Oregon Department of Forestry
Forest Practices
Compliance Monitoring Project:
1998 Pilot Study Results

NOVEMBER 1999

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COMMITTEES AND COORDINATORS

This study has oversight by external and internal review committees. The committees' main functions are to review and approve the study design and reports. The committees met throughout the development of the project and will continue to meet annually.

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INTRODUCTION

The Oregon Department of Forestry (ODF) regulates forestry operations on non-federal land. Landowners and operators are subject to the *Forest Practices Act and Rules* when they conduct any commercial activity relating to the growing or harvesting of trees. The Oregon Forest Practices Act (FPA) was adopted in 1972. The overarching objective of the act is to

> "encourage economically efficient forest practices that assure the continuous growing and harvesting of forest tree species and the maintenance of forestland for such purposes as the leading use on privately owned land, consistent with sound management of soil, air, water, fish and wildlife resources and scenic resources within visually sensitive corridors as provided by ORS 527.755 that assures the continuous benefits of those resources for future generations of Oregonians." (ORS 527.630 Policy, Oregon Forest Practices Act)

The state board of forestry has been vested with exclusive authority to develop and enforce statewide and regional rules. The forest practice rules are designed to address the resource issues identified in the FPA objective (sound management of forest, soil, air, water, fish and wildlife resources, and scenic resources). The rules are categorized into divisions, and each division has a description of purpose (Table 1). The purpose statements further refine the broad objectives of the rules and act.

Table 1. Oregon Department of Forestry Administrative Rules.

Division Number	Division Description
600	Definitions
605	Planning Forest Operations
610	Reforestation Rules
615	Treatment of Slash
620	Chemical and Other Petroleum Product Rules
625	Road Construction and Maintenance Rules
630	Harvesting Rules
635	Water Protection Rules: Purpose, goals, classification and riparian management areas
640	Water Protection Rules: Wetlands, and riparian management areas
645	Water Protection Rules: Riparian management areas and protection measures for significant wetlands
650	Water Protection Rules: Riparian Management Areas and Protection Measures for Lakes
655	Water Protection Rules: Protection Measures for other wetlands, seeps, and springs
660	Water Protection Rules: Specified Rules for Operations Near Waters of the State
665	Specified Resource Site Protection Rules
670 – 680	Civil penalties, appeals, hearings procedures, stay of operations, access to notifications and written plans, regional forest practice committees, and the resource site inventory and protection process.

The Forest Practices program is responsible for administering and monitoring the forest practice rules. These rules are subject to revision as necessary based on the best available science and monitoring data. Such revisions shall maintain the goals of the FPA as described above. The rules have undergone many revisions since 1972. The most recent changes to the water protection rules were in 1994 and 1995. Therefore this project was monitoring rules that had only been in place for approximately 3 years.

The forest practice rules cover a wide range of issues pertaining to forest operations and resource protection. In general, the rules are designed to minimize impacts of forest activities on other forest resources. The rules focus on minimizing sediment delivery to channels, providing 50-year flow and juvenile fish passage through culverts, maintaining function of riparian areas, and protecting water quality, air quality, wildlife and fish habitat. It is important to recognize that the rules focus on minimizing impacts versus having no impact. This is a practical approach to both maintaining an economically viable forest industry as well as protecting other forest resources.

The rules vary by georegion and by stream type. There are 7 georegions defined as a geographic areas with similar vegetation type, climate, physiography. There are 9 stream types defined by stream size (stream flow) and beneficial use. This approach endeavors to recognize that forests are dynamic, with regional differences resulting from inherent characteristics and disturbance regimes.

The ODF Forest Practices Act and Rules are considered a Best Management Practices (BMPs) Program. BMPs are defined as practices selected by an agency that are practical and effective at reducing non-point source pollution to standards compatible with water quality goals. Once an agency's BMPs are approved by the state water quality regulatory agency, they are certified as the water quality management plan (WQMP) for landowners that implement them. A WQMP illustrates how a landowner will achieve acceptable water quality. When forest landowners properly implement BMPs they are actually implementing a WQMP, designed to maintain water quality. It is the responsibility of the ODF to monitor the effectiveness and implementation of BMPs in achieving that objective.

ODF forest practices monitoring program has implemented a pilot study to monitor compliance with BMPs on non-federal forestland. The BMP compliance monitoring project is a three-year project designed primarily to look at how the department, landowners and operators are implementing the forest practice rules. The first year of the project was used to implement a pilot study. The main goals of the 1998 pilot study were to:

1) Test and refine the efficiency and effectiveness of site-selection and data collection protocols developed to address the BMP compliance monitoring questions.
2) Identify the ultimate sample size needed to determine rule compliance with statistical confidence.
3) Provide preliminary data to answer the monitoring questions on compliance with BMPs and stream crossing regulations.

The results of this pilot study have been used to revise the site-selection and data-collection protocols. Over the next two years, the final version of the BMP compliance monitoring project will be implemented, and a final report will be available in 2001. The goal of the BMP compliance

monitoring project is to identify the level of forest operations in compliance with the forest practice rules, based on a statistically reliable sample, and determine if adjustments to the compliance program administration are needed. For example, the project may reveal areas where forest practice rule language can be clarified, administration of the rules can be improved, or where additional education and training is needed.

The BMP compliance monitoring project is just one component of the forest practices monitoring program (Dent, 1997). The strategy of the monitoring program is to monitor compliance separately from effectiveness and validation monitoring. The forest practices monitoring program currently coordinates separate projects to monitor the effectiveness of forest practice rules with regard to landslides, riparian function, stream temperature, chemical applications, and sediment delivery from forest roads. Validation monitoring is being conducted to test the basic assumptions underlying BMP's.

Background

The ODF achieves BMP compliance through a balanced program of rule education, technology transfer, incentives and enforcement. ODF employs 52 forest practice foresters (FPFs), stationed in 25 unit and district offices throughout the state. Through a series of inspections and site visits, FPFs work with landowners and operators to facilitate proper implementation or compliance with the forest practices rules. Not all operations are inspected by FPFs due to extremely heavy workloads. Therefore, FPFs prioritize operations to determine inspection schedules. When rules are not properly implemented, the violation is discovered, and resource damage results from noncompliance, a citation or repair order is issued.

The Forest Activities Computerized Tracking System (FACTS) and a civil penalties database can be queried to gage the level of compliance based on the number of citations. Data have been compiled for 1987 through 1996. These data summarize all operations that have been inspected by an FPF or state forester. The limitations of these data are due to the biased nature of the sample (i.e., based on a prioritization of operations rather than a random sample). However, the power of these data resides in the sheer number of operations assessed. For example, in 1996 approximately 21,735 operations were inspected as compared with 52 for the BMP pilot study. While the FACTS data may be biased, there is also an unavoidable bias inherent to the BMP study in that access was denied on approximately 9% of the randomly selected sites.

Figure 1 depicts trends in compliance over recent years (1987 - 1996). Results indicate that compliance has ranged from 96% to 98%. These rates show minor fluctuations in compliance and that over time the forest practices program appears to be successful in achieving compliance with the FPA and rules.

While the inspection and citation records are a valuable monitoring tool, a statistically reliable sample of BMP compliance is needed to determine if the compliance program is producing desired results and to identify methods to improve compliance. Furthermore, more detailed information is needed on specific rule-by-rule compliance rates and to quantify if resource damage has occurred as a result of noncompliance.

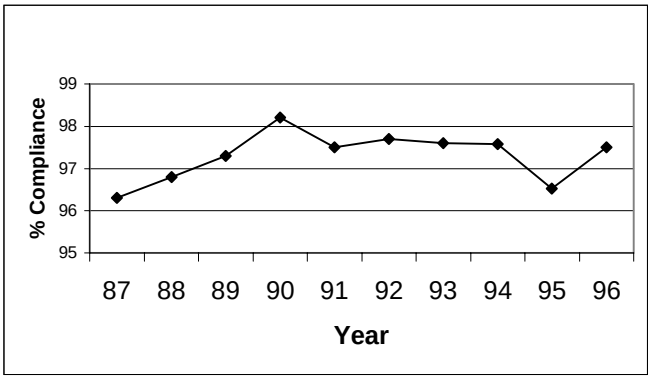


Figure 1. 1987-1996 Compliance Rates. Based on inspected operations for 1987 through 1996.

Related Monitoring and Research

Other states have implemented projects to assess compliance rates and effectiveness of administration programs to protect natural resources. Most commonly these projects have utilized an interdisciplinary team approach and combined compliance and effectiveness monitoring. Projects typically consist of some sort of rating criterion on which to assess both compliance and effectiveness. The following is a summary of some of these other programs.

California

A 1999 report from California (CDF, 1999) evaluated both compliance and effectiveness of forest practice rules in protecting water quality. Registered professionals foresters and an earth scientist evaluated forest practices on 150 randomly selected sites. The authors conclude that California forest practice rules are effective at protecting water quality, since 95% of the sediment issues resulted from noncompliant practices. Roads and crossings had the greatest potential to deliver sediment to streams. Of particular concern were stream crossings, construction, spacing, maintenance, and size of drainage structures; erosion of fill from road discharge; and sidecast on steep slopes. Compliance rates were lowest for road-related rules. Overall landings and skid trails had much less impact on water quality than roads. Stream and lake protection was very high.

Florida

The Florida Division of Forestry selects 150 sites to be monitored biennially by a professional forester (Southern Group of State Foresters, 1990). Virtually all aspects of the operation are assessed and the site is given a pass fail based on the data collection. Statewide compliance with BMPs ranged from 84 – 94%, and averaged over 89% through 1989 with over 600 sites surveyed.

Idaho

An interdisciplinary team was used consisting of a representative from forest landowners, Idaho Department of Fish and Game, U.S. Forest Service, Plum Creek Timber Co., Bureau of Land Management, Department of Lands, and DEQ (Idaho Department of Health and Welfare, 1997).

The study focused on practices that could result in delivery of pollutants to streams. Effectiveness and implementation was rated as poor to excellent. Forty sites were monitored from July through September 1996. Results indicate 97% compliance. Rule effectiveness was rated as 99% effective, yet half the sites delivered sediment to the stream as a result of forest activity. Most common departures from BMPs were associated with road rules.

Montana

In the state of Montana, application and effectiveness of forest practice rules were rated on federal, state, nonindustrial and industrial forestland in 1994 (Frank, 1994), 1996 (Mathieus, 1996) and 1998 (Fortunate et al., 1998). Three to four interdisciplinary teams were used consisting of a fish biologist, forester, hydrologist, a conservation-group representative, road engineer, and a soil scientist. Forty-two to 47 sites were monitored from July through September 1994.

Results indicated that in 1994, 1996, and 1998 compliance with minimum BMP requirements was 91%, 92%, and 94%, respectively. Compliance was 83%, 81% and 89%, for high-risk sites in 1994, 1996, and 1998, respectively. The greatest impacts and highest percent of departure from BMPs were associated with road drainage and maintenance during all of the monitoring periods.

Maryland

In Maryland, survey teams were formed of representatives from each agency with a vested interest in resource protection (Koehn and Grizzel, 1995). Team members were fixed for the field season, yet varied between sites. A field-based questionnaire was implemented on sites grouped by physiographic region. Compliance was rated qualitatively as: excellent, fair, good, or poor for each BMP. They also used a landowner/operator questionnaire to determine BMP awareness. Ninety-nine sites were sampled from summer through fall 1994. Results indicate an 82% compliance rate overall. Poorest compliance was associated with soil stabilization on road fill and cut slopes, skid trails and road drainage.

Southern Group of State Foresters

A regional BMP Task Forces was assembled in the Fall of 1993 to establish criterion for BMP Compliance Monitoring (Southern Group of State Foresters, 1994). Under consideration were the frequency, site selection, categories to be evaluated, methodology, enforcement issues, and precision. The group recommended a biennial review, on sites that were no more than 2 years old. The sites should be selected using a random, stratified, process and the sample size should be large enough to achieve a 5% precision level. Timber harvesting, site preparation, roads, stream crossings, streamside management areas, chemical applications, burning and harvest plans should be evaluated. Evaluations and reports should be provided at the rule level, the practice level, and at the operation level. BMPs should be compliant or noncompliant (i.e. no marginally noncompliant) and operation compliance level should be based on the number of practices that applied at the site. A risk or impact assessment should be made. If significant noncompliance is identified and the party is unwilling to comply with correction recommendations, enforcement should be taken.

Virginia

A 1997 report from the Virginia Department of Forestry reported that sediment production resulting from timber harvesting has increased in Virginia (Austin, 1997). This increase was estimated using a computer model that utilized measured sediment volumes from research and monitoring sites,

BMP compliance rates, and area logged each year. The model estimates sediment load from harvesting, burning, bulldozing; sediment reduction from BMPs; and the post-harvest rates of decline in sediment yield. The increased sediment production was attributable to two factors: decreasing compliance with forest practice rules and increasing rate of harvest. Results indicate that as compliance with BMPs decreased from 1992 through 1997 the sediment yield increased. In addition, the estimated land area being logged each year increased.

Washington: Timber Fish and Wildlife 1991-1992

In Washington, three "surveyors" accompanied by one Department of Natural Resources (DNR) staff person evaluated compliance and public resource damage on private forest operations (TFW, 1992). Data forms and questionnaires were developed to assess all forest practice rules that applied to the site. One hundred and ninety-one sites were randomly selected from notifications and assessed during the summer of 1991.

Low compliance was most commonly associated with maintenance of active and inactive roads, harvest activities within riparian management areas, and "special conditioning" which refers to wildlife protection.

Water Quality in Relation to Compliance Monitoring

Results from monitoring and research indicate that road systems are by far the greatest chronic sources of sand and/or fine sediment to stream systems. Of all the activities that take place on a forest operation roads are considered to have the greatest potential to impact water quality (Megahan and Ketcheson, 1996). Compliance monitoring may reveal more than water quality monitoring especially in the arena of roads (Macdonald and Smart, 1992). Instream measures are an integration of everything upslope. Consequently, instream measurements can be a diluted or exaggerated version of what is occurring higher up in the channel network or on adjacent slopes. Consequently, it is usually easier to accurately identify a drainage-related sediment source and to quantify the volume of sediment it produced than it is to measure sediment in the stream and work backwards to the source.

Burroughs and King (1989) demonstrated that certain practices can reduce the delivery of road sediment to stream channels. Examples include surfacing the road, erosion control on fill slopes, increasing distance between fill slopes and streams, reducing connectivity to stream crossings, adequate and functional cross drains, and rocking ditches (Burroughs and King, 1989, Skaugset and Allen, 1998). Implementation monitoring of these practices can improve our understanding of how to further minimize road-related impacts.

ODF Stream Rule Research

Compliance rates can be a function of landowner support of the rules and regulations. Hairston-Strang and Adams (1997) researched the response of landowners and operators regarding Oregon 1994 stream rule changes. This study looked at what kinds of factors influenced the willingness and support of industrial landowners, nonindustrial private landowners and logging operators to participate in the administrative program. There was a significant difference in response based on survey group (industrial, nonindustrial and operator). Hairston interpreted this as a reflection of different social norms for these groups and recommended reaching the respective groups with techniques that speak to these norms.

Cost and personal control were most commonly listed as reasons for lack of support. Factors which influenced support for the rules include understanding and involvement in the rule revision process (without prerequisite of technical knowledge), economic incentives, rules based on social norms, and good science and assurance of no increased regulation.

The Hairston-Strang and Adams study documented a sentiment that due to the importance of road sediment control, more literature needs to be available to operators on such topics as waterbars, culverts and road fills. Forest Practice Foresters should emphasize beginner and small ownership reforestation inspections, give less attention to proven operators and landowners and be freed up from paperwork.

OBJECTIVES AND MONITORING QUESTIONS

In order to answer the three objectives described in the Introduction (test BMP monitoring protocol, identify sample size needed, and provide preliminary results to answer monitoring questions with regard to BMP compliance), the ODF implemented this pilot study. The pilot study results have been used to refine the site-selection process, field methods, internal and external communication and outreach. Specific recommendations regarding these issues are identified in the recommendation section of this paper and have already been implemented for the 1999 field season.

Based on the results described in this paper, it has been determined that ODF needs a sample size of 189harvest units and 100 stream crossing sites. ODF predicts these sample sizes will provide a 5% precision for harvest unit results and 10% precision for stream crossing results.

The final objective, to provide preliminary results with regard to BMP compliance, is addressed in this report. This report identifies the objectives and monitoring questions of the BMP compliance Monitoring Project. The study design and methods are described and preliminary results presented. The recommendations focus on the pilot study objectives, but do provide some recommendations with regard to potential rule compliance issues.

Objectives

The ODF BMP compliance monitoring project will build on previous monitoring and research studies of forest practice rules and learn from projects undertaken by other states. The specific objectives are as follows:

1) Determine, through statistically valid sampling, the level of operator/landowner compliance with best management practices (BMPs).

2) Identify opportunities to improve program administration, operator education, and technology transfer or rule clarity.

Monitoring Questions

In order to meet these objectives, we will answer the following monitoring questions:

1) *How often did operators comply with BMPs described in the forest practice rules pertaining to water protection, road construction and maintenance, harvesting, and high-risk sites?*

2) *Have stream crossing structures on newly constructed and/or reconstructed roads been designed and installed according to ODF guidelines regarding fish passage and the 50-year stream flow event?*

3) *How do the statistical sample results compare with results based on forest practice foresters (FPF) inspections? Is there a correlation between number of FPF inspections and compliance rates?*

4) *Are there particular rules that consistently have a lower or higher level of compliance? If the former, can the guidance and/or rule language be modified to improve compliance? Are there educational and training opportunities/materials regarding those rules?*

5) *When BMP compliance is inadequate, to what extent are quality and function of riparian areas, stream channels and/or fish habitat compromised?*

STUDY DESIGN

The site selection process and field protocols were divided into unit-level sites and stream crossing sites. At a unit-level site, the whole unit (harvest practices, roads, skid trails, etc.) was evaluated for compliance with all forest practice rules designed to protect water quality and fish habitat (roughly 149 rules). At a stream-crossing site, the structure (bridge, culvert or ford) was evaluated for fish passage and capacity for the 50-year stream-flow event. Stream-crossing results are reported in a supplement to this report (Dent and Allen, 1999) and will not be discussed further in this document. A description of the unit-level site selection process, data collection and results follows.

