices at 4% <sup>b</sup>	Annual actual current output w/constraints (level 2)	Present value foregone using market clearing RPA prices at 4% <sup>c</sup>	Annual actual current output w/constraints (level 2)	Present value foregone using market clearing RPA prices at 4% <sup>d</sup>
		<i>Million board feet</i>		<i>1993 dollars</i>		
Montana— Bitterroot	3.12	5,050,508	123	6,907	31,350	7,613,617
Alaska— Tongass	418.00	301,942,817	0	0	4,672,000	1,002,856,871
<b>Total National Forests</b>	<b>755.85</b>	<b>948,314,024</b>	<b>357,900</b>	<b>15,675,658</b>	<b>12,360,781</b>	<b>2,994,298,247</b>
<b>Total, BLM districts and National Forests</b>	<b>762.26</b>	<b>960,014,114</b>	<b>452,494</b>	<b>19,852,745</b>	<b>14,762,874</b>	<b>3,620,817,302</b>

NA = not available.

<sup>a</sup> This analysis is for the entire anadromous fish-bearing drainage, not just the RHCA, because the PACFISH standards and guidelines call for changes in management primarily within the RHCA but that impact upslope management outside the RHCA such that normal operating procedures within the drainage are affectively precluded. Timber output was reported by Forest or district and not by anadromous drainage as was the case for the range and recreation data. Therefore, the actual current output for timber was multiplied by the percentage of the Forest or district in the range of anadromous fish for an estimate of the output just in the anadromous fish-bearing drainages.

<sup>b</sup> Prices used to calculate timber value foregone were from the 1993 RPA timber assessment; annual prices from 1994 to 2003 were predicted by TAMM (given in 1982 dollars). The prices were applied to the annual timber output foregone; each year was discounted at 4 percent. Values were converted from 1982 to 1993 dollars by using the producer price index for finished goods (PPI=124.9 for January to September 1993, 100.0 for 1982).

<sup>c</sup> Prices used to calculate the range value foregone are fair market rental values from the 1990 RPA program and were \$6.11 for the Northern Region, \$4.46 for the Intermountain Region, \$4.91 for the Pacific Southwest Region, and \$4.72 for the Pacific Northwest Region (1989 dollars). These prices were converted to 1993 dollars by using the producer price index for finished goods (PPI=124.9 average from January to September 1993, 113.6 in 1989) and were applied to the change in output. The formula for calculating the present value of a 10-year annuity at 4 percent was then applied.

<sup>d</sup> Prices for recreation are from the 1990 RPA and were applied to the change in output through the following assumed activity types (based on the breakdown by field units that had losses): 50 percent camping, 15 percent trail/hike, 10 percent view-auto, 10 percent fishing, 5 percent swimming, 5 percent big game hunting, and 5 percent nonmotor boating. The product was converted to 1993 dollars by using the consumer price index for all items (CPI-U=144.0 average from January to September 1993, 124.0 in 1989) and a 10-year annuity at 4 percent was applied.

**Table 12—Summary of the economic impact on Federal timber, range, and recreation programs in applying the PACFISH strategy and comparison of the mitigated case with economics to the worst case, 1994 to 2003, in present value terms**

Resource program	BLM districts				National Forests			
	Mitigation costs	Value of foregone output	Total cost of PACFISH	Gross value of actual current program	Mitigation costs	Value of foregone output	Total cost of PACFISH	Gross value of actual current program
----- Present value in million 1993 dollars -----								
Timber	1.10	4.46	5.56	11.70	22.88	279.69	302.58	948.31
Range	7.59	.12	7.71	4.18	13.82	1.13	14.94	15.68
Recreation	6.63	13.27	19.90	626.52	39.49	126.64	166.13	2,994.30

Some field units seem to be more cost effective than others in mitigating their range programs, but ownership patterns differ as do the types and costs of mitigation measures that need to occur. For many units, however, the difference between gross value of the current range program and the cost to implement the PACFISH strategy in those programs is so great that shut down may be more efficient. Further individual comparisons are left to the discretion of the decisionmakers.

## Discussion

The analysis of the output reductions without economics showed that both the NFS and BLM incurred the greatest output reduction in their timber programs, whereas the greatest costs occurred in the range program on BLM lands and in recreation for NFS. When economics was used, however, the value of the lost output was included as a cost of implementing the PACFISH strategy along with the mitigation costs; the total of both costs from the mitigated case would have to be less than the total gross value of the current program to maintain an order of efficiency. The present values of the mitigation costs and output losses incurred in the next decade compared to the gross present value of the current resource program outputs in anadromous fish-bearing drainages are summarized in table 12.

Both BLM and NFS recreation and timber programs across anadromous fish-bearing drainages show gross values significantly greater than both types of costs. The range program was fairly close in gross value and cost on NFS lands, but both costs associated with implementing the PACFISH strategy on BLM lands was greater than the gross value of their range program. This calls into question the efficiency of the latter if the cost to shut the range program down is greater than the difference between the gross value and the total cost of implementing the PACFISH strategy. This does not seem likely given that most costs to shut the program down would be similar but not as extensive as the costs given to implement the PACFISH strategy.

The ranking of severity among the programs for the estimated output reductions and those impacts when economics are added change as well. Remember that the biggest output reduction was in the timber program for both BLM and NFS; however, when the lost resources are valued, BLM lands show the greater loss in their recreation program. It is interesting to note that the actual current recreation programs on both BLM and NFS lands are significantly more valuable than the other two programs, with magnitudes of difference between the value of the actual current program and the costs of implementing the PACFISH strategy.

## Conclusions

Implications of the interim PACFISH comprehensive strategy for improved Pacific salmon and steelhead habitat management for BLM districts and NFS lands west of the Rocky Mountains that have anadromous fish were analyzed with and without economics. The output reduction and associated mitigation costs, when analyzed without economics, did not take into account the temporal nature of the impacts in conjunction with the value of money or the value that society holds for the resources lost. Incorporating economics also changed the perceived ranking of severity among the impacts and highlighted inefficiencies, such as in the case of range, in regards to whether implementing an action such as the PACFISH interim strategy increases social welfare or not.



## Acknowledgments

We are thankful to the Forest Service and BLM analysts who provided exemplary assistance in pulling together this information in a short timeframe. Judy Mikowski, forestry technician, Portland Forestry Sciences Laboratory, helped produce many of the tables in this report. Cecely Anderson, administrative support services, Portland Forestry Sciences Laboratory, provided flexible and timely assistance in preparing and mailing information to the field units. Finally, the PACFISH Strategy Field Team provided initial comments.

## Literature Cited

- Endangered Species Act. Act of December 28, 1973.** 87 Stat. 884, as amended; 16 U.S.C. 1531-1536, 1538-1540.
- Forest and Rangeland Renewable Resources Planning Act. Act of Aug. 17, 1974.** 88 Stat. 476, as amended; 16 U.S.C. 1600-1614.
- Forest Ecosystem Management Assessment Team [FEMAT]. 1993.** Forest ecosystem management: an ecological, economic, and social assessment. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior [and others]. [Irregular pagination].
- Haynes, R.W. 1990.** An analysis of the timber situation in the United States: 1989-2040. Gen. Tech. Rep. RM-199. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 286 p.
- Haynes, Richard W.; Adams, Darius M.; Mills, John R. 1995.** The 1993 timber assessment update. Gen. Tech. Rep. RM-GTR-259. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- Haynes, Richard W.; Bolon, Natalie A.; Hormaechea, Daniel T. 1992.** The economic impact on the forest sector of critical habitat delineation for salmon in the Columbia and Snake River basin. Gen. Tech. Rep. PNW-GTR-307. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.
- Interagency Supplemental Environmental Impact Statement (SEIS) Team. 1993.** Supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior [and others]. [Irregular pagination].
- Nehlsen, W.; Williams, J.E.; Lichatowich, J.A. 1991.** Pacific salmon at the cross roads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries. 16(2): 4-21.
- U.S. Department of Agriculture, Forest Service. 1991.** Resource pricing and valuation procedures for the recommended 1990 RPA program. Washington, DC: U.S. Government Printing Office. 33 p.
- U.S. Government Printing Office. 1993.** Economic report of the President. Washington, DC. 474 p. [Transmitted to Congress, January 1993].

Appendix 1  
Information Sent to  
Field Units



United States  
Department of  
Agriculture

Forest  
Service

Pacific  
Northwest  
Research  
Station

Forestry Sciences Laboratory  
1221 SW. Yamhill Street  
P.O. Box 3890  
Portland, Oregon 97208

Reply To: 2760

Date: August 5, 1993

REPLY DUE AUGUST 18, 1993

The purpose of this data request is to gather information on expected impacts of adopting PACFISH standards and guidelines to meet riparian management objectives throughout the range of anadromous fisheries on National Forest System and Bureau of Land Management public lands in the West. The information will be used within the next two months by the Chief of the Forest Service and the Director of the Bureau of Land Management to help decide on the future course and scope of the PACFISH effort. Direction to proceed now with this effort has been issued by both Forest Service and BLM Washington Offices to the Regional Foresters and State Directors (BLM 6840/FS 2670 memo dated 7/28/93 signed by Unger, Conn and Ross), and by those line officers to the appropriate Forest Supervisors and District Managers.

National Forests and BLM Districts involved are those in Washington, Oregon, California, Idaho and Montana which support anadromous fish habitat and are not covered under the President's Forest Plan for the range of the northern spotted owl. The Tongass National Forest in Alaska is also included.