Site Selection

Defining the Population

The focus of this project was to monitor forest operations that had the potential to affect waters of the state and on sites that had to comply with 1994 rule revisions. Therefore, potential operations had to meet the following criterion to be field surveyed:

- harvest units associated with a stream,
- harvested starting by January 1996 and completed by December 1997.

Two weeks prior to data collection for the 1998 pilot study, a query of the FACTS database was performed. A population of 2,591 harvest units met the initial criterion for the pilot study. Using a stratified random sample (described below), 150 sites were selected. The goal was to evaluate roughly 50 sites for the 1998 pilot study. The extra sites were randomly selected to use as backup in the event that property access was not granted or some of the sites did not meet the criterion.

Stratification and Random Selection

The sample was stratified by stream classification, district and ownership to address three characteristics that warranted further consideration in the sampling design. These included:

- Heightened concern with fish-bearing streams.
- Differences between industrial and nonindustrial landowners.
- Regional differences in the numbers of notifications and rule requirements.

Stream classification. The ODF uses a designation of Type F for fish-bearing streams, Type N for non-fish-bearing streams, and Type D for domestic water sources that are not fish-bearing. In addition, there were a number of streams in the BMP population with no information on stream classification. These are referred to as unknown.

The random sample was intentionally biased to capture more fish-bearing streams. The justification for the bias was attributed to the critical issues surrounding fish habitat. An additional justification was that most fish-bearing streams are likely to have small Type N streams as tributaries within the operation. Therefore, the selection process, although biased towards fish-bearing streams, was still likely to capture a sufficient number of small Type N streams for analysis. Consequently, 60% of the sites contained fish-bearing streams. The remaining 40% were partitioned according to the relative proportions of Type N and unknown streams in the population. Therefore, 10% of the sites were known N or D streams and 30% were unknown. The weakness of this stratification is that it may under sample steep terrain since steep gradient channels are more common on small type N streams.

District Stratification. ODF has partitioned non-federal ownership into 14 districts spread throughout the state. FPF's working out of district offices are responsible for administering the FPA on non-federal ownership that fall within their areas. A 5% sample was randomly selected from the total notifications in each district with a minimum of five sites for each district. This technique weighted the sample by the number of notifications per district and provided a statewide distribution of sites.

Land Ownership Stratification. The landowner classes include: Industrial, Nonindustrial, and Other. Other includes state, non-profit organization, city, locally, and county-owned land. The sample size for each landowner class was proportionate to the average size (in acres) of operations with streams in each landowner classification. For example, while the number of notifications for industrial versus nonindustrial is comparable (1305 and 965), the average size of an operation with a stream is twice as large for industrial (109 acres) than for nonindustrial landowners (46 acres). Therefore, the sample was weighted to capture more industrial operations. The relative proportions based on acreage are 70% industrial, 20% nonindustrial, and 10% state, local and other (Table 2). It is important to note that the operation size only applies to operations with streams and may be artificially high due to this focus.

Table 2. Landowner Population Characteristics.

Landowner Class	Number of Notifications	Average Acres	Total Acres	Percent of Total
1 State, Local & Other	286	73	20,878	10%
4 Nonindustrial	965	46	44,390	21%
5 Industrial	1,340	109	146,060	69%

Site Characteristics

Data collection was completed on a total of 52 sites (Figure 2). The ownership, classification and stream type are listed in Table 3 and shown in Figure 3. There was not enough time to visit sites from each district and access was denied five times. Seventy-seven percent of the sampled sites were under industrial ownership, 17% nonindustrial, and 6% were under other ownership. Seventy-three percent were Type F streams, 8% were Type N streams, and 19% were unknown (at the time of random selection). Sixty-one percent of the units were managed with a clearcut prescription, 27% were partial cuts, and 12% were salvage sales.

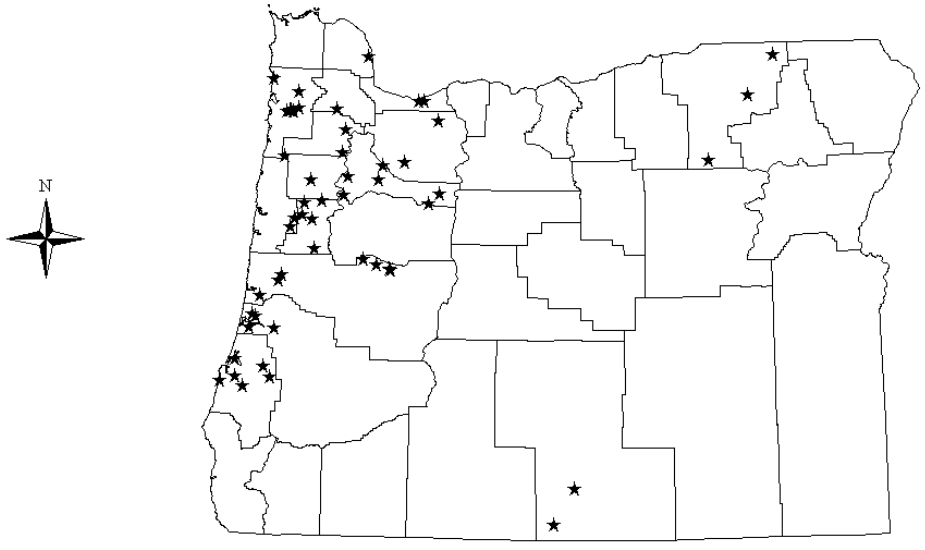


Figure 2. Location of Units Surveyed for the BMP Compliance Monitoring Project.

Table 3. Ownership and Stream Class for the BMP Monitoring Site.

	Visited	Landowner			Stream		
District	Total	Ind.	NonInd	Other	Fish	N/D	Unknown
Coos	10	7	2	1	5	1	4
Clackamas-Marion	10	8	2	0	8	0	2
West Oregon	9	6	1	2	7	0	2
Tillamook	8	6	2	0	7	1	0
East Lane	4	4	0	0	3	0	1
Forest Grove	3	3	0	0	2	1	0
Northeast Oregon	3	2	1	0	2	1	0
West Lane	3	3	0	0	2	0	1
Klamath-Lake	2	1	1	0	2	0	0
Astoria, Central Oregon, SW Oregon, and Douglas	Not Sampled due to lack of time						
Linn * (denied on two sites)	0	0	0	0	0	0	0
Total	52	40	9	3	38	4	10
Percent	100	77	17	6	73	8	19

Rule Focus

The forest practice rules designed to protect water quality and fish habitat, are detailed and complex, and span multiple rule divisions. In addition, 149 rules could potentially be assessed at any given unit . Therefore the rules, with the exception of the vegetation retention rules, will not be described in detail.

Nine rule divisions were assessed: Planning Forest Operations (Division 605), Treatment of Slash (Division 615), Chemical and Other Petroleum Products (Division 620), Road Construction and Maintenance (Division 625), Harvesting (Division 630), Vegetation Retention Along Streams (Division 640), Significant Wetlands (Division 645), Lakes (Division 650), and Other Wetlands and Seeps (Division 655). The purpose and brief description of each division is described in the results section.

Rules that are designed to maintain productivity and wildlife habitat, or that describe the purpose of the rules have not been assessed for three reasons. First, this project focuses is BMPs that are designed to protect waters of the state. Secondly, some of the rules must be assessed at the time of application, prior to application, or a few years after application. The BMP evaluations occurred one to two years after application. Finally, rules that describe the purpose and background of the division do not define how a practice should be implemented and therefore are not monitored with this project.

Riparian Management Area Prescriptions

The vegetation retention rules (OAR 629-640 and 645) require explanation because there are a range of prescriptions that can be used by a landowner when operating near waters of the state. The use of the prescriptions and the level of compliance as it relates to the different prescriptions are described in this report. Therefore, some detail is provided here on those rules. However, refer to the forest practice rules for a complete discussion of the water protection rules and other BMPs (Forest Practice Administrative Rules, 1996). A riparian management area (RMA) is

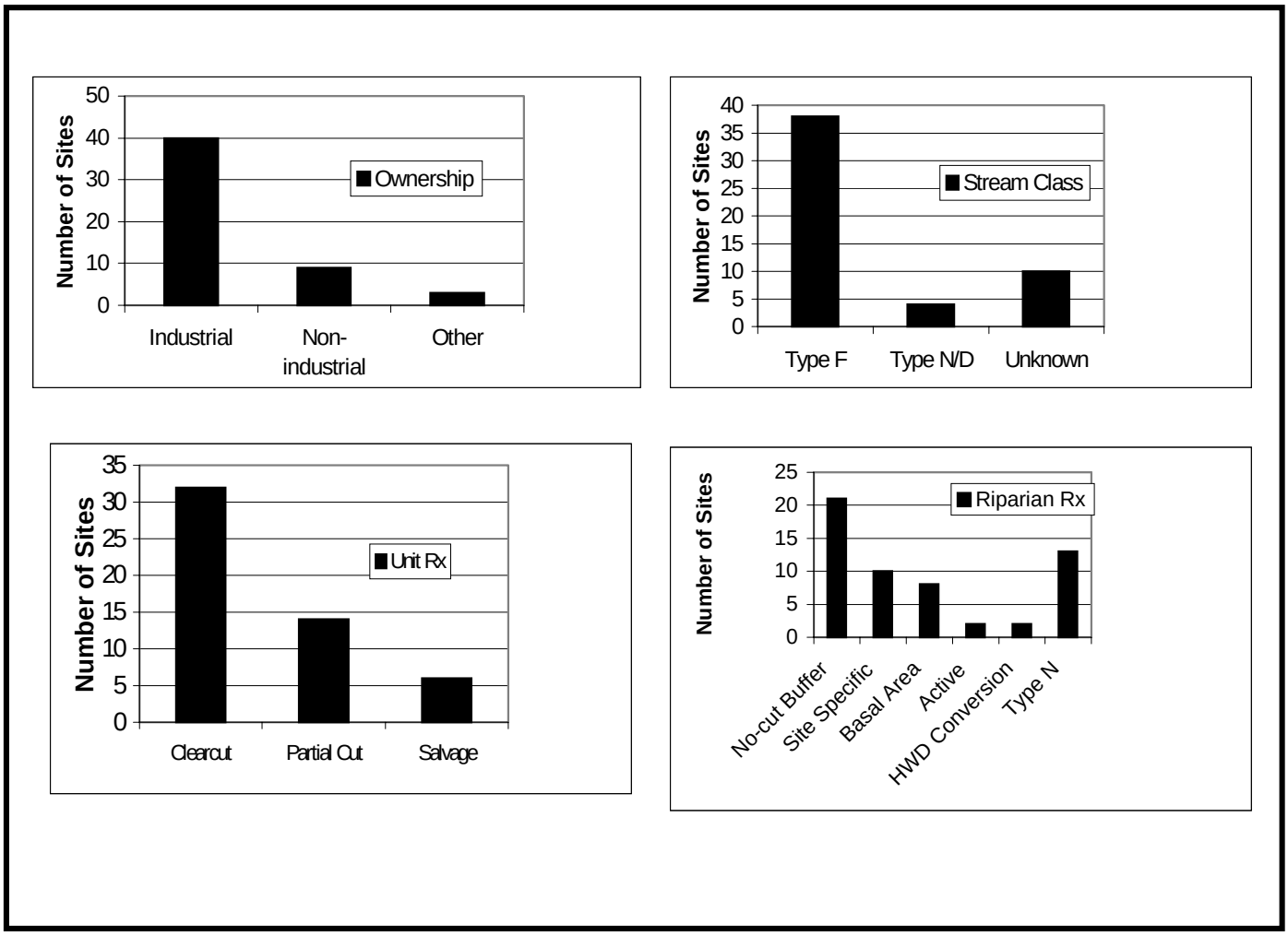


Figure 3. BMP Site Characteristics: Ownership, Stream Classification, Unit Prescription and Riparian Prescription. The riparian prescriptions are described in the text.

established on most streams that are within or adjacent to a harvest unit. RMAs can be managed using six different prescriptions as described below.

No-cut Buffer (OAR 629-635-310): The landowner can leave a fixed buffer width and not harvest within the RMA. RMA widths vary by stream size and type. For example the RMA width is 100, 70 and 50 feet for large, medium and small fish-bearing streams, respectively. Unless indicated in the written plan, compliance is based on an average measurement of the no-cut buffer. For the RMA's managed with this prescription and monitored in this study, the written plans indicated that the operations would not enter the RMAs. Any entry into the RMA is therefore was considered noncompliant.

Standard Target Basal Area (OAR 629-640-100): A standard conifer basal area target has been established that varies by stream size and type. If the pre-harvest conifer basal area exceeds the target, the landowner can harvest to the standard target while retaining a 20 foot no-cut buffer, and a specified number of trees per 1000 feet, which also varies by stream size. If the basal area is less than the standard target but greater than one half the standard target, the landowner must retain all conifers 6 inches and greater in the RMA up to a specified number of trees per 1000 feet which varies by stream size.

Active Management (OAR 629-640-110): A landowner can place large wood in the stream and receive a basal area credit. Piece size and credit vary by stream size and type. The credit allows for additional harvest in the RMA but never below the active management basal area target.

Small Type N Streams: (OAR 629-649-200): Most small type N streams do not have RMA requirements other than equipment and site preparation restrictions.

Alternative Prescription (OAR 629-640-300): If the basal area is less than one half the standard target, the landowner can use an alternative prescription. There are two conditions which may warrant an alternative prescription: a catastrophic event or a riparian stand capable of supporting conifers which currently is dominated by alders. In the case of this study, only the second condition was encountered. The landowner applied a riparian conifer restoration prescription. A riparian conifer restoration is used to convert a hardwood-dominated riparian area to conifers. Alternating conversion and retention blocks are established. In the conversion block, the landowner can harvest all trees to within 10 feet of the stream and replant conifers. Retention blocks have fixed conifer and hardwood no-cut buffers that vary by stream size.

Site Specific Plan (OAR 629-640- 400): A landowner has the option to develop a site-specific plan. The goal of this rule option is to encourage landowners to look for opportunities to enhance and restore riparian areas.

There were 63 riparian management areas (RMAs) surveyed in this study. Sixty percent of the RMAs were managed with a no-cut buffer, 16% were managed to meet a basal area target, 19% were managed with a site-specific prescription, 3% with riparian conifer restorations, and 2% used an active management alternative. The prescription choice varied somewhat with ownership class as described in the results section.

FIELD AND ANALYTICAL METHODS

In an effort to answer the monitoring questions, ODF developed a protocol with two approaches to data collection: (1) compliance rating data and (2) numeric data. Both of these approaches were also used to assess sediment sources. A brief description of these methods follows. Please refer to appendix A for a detailed description of the data collection methods and data collection field forms. The full protocol, BMP Compliance Audit Project, Version 3.0, is available upon request.

Compliance Rating System
An experienced retired FPF evaluated each site using the compliance rating system. The compliance rating system provides qualitative data regarding rule compliance. All the rule applications that applied to each site were rated as Exceeds, Meets, or Noncompliant. When noncompliance was identified, the infraction was further described as one of the following types of infractions: (1) administrative, (2) resource concern, or (3) a stream impact.

Administrative Noncompliance.
Administrative noncompliance refers to an activity that did not comply with notification and/or written plan requirements described in the rules. For example, if a site were harvested within 100 feet of a Type F stream without a written plan but all resource protection rules were in compliance, this would be an *administrative* noncompliance.

Resource Concern
There are other situations were the noncompliance is more than administrative, yet there is no immediate impact on the resource. For example, OAR 629-615-100 (2) requires the disposal of unstable slash accumulations around landings to prevent entry into streams. Noncompliance with this rule may identify unstable landing slash that has not entered the stream but has the potential to enter the stream. This would be identified as a *resource concern*.

Stream Impact
Finally, if the infraction results in sediment or slash delivery to the stream, water quality impairment, or significant loss of riparian vegetation, then the noncompliance is described as a *stream impact*.

Numeric Data Collection
A two-person BMP field team surveyed the sites collecting numeric data. The numeric data are a combination of quantitative and categorical assessments. For example, in the case of riparian management areas the BMP field team established transects spaced 200 feet apart for the entire length of the RMA. Along each transect the team documented area (quantitative) and source (category) of vegetation and ground disturbance; accumulations of slash in the channel (category) width of no-cut buffer (quantitative); sediment delivery (quantitative and source category); and effects of ground and vegetative disturbance on stream and riparian resources (quantitative and categorical). In addition, if the riparian area was managed to meet a basal area target, the team conducted a 100% cruise of conifers and other trees and snags that count towards the basal area target (quantitative). A similar approach was used for written plans, wetlands, felling, yarding, treatment of slash, road maintenance, road drainage, stream crossings, landings, and high-risk sites.

Sediment Sources
The forest practice rules in part are designed to minimize sediment delivery to stream systems and interpretation of compliance often hinges on whether sediment was delivered to the stream or not. For the purposes of this study, sediment sources were categorized as either “sediment eroded” or “sediment stored”. Sediment eroded indicates the sediment has been transported off site, delivered to a channel, and an erosional feature (e.g. rill, gully, concave area left after a landslide) remains that can be measured. Sediment stored refers to a volume of material still present that has entered the channel, is within the high water mark, or is likely to enter the channel (e.g. fill from a temporary crossing, side caste that has sloughed into the stream).

The BMP field team estimated the volume of sediment that had been eroded from a site by measuring the width, depth, and length of the erosional feature (e.g. rills, gullies, or landslides). The field team estimated the volume of sediment that was stored by measuring the height, width and length of the feature (e.g. over-steepened fill or a road fill that had slumped into the stream). Due to the imprecise nature of these measurements the volumes were categorized as one of the following: Incidental (0-1 cubic yards), Moderate (1-10 cubic yards), Significant (10 –100 cubic yards), or Great (over 100 cubic yards). The erosion type was characterized as sidecast failure, fill washout, drainage issue, deep seated landslide, shallow failure, or other. The detailed methods are provided in Appendix A.

There are limitations to this approach to sediment input monitoring. This approach only captures sediment input that can be traced during the dry, summer, field season. Road maintenance practices themselves can eliminate evidence of erosion. In addition over time evidence of erosion can be obscured by vegetation. ODF has done extensive work assessing forest practices and landslides (Robison et al., 1999) and on the potential for forest roads to deliver sediment to streams (Skaugset and Allen, 1998). More monitoring is needed on chronic sources of sediment from winter-time equipment operation and road use.

Calculating Compliance

The rating system and the numeric data are used to assess the same rules. However, the numeric data are used to describe the condition of the resource (stream, RMA, etc.) or feature (e.g., road, skid trail, etc.) being assessed while the compliance rating data are used to calculate compliance. The numeric data will only be used to determine compliance on a subset of rules in which numeric criteria are written into the rules. For example, the Riparian Vegetation Retention rules provide precise measures of compliance that can be evaluated numerically (e.g., no-cut buffer widths, basal area retention, etc.). Other rules require landowners and operators to minimize and avoid impacts. These rules require judgement on the part of an experienced forest practice forester or natural resource specialist to determine compliance. For example, road construction and maintenance rules require that operators locate roads to minimize the risk to waters of the state and avoid steep slopes. In this example, the numeric data will describe the percent of roads in different locations, and the compliance assessment data will reflect which of the roads were in compliance with road location rules.

Compliance rates are calculated and reported at a unit-level and at a rule-level. Compliance results are weighted such that all rules count equally towards the total unit-level and rule-level compliance. Consequently, multiple applications of the same rule within a given unit do not outweigh a single application of a different rule on that same unit.

The features themselves (roads, landings, stream crossings, riparian areas) are described using the numeric data. These “numeric summaries” are not weighted in the manner described above in an effort to reflect the overall effect of forest practices on resources. Consequently, in some cases the sample size is larger for the numeric summaries than for the summarized compliance rating data.

Generally, there was good agreement between the rating and numeric techniques. However, there are discrepancies and they are discussed as they arise. The discrepancies are greatest when the

sample size is low. Discrepancies also arise when the BMP field-team evaluated a feature numerically that was not assessed using the compliance assessment technique. For example, since the BMP-team systematically surveyed entire road systems they identified culverts and crossings that were overlooked with the braoder rating approach. Conversely, the rating approach was used to evaluate small type N streams while the BMP-field team did not assess small Type N streams. The final sources of discrepancies were attributable to practices that were in compliance yet still resulted in an impact on the resource.

RESULTS

The 1998 pilot study results are reported at two levels: (1) unit-level and (2) rule-level. A total of 52 sites were evaluated, however only 49 sites were evaluated using the compliance rating system. The unit-level results identify how many units met or exceeded the rule requirements and the average compliance across 49 units. The rule-level results summarize compliance rates for individual rules (149 rules) applied at multiple units (49 units). The unit-level results are based strictly on compliance rating data while the rule-level results utilize both the compliance rating data and the numeric data. The numeric summaries include data from the additional 3 sites. See the field and analytical methods section for a detailed description of how compliance rates were calculated.

Unit-level Compliance

One or more noncompliant practices were identified on 21 out of 49 sites, or 43%. Only twenty-eight out of 49 sites (57%) met or exceeded all of the BMP rules that applied (Table 4 and Figure 4). However, this does not take into account the number of practices that applied at these sites. For an individual site, percent compliance is equal to the number of compliant practices divided by the number of rules that applied to that site. In view of that, although 43% of the sites had one or more noncompliant practices, the average compliance rate across 49 units was 98%.

Noncompliant practices did not always result in an impact on the resource. Nine out of 49 units (18%) had a noncompliant practice that resulted in an impact on the stream. There were a total of 62 noncompliant practices out of 3,367 applied practices. Ten (16%) of the noncompliant practices were administrative, 32 (52%) resulted in a resource concern, and 20 (32%) resulted in an impact on the resource (Table 4). There were an additional six sites with sediment delivery to the stream that were not identified as having noncompliant practices. For example, a deep-seated landslide

Table 4. Site Compliance Summary.

Site	Exceeds Compliance	Meets Compliance	Non-Compliance	% Compliance	Noncompliance Type:		
					Administrative	Resource Issue	Resource Impact
1	8	33	0	100			
2	15	31	1	98		1	
3	8	49	0	100			
4	10	45	1	98	1		
5	7	58	0	100			
6	0	65	2	97	1	1	
7	0	41	3	93	3		
8	0	65	0	100			
9	0	52	0	100			
10	0	45	0	100			
11	0	74	0	100			
12	7	53	0	100			
13	0	49	0	100			
14	8	92	6	94		1	5
15	0	94	2	98		1	1
16	8	45	0	100			
17	0	65	0	100			
18	4	61	2	97		2	
19	0	53	0	100			
20	0	46	1	98	1		
21	8	85	16	85		13	3
22	8	75	0	100			
23	8	54	0	100			
24	0	56	0	100			
25	2	90	0	100			
26	0	53	0	100			
27	2	73	0	100			
28	7	91	0	100			
29	0	93	0	100			
30	2	55	2	97		2	
31	7	88	2	98		1	1
32	0	53	0	100			
33	8	86	6	94		2	4
34	0	50	0	100			
35	0	54	3	95		1	2
36	0	53	2	96	1	1	
37	-	-	-	-			
38	0	108	3	97	1		2
39	0	81	1	99			1
40	13	77	1	99		1	
41	7	96	0	100			
42	0	76	0	100			
43	-	-	-	-			
44	0	61	2	97	1	1	
45	7	61	2	97	1		1
46	0	48	0	100			
47	-	-	-	-			
48	0	47	2	96		2	
49	7	49	0	100			
50	0	52	0	100			
51	0	79	0	100			
52	0	84	2	98		2	
Total	161	3144	62	98.4	10	32	20
%Tot.	4.8	93.4	1.8		16	52	32

occurred on one of the sites, resulting in a cutslope failure and delivery of sediment to the stream. It was determined that all the rules regarding road design, construction and maintenance were followed, so the site was considered in compliance. On another site, the road maintenance rules were complied with, yet erosion occurred at the outlet of a waterbar. These and the remaining sites are discussed in detail under the sediment sources section.

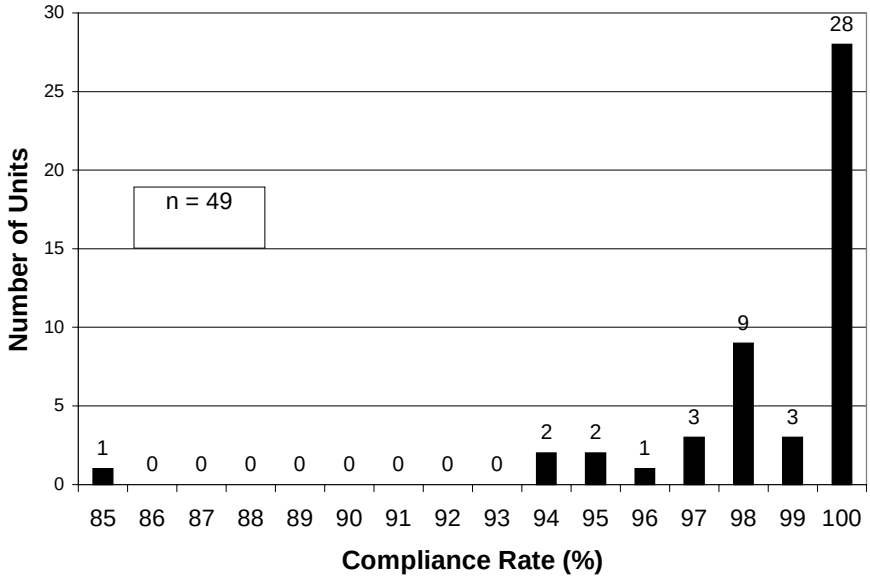


Figure 4. Frequency Distribution of Unit-Level Compliance Rates. All units had a compliance rate of 85% or greater.

The average number of infractions per unit was 1.2, minimum was 0, and the maximum was 16. The site with 16 infractions had 219 practices evaluated under 109 rules resulting in a compliance rate of 85%. In general, the number of infractions does not vary with the number of practices that applied to a site.

It is important to recognize the number of BMPs that a landowner/operator must properly implement in order to put these results in perspective. The number of BMPs that applied to each site varied from 41 to as high as 111, with an average of 65 rules per site. However, a practice is typically repeated within a given unit (i.e., more than one landing, stream crossing, skid trail or RMA). For example, while a maximum of 109 rules applied to site #21, there were actually 219 opportunities to comply with BMPs on that one site. Furthermore, this study is only examining BMPs that are designed to protect waters of the state. There are a host of other rules that must be properly implemented (i.e., wildlife protection, soil productivity and reforestation). There were a total of 3,367 rule applications evaluated using the compliance rating methodology. The percentage of practices exceeding rule requirements was 5%; 93% met the basic rule requirements, and only 2% of the practices were not in compliance with the forest practice rules (Table 5).

Table 5. Percent of Practices That Exceed, Meet or are Not Compliant with the Forest Practice Rules

Compliance Rating	Number of Practices	Percent of Total
Exceeds	161	4.8%
Meets	3,147	93.4%
Noncompliance	57	1.8%

Trends in Ownership

Three ownership classes were examined to investigate relationships between ownership and compliance: industrial, nonindustrial and other. The average unit-level compliance rates were basically the same across all ownership types (Table 6). The average unit-level compliance rates were 99%, 98% and 99% for industrial, nonindustrial and other ownerships respectively. All ownership classes had a maximum compliance rate of 100% compliance. The minimum compliance rates were 98%, 85% and 99% for industrial, nonindustrial and other respectively.

For industrial and nonindustrial lands, the most common RMA prescription was the use of a no-cut buffer (39% and 44% respectively), followed by site-specific plans (18% and 17% respectively) and then standard basal area target (12% and 11% respectively). The riparian conifer restoration and active management occurred only on industrial land. Units with small Type N streams only comprised 24% and 28% respectively of industrial and nonindustrial sample. Lands under other ownership predominantly used the site-specific plan (67%) (Figure 6).

Table 6. Average, Maximum and Minimum Unit-Level Compliance Rates by Ownership Class.

Unit-level Compliance Statistic	Compliance Rate by Ownership		
	Industrial	Nonindustrial	Other
Average	99%	98%	99%
Maximum	100%	100%	100%
Minimum	95%	85%	98%

Rule-level Compliance Summaries

The forest practice rules and regulations are organized into separate divisions and rule numbers (Table 7). Compliance rates were very high (91% – 100%) for each division and averaged 97% overall. The divisions are discussed below and shown in Table 5. Table 8 lists all the rules that were assessed during the 1998 pilot study. What follows is a detailed discussion of each rule division and the noncompliant practices. The discussions summarize both the compliance rating data and the numeric data.

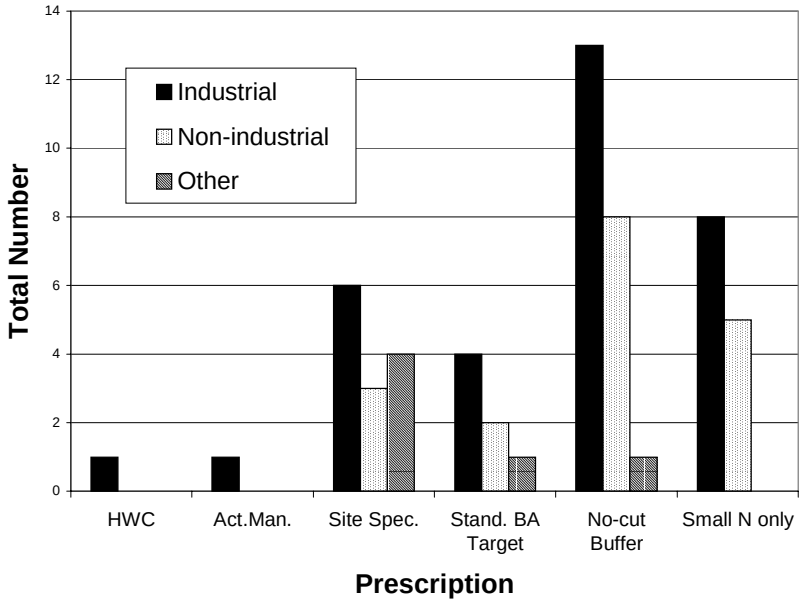


Figure 6. Riparian Prescription and Ownership Class. (RCR = riparian conifer restoration, Act. Man. = active management, Site spec. = site specific plan, Stand. BA Target = standard basal area target, Small N only = there was only a small type N stream on the unit.)

Table 7. Average Compliance Rates for Rule Divisions Monitored Under This Project

Division Number	Division Description	Average Compliance Rate
629-605	Planning Forest Operations	94%
629-610	Reforestation	92%
629-615	Treatment of Slash	99%
629-620	Chemical and Other Petroleum Products	100%
629-625	Road Construction and Maintenance	97%
629-630	Harvesting	98%
629-640	Vegetation Retention Along Streams	95%
629-645	Protection Measures for Significant Wetlands	100%
629-650	Protection Measures for Lakes	No Lakes
629-655	Protection Measures for Other Wetlands, Springs & Seeps	91%

Planning Forest Operations (OAR 629-605)

Compliance with the rules regarding notification to the department about a forest operation (OAR 605-140&150) and under what circumstances a written plan is required (OAR 605-170) was 94%. There were 10 noncompliant practices on 8 sites. Nine of these were administrative, 1 resulted in a resource concern, and 1 resulted in a sediment impact to the stream (< 1 cubic yard of sediment delivered). The specific rule infractions included: 1 failure to notify downstream users, 5 failures to address streams and lakes in the written plan, 1 failure to address significant wetlands in the written plan, and 2 instances where the written plan was not followed (Table 8).

Table 8. Summary of Compliance with Individual Rules. EX = exceeds compliance standards, MT = meet compliance, NC = noncompliance. Type of noncompliance is expressed as Admin. = administrative, Res. Iss. = potential resource issue, and Impact = impact on stream resource. Site numbers with noncompliance are shown under "Type of noncompliance". ER = erosion impact, BB = disturbance of channel bed and banks, WQ = water quality impact, RV = loss of overstory riparian vegetation.

Division 605: Planning Forest Operations (Division Avg. = 94%)			**Number of Practices in Each Compliance Rating**				**Type of Noncompliance** (site # shown under type of noncompliance)		
Division Rule	Sub	Rule Description	EX	MT	NC	% Comp	Admin.	Res.Iss.	Impact
629-605- 140	1	Notification - Downstream holders	0	31	1	97	7		
150	1	Notification	0	32	0	100			
170	1a	Written Plan - Streams/Lakes	0	27	6	82	6, 7, 36, 38	35	21-ER
	1c	Written Plan - Sign. Wetlands	0	30	1	97	20		
	5	Written Plan - Compliance	0	29	2	94	44, 45		
Division 610: Reforestation (Division Avg. = 92%)									
629-610- O40	2	Reforestation/Site Prep - Begin 12 Mos.	3	9	0	100			
	3	Reforestation/Site Prep - End 24 Mos.	3	9	0	100			
O90	1	Reforestation - LUC Prior Approval	0	3	1	75	7		
Division 615: Treatment of Slash (Division Avg. = 99%)									
629-615- 100	2	Landing Slash Disposal	0	47	1	98		18	
200	1	Mech. Site Prep. - WOS Sed./Debris	0	17	0	100			
	2	Mech. Site Prep. - Filtering	0	16	1	94			39-BB
	3	Mech. Site Prep. - RMA Protection	0	17	0	100			
	4	Mech. Site Prep. - WOS Protection	0	17	0	100			
300	2d	Burning - RMA Protection	0	15	0	100			
	2e	Slash - Channel and RMA Accum.	0	15	0	100			
	3	Written Plan - RMA Requirements	0	0	0	-			
Division 620: Chemical and Other Petroleum (Division Avg. = 100%)									
629-620- 100	1	Petroleum Products - Prevent Leaks	0	49	0	100			
	2	Petroleum Products - Protect WOS	0	49	0	100			
400	1	Chemicals - RMA Protection	0	6	0	100			
	2	Chemicals - RMA Protection	0	6	0	100			
	4	Chemicals - No Aerial Apps. W/in 60'	0	6	0	100			
	5	Chemicals - 10-Foot No-Touch	0	6	0	100			
800	3	Notification - Commun. Water Mangr.	0	0	0	-			

Table 8 continued

Division 625: Road Construction and Maintenance (Division Avg. = 97)			Number of Practices in Each Compliance Rating				Type of Noncompliance		
Division Rule	Sub	Rule Description	EX	MT	NC	% Comp	Admin.	Res.Iss.	Impact
629-625- 100	2b	Written Plan - Temp. Xings	0	4	1	80	4		
	2c	Written Plan - RMA Road Construct.	0	3	0	100			
	3	Written Plan - NOW/SWO H.R. Rds.	0	3	0	100			
	4	Written Plan - Stream Xings >15' Fill	0	3	0	100			
	5	Written Plan - Active Management	0	3	0	100			
200	2	Road Location - WOS	0	18	0	100			
	3	Road Location - Stability, RMAs	0	18	0	100			
	4	Stream Crossings - Minimize	0	18	0	100			
310	1	Road Location - Stability	0	18	0	100			
	2	Road Waste Mat. - End Haul	0	18	0	100			
	3	Road Width - Minimize	0	18	0	100			
	5	Road Fill - Stabilization	0	18	0	100			
320	1b	Stream Xings - Minimize Fill Volume	0	11	0	100			
	1B	Stream Xings - Fill >15' in WP	0	11	0	100			
	1c	Stream Xings - Prevent Fill Erosion	0	9	2	82			33-ER, 14-ER
	2a	Road Drainage - 50-year Peak Flow	0	9	2	82		14, 21	
	2b	Stream Xings - Allow for Fish Pass.	0	10	1	91		21	
330	1	Road Drainage - Effective Control	0	17	1	94		21	
	2	Road Constr. - No Stream Diversion	0	18	0	100			
	3	Road Drainage - Effective Filtering	0	16	2	89		21	33-ER
	4	Road Drainage - Springs and Seeps	0	17	1	94		21	
	5	Road Drainage - Avoid H.R. Sites	0	17	1	94		21	
340	-	Waste Area Location - Stability	0	2	0	100			
410	-	Waste Area Drainage - WOS	0	18	0	100			
420	1	Road Drainage - Clear Ditches	0	18	0	100			
	2	Road Drainage - Effective Xdrains	0	18	0	100			
	5	Road Drainage - Remove Berms	0	18	0	100			
430	1	Stream Crossings - Min. Disturbance	0	13	0	100			
	2	Machinery - Channel Disturbance	0	13	0	100			
	3	Stream Crossings - Installation	0	13	0	100			
	4	Road Drainage - WOS Filtering	0	13	0	100			
	5.1	Temp. Xings - Removal	0	9	0	100			
	5.2	Temp. Xings - Sediment Barriers	0	9	5	67			14, 21, 31, 33, 35-ER
440	1	Fill/Sidecast/Waste - Stabilization	0	15	2	88		21, 33	
	3	Landings - No Logs/Slash in Fill	0	18	0	100			
500	1	Rock Pits	0	2	0	100			
	2	Rock Pits	0	2	0	100			
	3	Rock Pits	0	2	0	100			
	4	Rock Pits	0	2	0	100			
	5	Rock Pits	0	2	0	100			
600	2	Road Drainage - Surface Mainten.	0	36	2	95		21	45-ER
	5	Road Oil - Application Req'ments	0	38	0	100			
	7	Road Drainage - Waste Storage	0	38	0	100			
	8	Stream Crossings - Maintenance	0	38	0	100			
650	2	Vacating Roads - Effectively Block	0	6	0	100			