The attached pages describe the data needed, and include necessary reference materials. We ask that you give both high priority and careful attention to your response. This information will give the Chief and Director an idea of the magnitude of effects that can be expected if the PACFISH strategy is adopted. If the Chief and Director decide to move ahead with the development of an Environmental Impact Statement (EIS) for the PACFISH strategy, you will be asked to validate and expand in detail these impact estimates during the preparation of the EIS.

Questions should be directed to your Regional or State Coordinator:

Fred Stewart, FS/R1 (406/329-3818) F.STEWART:R01F16A  
Dave Iverson, FS/R4 (801/625-5127) D.IVERSON:R04A  
Mike Skinner, FS/R5 (415/705-1870) M.SKINNER:R05A  
Dick Phillips, FS/R6 (503/326-5292) R.PHILLIPS:R06A  
Rebecca Baldwin, FS/R10 (907/586-7809) R.BALDWIN:R10A  
Dick Bastin, BLM/ID&CA (208/384-3056)  
Mike Crouse, BLM/OR&WA (503/280-7045)



Caring For the Land and Serving People  
Printed on Recycled Paper



If you cannot reach your coordinator, feel free to call one of us:

Richard Haynes, PNW-Portland (503) 321-5802 (FAX 503/321-5901)  
Natalie Bolon, PNW-Portland (503) 321-5805 (FAX 503/321-5901)  
Chris Hansen-Murray, USFS-Seattle (206) 744-3276 (FAX 206/744-3255)



RICHARD W. HAYNES  
Program Manager  
Social and Economic Values

cc: Phil Janik, FS/WO-WLF  
Bob Joslin, FS/R4  
Dick Bastin, BLM/ID  
Mike Crouse, BLM/WA-OR  
Fred Everest, FS/PNW-Juneau  
Gordon Haugen, FS/R6

Enclosures:

Data Request Narrative  
Data Sheets  
PACFISH Goals  
Riparian Management Objectives  
PACFISH Standards and Guidelines  
Riparian Habitat Conservation Area Width Descriptions  
Key Watershed Designations

## PACFISH DATA REQUEST NARRATIVE

8/5/93

### Introduction

For this effort, we need to know what the estimated effects will be on your timber, range and recreation programs if the PACFISH riparian management objectives (RMO's) and the PACFISH standards and guidelines are adopted and applied to the watersheds within the range of anadromy on your unit. In particular, we want to know estimated changes in timber volumes, livestock AUMs, and developed/dispersed recreation use. We also want estimates of the related program administration costs.

We know there may be impacts in other resource areas as well, but for now our data request is limited to these resources. However, if there is a particularly significant potential impact in another resource area, please bring it to our attention and provide as quantitative a description as possible.

### Process Overview

We need to estimate the impacts on resource activity/output levels if the PACFISH strategy were to be adopted. This means that Riparian Habitat Conservation Areas (RHCAs) would be delineated on the ground as management areas, according to the interim RHCA width guidelines, and the PACFISH riparian management objectives (RMOs) and standards and guidelines (S&Gs) would apply within the RHCAs.

The range of anadromy for each Forest and District has been determined. If you do not yet have that information, check with your Regional or State Coordinator. In addition, "key watersheds" have been identified for all the National Forests concerned, except the Tongass. All of the watersheds within the Snake River Basin affected by the Threatened and Endangered listings in place there are considered key watersheds. Key watersheds have not been identified for the BLM Districts. For those Districts, if you share an anadromous watershed with a National Forest, check with that Forest to see if they show the watershed listed as key. Use whatever designation the Forest shows. If you do not share the watershed, assume for this analysis that the watershed is key. This only affects the width of the RHCA delineation around intermittent streams.

Using whatever Forest or District data system you have in place, designate the RHCA boundaries for all streams in the anadromous watersheds on your unit, Refer to the RHCA discussion in your packet. For consistence purposes in this analysis, use the "feet" criteria to establish interim RHCA widths. However, if there are special problem areas of significance which you are relatively sure would be brought into an RHCA when laying out boundaries in more detail (see the alternative criteria for determining the boundaries in the RHCA paper), go ahead and include that area in your calculations.

Once you have the RHCA boundaries delineated, read through the RMO and S&G sections of your packet. Estimate as best you can the effects applying these S&Gs to meet the RMOs would have on your current program (see the discussion below for more detail on the three activity/output levels we want you to report).

With this packet are data sheets to fill in for each of the three resource areas (timber, range and recreation), along with instructions for entry of the data into an ASCII delimited electronic file. The latter can be done by the Forests on the DG, and by the BLM Districts on a PC (if available). Fill out both the hard copy and the electronic file, and submit both.

**Report your figures in whole annual amounts -- e.g.,100, 1513, 4300000, etc.**

Complete your estimates and transmit them the fastest way possible to your Regional or State Coordinator by **Wednesday, August 18**. The coordinators will review the data submissions, work over any problem areas with you, and transmit them on to PNW-Portland by Monday, August 23. That will give us one week to review the data, get back to you with any additional problem areas, aggregate the data, and prepare a report for the WO PACFISH Work Group to incorporate in the briefing package for the Chief's and Directors Offices by September 1.

#### Analysis Baseline

We are asking for three output/activity levels:

- (1) as projected originally in your approved Forest or District (or similar) plan, by watershed (unit-wide for ASQ/DSHL) [**correlates to column marked "Level 1" on the data sheets**];
- (2) what your current levels are (generally FY93, but modify as necessary according to discussion below) [**correlates to column marked "Level 2" on the data sheets**];
- (3) what your expected levels would be if the PACFISH strategy is adopted [**correlates to column marked "Level 3" on the data sheets**].

Baseline plan levels are the adopted Forest plans for Oregon, Washington, Idaho, Montana and California Forests, the latest draft Forest plan for the Tongass, and the most current Resource Management Plans for the BLM Districts in Oregon, Washington, Idaho and California.

"Current level" is that level at which you are actually operating today. It may be at your plan level, or it may be different because of changes in management direction since the adoption of the Forest or District plan caused by management requirements for ESA-listed or other species of special concern, funding levels, etc. If you are in a temporary lull in outputs because of consultation, watershed analysis, or other project implementation adjustments, report as "current" that level which you will otherwise expect to be achieving under existing constraints, once your adjustments are made. Indicate when you expect to move out of your temporary low point and onto that expected path.

If you don't face the current constraint problems just mentioned, but your actual current activity/output levels have been fluctuating quite a bit from year to year because of program demands, changing budgets, or whatever, we encourage you to use a 2-3 year average to come up with that current level.

#### Analysis Period

Please provide estimated impacts for one decade (FY1994-FY2003). Expected output and activity levels can be shown as annual averages over the decade. However, if you expect temporary additional reductions because of consultation activities regarding ongoing and proposed projects, watershed analyses, and time needed to adjust practices on the ground, please note the years and levels of expected reduced outputs/activities, as well as the annual average levels you expect to achieve over the balance of the decade.

#### Scope

Data are requested by each anadromous watershed on your unit. If you need to aggregate watersheds for any reason, please note the aggregation made. Timber program effects (ASQ or decadal sustained harvest levels) will be reported for the entire unit, as those calculations by watershed are not generally consistent with the way Forest and District plans are done. However, changes or deletions in planned timber sales over the next decade in the anadromous watersheds should be reported at the watershed level.

#### Cost Information

For this data request, estimate what changes in program administration and management costs you expect to incur within the three resource areas, as compared to current levels, if PACFISH standards and guidelines are adopted. This could include increased timber sale prep and administration unit costs; increased grazing administration costs; costs of accelerating the range allotment planning process; recreation management, education and law enforcement costs; costs of additional planning and monitoring, etc. Do not include costs of carrying out watershed analysis, nor costs of actually revising Forest or District plans down the road. That information will be developed separately. **Report all costs in 1993 dollars.**

#### Riparian Management Objectives

For any help in understanding or clarifying the interpretation of the RMOs as found in your packet, contact:

Phil Janik, USFS/WO-WLF (202/205-1207);  
Bob Joslin, USFS/R-4 (801/625-5603), or;  
Dick Bastin, BLM/ID (208/384-3056).

We want to be sure that the interpretations made are as consistent as possible, and came from people very familiar with the development of the RMO's.

#### Standards and Guidelines

The S&G's are written with a fair degree of flexibility. Their overall intent is to achieve as expeditiously as possible the attainment of the RMO's. Local conditions will dictate what will be required, and much latitude is given the field units in this regard. Therefore, estimating potential effects relies heavily on your use of local knowledge and judgement on a watershed by watershed basis. Please be as realistic as possible -- avoid any tendencies to create an absolute worst case on one hand, or an unrealistic "we can keep doing business as usual" approach on the other. We do recognize that these will be broad-brush estimates in many cases.

#### Some Specific Concerns

**Rangelands:** Districts and Forests which have anadromous watersheds that include large areas of open rangelands in the valley bottoms, and which are potentially available or current used for grazing, may choose to use BLM's watershed-wide approach for estimating effects on the grazing

program of applying PACFISH standards and guidelines. RHCA widths will still be delineated, but it may be necessary to consider adjusting grazing practices throughout the watershed in order to meet the RMO's. The alternative of focusing on just the RHCA could potentially require the complete elimination of grazing as currently practiced in the watershed in order to be able to adequately protect the RHCA (unless complete fencing of the RHCA were done). Use the process which would provide effective attainment of the RMO's in the most cost-efficient manner, while maintaining output levels to the degree possible.