Table 8 continued

Division 630: Harvesting Rules (Division Avg. = 98%)			Number of Practices in Each Compliance Rating				Type of Noncompliance		
Division Rule	Sub	Rule Description	EX	MT	NC	% Comp	Admin.	Res.Iss.	Impact
629-630- 100	2	Yarding - Slopes >35%	1	47	0	100			
	3	Skid Trail Loc. - Min. Sidecast	1	47	0	100			
	4	Skid Trail Loc. - Stable Areas	1	47	0	100			
	6	Yarding - Min. Soil Disturbance	1	47	0	100			
200	1	Landing Size - Minimize	0	48	0	100			
	2	Landing Location - Stability	0	48	0	100			
	3	Landing Location - RMAs	0	48	0	100			
	5	Landing Waste - Stability	0	47	1	98		18	
300	1.1	Landing Drainage - Effective	1	48	0	100			
	1.2	Skid Trail Drainage - Effective	1	48	0	100			
	2	Skid Trail Drainage - Filtering	1	46	2	96			38-ER, 35-ER
	3	Skid Trail Drainage - Installation	1	48	0	100			
	4	Landing Drainage - Installation	1	48	0	100			
400	1	Waste/Slash Location - WOS	0	49	0	100			
	2	Sidecast - Stabilize	0	49	0	100			
	3	Petroleum Products - Related Waste	0	48	1	98		15	
	4	Waste Metal - WOS	0	49	0	100			
500	1	High Risk Areas - Prior Approval	0	11	0	100			
	2	High Risk Areas - WP Requirements	0	11	0	100			
600	1	Felling/Bucking - Min. Disturbance	0	45	3	94		21, 48	14-WQ
	2a	Felling - Fell Away From Streams	0	45	3	94		21, 48	14-WQ
	2cA	Bucking/Yarding - Min. Disturbance	0	48	0	100			
	3a	Slash - Remove From F/D Streams	0	48	0	100			
	3b	Slash - Remove From N Streams	0	48	0	100			
	3c	Slash - Place above High Water	0	48	0	100			
700	1	Yarding - Retain Veg./Min. Disturb.	0	23	0	100			
	2	Yarding - Min. Across Streams	0	23	0	100			
	3	Yarding Corridors - Written Plan	0	23	0	100			
	4	Yarding Corridors - Keep off Grnd.	0	23	0	100			
	5	Yarding Corridors - N/Min. Disturb.	0	23	0	100			
800	1	Ground Equipment - Min. Disturb.	0	36	0	100			
	2	Ground Equipment - Not in Streams	0	36	0	100			
	3	Ground Equipment - Min. Crossings	0	36	0	100			
	4a	Temp. Xing Design - Min. Sed.	0	9	0	100			
	4b	Temp. Xing Location	0	10	0	100			
	4c	Temp. Xing Fill - Approval for fill >15'	0	10	0	100			
	4d	Temp. Xing Design - Fish Passage	0	10	0	100			
	4e.1	Temp. Xing Fill - Removal Timing	0	6	3	67			14, 21, 33-ER
	4e.2	Temp. Xing Fill - Removal Location	0	9	1	89			21-ER
	6	Sediment Barriers - Effective	0	9	0	100			
	7	Ground Equipment Loc. - RMA	0	33	0	100			
	8	Skid Trail Location - <35' of Streams	0	18	0	100			
	9	Skid Trail Location - High Water	0	17	1	94			38-ER

Table 8 continued

Division 640: Vegetation Retention (Division Avg. = 95%)			Number of Practices in Each Compliance Rating				Type of Noncompliance		
Division Rule	Sub	Rule Description	EX	MT	NC	% Comp	Admin.	Res.Iss.	Impact
629-640- 100	2a	F RMA - 10' HWM Veg. Retention	9	23	1	97		52	
	2b	F RMA - 20' HWM Tree Retention	9	23	1	97		21	
	5	F RMA - # Live Trees/1000', Sizes	3	1	1	80		30	
	6a	F RMA - > Stn. Trg. - BA Req'mts	5	0	1	83		30	
	6b	F RMA - No RMA Harvest	9	5	7	67		2, 31, 33,	6-RV
	6cB	F RMA - < 1/2 Stn. Trg. - Prescript.	0	0	0	-			
	12	F RMA - Islands	0	0	0	-			
110	3	Active Man. - Prior Approval	1	2	0	100			
	11	Active Man. - Live Tree Req'mts	1	2	0	100			
	12	Active Man. - E. OR SF BA Req'mts	1	2	0	100			
200	2a	D/N RMA - 10' HWM Veg. Retention	10	28	0	100			
	2b	D/N RMA - 20' HWM Tree Retention	10	28	0	100			
	5	D/N RMA - # Live Trees/1000', Sizes	10	28	0	100			
	6	SN RMA - 10' HWM Veg. Retention	10	28	0	100			
	7a	D/N RMA - > Stn. Trg. - BA Req'mts	10	28	0	100			
	7b	D/N RMA - No RMA Harvest	10	28	0	100			
	7c	D/N RMA - < 1/2 Stn. Trg. - Prestcrpt.	10	28	0	100			
	13	D/N RMA - Islands	10	28	0	100			
300	3b	Alt. Prsc. #1 - Streamside Tree Retntn.	0	2	0	100			
	3c	Alt. Prsc. #1 - F - Meet Act. Man. Trg.	0	2	0	100			
	3d	Alt. Prsc. #1 - D/N - Meet Act. Man. Trg.	0	2	0	100			
	4a	Alt. Prsc. #2 - Gen. Prsc. Segments	0	2	0	100			
	4b	Alt. Prsc. #2 - Ret./Conv. Blocks	0	2	0	100			
	4c.1	Alt. Prsc. #2 - Max. 1/2 Length Conv.	0	2	0	100			
	4c.2	Alt. Prsc. #2 - <500' Conv. Blocks	0	1	1	50		52	
	4c.3	Alt. Prsc. #2 - 200' Ret. B/n Conv. Blks.	0	2	0	100			
	4dA	Alt. Prsc. #2 - Conv. - Ret. All W/in 20'	0	2	0	100			
	4eA	Alt. Prsc. #2 - Ret. - L Con/HW Rq'mts	0	2	0	100			
	4eB	Alt. Prsc. #2 - Ret. - M Con/HW Rq'mts	0	2	0	100			
	4eC	Alt. Prsc. #2 - Ret. - S Con/HW Rq'mts	0	2	0	100			
400	3	Site Specific Plans - Prior Approval	0	0	0	-			

Division 645: Protection Measures Significant Wetlands (Division Avg. = 100%)									
629-645- O10	1	Wetlands - Tree Retention	0	1	0	100			
	2	Wetlands - Tree Retention	0	1	0	100			
O30	1	Wetlands - Soil Disturbance	0	1	0	100			
	2a	Written Plan - Wetland Filling	0	0	0	-			
	2b	Written Plan - Wetland Machinery	0	0	0	-			
	2c	Written Plan - Wetland Road Construct.	0	0	0	-			
	3	Wetlands - No Draining	0	1	0	100			
O40	2	Wetlands - Understory Veg. Ret.	0	1	0	100			
	3	Written Plan - Wetlands Req'ments	0	0	0	-			

Division 645: Protection Measures Other Wetlands (Division Avg. = 91%)									
629-655- O00	2a	Other Wetlands - Soil/Water Quality	0	11	1	92			15-BB
	3	Other Wetlands - Soil/Water Quality	0	10	1	91		21	

Treatment of Slash (OAR 629- 615)

Compliance with rules that establish standards for treatment of slash was 99%. Specifically, the rules address disposal of slash around landings to prevent entry into streams (615-100 [2]), mechanical site preparation near waters of the state (615-200 [1, 2 and 3]), and protection of RMAs during prescribed burning (615-300 [2 and 3]). There were 2 noncompliant practices on 2 units. One resulted in a resource concern, and one resulted in a sediment delivery impact to the stream (1-10 cubic yards). Specific rule infractions include: 1 excessive slash around the landing, and 1 mechanical site preparation filtering practices (Table 8).

Reforestation Rules (OAR 629-610)

Compliance with rules that establish standards for the time that is allowed for reforestation (610-040 [2 and 3]), and reforestation exemptions for land use changes (610-090 [1]) was 92%. There were only 12 sites where these rules applied. One site did not comply with the reforestation exemption requirements, but was undergoing a land-use change. This was an administrative noncompliance, and it did not result in an impact or concern for stream resources (Table 8).

Chemical and other Petroleum Product Rules (OAR 629-620)

Compliance was 100% with rules that describe prevention, controlling and reporting leaks and spills (620-100 [1 and 2], protection of the waters of the state when applying chemicals (620-400 [1, 2, 4 and 5]), and notification of community water systems managers when applying chemicals (620-800 [3]) (Table 8).

Road Construction and Maintenance Rules (OAR 629-625)

Compliance averaged 97% with rules that establish standards for locating, designing, constructing, maintaining and vacating forest roads, rock pits and quarries in such a manner as to provide the maximum practical protection of water quality and fish habitat. The specific rules monitored under this division describe BMPs regarding: the prior approval process (OAR 625-100); road location (OAR 625-200); road prism (OAR 625-310); stream crossing structures; road drainage (OAR 625-330 and 420); waste disposal areas (OAR 625-340); and disposal of waste materials; stream protection from roads (OAR 625-430); stabilization of exposed material (OAR 625-440); rock pits and quarries (OAR 625-500); road maintenance (OAR 625-600); and vacating roads (OAR 625-650). What follows is a more detailed discussion of individual rule infractions within this division (Table 8).

There were 20 noncompliant practices on 11 sites, the most infractions out of any rule division. One infraction was administrative, 10 resulted in a resource concern, and 9 resulted in sediment delivery impact to the stream (1-10 cubic yards). The specific rule infractions included: no written plan for a temporary crossing, inadequate fill erosion control at stream crossings, inadequate design for juvenile fish passage, inadequate design for 50-year peak flow capacity, ineffective road drainage control, ineffective filtering, inadequate protection of springs and seeps, avoiding high risk sites, effective sediment barriers on temporary crossings, and road surface maintenance.

Road design and construction play critical roles in terms of potential sediment delivery to stream channels. Although road practices have improved over the past 10-15 years, existing roads that were not constructed to current design standards can pose an increased risk to stream resources. These “existing” roads and new roads were surveyed using numeric data collection protocols to

help interpret compliance rates. New roads are those that were constructed specifically for the operation being assessed. The road data are summarized in Appendix B. Twenty-six of the 52 sites surveyed had existing roads (constructed prior to 1983 road regulation revisions), and 17 of the 52 sites had newly constructed roads (constructed for the operations being assessed). All roads must be in compliance with road maintenance rules, while only newly constructed roads must meet the more recent road regulations concerning location, design and construction.

Road Location (629-625-200). All roads were considered in compliance with road location rules. Road location characteristics are shown in Table 9 for newly constructed and existing roads. The location descriptors are in order from left to right of highest potential impact on stream and channel resources. Roads in the "other" category are the least likely to impact stream resources than any other category (Table 9).

There were relatively more newly constructed road miles (12.5% increase in road length) in desirable locations ("other" category) than were found with existing roads. There were relatively fewer newly constructed road miles on high-risk sites, within RMAs, and on steep slopes (6.1%, 3.9%, and 2.9% decrease in road length, respectively) than were found with existing roads.

Table 9. Percent of Road Length in Each Location Category. Location is in order of decreasing potential to impact stream and channel resources.

				Average Percent of Total Road Length Located in Each Category Highest To Impact Streams → Lowest To Impact Streams						
	Number of Sites	Total length (ft)	Percent of total length	High Risk Site	High Water	RMA	Slopes >65%	Flood -plain	Wetland	Other
New Roads	17	62,700	30	0.6%	0%	0.03%	3.8%	0%	0%	95.2%
Existing Roads	26	144,690	70	6.7%	0%	3.9%	6.7%	0%	0%	82.7%
Difference between new and existing roads				6.1% Decrease	None	3.9% Decrease	2.9% Decrease	None	None	12.5% Increase

Road Prism (OAR 629-625-310). All roads were considered in compliance with road construction rules that address the road prism. Among other things, current road construction practices require operators to end-haul excess material from steep slopes or high-risk sites to prevent road-related landslides, minimize road widths, and design cut and fill slopes to minimize risk of landslides (Table 8).

Stabilization (OAR 625-440). In addition, operators are required to stabilize exposed material and fill considered potentially unstable. There was a 95% compliance rate with fill stabilization rule. There were two noncompliant practices where unstable fill resulting in sediment impacts to streams (Table 8).

These rules were assessed numerically by measuring the length of road with greater than 2 feet of sidecast on slopes greater than 65% (unstable sidecast), and the length of road with unstable fill and unstable cutslopes. Results suggest the average percent in each of these categories is low for

both newly constructed and existing roads (Table 10). The differences between new and existing roads with unstable sidecast, fill and cutslopes were negligible (0.7% or less).

Current road construction rules also require operators to minimize road width to no wider than necessary to accommodate use (OAR 625-310 [3]). All sites were considered in compliance with this rule. Road width was assessed numerically by estimating the average road width of newly constructed roads only. The vast majority of road miles (95.6%) had road widths less then 20 feet. The new road segments with an average width greater than 20 feet occurred on one site.

Table 10. Percent of Newly Constructed and Existing Road in Each Category

	Number of Sites	Total length (ft)	Average percent of total road length in each category		
			Unstable Sidecast	Unstable Fill	Unstable Cutslope
Newly Constructed	17	62,700	0.3%	0.5%	0%
Existing Roads	26	144,690	0%	0.1%	0.7%
Difference between new and existing roads			0.3% increase	0.4% increase	0.7% decrease

Road Drainage and Maintenance. Compliance rates ranged from 82 to 95% for road drainage rules (625-320, 330 and 600). There were nine infractions including inadequate protection of springs and seeps, not avoiding a high risk site, poor surface maintenance, poor drainage control, erosion of fill around stream crossings, and poor filtering prior to road drainage entering a stream. Four resulted in sediment impacts to the stream and five resulted in resource concerns (Table 8). Based on numeric data, 92.4% of road miles had functional drainage (ditched, outsloped, or waterbars), 7.6% of road length had eroding ditches, nonfunctional waterbars or rutted road.

Stream Crossings (OAR 629-625-320). One change that has been made to the numeric data collection protocol is to indicate when the crossing was installed. Since these data were not collected during the pilot study, compliance with some of the stream crossing rules cannot be assessed with the numeric data. There were a total of 45 stream crossings. For the majority of the crossings, 34 out of 45 were on small Type N streams. Six were on small F, 3 on medium F and 2 on large F streams (Table 11). The entire stream crossing data set is summarized in Appendix C.

One mechanism of minimizing sediment delivery to streams is by filtering the road drainage prior to entry to a stream channel. Compliance was rated as 89% with this rule (OAR 625-330-[3]) based on the rating data. Based on the numeric data, road drainage was effectively filtered on the majority of crossings (93%). For purposes of this study, it is considered noncompliant filtering if water is routed through a ditch for more than 500 feet (unfiltered ditch length) unless some sort of filtering practice has been implemented. Figure 7 shows the frequency distribution of unfiltered ditch length measured on 46 stream crossings.

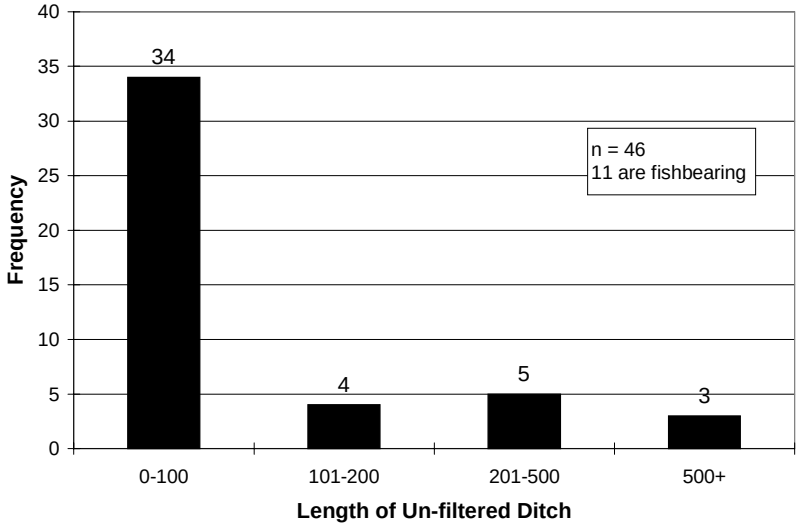


Figure 7. Length of Unfiltered Ditch Draining to a Stream Crossing. Longer distances generally have a greater likelihood of sediment being delivered to the stream.

Prevent Fill Erosion Around Stream Crossings. OAR 629-625-320 [3] requires stabilization of fill as needed to prevent erosion. The compliance assessment data indicate 82% compliance with stabilization of fill. There were two noncompliant practices that caused sediment impacts to streams. The numeric data show that 79% of the crossings implemented fill stabilization practices, 46% used vegetation, and 33% used rip-rap to stabilize the stream crossing fill (Table 11).

Fill Depths. Current regulations require that fill depths be less than 15 feet on stream crossings unless addressed and approved in a written plan (OAR 629-625-320 [1]). Out of 41 applicable crossings, 8 had fill depths greater than 15 feet. The assessment data indicate 100% compliance with fill and volume rules. This apparent discrepancy is most likely a function of not recording if the crossing was new or old in the numeric data. Older crossings would not have had to meet the 15 foot requirement. This has been incorporated into the 1999/2000 data collection protocol. Current efforts are underway by many industrial landowners to rebuild roads and crossings. This reconstruction effort should be monitored to determine effectiveness in reducing the percent of crossings with deep fill (19%).

Maintenance of Stream Crossings. Forest practice rules require that stream crossings be maintained to provide fish passage (OAR 629-625-600 [8]). Compliance with this rule was 100% based on the rating data. The numeric surveys indicated that 91% were fully open, 7% were partially obstructed, and 2% (one crossing) were fully obstructed. The obstructed crossing was not observed using the rating system because the observer did not see the crossing. Consequently overall compliance was rated as 100%. If it had been, it would have been rated as noncompliant.

Table 11. Characteristics of the 45 Stream Crossings

Crossing Characteristics (sample size)	Number of Crossings	Percent of Total
Stream Class (n=45)		
Small N	34	76%
Small F	6	13%
Medium F	3	7%
Large F	2	4%
Unfiltered Ditch Length (n=45)		
0-100 (ft)	34	76%
100-200 (ft)	4	9%
200-500 (ft)	4	9%
Over 500 (ft)	3	7%
Fill Depth Greater than 15' (n=41)	8	19%
Opening (n=43)		
Fully open	39	91%
Partially obstructed	3	7%
Obstructed	1	2%
Fill Stabilization (n=39)		
Vegetation	18	46%
Rip-rap	13	33%
None	8	21%
Sediment Delivery (n=45)	8	18%

Fish-passage and 50-year Stream Flow. ODF implemented a supplement pilot project that focused entirely on fish-bearing stream crossings. Refer to that report (Dent and Allen, 1999) for results concerning juvenile fish passage and 50-year stream flow capacity. Based on these data, compliance was 82% for the 50-year flow capacity, and 91% for passing juvenile fish (OAR 629-625-320 (1 and 2)). There were 2 sites without sufficient capacity to pass a 50-year design flow (resource concern) and one that would not pass juvenile fish (resource concern).

Cross Drain Culverts (data summarized in Appendix G). Compliance with rules regarding maintenance of cross drains (629-625-420) was 100%. There were 112 culverts that did not cross streams that were surveyed using the numeric data collection protocol. One hundred and five were fully open, six were partially obstructed, and one was completely obstructed. Again the obstructed culvert was not observed using the rating system because the process for assessing cross-drains is more systematic than that of the rating system. If it had been it would have been considered noncompliant. One culvert had sediment deposition at the outlet. There was no sediment delivery to stream channels associated with these non-stream crossing culverts.

Temporary Stream Crossings. Some of the lowest compliance rates for the entire study were associated with temporary crossing sub-rules 629-625-430 [5]. There were 14 temporary crossings. Two of these were fords, therefore temporary crossing rules that establish standards for removal of fill were not applicable. Six of the temporary crossings were on Type F streams, and one of these was not addressed in the written plan (OAR 629-625-100). While the sample size is low for temporary crossings, results suggest that crossings are not removed in a timely manner

(Table 12). Results also indicate that sediment barriers are not functional or are not being installed.

Compliance was 67% for removal timing (OAR 629-625-430 [5]) and 89% for removal location (OAR 629-630-800 [4e]). Due to the small sample size there is a discrepancy between the compliance rate for this rule and the numeric summaries. When the crossings are assessed individually, 6 of the 12 applicable temporary crossings were completely removed, five were not removed at all, and one was partially removed. Out of the six crossings that were removed, one had fill stored in an unstable location.

Compliance was 67% for sediment barrier rules (OAR 629-625-430 [5]). Due to differences in sample size there is a discrepancy between the compliance rate for this rule and the numeric summaries (see calculating compliance section). Based on the numeric summaries, sediment barriers were functional on 4 out of 12 crossings (33% compliance). When the crossings are assessed individually (versus at a unit level), 3 crossings were not functional and 5 crossings did not have sediment barriers installed. Six of those crossings resulted in sediment delivery to the stream.

Table 12. Temporary Crossing Removal and Sediment Control. (Written plan = if the crossing was identified in the written plan, SN = small Type N, SF = small Type F; Rmvd. = removed; Func. = functional; and Sed. Del. = sediment was delivered to the stream if "Y" and no sediment was delivered if "N".

Site #	Writ-ten Plan	Stream Type	Fill Removal		Fill Storage Location		Sediment Barriers			Sed Del
		SN	Not Rmvd	Partly Rmvd	Stable	Unstable	Func	Non-Func	Not Installed	
4	N	SF	-	-	-	-	-	-	-	N
11	Y	SF	X				X			N
14	Y*	SN	X						X	Y
14	Y	SF			X		X			N
21	Y	SF		X		X		X		Y
21	Y	SF			X			X		Y
26	N*	SN	X						X	N
31	N*	SN			X				X	Y
33	N*	SN			X			X		Y
33	N*	SN	X				X			N
35	N*	SN			X				X	Y
38	Y	SF	-	-	-	-	-	-	-	N
38	N*	SN			X		X			N
47	N*	SN	X						X	N
Total: 14 Crossings, 12 assessed for removal and sediment control			5	1	6	1	4	3	5	Y=6

* Not mandatory on Type N streams.

- Temporary crossing was a ford so fill and removal rules do not apply.

Harvesting Rules (OAR 629-630)

Compliance for the rules that are described and monitored in this division averaged 98%. This division establishes harvest practice standards that will minimize soil and debris from entering waters of the state and protect wildlife and fish habitat. The rules monitored under this division include skidding and yarding practices (630-100), landing design and construction (630-100), drainage systems for landings, skid trails and fire trails (630-300), treatment of waste materials (630-400), harvesting on high risk sites in Western Oregon (630-500), felling and removal of slash (630-600), and cable and ground-based yarding near waters of the state (630-700 and 800). What follows is a more detailed discussion of individual rules within this division.

There were 15 noncompliant practices on 8 units. The noncompliant practices resulted in a total of 6 resource concerns and 9 impacts on streams. Specific rule infractions included: landing waste stability, skid trail drainage, disposal of petroleum products, minimizing channel disturbance, felling away from small Type N streams, removal timing and location from temporary crossings, and skid trail location.

Landings (Data summarized in Appendix D). All landings were considered in compliance with OAR 630-300 [1], which requires that operators minimize landing size to that necessary for safe operation. A frequency distribution of landing areas is displayed in Figure 8. There were two landings considered to be outside the range of a desired landing area. They were 21,000 and 25,000 ft^2. They were considered in compliance because of the particular needs of those operations and there were no adverse effects of the landings on stream resources just by virtue of size.

Location and Drainage. Compliance with landing location and drainage rules (OAR 629-630-200-2 and 3) was 100%. There were 109 landings surveyed using the numeric data collection protocol. One hundred and three landings were ideally located. Four landings were located above high-risk sites and 2 were located in riparian management areas. These landings could not have been located anywhere else due to the constraints of the harvest unit and operational needs. While these particular landings were considered in compliance, the forest practice rules prohibit locating landings on unstable locations but do not prohibit locating landings above high risk sites. Drainage was considered functional on all landings.

Stability and Waste Material. Compliance with landing waste stability rules (OAR 629-630-200) was 98%. One landing had fill on slopes greater than 65% and was considered a resource concern. Six landings had debris (soil and organic matter) stored on slopes greater than 65%. None of the landings had sediment, debris or waste stored within the high water mark, and none resulted in sediment delivery to stream channels.

Skid Trails. Compliance was rated as 94% with current skidding and yarding rules that establish standards for skid trail location. Operators are required to avoid ground-based yarding on slopes greater than 35% as well as high risk sites, and to minimize the risk of sediment entering the stream (OAR 629-630-100 [1, 2, 4, and 5]). Operators can only locate skid trails in RMAs under certain conditions and are prohibited from locating skid trails within 35 feet of a type F or D stream or within the high water mark, except for stream crossings (OAR 629-630-800 [7,8 and 9]). There were 18 sites with skid trials, one of which located skid trails within a high water mark that resulted in sediment delivery to the stream. Numeric Data are summarized in Appendix E.

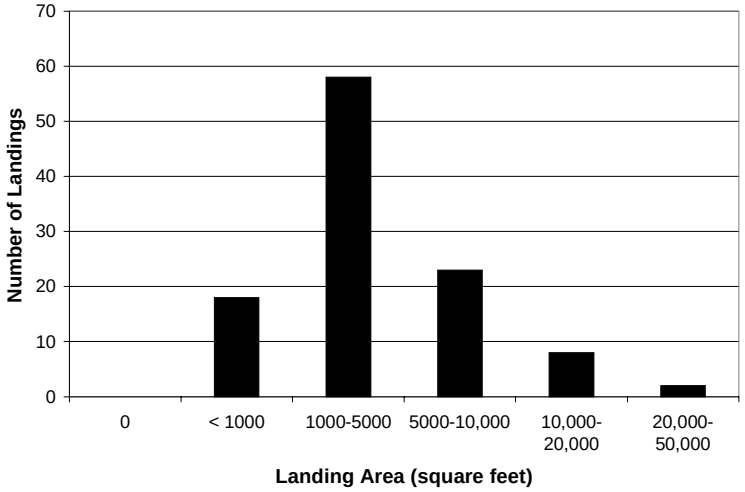


Figure 8. Frequency Distributions of Landing Areas. Sample size equals 109 landings surveyed using the numeric assessment protocol.

There were 98,100 feet (18.6 miles) of skid trail surveyed using the numeric data protocol on 18 sites (Table 13). Results indicate 92% of the total length of skid trails were on slopes of less than 35% and not in areas associated with streams. There were no skid trails within high risk sites, 0.2% within 35 feet of a Type F stream, 0.2% within the high water mark, and 5.3% on slopes greater than 35%, and 2.5% located within an RMA.

Drainage. Compliance for the skid trail drainage rule that requires adequate filtering (OAR 629-630-300) was 96%. There were two noncompliant practices that resulted in sediment delivery to streams. The numeric data indicate that 93% of skid trail miles had functional drainage (Table 14). Nonfunctional drainage was due to a bypassed drainage system (3.5%) or a drainage system not installed (3.5%). Sediment delivery is discussed in the sediment sources section of this report.

Table 13. Skid Trail Location

Location	Total Length (ft)	Percent of Total
High Risk Site	0	0.0%
Within 35 feet of F or D stream	200	0.2%
High Water Mark	200	0.2%
Slopes >35%	5200	5.3%
Within RMA	2500	2.5%
Other	90,000	91.7%

Soil Disturbance within the RMA. Compliance with rules designed to minimize soil disturbance within RMAs was 100 percent. There was no soil disturbance in 99.9% of total surveyed RMA. There was no sediment delivery due to harvesting activity found within RMAs, and no harvesting slash was found in Type F streams or medium and large Type N streams. Summaries of the entire RMA data set are provided in Appendix F.

Table 14. Skid Trail Drainage

Drainage	Total Length (ft)	Percent of Total
Functional	91200	93.0%
Excess Spacing	0	0.0%
Bypassed	3500	3.6%
Not Installed	3400	3.5%

Felling and Bucking. There were three noncompliant practices in which trees were not felled away from and disturbance was not minimized on small Type N streams. Compliance was 94% for OAR 629-630-600 [1 and 2a]. However, many sites were considered in compliance that, following an internal discussion with Forest Practices staff and some landowners, were determined to be out of compliance. Observations in 1998 indicated that the majority of small Type N streams had excessive slash loading due to felling trees into or across the stream. Excessive slash is described as being greater than 2 feet deep, covering greater than 50% of the channel such that it is difficult to walk up the channel, and stream function is impaired. During the 1998 field season, sites that met this description were erroneously determined to be in compliance due to a misunderstanding of the ODF rule guidance manual. Therefore, the authors suspect the 1998 compliance rate to overestimate the rate of compliance with this rule when small Type N streams are considered. In the case of Type F, and medium and large Type N streams, the compliance rate was correctly assessed as 100% with felling rules (Appendix F: Riparian Management Area Data Summaries). The 1999/2000 project has been adjusted to assess small Type N streams in accordance with the guidance.

Yarding Corridors through RMAs. Compliance was 100% with rules designed to minimize the number of corridors, the size of corridors and to maximize the spacing between corridors. There were 3 sites with written plans indicating the use of yarding corridors through RMAs. In each case no corridors were evident, indicating the operation caused no significant disturbance to the riparian management area.

Water Protection Rules *(OAR 629-640)*

Vegetation Retention Along Streams. The compliance rate for the rules described and monitored under this division averaged 95%. The purpose of streamside vegetative requirements is to produce the desired future conditions for the wide range of stand types, channel conditions and disturbance regimes that exist throughout forestlands in Oregon. The desired conditions vary depending on the site conditions, but in general the goal is to grow and retain stands that mimic mature forest conditions on fish-bearing streams. The goal along non-fish bearing streams is to support the functions and processes that are important to downstream fish and domestic uses and to protect water quality. What follows is a more detailed discussion of selected rules within this division.

Twelve noncompliant practices were associated with 10 units. Eleven of the noncompliant practices resulted in a resource concern and one resulted in an impact to the stream. Specific rule infractions included: harvesting within 10 feet of the high water mark (1 resource concern), harvesting within 20 feet of the high water mark (1 resource concern), maintenance of trees per

1000 feet (1 resource concern); maintaining the basal area target (1 resource concern); not harvesting in the RMA (6 resource concerns and one impact to stream); and conversion blocks less than 500 feet in length (1 resource concern). Numeric riparian data are summarized in Appendix F.

Harvesting in the RMA. There are three zones to consider in RMAs: the 10 foot no disturbance buffer; the 20 foot no-cut buffer; and the entire RMA (50, 70 or 100 feet depending on stream size). Ground disturbance and understory or overstory vegetative disturbance is prohibited within the first 10 feet from the average annual high water mark. Overstory harvest is prohibited within the first 20 feet. The entire RMA can be managed under a number of different prescription (see methods section). Seven of the twelve infractions were instances in which the written plan indicated that the operator would not enter the RMA at all, yet trees were harvested within the RMA. Compliance rates were 97% for the 10 foot and 20 foot zones and 67% for the entire RMA. Of the 67% in compliance, 43 percent of the sites exceeded compliance with the no-cut RMA width requirements.

The numeric results can be considered in terms of the total riparian management area surveyed. This provides a quantitative measure of the level of impact. The area surveyed is equal to the length of the RMA multiplied by the width (varies by stream type). There were a total of 17.2 miles of streams monitored with RMAs for a total area of 82 acres. Trees were felled away from streams for 96.1% of RMA length. Both understory vegetation and soil remained undisturbed for 99.9% of the 10 foot "no-touch" area. Trees were retained in 99.9% of the 20 foot no-cut area. Ninety-nine percent of the area managed with a no-cut buffer was not harvested. This no-cut prescription comprised 55% of the riparian sample area. So while the compliance rate was low (67%) for the number of operations that complied with no-cut buffer rules (OAR 629-640-100), the total area affected by noncompliance comprised only 1% of the riparian sample area.

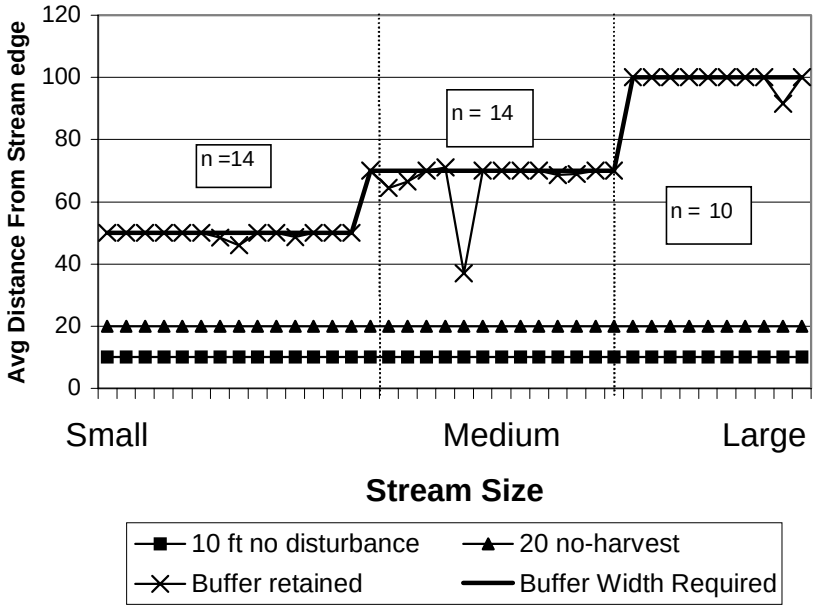


Figure 9. RMA No-cut Buffer Width Retention on Fish-Bearing Streams. Sample size equals 38.

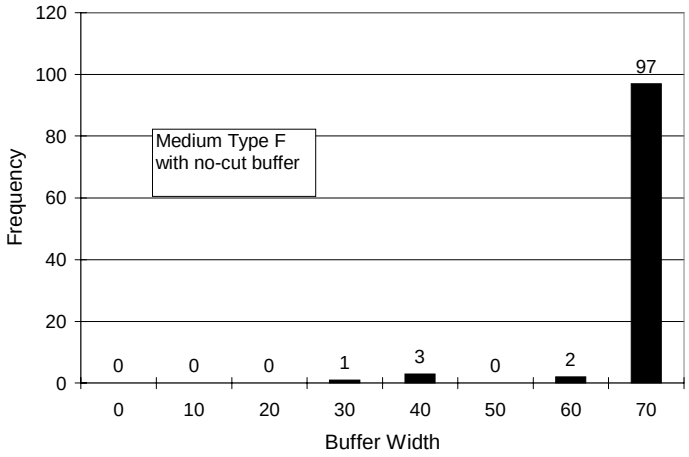
Figure 9 depicts RMA vegetation retention rules on 38 Type F RMAs that were managed with no-cut buffer prescriptions. Vegetation retention (10 foot, 20 foot and RMA width) was measured every 200 feet for the entire length of the RMA. The data in Figure 9 represent an average of those 200 foot transects for each RMA. (Transect data can be viewed in Figure 10). Figure 9 shows that the 10 foot and 20 foot vegetation retention rules were complied with 100% of the time. There were 9 out of 38 RMAs, in which the average no-cut buffer widths were less than required. In 8 of these RMAs, noncompliance resulted in less than a 10% loss in riparian area (length X width). The worst case scenario was on a medium stream where the average buffer width was less than 40 feet wide (rules require 70 feet). This resulted in a loss of 47% of the riparian area and the noncompliance was rated as impacting stream resources. Basal area was not collected on sites that were managed with a no-cut buffers, so this report cannot speak to potential impacts as they relate to basal area retention. For this reason the remaining noncompliant RMAs are considered to represent a resource concern.