**Roads:** Although at this time we are not requesting any specific information on road management and costs, the PACFISH standards and guidelines include a section on management of roads in RHCA's. Be sure to look at those S&G's and include in your resource impact estimations how changes in existing or planned roads according to the S&G's might affect existing or planned timber, range and/or recreation use on your unit. Existing or projected use levels may be affected because road access has to be seasonally or permanently curtailed, or planned roads may not be able to be constructed as originally planned. Be sure to coordinate with your road/transportation management folks in this area.

**Timber:** Be sure to report both effects on ASQ/DSHL for your unit, as well as expected effects on your actual timber sale program over the next decade within the RHCAs. If you have planned sales within an RHCA that are part of your scheduled volume, those would no longer be allowed. You would have to either cancel the sale completely, or move it to an alternative location outside the RHCA, perhaps with a reduction in volume. We are trying to determine the estimated effects on both the scheduled volume and on the actual timber sale program for the next decade.

**Recreation:** Recognize that application of the S&Gs to meet the RMOs may require seasonal closures to certain parts of streams to protect redds during spawning season; may require seasonal or permanent closing of portions of developed campgrounds along streams, or relocation of them away from the stream; and may require additional educational and law enforcement efforts to get visitors to recognize and adhere to the restrictions required to protect the habitat and fish.

Instructions for electronically entering  
PACFISH Economic Analysis Data  
(READ THROUGH FIRST)

1. **FIRST**, please fill out the hard copy of Data Collection Form 1 for each resource area affected for FY 1994-2003. Remember to use whole 1993 annual data and make as many copies of form 1 as needed to get all of the anadromous watersheds entered. You will be sending hard copies back as well as data entered electronically; per the following instructions. Send the electronic data as soon as it is completed.
2. For each row of data you enter, use zeros in the columns with no data.
3. The filled out table is a matrix 6 columns wide by however many anadromous watersheds your District or Forest has designated as analysis units.
4. Enter data from the form for each resource in a separate file in the manner specified below and name it with your District or Forest identification numbers and a resource abbreviation. For example, R6F4TIM, R6F4RNG, and R6F4REC could name 3 files, the first for data collection form 1 for timber, the second for data collection form 1 for range, and the third for data collection form 1 for recreation from the Malheur National Forest (NF). BLM Districts begin the filename with a "D" for District; examples are DOR30TIM, DOR30RNG, and DOR30REC for the Vale District in Oregon whose BLM identification number is OR-030, and DID40TIM, DID40RNG, and DID40REC for the Salmon District in Idaho, whose number is ID-040. The Spokane District in Washington, whose number is WA-130, is a special case as only 8 letters are allowed in the filename; use DWA13TIM, DWA13RNG, and DWA13REC.
5. **DATA ENTRY FORMAT:** The object is to merge this data directly into a Word Perfect table (set with corresponding codes) for publishing and summarizing of the data. For BLM Districts, on a PC use a program that can save a file as an ASCII delimited flat file. For NFs, use the DG "create a file." There should be no wrapping of data in the files, so change right tabs, etc to accommodate if it does occur (as there are only 6 columns of data to enter it should not occur). Enter the data with double quotes around it, a comma in between, and a hard return at the end of the line. **THERE SHOULD BE NO SPACES OUTSIDE OF THE QUOTES, NO COMMAS WITHIN ANY NUMBERS, AND NO DOLLAR SIGNS**, etc. Spaces are allowed within the name of the Watershed. **DATA LINE EXAMPLE** (example data is contrived):

"Middle Fork Salmon", "85800", "50000", "45000", "99000", "9000"

THIS FILE COULD THEN BE NAMED "R4F6REC" for the Challis NF recreation data on the Middle Fork of the Salmon river where the Forest plan calls for 85,800 RVDs (note by watershed or in general on the hard copy or a separate sheet the recreation activity type by percentage), 50,000 RVDs for the actual current output with constraints column (again note recreation activity type by percentage; if no change, indicate), the PACFISH output is 45,000 RVDs (note the recreation activity types by percentage; if no change, indicate), and so forth.

6. **ON THE DATA COLLECTION FORM FOR TIMBER** there is a second table on timber sales. Enter the data from it exactly as shown above only in a separate file. Name the file the same as the Data Collection form for timber only end it with TSL instead of TIM.



DISTRICT OR FOREST: \_\_\_\_\_

Date: \_\_\_\_\_

RESOURCE: **TIMBER** (in mmbf, see supplemental form) \_\_\_\_\_

Purpose: To help determine the economic impacts of implementing standards and guidelines to protect and enhance salmon and steelhead habitat on National Forest and BLM lands. Please study the footnotes carefully. Call \_\_\_\_\_ in the \_\_\_\_\_ at \_\_\_\_\_ if there are questions.

Name, DG address, and phone number of data supplier: \_\_\_\_\_

Forest or District	Total District or Forest-wide ASQ/DSHL from plan* (Level 1)	Actual current ASQ/DSHL w/constraints <sup>b</sup> (Level 2)	Total ASQ/DSHL with PACFISH scenario (with mitigation) <sup>c</sup> (Level 3)	Cost to apply PACFISH scenario (with mitigation) <sup>d</sup>	Other costs of PACFISH scenario <sup>e</sup>
-----Average annual data 1994-2003-----					

\*Based on data from the first decade of the plan; use base as agreed upon with PNW Research Station. ASQ=allowable sale quantity as used by Forest Service, DSHL=Decadal sustainable harvest level as used by the BLM.

<sup>b</sup>Total output expected from District or Forest given any considerations for ESA listing and Section 7 consultation, special management requirements for other fish/wildlife species taken on since plan approval; consistent under-funding compared to budgets required to implement plan levels, etc. If year-to-year output fluctuates significantly, the average of the most recent 2-3 years should be used.

<sup>c</sup>Output, with plan as base, from District or Forest if the PACFISH scenario is applied and mitigation measures are used to minimize any reductions in output.

<sup>d</sup>Cost to Government in 1993 dollars, with plan funding levels as base, of applying the PACFISH scenario with mitigation measures, to lessen the reductions in output while still meeting the plan and PACFISH scenario standards and guidelines on the District or Forest (include administration, program management, and so forth).

<sup>e</sup>Include any other costs of applying the PACFISH scenario in 1993 dollars, such as accelerating the updates of allotment management plans. Also, use a separate sheet to explain what the costs are and why they are included.

WHAT IS THE EFFECT OF THE PACFISH SCENARIO ON PLANNED TIMBER SALES IN THE RIPARIAN HABITAT CONSERVATION AREAS (RHCA's) IN THE NEXT DECADE?

Timber sales	Number	Volume (mmbf)
Cancelled		
Moved to outside the RHCA		
Moved to outside the RHCA and modified		

**PACFISH Supplemental Timber Worksheet**

(please return in hard copy when hard copy of data sheets are sent in)

District or Forest: \_\_\_\_\_  
 Name: \_\_\_\_\_

Date: \_\_\_\_\_

**I. Buffer data for anadromous watersheds based on PACFISH riparian habitat conservation area (RHCA) buffer widths.**

	Stream class 1		Stream class 2		Stream class 3 <sup>a</sup>		Stream class 4 <sup>b</sup>	
	Key watershed	Nonkey watershed	Key watershed	Nonkey watershed	Key watershed	Nonkey watershed	Key watershed	Nonkey watershed
Miles of Anadromous streams								
Suitable/commercial timberland acres in RHCA <sup>c</sup>								
-----Acres-----								

<sup>a</sup>Include buffer widths on wetlands greater than 1 acre.

<sup>b</sup>Include buffer widths on wetlands less than 1 acre.

<sup>c</sup>The total number of acres in the RHCA selected suitable for timber management under the plan.

**II. Base Data**

A. Suitable acres by land categories (calculate for B.1-3)

- (i) District or Forest-wide plan level
  - (a) Nonanadromous watersheds
  - (b) Anadromous watersheds
    - (1) Key watersheds
    - (2) Nonkey watersheds

Selected suitable acres  
 (i) = (a) + (b)  
 (b) = (1) + (2)

B. (1) Plan level output per anadromous watershed (Level 1)  
 (2) Actual current output with constraints (Level 2)  
 (3) PACFISH output (Level 3)

Suitable/commercial timberland acres

ASO/DSHL<sup>1</sup>

<sup>1</sup>Decadal sustainable harvest level (DSHL).



DISTRICT OR FOREST: \_\_\_\_\_

Date: \_\_\_\_\_

RESOURCE: **RECREATION** (in RVDs, specify output by type) \_\_\_\_\_

Purpose: To help determine the economic impacts of implementing standards and guidelines to protect and enhance salmon and steelhead habitat on National Forest and BLM lands. Please study the footnotes carefully. Call \_\_\_\_\_ in the \_\_\_\_\_ at \_\_\_\_\_ if there are questions.

Name, DG address, and phone number of data supplier: \_\_\_\_\_

Anadromous watershed	District or Forest plan output per anadromous watershed <sup>a</sup> (Level 1)	Actual current output w/constraints <sup>b</sup> (Level 2)	Output with PACFISH scenario (with mitigation) <sup>c</sup> (Level 3)	Cost to apply PACFISH (with mitigation) <sup>d</sup>	Other costs of PACFISH scenario <sup>e</sup>
-----Average annual data 1994-2003-----					
Total					

<sup>a</sup>Based on data from the first decade of the plan; use base as agreed upon with PNW Research Station.

<sup>b</sup>Total output expected from District or Forest given any considerations for ESA listing and Section 7 consultation, special management requirements for other fish/wildlife species taken on since plan approval; consistent under-funding compared to budgets required to implement plan levels, etc. If year-to-year output fluctuates significantly, the average of the most recent 2-3 years should be used.

<sup>c</sup>Output, with plan as base, from District or Forest if the PACFISH scenario is applied and mitigation measures are used to minimize any reductions in output.