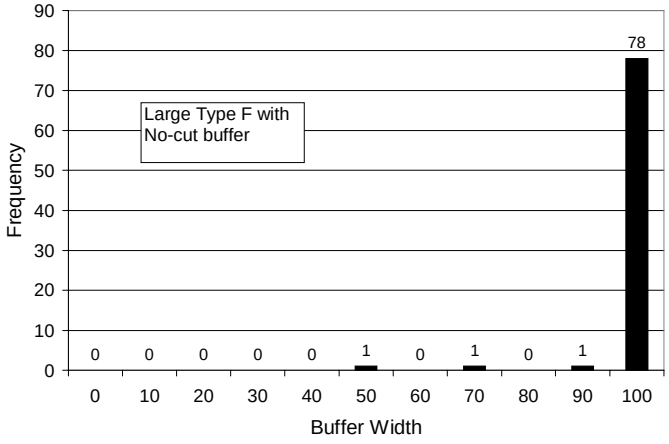
Figure 10 shows frequency distributions of buffer width transects on small, medium and large streams. There were 305 transects measured on 63 RMAs. The bulk of the transects (94.4%) meet rule requirements for no-cut buffers. Not shown are the 10 foot and 20 foot distances. There was one instance where the 10 foot line was not maintained (on a riparian conifer restoration), and one instance where the 20 foot line was not maintained (on a site managed for basal area).

Basal Area Retention. Compliance with basal area retention rules (OAR 629-640-100 6a) was 83%. If there is enough coniferous basal area within the RMA, landowners can manage for basal area (see methods section). This means they can harvest within the RMA but still must retain the 10 foot and 20 foot zones described above as well as meet a basal area standard target and retain a minimum of 30 and 40 trees per 1,000 feet of stream on medium and large streams, respectively. Basal area was collected on all the sites (n= 10) that were managed to meet a basal area target. These data are displayed in Figure 11. The solid line represents 100% compliance with the basal area targets. Points below the line do not meet requirements, and points above the line exceed the requirements. One site did not meet requirements for either live or total basal area. The remainder of the sites all exceeded compliance.

Trees per 1,000 feet. When managing for basal area, the operation must also meet a trees per 1,000 foot requirement if it is a medium or large stream. Compliance was 80% with this rule (OAR 629-640-100 [5]). Five of the 10 basal area RMAs also qualified for rules which require retention of 30 and 40 trees (medium and large streams, respectively) per 1,000 feet (Figure 12). In Figure 12, the solid line represents 100% compliance with these rules. Four out of five sites exceeded compliance and one was noncompliant.

Riparian Management Areas and Protection Measures for Significant Wetlands (OAR 629-645).
There was one significant wetland which had 100% compliance with all the rules monitored. This division describes rules and regulations designed to protect the values and functions of significant wetlands. The rules monitored under this include tree retention (645-010), soil and hydrologic function protection (645-030), and understory vegetation retention (645-040).





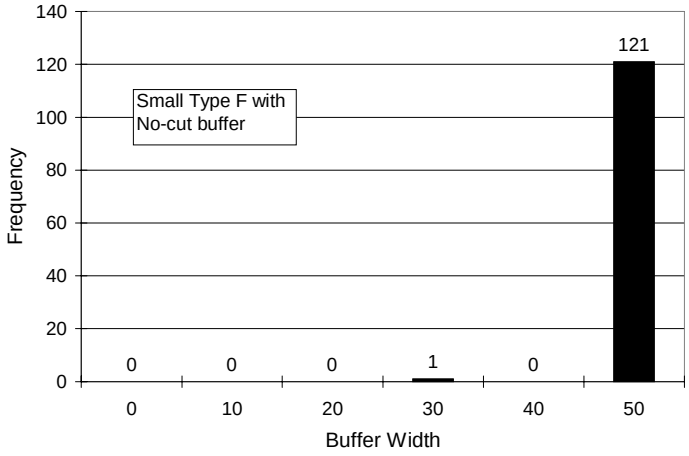


Figure 10. Frequency Distributions of Buffer Widths Data. Width was measured every 200 feet on 38 RMAs on large, medium and small fish-bearing streams managed with a no-cut buffer.

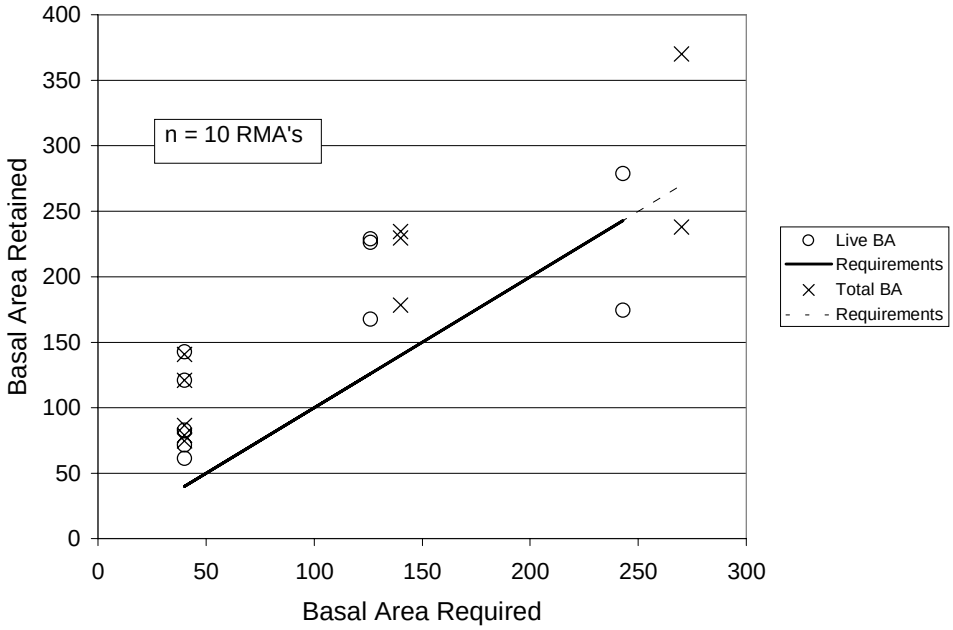


Figure 11. Conifer Basal Area Retained. Live and total basal area per 1000 feet of stream versus required basal area target. Sample size equals 10.

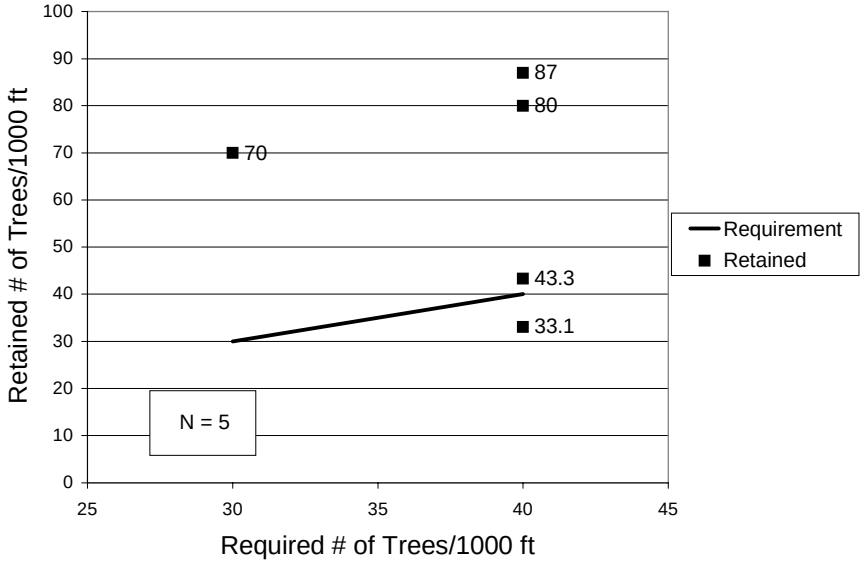


Figure 12. Number of Trees Retained. Number of trees retained per 1,000 feet versus the number of trees required per 1000 feet. Diameters vary by stream size. Sample size equals 5.

Riparian Management Areas and Protection Measures for Lakes (OAR 629-650).
There were no lakes associated with any of the BMP pilot sites. The rules described in this section are intended to protect the values and functions of lakes. Rules that will be monitored under this division include live tree retention (650-010), soil and hydrologic function (650-020), and understory vegetation retention (650-030).

Riparian Management Areas and Protection Measures for "Other Wetlands", Springs and Seeps (OAR 629-655).
Compliance with the rules monitored under this division averaged 91%. The sub-rules monitored under this division include protection of soil and understory vegetation around other wetlands, springs and seeps (OAR 629-655-000 [2a and 3]). There were 11 sites with "other wetlands", springs or seeps. There were 2 noncompliant practices associated with 2 units. The specific rule infractions included: protection of soil and understory vegetation (1 sediment impact to stream and 1 resource concern).

Water Protection Rules for Operations Near Waters of the State (OAR 629-660).
Compliance with rules described and monitored in this division was 100%. The rules define standards for channel protection (660-040) and removal or filling of soil or rock from streams.

Sediment Sources
Sediment sources were categorized as either "sediment eroded" or "sediment stored". Sediment eroded indicates the sediment has been transported off site and an erosional feature (e.g. rill, gully concave area left after a landslide) remains that can be measured. Sediment stored refers to a volume of material still present that has entered the channel, is within the high water mark, or is likely to enter the channel (e.g. fill from a temporary crossing, sidecast that has sloughed into the stream). Twenty-two sediment sources were identified using the numeric assessment on 11 different sites (Table 15). Three of the 22 sediment sources delivered sediment to Type F streams. Stream crossings and temporary crossings accounted for 63% (14 of the 22) of the sediment sources. There were an additional five associated with road construction and maintenance (23%), two with skid trails (9%), and one with a waste area site (5%). There were no sediment deliveries to stream channels as a result of felling and bucking, site preparation, cable yarding, landings, or cross-drain culverts.

Seventeen out of the 22 sources were considered to be a result of surface drainage issues versus shallow failures or deep-seated landslides. The estimated volume of sediment delivered to streams was incidental (< 1 cubic yard) for six sources, moderate (1-10 cubic yards) for 10 sources, and significant (10 – 100 cubic yards) for 6 sources. There were three sites with sediment stored within the high water mark. One stored a moderate (1-10 cubic yards) amount of sediment and 2 stored great (> 100 cubic yards) amounts of sediment.

Six of the 22 sediment sources resulted from practices that were not identified as noncompliant. There were three main reasons for this: (1) the practices were considered in compliance (2 sources); (2) the sediment was not a result of a forest practice activity (1 source); or (3) the practice or feature was not identified with the assessment protocol (3 sources). Practices considered in compliance even with sediment delivery included a gully below a waterbar and a skid trail with surface erosion delivering sediment to the stream channel. The road maintenance rules

Table 15. Sediment Sources Identified Through the Numeric Assessment Protocol

					Source												Erosion Type **						Volume Eroded ***					Volume Stored				
Site #	Stream Class				Mach Chan.	Hvst	Site Prep.	Skid Trails	Yard. Corr.	Temp. Xing	Land. Fill	Land. Wast.	Road	Waste Areas	Culv	Strm Xing	SF	FW	DR	DS	SH	OT	NO	IN	MD	SI	GT	NO	IN	MD	SI	GT
	SN	SF	MF	LF																												
14	X									X							X								X		X				
14		X														X			X					X			X				
19 *	X												X				X								X			X				
21	X									X									X						X				X			
21	X															X			X						X		X				
21	X															X			X						X							X
21		X								X									X						X		X				
22 +	X												X							X					X		X				
26 ^	X													X					X						X							X
31	X									X									X					X			X				
33	X									X									X						X		X				
33	X												X						X						X		X				
33	X															X			X					X			X				
33	X															X			X					X			X				
33	X															X			X						X		X				
33	X															X			X					X			X				
35	X															X		X							X		X				
35	X									X									X					X			X				
38			X					X											X						X		X				
44 *	X							X											X						X		X				
47 ^	X												X						X						X		X				
47 ^	X												X								X				X							X
TOTAL	**22**	**2**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**6**	**0**	**0**	**5**	**1**	**0**	**8**	**2**	**1**	**17**	**1**	**1**	**0**	**0**	**6**	**10**	**6**	**0**	**18**	**0**	**1**	**0**	**3**
% of total		9	5	0	0	0	0	9	0	27	0	0	23	5	0	36	9	5	77	5	5	0	0	27	45	27	0	82	0	5	0	

Shaded row indicates: all practices were considered in compliance (*), sediment was not a result of a forest practice activity (+), or the feature (waste area) or unit (#47) was not assessed using the rating system (^). All other sediment sources were associated with non compliant practices.

** Erosion Type: SF = sidecast failure, FW = fill washout, DR = drainage related, DS = deep seated failure, SH = shallow failure, OT = other.

*** Volume Eroded/Stored: NO = none, IN = incidental (< 1 cubic yard), MD = moderate (1 - 10 cubic yards), SI = significant (10 – 100 cubic yards), GT = great (> 100 cubic yards)

and skidding practices were considered in compliance, yet erosion occurred and sediment was delivered to the stream. One road-related sediment source was the result of a deep-seated landslide that was not considered a result of the road construction. This landslide was not considered a result of a forest practice activity.

A waste area and two road-related sediment sources were not assessed using the compliance rating methodology due to time constraints. The waste area would have been identified as noncompliant since part of it was located within the high-water mark of a stream channel.

These apparent discrepancies are discussed to illustrate two points. First, it is acknowledged in the FPA that harvesting and road construction present a certain level of risk to the stream resource. The forest practice rules are designed and written to minimize and avoid risk, not to eliminate risk. Therefore, it is expected that properly implemented, sediment-prevention measures will not eliminate all sediment delivery to stream channels. This pilot study begins to provide some quantifiable index of that risk. In the case of this pilot study, approximately 16% of the total volume of sediment eroded resulted from practices that were considered in compliance.

Secondly, methodologies that rely strictly on broad overviews may be likely to overlook a portion of sediment being delivered to stream channels. In the case of this study the rating system (less systematic approach than the numeric assessment) did not identify approximately 34.4% of the total volume of sediment that impacted streams as a result of a forest practice. Again, this is due to the fact that the BMP field team walked the entire length of stream and therefor was able to identify all incoming sediment that otherwise would have been overlooked. Sediment eroded accounted for 1.4%, and sediment stored accounted for 33% what was overlooked with the rating system. These results indicate that the rating system was more likely to identify sediment eroded (typically from an upland site) than sediment stored within the high water mark, channel or an unstable location.

SUMMARY AND CONCLUSIONS

The ODF Forest Practices Monitoring Program completed a pilot study to monitor compliance with Best Management Practices (BMPs). The main goals of the pilot study were to determine the ultimate sample size needed, test the field methods and study design, and to provide preliminary data on compliance.

Sample Size Needed

Based on the results of this study in which 52 sites were monitored, ODF needs to sample 189 harvest units to answer the compliance questions with a 5% precision level. This will be done over a two-year period using a two-person BMP monitoring team and the same project leaders from the pilot study.

For our calculations we selected a precision level of 5% (E = .05), or a desire to have 95% confidence in our results. Compliance rates varied depending on if the unit-level or rule-level results are used. We selected 85% (P = .85%). This value was selected because it represents the lowest unit-level compliance rate encountered with the pilot study for a site that had the greatest number of rules to implement. In that sense it represents the “worst case scenario”. In addition,

the unit-level compliance rate integrates the rule-level compliance because it reflects the number of rules that were in compliance. Had we used rule-level results and gone for the lowest common denominator we would be over sampling for the majority of rules. The population size for this study was 2,591. Using these values for the equation below, the needed sample size is 189.

The needed sample size was calculated using the following equation:

$$n = \frac{1}{\frac{E^2}{(4)(P)(1-P)} + \frac{1}{N}}$$

where:
n = needed sample size
E = desired precision level
P = estimated percent compliance rate
N = population size

Study Design and Methods

Sample Design

The study design will be altered slightly to account for variability in ownership patterns between districts. For the pilot study, 70% of the sample was industrial, 10% was nonindustrial and 20% was other. These ratios were based on the proportion of the land base in each of these categories. For the next phase of the project, the sample will be proportioned on a district basis rather than a statewide basis because some districts are composed almost entirely of nonindustrial ownership while others area composed almost entirely of industrial ownership.

Data Collection

The pilot study was designed with two data collection approaches: a numeric assessment and a qualitative compliance rating assessment. This will be continued during the next phase of the project as well. During the pilot study, the project leader visited the sites prior to the BMP field team and completed a compliance rating assessment of the site. During the next phase of the project the project leader and the team will visit the sites together. This should reduce the number of discrepencies between the two approaches to data collection.

The numeric data will be used to describe the condition of the resource (stream, RMA, etc.) or feature (e.g., road, skid trail, etc.) being assessed. The numeric data will only be used to determine compliance on a subset of rules in which numeric criterion are written into the rules. For example, the Riparian Vegetation Retention rules provide precise measures of compliance that can be evaluated numerically (e.g., no-cut buffer widths, basal area retention, etc.). Other rules require landowners and operators to minimize and avoid impacts. These rules require judgement on the part of an experienced forest practice forester or natural resource specialist to determine compliance. For example, road construction and maintenance rules require that operators locate roads to minimize the risk to waters of the state and avoid steep slopes. Numeric data describe the percent of roads in different locations, and the compliance assessment data reflect which of the roads were in compliance with road location rules.

Protocol Changes

Minor changes have been made to the protocol to increase precision, increase the capability to compare the rating data and the numeric data, to build understanding, acceptance and support, and to capture volunteer efforts on the part of landowners to go beyond rule requirements. Examples include:

- Photo documentation points.
- Clarification of sediment sources at stream crossings.
- Exact measurement of filtering distance rather than categorical designations.
- Document when a stream crossing was installed
- Document frequency of buffer strip transects that are wider than required.
- Compliance rating and numeric data collection are done at the same time to increase consistency in findings.
- Change assessment protocol to capture noncompliance with protection of small Type N streams from excessive slash loading.
- Use the numeric data collection for calculating compliance for additional rules such as maintenance of cross drains and stream crossings, temporary crossings, etc.
- Build understanding, acceptance and support within the department for the project.
- Provide a schedule two weeks in advance of field visits to FPFs and landowners.
- Letters are sent to the landowner after confirmation that the site will work for the study.
- Weight ownership stratification by district rather than based on the entire state.
- Mail copies of rating datasheets to landowners and FPFs at the end of each site visit.

Additional Analyses on Related Enforcement Action

The next phase of the project will include an assessment of enforcement action that had previously been taken by forest practice foresters on monitoring sites. This will include a summary of the number and type enforcement actions (written statement, citation) that were taken and how those statistics compare with compliance monitoring results. This is an important component of understanding the administration of the forest practices program. While these data were collected for the pilot study they were not analyzed in time for this report.

Findings on BMP Compliance Rates

The authors caution against strong conclusions due to the pilot nature of the study. These findings are based on a pilot study of 49 harvest units that were selected using a random stratified sample. One hundred and forty nine rules could potentially have been assessed at any given site. However, all rules did not apply on each harvest unit, therefore sample size varies by rule. Due to the pilot nature of the study and the small sample size, this study is being repeated on a larger scale to corroborate the pilot study findings. Preliminary analyses of the data are provided for monitoring questions 1, 4, and 5. These analyses were done both to determine if the appropriate data were being collected and to provide a preliminary measure of compliance. Monitoring question #2 is answered with a separate study and monitoring question #3 will be answered with the final phases of this BMP monitoring project.

Monitoring Question #1

How often did operators comply with BMPs described in the forest practice rules pertaining to water protection, road construction and maintenance, harvesting, and high-risk sites?

Compliance rates were analyzed at two levels: unit level and rule level. Nearly half of the units, 43%, had at least one noncompliant practice. However, only 9 units, 18%, had noncompliant practices which resulted in an impact to the resource. These findings are consistent with results from other states. While it is common to find compliance issues when a site is evaluated closely, the goal of the ODF is to increase the number of units that rate 100% compliance.

Given this, it is perhaps an over-simplification to rate compliance simply on whether or not there is a compliance issue of any kind on a unit (i.e. 43% of the units had one or more noncompliant practices). A more accurate representation of compliance needs to account for the high numbers of rules that must be applied to a site and if the noncompliance results in an impact to stream resources. The average unit-level compliance across 49 units was 98%. There were 3,365 practices evaluated. There were a total of 62 noncompliant practices identified or 98% compliance. Forest practice rules were exceeded on 5% of the practices.

Monitoring Question #4

Are there particular rules that consistently have a lower or higher level of compliance?

Results suggest that at a rule level, compliance rates are quite high. Average compliance rates varied from 91% to 100% for nine rule divisions. The lowest compliance rate for a division was 91% for "Other" Wetlands, Springs and Seeps (OAR 629-655), the sample size was only 11. The highest compliance rate for a division was 100% for Chemical and Other Petroleum Products (OAR 629-620). The sample size varied from 49 to 6 depending on the rule being assessed. Compliance with significant wetlands could only be assessed on one unit. If the sample size is small again in the next phase of the project, significant wetlands may need to be assessed separately.

Practices implemented under the Road Construction and Maintenance Division (OAR 629-625) have a high compliance rate (97%). Results suggest that while there is a general trend towards improvement in road location, there are still problems with road maintenance. The individual practices that demonstrated noncompliance and had the greatest impacts on streams included road drainage and temporary crossings. Of the road-related noncompliant practices, 70% were associated with road drainage and 25% with temporary crossings. The sample size was low for temporary crossings (14 crossings on 9 sites) but there were consistent problems. It is also important to note that these assessments were completed during the dry summer season and consequently are likely to underestimate erosion and sediment delivery to stream systems that result from forest practices.

Practices implemented under the Harvesting Rules Division (OAR 629-6630) have high compliance rates (98%), with the most common issues being skid trail drainage and felling trees away from small Type N streams. We anticipate that felling away from small Type N streams is a bigger issue than these data suggest**.** The ODF guidance manual requires that small Type N stream be treated the same as any other stream when it comes to protection of bed and banks and water quality during the felling operation. If slash enters a small type N stream, the guidance manual requires that it be removed so that 50% of the channel does not have slash in it. This guidance was not

properly considered when assessing small type N streams for the pilot study. This situation has been corrected for the final implementation of the BMP monitoring project.

Practices implemented under the vegetation retention division have a high compliance rate (95%). Compliance with riparian management area (RMA) rules is mixed. Examples of exceeding rule compliance were most common in this division ranging from 26 to 42%. Both the most common noncompliance and the highest rule exceedance with riparian rules were on RMAs that were designated as no-cut buffers. Operators harvested within these RMAs on 33% of the sites even though written plans indicated no-harvest. However, operators and landowners exceeded the requirements on 42% of the sites. Operators and landowners consistently maintained the 10 foot and 20 foot no-cut buffers.

Monitoring Question #5

When BMP compliance is inadequate, to what extent are quality and function of riparian areas, stream channels and/or fish habitat compromised?

Noncompliance resulted in an impact to the stream on 20 out of the 62 noncompliant scenarios. The bulk of the impacts resulted from sediment delivery to streams. There were also instances of disturbance to bed and banks and loss of riparian vegetation. Out of the remaining noncompliant situations, 10 were considered strictly administrative and 32 considered a potential resource concern.

Seventeen miles of stream and 82 acres of RMA were surveyed. When no-cut harvest boundaries were not properly maintained, 1% of the total riparian area sampled was affected. Only one out of nine noncompliant riparian vegetation practices resulted in an impact to the stream. The remainder were considered potential impacts.

Twenty-two sediment sources were identified using the numeric assessment on 11 different sites. Three of the 22 sediment sources delivered sediment to Type F streams the remainder were to Type N streams. Stream crossings and temporary crossings accounted for 63% (14 of the 22) of the sediment sources. There were an additional five associated with road construction and maintenance (23%), two with skid trails (9%), and one with a waste area site (5%). The volume of sediment delivered ranged from <1 to 100 cubic yards. There were no sediment deliveries to stream channels as a result of felling and bucking, site preparation, cable yarding, landings, or cross-drain culverts.

RECOMMENDATIONS

Since this is a pilot study, recommendations are limited to two main points: (1) completing the next phase of the Compliance Monitoring Project and (2) raising awareness to department personnel, stakeholders and the public for consideration.

Complete the Next Phase of the Project

This study will be continued over the next two years on 189 sites. Annual reports will be made to the Board of Forestry on preliminary results. ODF will continue to work with the internal and

external review committee to provide oversight and to coordinate the project. At the completion of the next phase, the department will consider the long-term needs for this kind of compliance monitoring and where the gaps are that this type of monitoring cannot address.

Raise Awareness on Key Findings

It is important to recognize the limitations of a pilot study. The greatest limitation of this study is the small sample size. Therefore, the second phase of the project is needed to collaborate these findings before strong recommendations can be made. However, there are some actions that can be taken to alert landowners, operators and department personnel of the potential issues that do exist. This allows landowners to adjust operations and department personnel to prioritize as needed, particularly if they have observed the same trends on their ownership or in their district. The main areas of concern identified by this pilot study include:

- A need for increased awareness that small Type N streams must be protected to the same level as any other stream from excessive slash accumulation. This is to prevent detrimental effects on water quality and channel morphology and retain the sediment and water routing capabilities of the system.

- Road construction and design practices seem to have improved over time. The remaining road-related issues fall predominately to road drainage and temporary and permanent stream crossings. The ODF is in the process of developing a road management guidebook for repair of existing roads that will be available this year. ODF and Oregon State University will jointly sponsor a Road Stewardship Conference in early 2000.

- Landowners, timber owners, operators, and department personnel need to work together to ensure that landowners and operators retain the desired buffer width on RMAs that are intended to be managed with a “no-harvest buffer”.

Consider Related Monitoring

While the focus of this study is on compliance some data were provided on erosion and sediment delivery to streams. The bulk of the road construction and maintenance rules are designed to minimize sediment delivery to streams. More quantitative information is needed on the result of this policy in terms of the volume of chronic sediment being delivered to streams. Sediment production, delivery and transport need to be monitored in the winter to determine the effectiveness of forest practice rules in minimizing sediment impacts on streams.

Due to the study design, these samples may underrepresent units with high-risk sites. In addition, the sample size was small for temporary crossings and significant wetlands. At the completion of the BMP compliance monitoring project the forest practices monitoring program will evaluate the need for focused efforts on compliance with high-risk site, temporary crossings, and significant wetlands rules.

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APPENDIX A: DETAILED 1998 PILOT STUDY FIELD METHODS AND FIELD FORMS

**Note: This protocol has been revised for the 1999 and 2000 field seasons. Please request current protocol for purposes other than 1998 pilot study data. **

- Detailed Field Methods for Numeric Data Collection
- Numeric Data Collection Field Forms
- Detailed description of Compliance Rating System
- Compliance Rating Field Form

Detailed Methods

Field Methods

This section describes specific assessment methods used at each site. ***Please note this protocol has been updated for the 1999 and 2000 data collection periods!!***

Overall Methodology

The project lead (Conrad Tull) will coordinate the crew, consult with the FPF and the landowner prior to the field survey. Tull will collect all relevant paperwork, written plans, repair orders, aerial photographs, unit maps, and topographic maps. He will schedule a consultation with the FPF one or two days before the BMP crew does the field survey. Initially, Tull will accompany the crew in the field for the entire day. As the season progresses, Tull will orient the crew to the site, and document his overall evaluation of compliance. He will coordinate the BMP crew and provide oversight in situations where the crew requires specific input on specific questions.

The FPF who administrated the site, supervisors, and landowners are welcome to accompany the crew and project leader in the field during the survey. The crew will be collecting numeric data that is not subject to interpretation. However, the landowner will undoubtedly be able to provide the crew with necessary information about the operation and site. Also, there will be opportunity for discussion of the rules and administrative program as a whole with the project lead and FPF. If the landowner grants permission, interested publics may be interested in accompanying the field crew as well.

Overall Documentation

When the crew arrives at the site they will take a GPS data point. Data will be collected as described below and kept on data sheets linked by the unique unit name and stream name. When a unit map is available, the crew will document locations of: high risk sites, features that deliver or have the potential to deliver sediment to the stream channel, RMA's surveyed with the detailed methodology, LWD placement, and direction of windfall within the RMA. If the unit map is not available the crew will hand sketch the unit on a topographic map for general communication and record keeping purposes. An attempt will be made to create a unit map using GIS, aerial photographs, topographic maps and orthophotos.

General Information:

- Site Name
- Notification number
- Stream Name
- Stream Size
- Stream Type
- General, alternative, or site specific prescription for RMA
- Written Plan (y/n)
- Georegion
- County
- New Road Construction or reconstruction (y/n)
- Legacy road/skid trails?
- Wetlands

- Industrial/Nonindustrial

Division 635: Water Protection Rules

Consultation and Written Plan Topics: Available data on basal area (BA) prior to and post harvest, active management plans, written plans, alternative and site specific prescriptions, BA credit, volunteer Oregon Plan for Salmon and Watersheds (OPSW) measures, hand-spraying, and stream crossings, no-cut widths, site-preparation, prescribed burning and/or chemical applications within the RMA; preventing sediment from getting into the stream, placement of wildlife trees in the RMA, other volunteer efforts.

There are two categories of RMA assessments:

1. *Detailed RMA Survey* used if there **was management** within the RMA, and
2. *Overall Compliance Methodology* to be implemented on all streams in the unit.

(1) If there was management within the RMA a combination of transects and cruising will be used to collect data as described in the *Detailed RMA Survey* (below). The crew will establish the first transect 25 feet in from one end of the unit. Transects will be established every 200 feet after that. At each transect they will measure vegetation retention widths, slope, ground disturbance from mechanical site preparation, prescribed burning and distance from stream of chemical applications. As they move along the stream, the crew will cruise the RMA measuring conifers and hardwoods as described below. They will document reforestation within 20 feet and within the RMA, volunteer efforts in support of the salmon plan, and placement of large woody debris.

NOTE:

Units with more than one managed RMA stream*:* If there is more than one managed stream in the unit, the crew will randomly select one of the streams and implement the Detailed RMA Survey. This will be done by assigning a number to each of the managed streams, and rolling a die until one of the assigned numbers is displayed.

Long streams. If the managed streams are longer than 3000 feet, the crew will implement the Detailed RMA Survey on ***one side of the stream only***. If the stream is greater than 6,000 feet in length it will be assessed using the overall compliance method rather than the detailed RMA survey.

No management on any streams in the unit. If none of the streams in the unit had harvest within the RMA, the crew will implement the detailed survey, without the basal area measurements, on one, randomly selected stream within the unit.

(2) An overall assessment of the RMA will be implemented on all the streams using the *Overall Compliance Method* (described in Section 2.8). Data parameters are the same for both the detailed RMA survey and the overall compliance methods, with the exception of the cruise. Cruises will not be implemented on streams without management within the RMA.

Detailed RMA Survey for Streams with Managed RMAs

1. Transect Data

Data gathered along transects address RMA widths and vegetation retention regulations (635-310, 640-100 &200); mechanical site preparation (615-200), prescribed burning (615-300), and ground-based chemical applications (620-400), and removal of slash (630-600).

Written Plan: The crew will have a summary of the written plan. When documenting conditions that are addressed in the written plan, and asterisk (*) will be placed next to the data.

Hillslope in RMA: Crew will measure average slope steepness of the RMA using a clinometer.

Vegetation Retention and ground disturbance within the RMA: There are three compliance issues to document along each transect:

A. *No-cut width*: distance in feet measured from the average annual high water mark to the first stump. If the crew reaches the outer edge of the RMA without encountering a stump a "+" symbol will be used next to the RMA width (i.e. on a medium F stream the data would read 70+)

B. *Maintenance of understory vegetation w/in 10 ft. of high water mark (640-200(a))*: Yes/No. If no then document area and source as:

CA Chemical application
SP Mechanical site preparation
MA Machinery
YD Yarding
FE Felling
HS Harvest of unmerchantable trees within 10' of small type N
PB Prescribed burning
OT Other

C. *Ground disturbance and prescribed burning within the RMA*: surveying the ground on 10 feet of each side of the transects, the crew will measure distance (ft) from the high water mark and area (ft2) of ground disturbance or burning. Source of disturbance will be coded as:

OM Operated machinery within the channel
YD Yarding
FE Felling
SP Mechanical site prep
PB Prescribed burning
OT Other (Explain)

** skid trails, roads and landings assessed separately

Effect on Stream Resource: For numbers 2 and 3 effect on the stream resource will be described as:

NO None
VD Understory vegetation damaged
VA Complete elimination of understory vegetation
SD Soil disturbance within RMA/no sediment delivered to stream
BB Disturbance of channel bed and banks

ER Rills, gullies or bank erosion delivered sediment to the channel

If BB or ER, crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:
NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material, bank erosion)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

Removal of Slash (630-600)*:* Crew will document the amount of slash accumulated within the average annual high water mark for each reach between transects as:
AB Absent - No visible debris, other than one or two pieces over the entire visible area.
SP Sparse - A few pieces of debris over the visible area, but no significant clusters.
NC Non-contiguous - A significant number of pieces, but a majority of the pieces are not touching each other.
CN Contiguous - Many pieces that are mostly touching each other. When categorized as *contiguous*, estimate the depth of debris to the nearest foot in the stream will be given.

Effect on Stream Resource: For each reach the effect of slash accumulations will be categorized as:
NO None
WQ Potential to impair water quality (slash within wetted width, low gradient, perennial channel)
DH Potential contribution to debris torrent hazard (in channels greater than 6% with high-risk site upstream)

2. Basal Area Cruise on Type F , D and Large and Medium Type N Streams (640-100 & 200).

Basal area measurements will be implemented on streams that have had active management or harvesting within the RMA. These are referred to as managed streams.

Conifers: Species and DBH to the nearest inch of all conifers in the RMA measured with a biltmore stick and/or a D-tape (to be decided).

Distance from the Stream: Each measured tree will be categorized as either < 20 feet of or >20 from the high water mark

Blow Down: Diameter (in), species (code), and direction of fall of all conifers (towards or away from stream).

24" Non-alder hardwoods (>20 feet from stream): Measure DBH and species of all.

Cottonwood/ Oregon Ash (>20 feet from the stream): If the landowner used CW or OA as part of the basal area calculations, the crew will measure the DBH of all CW and OA greater than 20 feet from the stream and greater than 6 inches in diameter.

Conifer Snags: Crews will measure the DBH of all snags over 30 feet tall (ocular height estimate) and > 6 inches in diameter.

Eastern Oregon and Blue Mountain Georegions: Crew will document diameter and species of all hardwoods >6 inches in diameter.

3. Number of conifers per 1000 feet (640-100)
Calculated from the conifer cruise.

4. Small Type N Streams (640-200)
Regulations vary by georegion. If site does not meet basin requirements the project lead will assess the stream using the overall compliance methodology. If site meets basin requirement then the crew will walk the stream channel and assess:

Maintenance of vegetation w/in 10 ft. of high water mark: Crew will document if the understory and/or unmerchantable trees were maintained within 10 feet of the average annual high water mark. Yes/No. If no then document area in (ft2) and source as:

CA Chemical application
SP Mechanical site preparation
MA Machinery
YD Yarding
FE Felling
HS Harvest of unmerchantable trees within 10' of small type N
OM Operated machinery within the channel
PB Prescribed burning
OT Other

Effect on Stream Resource: If "no" to above then the crew will describe the effect on the stream resource as:

NO None
VD Understory vegetation damaged
VA Complete elimination of vegetation
SD Soil disturbance within RMA/no sediment delivered to stream
BB Disturbance of channel bed and banks
ER Sediment delivered to the channel

Crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:

NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material, bank erosion)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

Removal of Slash (630-600)*:* Crew will document the amount of slash accumulated within the average annual high water mark (regardless of georegions) for each reach between transects as:
AB Absent - No visible debris, other than one or two pieces over the entire visible area.
SP Sparse - A few pieces of debris over the visible area, but no significant clusters.
NC Non-contiguous - A significant number of pieces, but a majority of the pieces are not touching each other.
CN Contiguous - Many pieces that are mostly touching each other. When categorized as *contiguous*, estimate the depth of debris to the nearest foot in the stream will be given.