<sup>d</sup>Cost to Government in 1993 dollars, with plan funding levels as base, of applying the PACFISH scenario with mitigation measures, to lessen the reductions in output while still meeting the plan and PACFISH scenario standards and guidelines on the District or Forest (include administration, program management, and so forth).

<sup>e</sup>Include any other costs of applying the PACFISH scenario in 1993 dollars, such as accelerating the updates of allotment management plans. Also, use a separate sheet to explain what the costs are and why they are included.

**PACFISH Strategy:  
Goals/Riparian Management Objectives**

**BACKGROUND**

The purpose of the PACFISH strategy is to provide habitat conditions that contribute to the conservation and restoration of naturally reproducing stocks of Pacific salmon and anadromous trout on Forest Service (FS) and Bureau of Land Management (BLM) lands in California, Oregon, Idaho, Washington, and Alaska. It's focus is on maintaining and restoring ecological functions and processes that operate in a watershed to create good fish habitat.

**Productive Salmonid Habitats**

In general terms, productive natural habitats in 3rd to 5th order watersheds supporting mixed species communities of anadromous salmonids are characterized by:

- **excellent water quality** (i.e, year round supply of cool, well-oxygenated water, and free from pollutants. Suspended sediment does not exceed background levels in undisturbed watersheds and remains in phase with freshets and flood events.)
- **sufficient water quantity** (i.e, amplitude and timing of annual flow events provides water to meet spawning, rearing and migration requirements.)
- **complex channel characteristics** (i.e, the most productive stream reaches for mixed salmonid communities have low gradients (<5%) with a combination of constrained and unconstrained segments containing a broad diversity and complexity of habitat features. Streams maintain a balance between high quality pools, riffles, glides, and side channels, with a pool frequency of about one pool per four to seven channel widths. Cover features such as large woody debris, boulders, undercut banks, overhanging vegetation, deep water, and surface turbulence are abundant in all habitats. Substrates consist of a variety of particle sizes ranging from silts to boulders to accommodate the spawning and rearing needs of all the species within the community. Spawning gravels contain low percentages of fine sediments. Channels are free of obstructions that interfere with the upstream or downstream migration of adult or juvenile salmonids.)

-- **healthy riparian communities** (i.e. forested watersheds contain large conifers or a mixture of large conifers and hardwoods in riparian zones and near-stream upland areas. Stream banks are vegetated with shrubs and other low-growing woody vegetation. Non-forested watersheds or portions of watersheds (generally rangeland systems) have an abundance of shrubs in the riparian zones and along streambanks and/or luxuriant growth of deep rooted grasses, sedges, and forbs. Root systems of plant communities adjacent to streambanks of the active channel allow development and maintenance of stable undercut banks.)

-- **stable watersheds** (i.e. upland portions of watersheds are well-vegetated, fairly stable, and free from chronic and accelerated sedimentation. Watersheds are free from disturbances that alter natural stream flow regimens and the quality of water emanating from uplands. Unstable headwall areas are vegetated with large conifers, or a combination of conifers and hardwoods.)

This description of good habitat for anadromous salmonids applies to watersheds as a whole. All of the described features may not occur in a specific segment of stream within a watershed, but all should occur in abundance in the watershed in total.

#### **Components of Alternatives to Provide Good Habitat**

The PACFISH strategy presents eight alternatives for providing the productive habitat conditions described above. The Forest Conference Team produced an alternative modified from one of the PACFISH alternatives. Each alternative affords different probabilities of success and operates on a different time trajectory. The more conservative alternatives offer the highest levels of protection for remaining good habitats and the shortest time frame for restoration of degraded habitats. Four components underlie the alternatives. Each component addresses a critical aspect for maintaining and restoring fish habitat and ecological functions in streams. They include:

-- **delineating key-watershed** (i.e, a landscape-scale system of watershed protection across lands managed by the FS and BLM.)

-- **establishing Riparian Habitat Conservation Areas** (i.e. areas within all watersheds that are the primary contributors/regulators of water quality, sediment, and organic material where land-use activities are restricted to those that either directly benefit or do not adversely affect fish habitat.)

-- **implementing watershed analyses** (i.e. an explicit level of evaluation designed to determine geomorphic and ecologic processes operating in specific watersheds, identify boundaries of Riparian Habitat Conservation Areas, provide information to refine Riparian Management Objectives and other habitat objectives to better reflect the inherent ecological capabilities of specific watersheds, and provide a blueprint for restoration measures.)

-- **initiating comprehensive watershed restoration measures** (i.e. capital investment to accelerate restoration of watershed function and health, with priority given to those watersheds that have the greatest potential to provide high quality fish habitat and contribute to conservation of "at risk" salmonid stocks.)

The PACFISH alternatives define how the four components are used and the portion of the landscape they apply to.

### **Management Direction**

To provide an appropriate level of consistency and assurance that management of watersheds on FS and BLM lands provides habitat conditions that contribute to recovery and sustained natural production of anadromous salmonids, the PACFISH strategy includes management direction in the form of goals, objectives, and standards and guidelines. The role of each is briefly summarized below:

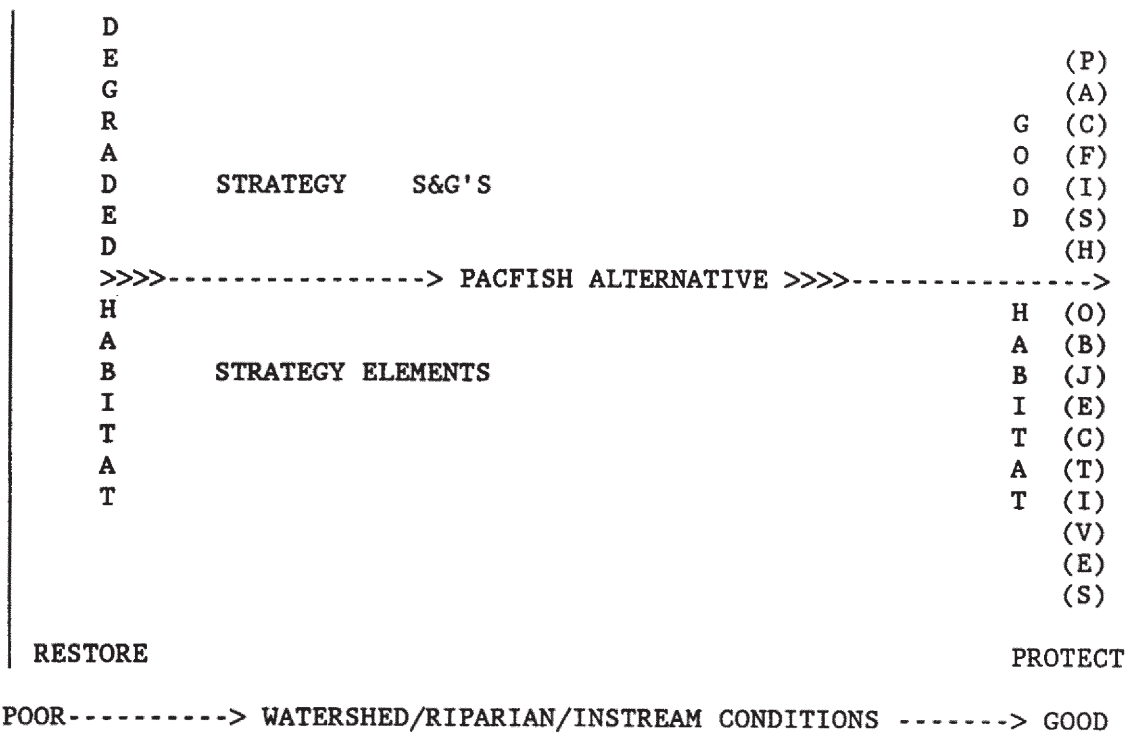
-- **goals** establish a common expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats.

-- **objectives** for stream channel, riparian, and watershed conditions that are measurable, together provide a quantitative description of good salmonid habitat, and serve as indicators against which attainment, or progress toward attainment, of the goals will be measured.

-- **standards and guidelines** (S&G's) for implementation of management activities to provide assurance that objectives for stream channel, riparian, and watershed conditions are met. S&G's are designed to steadily move stream habitat toward the defined conditions indicative of good habitat; or, if current habitat is in good condition, that conditions remain favorable in managed landscapes. The extent of the landscape to which S&G's are applied varies by alternative.

There are direct linkages between the management direction described above, and the components of the alternatives (Figure 1). The goals and objectives define the habitat conditions needed to contribute to conservation and restoration of naturally reproducing salmonid stocks. The standards and guidelines describe limitations on management activities to meet those conditions. Delineation of Key Watersheds and RHCA's in the various alternatives help to define where and how quickly management direction is applied. Information gathered through watershed analysis is used to refine objectives and adjust standards and guides to better match the ecological capabilities of specific watersheds, or more effectively accomplish strategy goals.

Figure 1. Linkages between PACFISH goals, objectives, standards and guidelines, and alternatives of the strategy. Habitat in good condition will be protected and degraded habitats will be restored through application of the strategy.





## GOALS FOR WATERSHED, RIPARIAN AREA, AND STREAM CHANNEL CONDITIONS

Protection and restoration of habitat quantity, quality, diversity, and complexity is critical to conservation and restoration of many stocks of western anadromous salmonids that inhabit lands managed by the FS and BLM. Since the quality of water and fish habitat in aquatic systems is inseparably related to the integrity of upland and riparian areas within their watersheds, the Strategy articulates several goals for watershed, riparian, and stream channel conditions. As noted elsewhere, collectively these goals establish a common expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats.

The goals are to maintain or restore:

- **water quality** to a degree that provides for stable and productive riparian and aquatic ecosystems.
- **stream channel integrity, channel processes, and the sediment regime** under which the riparian and aquatic ecosystems developed. (Important elements of the sediment regime include the timing, volume, and character of sediment input and transport.)
- **instream flows** to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges.
- **natural timing and variability of the water table elevation** in meadows and wetlands.
- **diversity and productivity** of native and desired non-native plant communities in riparian zones.
- **riparian vegetation to:**
  1. provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems.
  2. provide adequate summer and winter thermal regulation within the riparian and aquatic zones.
  3. help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.

-- **riparian and aquatic habitats necessary to foster the unique genetic fish stocks** that evolved within that specific geo-climatic region.

-- **habitat to support populations** of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

The forgoing goals apply broadly to FS and BLM landscapes in California, Oregon, Washington, Idaho, and Alaska.

## **OBJECTIVES**

Measurable objectives for stream channel, riparian, and watershed conditions provide the "criteria" against which attainment, or progress toward attainment, of the goals will be measured. They provide the target that managers of federal lands will be aiming for as they conduct resource management activities across the landscape. Without the benchmark provided by measurable objectives, our perception of good habitat suffers a continual erosion. Additionally, the objectives should be time-specific and established on a drainage or other biologically significant production basis, to reflect the ecological capabilities of specific systems.

### **Factors Complicating Establishment of Objectives**

Quantitative definition of stream channel, riparian, and watershed conditions (i.e. "good habitat") that are indicative of having met Strategy goals is complicated by several factors, including:

-- **anadromous salmonids inhabit diverse ecological settings.** Watershed topography, geology, vegetation, and climatic features interact to produce the floodplain and channel features that shape salmonid habitats. The variation in these features, and associated habitats, over the range of Pacific anadromous salmonids makes quantitative description of good habitat a monumental task.

-- **natural variability of conditions within given ecological settings.** Even within given ecological settings there may be significant natural variability in some habitat features.

-- **anadromous species have evolved into numerous locally adapted stocks.** Each species has a variable number of discrete stocks that are genetically isolated from each other and specifically adapted to local habitat characteristics. Hundreds of such stocks utilize streams and lakes for reproduction and freshwater rearing in the forests and rangelands of California, Oregon, Washington, Idaho, and Alaska. Each stock has exacting but slightly different habitat requirements, necessitating diverse and complex habitats to maintain viable populations of all groups.

-- **life history characteristics of anadromous salmonids are complex.** The life history of anadromous salmonids adds to the complexity of freshwater habitat needs. All anadromous salmonids spawn in freshwater and juvenile fish rear in streams and lakes for variable periods of time before moving to sea where they grow to adulthood. Juveniles of some species reside in freshwater for only a few weeks, but more commonly, juveniles reside in freshwater for one to several years, growing in size to 6-8 inches or more before entering the sea. Freshwater habitats often must accommodate several age classes of young anadromous fish ranging in size from one to eight inches through spring, summer, fall, and winter seasons. Habitat needs are different for each age class and season of the year. Therefore, freshwater habitats must provide good water quality and quantity and a wide variety of substrates, riffles, pools, glides, and side-channels, cover, and food resources to accommodate the habitat needs of all the age classes.

-- **anadromous salmonids occur as communities and co-exist with other aquatic species.** Assemblages of western anadromous salmonids associated with public lands include five species of Pacific salmon, two trouts, and one char. It is quite common for several species, numerous stocks and a variety of age classes to exist in concert in the same sections of stream systems throughout their range. As a result, the anadromous salmonid community of most aquatic systems is a complex mixture of several species, stocks, and age classes. The complexity of anadromous salmonid communities varies geographically throughout their range. At the extreme southern and northern ends of the range and in the upper reaches of the largest river systems (e.g., Columbia River) anadromous communities tend to be less complex than in the central portion of the range. The simpler communities might consist of one to three species and several stocks, while the more complex communities can consist of eight species and numerous stocks.

The complex habitat needs of anadromous salmonids can not be discussed in isolation. Most of the aquatic systems used by anadromous salmonids also are used by a variety of resident trout, char, and other aquatic species. Where anadromous communities are less complex, often resident fish communities tend to be more complex. These species also have exacting habitat needs that differ from anadromous species but must be met by the same habitats. The combination of anadromous and resident fish assemblages living in concert in freshwater systems adds to the need for habitat complexity and diversity throughout the west.

-- **available data for quantifying habitat features are limited.** The freshwater habitat requirements of anadromous salmonids have been well-documented in the scientific literature. In general, however, descriptions of habitat requirements are species-specific and do not take into account the fact that almost all aquatic habitats used by anadromous fish must accommodate complex communities of species and stocks rather than a single species or stock.

### **Identification of Interim Riparian Management Objectives**

Given the need for measurable objectives and the limitations noted above, the PACFISH strategy includes a set of interim Riparian Management Objectives to guide land management decisions. More specific objectives will be developed as watershed analyses are conducted for individual drainages. The specific objectives will be tailored to the geology, topography, climate, vegetation, and needs of specific salmonid assemblages in the watersheds, and an assessment of what habitat conditions are attainable in a given watershed.

### **Use of Undisturbed Habitats to Establish Interim Riparian Management**

**Objectives.** Inventory information from habitats largely undisturbed by human activities, and that successfully accommodate a complex community of species and stocks was used to develop interim Riparian Management Objectives. Systems that have suffered recent catastrophic disturbance (i.e. fire, flood, volcanoes, landslides, earthquakes, etc.) and are in unfavorable productive states were screened out of the data base, because natural disturbances of this type are unpredictable, occur irregularly across the landscape, and have recurrence intervals of centuries to millennia,

**Data Available to Establish Interim Riparian Management Objectives.** Although stream inventories have been conducted by state and federal agencies in California, Oregon, Washington, and Idaho since the 1930's, and more recently in Alaska, few are quantitative enough to be replicated or used comparable protocols. An exception is an extensive survey of salmon habitats of the Columbia Basin conducted by the Bureau of Fisheries between 1938 and 1941. That survey quantified habitat in 6,000 miles of Columbia Basin streams and provided data on pool frequency and substrate characteristics that can be used to establish measurable objectives for good habitat. Watershed-scale stream inventories conducted by the Forest Service since 1988 in Oregon, Washington, and Alaska also provide a substantial data base (more than 2000 miles surveyed) for establishing measurable objectives for features of good salmonid habitat.

**Selection of Habitat Features for Interim Riparian Management Objectives.**

Interim objectives address selected features of salmonid habitats that are:

-- good indicators of ecosystem health. Aquatic systems are ecologically complex and inseparably linked to riparian and upland terrestrial systems. As described elsewhere, the complexity of habitat features and their interactive nature makes identification of measurable objectives a difficult task. However, some habitat features can be used as surrogates for the processes that lead to habitat formation, and in combination with other features can be used as indices to the health of watershed systems and salmonid habitat quality. For example, an abundance of pools in a stream may indicate: a balance between sediment input to a system and sediment processing, the presence of roughness elements in the channel (e.g. large woody debris, boulders, or root-reinforced streambanks), and/or normal variations in streamflow. Large wood in a stream may indicate the presence of healthy riparian and near-stream upland vegetative communities, while providing cover complexity in the active channel and habitat for healthy invertebrate populations that serve as salmonid food sources.

-- easily quantified and subject to accurate repeatable measurements.

**Habitat Features Selected for Interim Direction.** The Strategy proposed Riparian Management Objectives that are defined by a key feature and several supporting features that meet the two criteria described above. The key feature (kf) and supporting features (sf) are:

- **pool frequency** (kf)  
(all systems)
- **water temperature** (sf)  
(all systems)
- **large woody debris frequency** (sf)  
(forested systems)
- **streambank stability and lower bank angle** (sf)  
(non-forested systems)
- **width to depth ratio** (sf)  
(all systems)

**Interim Riparian Management Objectives for Selected Features.** Stream inventory data referenced above were used to establish interim objectives for pool frequency, large woody debris, bank stability and lower bank angle, and width to depth ratio. State water quality standards were used to define favorable water temperatures'. The table below summarizes the landscape-scale interim Riparian Management Objectives for these selected habitat features.

<u>HABITAT FEATURE</u>	<u>INTERIM OBJECTIVE</u>
<b>Pool Frequency</b> (all systems)	Varies by channel width, see below:
wetted width in feet:	10    20    25    50    75    100    125    150    200
number pools per mile:	96    56    47    26    23    18    14    12    9
<b>Water Temperature</b> (all systems)	Compliance with state water quality standards, or maximum <68F.
<b>Large Woody Debris</b> (forested systems)	Coastal California, Oregon, Washington, and Alaska. >80 pieces per mile; >24 inch diameter; >50 foot length.
	East of Cascade Crest in Oregon, Washington, Idaho. >20 pieces per mile; >12 inch diameter; >35 foot length.
<b>Bank Stability</b> (non-forested systems)	>80 percent stable.
<b>Lower Bank Angle</b> (non-forested systems)	>75 percent of banks with <90 degree angle (i.e. undercut).
<b>Width/Depth Ratio</b> (all systems)	<10

**Limitations of Interim Riparian Management Objectives.** In development of interim Riparian Management Objectives an effort was made to stratify stream inventory data by stream size, constrained and unconstrained floodplains, geographic area, hydrologic province, and geologic province. The data base available, however, was inadequate for this level of stratification. Instead, all of the data (from more than 100 watershed-level surveys) were combined to develop landscape-scale interim habitat objectives that can be applied broadly to guide management activities on public lands over the entire range of anadromous salmonids from California to Southcentral Alaska.

A watershed analysis will be required to determine habitat objectives that are desirable and attainable within specific streams or reaches of streams. Until such specific watershed analyses are completed, these interim Riparian Management Objectives will be used to estimate the differences between existing and good habitat conditions and trends relative to attainment of PACFISH goals.

**Application of Interim Riparian Management Objectives.** Interim objectives apply at the watershed scale for stream systems of moderate size (3rd to 5th order). Each of the interim objectives must be met or exceeded before general habitat conditions would be considered good for anadromous salmonids. However, application of the interim objectives requires thoughtful analysis and common sense. That is, if the objective for pool frequency is met or exceeded, there may be some latitude in assessing the importance of meeting the objectives for the supporting features that contribute to channel roughness and complexity. For example, in headwater steelhead streams with an abundance of pools, fewer pieces of large wood in the presence of an abundance of large boulders might still constitute good habitat. The goal is to achieve a high level of habitat diversity and complexity, and that can be achieved through a combination of roughness elements. Watershed analysis will play an important role in establishing site-specific clarification of these interactions. Differences in ownership patterns (i.e. blocked, checkerboard, scattered) also will require that common sense guide the application of interim Riparian Management Objectives.



Habitat conditions that do not meet the interim Riparian Management Objectives may be predicted as part of the "analysis of alternatives process" or measured during/following implementation of land management activities. Predicted habitat conditions that do not meet interim objectives will require additional watershed/fisheries analysis. This analysis will:

- identify principle features contributing to predicted habitat conditions that will not meet the interim Riparian Management Objectives.
- determine if the proposed activities should be redesigned, modified, moved, or dropped.
- identify required mitigation measures to bring the activity in line with interim Riparian Management Objectives.
- evaluate the "fit" of interim Riparian Management Objectives relative to the ecological capabilities of the specific watershed and the habitat requirements of the species complex occurring in that watershed.
- be completed and documented as part of the environmental analysis process.

Measured habitat conditions that do not meet interim Riparian Management Objectives would trigger additional analysis to:

- identify principle factors responsible for measured habitat conditions that do not meet interim Riparian Management Objectives.
- evaluate the "fit" of interim Riparian Management Objectives relative to the ecological capabilities of the specific watershed and the habitat requirements of the species complex occurring in that watershed.

Based on this analysis, the agency would take one or more of the following actions as appropriate:

- modify/refine/discontinue the management activities resulting in habitat conditions that do not meet interim Riparian Management Objectives.

- review/revise the schedule of activities, standards and guides, etc.
- initiate new activities (e.g. rehabilitation) to meet interim Riparian Management Objectives.
- revise the Riparian Management Objectives to more accurately reflect the ecological capabilities of the specific watershed.

Document the results of the analysis, the actions to be taken, and the time-frame within which those actions will occur.

**Revision of Interim Riparian Management Objectives.** Given the lack of information to establish watershed specific measurable objectives, an on-going process for refinement of the objectives will be necessary. The process for revision will include four components:

- revision must be driven by sound, locally applicable quantitative field data and applicable research.
- the data must clearly indicate that the ecological capability of the system is significantly different from those described by the interim Riparian Management Objectives.
- the proposed revision is supported by discussion/analysis demonstrating that the new objective better indicates achievement of PACFISH strategy goals.
- the revision will be documented and reviewed by a designated team of watershed/fisheries managers and research scientists.

Within the Columbia River Basin, drainage specific "desired future condition (DFC) numeric values" have been developed. These DFC values are consistent with the PACFISH strategy definition of "objectives." In lieu of the more broadly defined PACFISH interim Riparian Management Objectives, DFC values will be used to guide land management in the drainages for which they were developed.

**PACFISH Strategy:  
Standards & Guidelines**

**BACKGROUND**

The purpose of the PACFISH strategy is to provide habitat conditions that contribute to the conservation and restoration of naturally reproducing stocks of Pacific salmon and anadromous trout on Forest Service (FS) and Bureau of Land Management (BLM) lands in California, Oregon, Idaho, Washington, and Alaska. It's focus is on maintaining and restoring ecological functions and processes that operate in a watershed to create good fish habitat.

**Management Direction**

To provide an appropriate level of consistency and assurance that management of watersheds on FS and BLM lands provides habitat conditions that contribute to recovery and sustained natural production of anadromous salmonids, the PACFISH strategy includes management direction in the form of goals, objectives, and standards and guidelines. The role of each is briefly summarized below:

- **goals** establish a common expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats.
  
- **objectives** for stream channel, riparian, and watershed conditions that are measurable, together provide a quantitative description of good salmonid habitat, and serve as indicators against which attainment, or progress toward attainment, of the goals will be measured.
  
- **standards and guidelines** (S&G's) for implementation of management activities to provide assurance that objectives for stream channel, riparian, and watershed conditions are met. S&G's are designed to steadily move stream habitat toward the defined conditions indicative of good habitat; or, if current habitat is in good condition, that conditions remain favorable in managed landscapes. The extent of the landscape to which S&G's are applied varies by alternative.

## **STANDARDS AND GUIDELINES**

The following S&G package was developed by the PACFISH Washington Office Work Group and Field Team.

### **Timber Management**

- TM-1. Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below. Riparian Habitat Conservation Areas shall not be included in the land base used to determine the Allowable Sale Quantity, but any volume harvested can contribute to the timber sale program.
- a. Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting if there are no impacts that are inconsistent with attainment of Riparian Management Objectives.
  - b. Remove salvage trees only when present and future woody debris needs are met and other Riparian Management Objectives are not adversely affected.
  - c. Apply silvicultural practices for Riparian Habitat Conservation Areas to control stocking, reestablish and culture stands, and acquire desired vegetation characteristics in a manner that assures Riparian Management Objectives are met.

### **Roads Management**

- RF-1. Cooperate with federal, Tribal, state, and county agencies, and cost-share partners to achieve consistency in road design, operation, and maintenance necessary to attain Riparian Management Objectives.
- RF-2. For each existing or planned road, meet the Riparian Management Objectives by:
- a. minimizing road and landing locations in Riparian Habitat Conservation Areas.
  - b. completing Watershed Analyses prior to construction of new roads or landings in Riparian Habitat Conservation Areas.
  - c. establishing and developing Road Management Objectives for each road, including preparation of:

1. road design criteria, elements, and standards that govern construction and reconstruction.

2. operation and maintenance criteria that govern road operation, maintenance, and management.

d. minimizing sediment delivery to streams from the road surface.

1. outsloping of the roadway surface is preferred, except in cases where outsloping would increase where sediment delivery to streams or where outsloping is infeasible or unsafe.

2. route road drainage away from potentially unstable channels, fills, and hillslopes.

e. minimizing disruption of natural hydrologic flow paths.

f. restricting sidecasting.

RF-3. Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives by:

a. reconstructing road and drainage features that pose a substantial risk.

b. prioritizing reconstruction based on the current and potential impact to riparian resources and the ecological value of the riparian resources affected.

c. closing and stabilizing, or obliterating and stabilizing roads not needed for future management activities.

RF-4. New culverts, bridges and other stream crossings in locations of substantial risk, and existing culverts, bridges and other stream crossings determined to pose a substantial risk to riparian conditions will be improved to accommodate a 100-year flood, including associated bedload and debris. Priority for upgrading will be based on the potential impact and the ecological value of the riparian resources affected. Crossings will be constructed and maintained to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

RF-5. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

- RF-6. Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Riparian Management Objectives. This plan shall address items such as the following:
- a. Road Management Objectives for each road.
  - b. road operation and maintenance.
  - c. post-storm inspections and maintenance.
  - d. during-storm inspections and maintenance.
  - e. regulation of traffic during wet periods.

#### **Grazing Management**

- GM-1. Adjust grazing practices (e.g. length of grazing season, stocking levels, timing of grazing, etc.) to eliminate impacts that are inconsistent with attainment of Riparian Management Objectives. If adjusting practices is not effective, eliminate grazing.
- GM-2. Locate new livestock handling and/or management facilities outside Riparian Habitat Conservation Areas. For existing livestock handling facilities inside the Riparian Habitat Conservation Areas, assure that Riparian Management Objectives are met. Where these objectives cannot be met, require relocation or removal of such facilities.
- GM-3. Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that will assure Riparian Management Objectives are met.
- GM-4. Adjust wild horse and burro management to eliminate impacts that are inconsistent with attainment of Riparian Management Objectives.

#### **Recreation Management**

- RM-1. Design, construct, and operate recreation facilities, including trails and dispersed sites, within Riparian Habitat Conservation Areas in a manner that contributes to attainment of the Riparian Management Objectives. For existing recreation facilities inside Riparian Habitat Conservation Areas, assure that Riparian Management Objectives are met. Where Riparian Management Objectives cannot be met, require relocation or closure of recreation facilities.
- RM-2. Adjust dispersed and developed recreation practices that are inconsistent with attainment of Riparian Management Objectives. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective, eliminate the practice or occupancy.

- RM-3. Wild and Scenic Rivers, Wilderness, and other Recreation Management plans will address attainment of Riparian Management Objectives.

### **Minerals Management**

- MM-1. If the Notice of Intent indicates a mineral operation could affect attainment of Riparian Management Objectives, require a reclamation plan, approved Plan of Operations (or other such governing document), and reclamation bond. Impacts that cannot be avoided will be reclaimed after operations to as near the pre-mining condition as practicable to meet Riparian Management Objective. Reclamation Plans will contain measurable attainment and bond release criteria for each reclamation activity.
- MM-2. Locate structures, support facilities, and roads outside Riparian Habitat Conservation Areas. Where no alternative to siting facilities in Riparian Habitat Conservation Areas exists, locate in a way compatible with Riparian Management Objectives. Road construction will be kept to the minimum necessary for the approved mineral activity. When a road is no longer required for mineral or land management activities, it will be closed, obliterated, and stabilized.
- MM-3. Prohibit solid and sanitary waste facilities in Riparian Habitat Conservation Areas. If no practicable alternative to locating mine waste (waste rock, spent ore, tailings) facilities in Riparian Habitat Conservation Areas exists, and releases can be prevented and stability can be ensured, then:
- a. analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.
  - b. locate and design the waste facilities using best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in Riparian Habitat Conservation Areas.
  - c. monitor waste and waste facilities to confirm predictions of chemical and physical stability, and make adjustments to operations as needed.
  - d. reclaim waste facilities after operations to assure chemical and physical stability and to meet the Riparian Management Objectives.
  - e. require reclamation bonds adequate to ensure long-term chemical and physical stability of mine waste facilities.

- MM-4. For leasable minerals, prohibit surface occupancy within Riparian Habitat Conservation Areas for oil, gas, and geothermal exploration and development activities where contracts and leases do not already exist, unless there are no other options for location and Riparian Management Objectives can be met. Adjust the operating plans of existing contracts to eliminate impacts that are inconsistent with attainment of Riparian Management Objectives.
- MM-5. Sand and gravel mining and extraction within Riparian Habitat Conservation Areas will occur only if Riparian Management Objectives can be met.
- MM-6. Develop inspection and monitoring requirements for mineral activities. Evaluate the results of inspection and monitoring to modify mineral plans, leases or permits as needed to eliminate impacts that are inconsistent with attainment of Riparian Management Objectives.

### **Fire/Fuels Management**

- FM-1. Design fuel treatment and fire suppression strategies, practices, and activities to meet Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management activities could perpetuate or be damaging to long-term ecosystem function.
- FM-2. Locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside of Riparian Habitat Conservation Areas. If the only suitable location for such activities is within the Riparian Habitat Conservation Area, an exemption may be granted following a review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements. Utilize an interdisciplinary team to predetermine suitable incident base and helibase locations during presuppression planning.
- FM-3. Minimize delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where over-riding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor, when an escape would cause more long-term damage.
- FM-4. Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.
- FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan needed to attain Riparian Management Objectives whenever Riparian Habitat Conservation Areas are significantly damaged by a wildfire or a prescribed fire burning out of prescription.



## Lands

- LH-1. For hydroelectric and other surface water development proposals, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to Federal Energy Regulatory Commission (FERC) that require flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies.
- LH-2. Locate new hydroelectric ancillary facilities outside Riparian Habitat Conservation Areas. For existing ancillary facilities inside the RHCA that are essential to proper management, provide recommendations to FERC that assure the Riparian Management Objectives are met. Where these objectives cannot be met, provide recommendations to FERC that such ancillary facilities should be relocated. Hydroelectric facilities that must be located in the Riparian Habitat Conservation Area, will be located, operated, and maintained to eliminate adverse effects that are inconsistent with attainment of the Riparian Management Objectives.
- LH-3. Issue leases, permits, rights-of-way, and easements to avoid adverse effects that are inconsistent with attainment of the Riparian Management Objectives. Where the authority to do so was retained, adjust existing leases, permits, rights-of-way, and easements to eliminate adverse effects that are inconsistent with attainment of the Riparian Management Objectives. If adjustments are not effective, eliminate the activity. Where the authority to adjust was not retained, negotiate to make changes in existing leases, permits, rights-of-way, and easements to eliminate adverse effects that are inconsistent with attainment of the Riparian Management Objectives. Priority for modifying existing leases, permits, rights-of-way, and easements will be based on the current and potential impact and the ecological value of the riparian resources affected.
- LH-4. Use land acquisition, exchange, and conservation easements to meet Riparian Management Objectives and facilitate restoration of fish stocks and other species at risk of extinction.

## General Riparian Area Management

- RA-1. Identify and cooperate with federal, Tribal, state and local governments to secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.
- RA-2. Fell trees in Riparian Habitat Conservation Areas when they pose a safety risk. Keep felled trees on-site when needed to meet woody debris objectives.

- RA-3. Apply herbicides, pesticides, and other toxicants, and other chemicals in a manner to avoid impacts that are inconsistent with attainment of Riparian Management Objectives.
- RA-4. Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows.

#### Watershed and Habitat Restoration

- WR-1. Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserve the genetic integrity of native species, and contributes to attainment of Riparian Management Objectives.
- WR-2. Cooperate with Federal, State, local, and Tribal agencies, and private land-owners to develop watershed-based Coordinated Resource Management Plans (CRMPs) or other cooperative agreements to meet Riparian Management Objectives.

#### Fisheries and Wildlife Management

- FW-1. Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of the Riparian Management Objectives.
- FW-2. Design, construct and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that is consistent with attainment of the Riparian Management Objectives. For existing fish and wildlife interpretive and other user-enhancement facilities inside Riparian Habitat Conservation Areas, assure that Riparian Management Objectives are met. Where Riparian Management Objectives cannot be met, relocate or close such facilities.
- FW-3. Cooperate with federal, tribal, and state wildlife management agencies to identify and eliminate wild ungulate impacts that are inconsistent with attainment of the Riparian Management Objectives.
- FW-4. Cooperate with federal, tribal, and state fish management agencies to identify and eliminate impacts associated with habitat manipulation, fish stocking, fish harvest, and poaching that threaten the continued existence and distribution of native fish stocks inhabiting federal lands.

## APPLICATION OF STANDARDS AND GUIDELINES

Because Riparian Habitat Conservation Areas (RHCAs) are recognized areas of the watershed within which the agencies should exercise special sensitivity, a set of interim standards and guidelines have been developed to guide management activities therein. These interim standards and guidelines will apply to RHCAs in all watersheds within the range of Pacific anadromous fish and will supplement standards and guidelines for areas of the watershed outside the RHCA that already are present in existing planning documents. In proposing special standards and guidelines for RHCAs we do not intend that activities in other parts of the watershed should be unregulated. The combination of the proposed interim standards and guidelines for RHCAs with the existing standards and guidelines will provide a benchmark for management activities that reflects our increased sensitivities and commitment to ecosystem management. The implementation of this proposal is designed to assure that objectives for watershed condition will be met.

Fragmented and mixed land ownership patterns among federal, state, tribal and private landowners will require special skills in the implementation of the proposed interim standards and guidelines. For some standards and guidelines, it may be possible and appropriate to implement standards and guidelines on Forest Service or Bureau of Land Management administered lands where intermixed with nonfederal lands, regardless of practices on the nonfederal lands. In other situations, such implementation may not be possible or appropriate. For example, road landings and pull-outs could be minimized within RHCAs on Forest Service and Bureau of Land Management lands even if not minimized in riparian zones on nonfederal lands. In this case, implementation of standards and guidelines regarding minimization of road landings and pull-outs in RHCAs on federal lands will help attain Riparian Management Objectives even if the standards is not applied on adjacent nonfederal lands. In some cases, however, such as road maintenance conducted across all jurisdictions by a county government, it may be impractical to implement standards and guidelines only where the road crosses federal lands. Regardless, it is imperative that when dealing with land management activities that occur across lands of mixed ownership that the federal land managers work closely with other land managers to apply PACFISH interim standards and guidelines across all landownerships whenever possible.

Execution of a comprehensive monitoring program is necessary to insure appropriate implementation of interim standards and guidelines and to determine their effectiveness. All monitoring programs should include the following components:

- analysis of whether interim standards and guidelines were properly implemented (implementation component);
- analysis of whether implementation of interim standards and guidelines has helped achieve PACFISH goals and objectives (effectiveness component); and
- analysis of whether the cause and effect relationships that helped shape the interim standards and guidelines remain valid (validation component).

Results of monitoring may indicate the need for revisions of management actions or revisions of interim standards and guidelines to more clearly suit local watershed conditions for achieving PACFISH goals and objectives. If monitoring determines that the interim standards and guidelines have not been properly implemented, the following actions should be taken:

- modify actions to insure proper implementation of interim standards and guidelines; or
- eliminate or delay activity until implementation of interim standards and guidelines can be insured or until such time that revised standards and guidelines more suitable for local watershed conditions have been developed and reviewed.

If monitoring determines that interim standards and guidelines have not been effective in helping to meet PACFISH goals and objectives, or if underlying cause and effect relationships have changed, then revision of standards and guidelines to meet conditions of the local watershed may be necessary.

#### **REVISION OF STANDARDS AND GUIDELINES**

The standards and guidelines were developed to establish a consistent application of management sensitivity to activities within RHCAs throughout the entire geographic range of Pacific anadromous fish. The standards and guidelines were written to provide assurance that the Riparian Management Objectives are met, and habitat on lands managed by the Forest Service and the Bureau of Land Management is maintained in, or restored to "good" condition. If monitoring indicates that a change in standards and guidelines (either increasing or decreasing management flexibility) is needed to assure the Riparian Management Objectives are met, any change will be made through subsequent formal changes of the Forest Land Management or Resource Management Plans (i.e. amendments or revisions). Any revision to the standards and guidelines must be based on all of the following criteria:

- the data must clearly indicate that the ecological capability of the system is not being adequately addressed by existing standards and guidelines;
- revision must be driven by sound, locally applicable monitoring results and research;
- the proposed standards and guidelines are supported by analysis and discussion clearly showing the proposed modification(s) better support achievement of PACFISH goals and objectives; and
- the revision will be documented and reviewed by a designated team of watershed/fisheries managers and research scientists.

## PACFISH STANDARDS & GUIDELINES

Comments Received After  
July 21, 1993  
Policy Group Approval of PACFISH Recommendation

### Lands

LH-1. For hydroelectric and other surface water development proposals, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to Federal Energy Regulatory Commission (FERC) that require flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies.

Comment: Change language to say that for new projects adverse effects must be minimized rather than stating that habitat conditions should be maintained or restored. This is because it would be impossible to maintain or restore habitat in cases where new hydro would be going in.

LH-3. Issue leases, permits, rights-of-way, and easements to avoid adverse effects that are inconsistent with attainment of the Riparian Management Objectives. Where the authority to do so was retained, adjust existing leases, permits, rights-of-way, and easements to eliminate adverse effects that are inconsistent with attainment of the Riparian Management Objectives. If adjustments are not effective, eliminate the activity. Where the authority to adjust was not retained, negotiate to make changes in existing leases, permits, rights-of-way, and easements to eliminate adverse effects that are inconsistent with attainment of the Riparian Management Objectives. Priority for modifying existing leases, permits, rights-of-way, and easements will be based on the current and potential impact and the ecological value of the riparian resources affected.

Comment: Use the term "minimize" rather than "avoid" since in some cases it may be impossible to avoid effects, for instance in cases where you have access to private land or interstate pipelines that cannot be relocated around a RHCA.

Comment: FERC should be given a chance to comment on the PACFISH strategy.

Minerals Management

MM-1 to MM-6.

Comment: Include language directing that minerals activities be eliminated if adjustments can't be made to meet Riparian Management Objectives.

## RIPARIAN HABITAT CONSERVATION AREAS

### Description of Recommended Widths

#### BACKGROUND

Riparian Habitat Conservation Areas (RHCAs) are portions of watersheds where riparian-dependent resources receive primary emphasis and where special Standards and Guidelines apply. Special management sensitivity is expected within RHCAs, however, RHCAs are not "lock-out" zones. RHCAs include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect streams, stream processes, and fish habitats. RHCAs generally parallel the stream network, but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes. RHCAs will be delineated in every watershed on Forest Service and Bureau of Land Management administered land within the range of Pacific anadromous fish.

Prescribed widths for RHCAs of different waterbodies were determined based on several ecological and geomorphic factors. The interim widths described below are designed to provide a high level of fish habitat and riparian protection until Watershed Analysis can be completed. Watershed Analysis will identify critical hillslope, riparian, and channel processes that must be evaluated in order to tailor RHCA delineation to specific watersheds in a manner that assures protection of riparian and aquatic functions. The interim widths will apply until Watershed Analysis is completed, a site-specific analysis is conducted and described, and the rationale for final RHCA boundaries is presented.

#### INTERIM WIDTHS

Four categories of stream or water body, and the interim widths for each are:

**Fish-bearing streams:** RHCAs consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

**Permanently flowing non-fish-bearing streams:** RHCAs consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year flood plain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.

**Ponds, lakes, reservoirs, and wetlands greater than 1 acre:** RHCAs consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.

**Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas:** This category applies to features with high variability in size and site-specific characteristics. At a minimum the RHCAs must include:

the extent of landslides and landslide-prone areas,

the intermittent stream channel and the area to the top of the inner gorge,

the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation, and

for Key Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest;

for watersheds not identified as Key Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one-half site potential tree, or 50 feet slope distance, whichever is greatest.



EXAMPLE:

Riparian area widths (one side of stream) and percent of basin in delineated area using Augusta Creek, Oregon, as an example.

Stream Category	Interior Widths (ft) of delineated Riparian Area			
	BLM*	FS**	Not Key Wtrshed RHCA	Key Watershed RHCA
Permanently flowing, fish bearing (high value)	225	200	340	340
Permanently flowing, fish bearing (lower value)	150	100	340	340
Permanently flowing, non-fish bearing	100	100	170	170
Intermittent	0	25	85	170
Percent of watershed in Riparian delineation	8.5	14	36	53

\* From draft western Oregon Bureau of Land Management plans.

\*\* From Willamette National Forest plan.

**PACFISH Strategy:  
Key Watersheds**

**CRITERIA FOR KEY WATERSHED DESIGNATION IN THE CONTIGUOUS US**

The Key Watershed concept was designed to provide a pattern of protection across the landscape where habitat for anadromous fish would receive special attention and treatment. These watersheds would protect or restore habitat for listed stocks, stocks of special interest or concern, or salmonid assemblages of critical value for productivity or biodiversity. Areas in good condition would serve as anchors for the potential recovery of depressed stocks, and also would provide colonists for adjacent areas where habitat had been degraded by land management or natural events. Those areas of lower quality habitat with a high potential for restoration would become future sources of good habitat with the implementation of a comprehensive restoration program.

Key Watersheds have already been designated in the owl region in California, Oregon, and Washington. Criteria for designating key watersheds in that geographic region were:

- (1) watersheds with stocks listed pursuant to the Endangered Species Act, or stocks identified in the 1991 American Fisheries Society report as "at risk;" or,
- (2) watersheds that contain excellent habitat for mixed salmonid assemblages; or,
- (3) degraded watersheds with a high restoration potential.

Preliminary identification of key watersheds within the range of Pacific anadromous fish in the contiguous United States but beyond the Owl Forests/Districts has been initiated, and needs to be validated and completed by the PACFISH Field Team. Identification of Key Watersheds in Alaska has not yet begun.

## POTENTIAL MODIFICATION OF KEY WATERSHED CRITERIA FOR APPLICATION IN ALASKA

To designate Key Watersheds in Alaska, the criteria used in the Owl Forests/Districts would have to be modified to accommodate the fact the the 1991 American Fisheries Society report did not examine the status of Pacific anadromous fish stocks in Alaska, and thus did not report any Alaska stocks as "at risk." However, a report published in 1987 (by G.W. Konkel and J.D. McIntyre in the U.S. Fish and Wildlife Service Technical Report 9) on trends in spawning populations of Pacific anadromous salmonids suggests that coho and chum salmon populations (in general) had declining trends, while chinook, sockeye and pink salmon populations had increasing trends in Alaska. Steelhead trout stocks also are believed to be declining in Alaska.

Several studies are underway to determine the status of Pacific anadromous fish stocks in Alaska. In 1992, Forest Service researchers began an investigation to identify the unique stocks of anadromous fish on National Forests in Alaska. In addition, the Alaska Chapter of the American Fisheries Society has formed a steering committee and received funding to conduct a study identifying anadromous fish stocks "at risk" throughout the state.

If National Forests in Alaska are to be examined for identification of Key Watersheds, the following systems might be a good candidates for designation:

- (1) Any system with a unique or sensitive stock identified in the partnership study by R-10 and PNW.
- (2) A sample of tributaries to mainland trans-boundary rivers (and/or the mainstems of the rivers themselves). These might contain stocks of very different genotypic and phenotypic character from small coastal or island systems.
- (3) A sample of large island stream systems that contain multiple species and stocks of anadromous salmonids.
- (4) A sample of small island and mainland stream systems that contain small runs of anadromous salmonids. Such systems would be highly vulnerable to natural or human disturbance.
- (5) A sample of systems with unusually high productivity for anadromous salmonids. ADF&G should have a list from which to choose.
- (6) A sample of streams draining geologic features of unusual nature, for example, the karst formation on North Prince of Wales Island.

Definition of a key watershed network should begin with an examination of existing reserves (wilderness, National Monuments, etc) and then use the above criteria to complete a relatively even distribution of refugia across the National Forests of Alaska (see maps of key watersheds in Oregon, Washington, and California as examples).

A similar modification of criteria would need to be made for designation of Key Watersheds on BLM administered public lands in Alaska.

**Bolon, Natalie A.; Hansen-Murray, Christopher S.; Haynes, Richard W. 1995.**

Estimated economic impacts on the timber, range, and recreation programs on NFS and BLM public lands from adopting the proposed interim PACFISH strategy. Gen. Tech. Rep. PNW-GTR-344. Portland, OR: U.S. Department of Agriculture. Forest Service, Pacific Northwest Research Station. 80 p.

Implications of the interim PACFISH comprehensive strategy for improved Pacific salmon and steelhead habitat management were estimated for Bureau of Land Management (BLM) districts and National Forest System (NFS) lands west of the Rocky Mountains that have anadromous fish. The physical impacts and associated mitigation cost from implementing PACFISH over the next decade in Pacific Northwest, Intermountain, Northern, Pacific Southwest, and Alaska Region National Forest and BLM district recreation, range, and timber programs were analyzed with the actual current output as the base. Upon valuing the lost resources, the BLM lands showed the greatest loss in their recreation program. The current recreation programs on both BLM and National Forest lands are significantly more valuable by a magnitude of difference over the range and timber programs.

Keywords: Bureau of Land Management, National Forests, anadromous fish, economic impacts, habitat management, PACFISH, policy analysis, salmon.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

The United States Department of Agriculture (USDA) Forest Service is a diverse organization committed to equal opportunity in employment and program delivery. USDA prohibits discrimination on the basis of race, color, national origin, sex, religion, age, disability, political affiliation, and familial status. Persons believing that they have been discriminated against should contact the Secretary, U.S. Department of Agriculture, Washington, DC 20250, or call 202-720-7327 (voice), or 202-720-1127 (TDD).

Pacific Northwest Research Station  
333 S.W. First Avenue  
P.O. Box 3890  
Portland, Oregon 97208-3890