Effect on Stream Resource: For each reach the effect of slash accumulations will be categorized as:
NO None
WQ Potential to impair water quality (slash within wetted width, low gradient, perennial channel)
DH Potential contribution to debris torrent hazard (in channels greater than 6% with high-risk site upstream)

Voluntary Leave areas on Small Type N streams (Oregon Salmon Plan):
Average Buffer width: Visual estimate of average width (ft).
Length of Stream: Length (ft) of stream with leave areas.

5. Basal Area Credit (640-110)
Written Plan topics: Basal area placed, basal area claimed, where was basal area claimed (i.e. for a separate unit).

LWD placement: Crew will measure the large-end diameter (in), length of logs placed in streams (ft), and the channel width at the placement location (ft). Locations will be mapped.

Riparian conifer restorations (640-300)*:*
Written Plan topics: Length of retention and conversion blocks

Conversion and Retention Block Widths and Lengths: Buffer widths will be measured at the beginning and end of each block, **and** every 200 feet in between. Distance from average annual high water mark to the first stump will be documented as follows:

Conversion Blocks: Measured in feet out to 10 feet, then documented as 10+

Retention blocks:
- Large: conifers to 50 feet, then 50+, hardwoods to 30 feet, then 30+
- Medium: conifers 30 feet, then 30+, hardwoods to 20 feet then 20+
- Small: measured out to 20 feet, then 20+

Maintenance of understory vegetation w/in 10 ft. of high water mark: Along each 200 foot transect the crew will document maintenance of understory vegetation. Yes/No. If no then document area in (ft2) and source as:

CA Chemical application
SP Mechanical site preparation
MA Machinery
YD Yarding
FE Felling
HS Harvest of unmerchantable trees within 10' of small type N
PB Prescribed burning
OT Other

Ground disturbance and prescribed burning within the RMA: surveying the ground on 10 feet of each side of the transects, the crew will measure distance (ft) from the high water mark and area (ft2) of ground disturbance or burning. Source of disturbance will be coded as:

OM Operated machinery within the channel
YD Yarding
FE Felling
SP Mechanical site prep
PB Prescribed burning
OT Other (Explain)

** skid trails, roads and landings assessed separately

Effect on Stream Resource: If "no" to above then the crew will describe the effect on the stream resource as:

NO None
VD Understory vegetation damaged
VA Complete elimination of vegetation
SD Soil disturbance within RMA/no sediment delivered to stream
BB Disturbance of channel bed and banks
ER Sediment delivered to the channel

Crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:

NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material, bank erosion)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

Removal of Slash (630-600)*:* Crew will document the amount of slash accumulated within the average annual high water mark (regardless of georegions) for each reach between transects as:
AB Absent - No visible debris, other than one or two pieces over the entire visible area.
SP Sparse - A few pieces of debris over the visible area, but no significant clusters.
NC Non-contiguous - A significant number of pieces, but a majority of the pieces are not touching each other.
CN Contiguous - Many pieces that are mostly touching each other. When categorized as *contiguous*, estimate the depth of debris to the nearest foot in the stream will be given.

Effect on Stream Resource: For each reach the effect of slash accumulations will be categorized as:
NO None
WQ Potential to impair water quality (slash within wetted width, low gradient, perennial channel)
DH Potential contribution to debris torrent hazard (in channels greater than 6% with high-risk site upstream)

Felling away from the stream (Y/N)

7.0 Other Voluntary measures in support of the Oregon Salmon Plan
Reforestation within 20 feet of high water mark, within RMA
Other

Division 645 Assessment: Significant Wetlands
Written Plan (645-030): Does the written plan address filling, machinery activity and/or road construction within the wetland.

Stream Associated Wetlands (635-310): Crews will measure the buffer width from the stream's edge for all stream-associated wetlands every 200 feet.

Soil, hydrologic function and Vegetation retention for significant wetlands (645-030, 040 and 050): Crews will document:
If the wetland was filled (area filled ft2),
If machinery operated within the wetland (area disturbed ft2)
If road construction (see road survey)
Retention of understory vegetation (area disturbed in ft2)
Removal of snags and down wood (number of snags and downed logs)

Division 615 Assessment: Treatment of slash

1. Mechanical site preparation (615-200):

Mechanical site preparation within the RMA: Yes/no. If yes, see RMA transects.

2. Prescribed Burning (615-200)

Prescribed burn in RMA: Yes/No. If yes:
Area burned: See RMA transect data.
Slopes : Average slope of RMA as measured in the RMA transect data.
Written plan: Does it address resource issues?

Prescribed burning in the unit: If the prescribed burn resulted in sediment delivery to the stream the crew will document:
Area contributing to sediment delivery (ft2) ____

Crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:

NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:

SF Sidecast failure (unconsolidated material, bank erosion)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

Division 625 Assessment: Road Construction and Maintenance

All roads in the unit and newly constructed to access the unit will be assessed using this protocol.

General information: Primary landuse, other multiple uses, miles of new road construction

NOTE: When stations are used for data collection, 1 station equals 100 feet.

1. Road Location (625-200): Crews will document total number of stations of new or reconstructed roads that are located on: high risk sites, below high water mark, within the RMA, slopes greater than 65%, wetland, floodplain, and other. Stations in each location will be categorized as new construction or existing road.

From each category above crew will document if sediment was delivered to the waters of the state.

Crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored in large amounts) to the channel as:

NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
SF Shallow Failure
OT other

2. Road Prism (625-310)
Avg. **new** road width ____ ft. (inside ditch to outside of fill, not just running surface).

Crew will document the total number of stations in each of the following conditions:

Fill/sidecast (at least 2 ft depth) on slopes over 65%
Fill unstabilized (eroding, drops, slid)
Cut unstabilized (ravel or slides)
Deep seated landslides

3. Stream Crossings (625-320) For each crossing (numbered in order measured) the crew will document:
Stream will be coded by classification:
S small
M medium
L Large
And type:
N none
F Fish
D Domestic
U Unknown

Structure Type will be coded as:
RC Round Culvert
AC Arch Culvert
OA Open-Arch
BR Bridge
FD Ford
OT Other

At each crossing crew will document:
Structure Size will be recorded as diameter (in) for round culvert, rise and span (ft) for arches, span (ft) for bridge or ford.

Fill Depth: in feet from the outside edge of the road surface to the original channel
Inlet opening: in percent, as compared to design opening area
Culvert Slope(for F, U streams): as a fraction
Countersinking (for F, U streams): (imbedded gravel) as G (gravel/cobble) or B (bare)
Outlet drop: (in feet)
Filtering (distance above crossings, feet) will be coded as:

1	under 100
2	100-200
5	200-500
5+	500

At each crossing stabilization and erosion control will be documented as:

VG	vegetated
RR	Rip-rap
OT	other
NO	none

At each crossing crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:

NO:	None (0 cubic yards)
IN:	Incidental (0-1 cubic yards)
MD:	Moderate (1-10 cubic yards)
SI:	Significant (10-100 cubic yards)
GT:	Great (over 100 cubic yards)

The type of erosion will be described as:

SF	Sidecast failure (unconsolidated material)
FW	Fill washout
DR	Drainage (surface erosion)
DS	Deep seated landslide
OT	other

4. <u>Drainage all active and inactive roads in unit (625-330 & 420)</u>

Ditch and surface water control: Crew will document the total number of stations in which the road drainage can be described as:
Ditch Filled
Ditch Cutting
Ditch Functional
Outsloped
Waterbar Functional
Waterbar Non-functional
Water down ruts/uncontrolled

Cross drains (exclusive of waterbars) For each structure the crew will document:
Inlet function
FO fully open

PO partially open
OB Obstructed

Outlets will be coded as:
CL clean
DP deposition
GC gullly to channel
GH gully to high risk site

5. Waste Disposal Areas > 100 yards (625- 410)
Signs of failure (Y/N)
Below high water level (Y/N)

6. Rock Pits (present in or adjacent to unit) (625-500)
Crew will categorize the rock pits as:
Active, inactive, or vacated
In channel, erosion from banks, fine sediment delivery

Division 630 Harvesting (continued): Skidding and Yarding Practices (630-100)

1. Systems used (may be more than one):
TS Tractor/skidder
SH shovel
ME mechanized
SS short span cable (< 800 feet)
LS long span cable (> 800 feet)
HE helicopter
OT (describe)_____

2. Skid trail locations: Crews will document total number of skid trail stations:
On slides/high risk sites
Within 35 ft Type F or D
Within high water level type N
On slopes over 35%
Within the RMA
Other skid trails eroding to stream

Skid Trail drainage
The above stations will be divided into one of the following drainage conditions: functional, bypassed, excess spacing, or not installed.

Crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:
NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)

GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

If the skid trail delivers sediment to the stream crew will not distance to stream channel of skid trail and slope of the ground.

3. Landings (630-200, 300)
Number ____
Average area ___ feet
Number on high risk sites ___
Number in RMA/channel ____
Fill greater than 2 feet deep on slopes over 65 percent (y/n)
Fill below high water level (y/n)
Debris/waste on slopes over 65 percent (area/depth)
Debris/waste below high water level (area/depth)

Effect of each landing on stream resource: For each landing measured above crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:

NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

Landing drainage (away from landings, fills, steep slopes):
FU functional
FE fill erosion
LS landslide

4. Waste materials (630-400)

Petroleum Products: Crews will document each observed waste disposal issue for the unit, road, RMA and stream channel. Within each of these areas the crew will use one or more of the following codes.

NO none
DP drops
PL pool
OD observed delivery
MT metal in channel or wetland from current operation.

5. High risk sites(630-500):

Crews will document the number of or percent of the unit with high risk sites.
High risk sites include the following landforms:

- Actively moving landslides;
- Slopes steeper than 80%, excluding stable rock;
- Headwalls or draws steeper than 70%;
- Abrupt slope breaks, where the lower slope is steeper and exceeds 70%, except where the steeper slope is stable rock;
- Inner gorges (not local channel banks) with slopes steeper than 60%; or
- Sites with other characteristics determined to be of marginal stability by ODF personnel (use for comparison).

(First 5 are field determined, last is determined from office files)

For each high risk site crew will indicate

ST skid trails built on high risk site
GG gouging (continuous exposure of mineral soil to 6"depth)
DF deferral (geotech will review)
LS landslides (on map)

Removal of Slash (630-600)*:* Crew will document the amount of slash accumulated At each high-risk site as:

AB Absent - No visible debris, other than one or two pieces over the entire visible area.
SP Sparse - A few pieces of debris over the visible area, but no significant clusters.
NC Non-contiguous - A significant number of pieces, but a majority of the pieces are not touching each other.
CN Contiguous - Many pieces that are mostly touching each other. When categorized as *contiguous*, estimate the depth of debris to the nearest foot in the stream will be given.

Effect on Stream Resource: For each high-risk site the effect of slash accumulations will be categorized as:

NO None
WQ Potential to impair water quality (slash within wetted width, low gradient, perennial channel)
DH Potential contribution to debris torrent hazard (in channels greater than 6% with high-risk site upstream)

Division 630 Harvesting (continued) Cable Yarding Near Waters of the State (630-700 & 800)

1. Cable-Yarding Near Streams (630-700)
For purposes of this study, a *Yarding Corridor* is defined as an opening in the RMA used to yard trees and does not include yarding over the top of trees with no significant impact to canopy cover, or through a natural opening.

Yarding Corridors through RMA: Crew will document if the corridor was a natural opening, distance between corridors, and widths of corridors. The written plan will be referenced for addressing this kind of activity.

Effect on RMA and stream of yarding through and/or over RMA:
Overstory
ND No canopy cover loss
ML Minor loss of canopy cover (<10%)
MD Moderate loss of canopy cover (10% to 30%)
HL Heavy loss of canopy cover (> 30%)

Understory/Ground/Channel Disturbance
NO None
VD Understory vegetation damaged
VA Complete elimination of understory vegetation
SD Soil disturbance within RMA/no sediment delivered to stream
BB Disturbance of channel bed and banks
ER Rills, gullies or bank erosion delivered sediment to the channel
OT other

If yarding disturbance resulted in sediment delivery to the stream, crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:
NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material, bank erosion)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

2. Ground-based Yarding (630-800)
Temporary crossings
Number by stream classes F __ D __ N __

Location___
Addressed in written plan ____
Maximum height ___ feet.
Crossing removal: left___ partial ___ complete
Sediment barriers will be coded as:
FU functional
NF non-functional
NI not installed

Fill Storage Location
UL Unstable location on slopes >65%
HM Below the high water mark
ST Stable location above the high watermark

Effect on stream resource
Crews will estimate volume of sediment that was delivered to the stream channel (delivered) or has the potential to deliver (stored) to the channel as:
NO: None (0 cubic yards)
IN: Incidental (0-1 cubic yards)
MD: Moderate (1-10 cubic yards)
SI: Significant (10-100 cubic yards)
GT: Great (over 100 cubic yards)

The type of erosion will be described as:
SF Sidecast failure (unconsolidated material)
FW Fill washout
DR Drainage (surface erosion)
DS Deep seated landslide
OT other

Data sheets: Water Protection Rules

Oregon Dept. of Forestry 1998 **Buffer Transects**
Forest Practices BMPCAP

Unit : **Type:** F / D / N **Side:** L / R p ___ of ___
Stream: **Size:** S / M / L **Direction:** U / D
Date: **RMA Width:** **Con. Felled away from Stream:** Y / N

			Understory Vegetation					No-Cut		RMA Disturbance				Slash in Stream		
R / C	Trans (ft)	% Slope	10' retained ?	Source	Effect	Area (ft^2)	Delivery ?	CN width (ft)	HW width (ft)	Source	Effect	Area (ft^2)	Delivery ?	Amount	Depth (ft)	Effect

Oregon Dept. of Forestry 1998 **Type F, D, and Lrg. and Med. N Streams**

Forest Practices BMPCAP

Unit: **Date:** **Crew:** **Harvest Type:** 1 / 2 / 3
Notification # **Harvest Meth.:** **High Risk?:** Y / N
GeoRegion: **W.P.?:** Y / N **Owner Type:** Ind. / Non.
County: **Site Prep:** Mech. / Burn / Chem. / None **Wetlands?:** Y / N

Stream Name	Size/Type	Str. Lngth(ft)	Prescptn.	Active Man?	Re-gen. w/in 20'	Re-gen. in RMA?	Cor-ridors ?	Temp Xings ?	**Notes**
LWD Placement	Lngth (ft)	Diam (in)	Str,. Wdth (ft)	Lngth (ft)	Diam (in)	Strm Wdth (ft)	Lngth (ft)	Diam (in)	Stream Wdth (ft)
Str:									

Oregon Dept. of Forestry 1998
Forest Practices BMPCAP

Small Type N Stream

Unit: **Date:** **Crew :** **Harvest Type:** 1 / 2 / 3

Notification # **Harvest Meth.:** **High Risk?:** Y / N
GeoRegion: **W.P.?:** Y / N **Owner Type:** Ind. / Non.
County: **Site Prep:** Mech. / Burn / Chem. / None **Wetlands?:** Y / N

	Retained 10'			Slash in Stream			Vol. Leave?			
Stream	Source	Effect	Area (ft^2)	Amount	Depth (ft)	Effect	Vol. Leave?	Avg. Wdth (ft)	Str. Lngth (ft)	**Notes**

Oregon Dept. of Forestry 1998 **General RMA Cruise**
Forest Practices BMPCAP

Unit: **Stream Size:** S / M / L **Date:** p ___ of ___
Stream: **Stream Type:** F / D / N **Side:** L / R
Length:

RMA Cruise (>6" DBH)								**H.W. Credit**		**Notes**
Cruise #	Tree	DBH(in)	Spp.	Snag ?	20 ft?	Wind?	Directn	Spp.	DBH(in)	

Data Sheets: Wetlands

Worksheet for Overall Compliance Check
Wetlands

Site name Notification Number
Surveyor Georegion

Wetlands								
Number	Ground disturbance			Filled	Understory			Snag
	Area (ft2)	Source (code)	effect (code)	Area (ft2)	Disturbed (Area ft2)	Source (code)	effect (code)	Wood (Y/N)

Data Sheets: Treatment of slash

(included in the RMA transect data)

Data Sheets: Road construction and maintenance

Oregon Dept. of Forestry 1998 Date: Site Name: **Road Condition**
Forest Practices BMPCAP Crew:

Record Every Station

Location

Road Stations in:	Stations tally new	Stations tally existing	Width road avg.	Sed. Sheet tally
High Risk				
High Water				
RMA				
> 65%Slopes				
Wetlands				
Floodplain				
Other				

Road Surface Drainage

Drainage Type:	Stations tally
Functional Ditch	
Filled Ditch	
Eroding Ditch	
Outsloped Road	
Functional Waterbars	
Nonfunctional Waterbars	
Rutted/unconcontrolled	

Record as Found

Cut and Fill Slopes

Problem Found:	Stations tally new	Stations tally existing
>2' Fill, >65% slope		
Unstable Fill		
Unstable Cut		

Waste Disposal Area

Number	Condition code	High Water y / n	Sed. Sheet y / n
1			
2			
3			

Rock Pits

Number	Condition code
1	
2	
3	

Oregon Dept. of Forestry 1998
Forest Practices BMPCAP

Crew:
Date:

Site Name:
Georegion:

Drainage Features

	Culvert Detail			**Stream Crossing Detail**											
	Diameter	Inlet	Outlet	Stream	Filtering	Type	Width	Fill	Stab.	Open	Drop	Bed	Slope	Fish	Erosion
	inches	code	code	size/type	code	code	feet	feet	Code	%	inches	code	%	y / n	code
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															

Data Sheets: Harvesting (skidding and yarding)

Oregon Dept. of Forestry 1998 **Unit:** **Skid Trails**
Crew:
Forest Practices BMPCAP **Date:** **Georegion:**

Skid Trails

Skid Trails In:	Functional feet	Non-funt. feet	Ex. Spac. feet	Not Installed feet	Sed. Sheet Y / N
High Risk Sites					
W/in 35' of Type F/D					
High Water of Type N					
Slopes >35%					
RMA					
Others					

* Addressed in Writen Plan

High Risk Sites

Notes (if sediment delivered document distance to stream and slope of ground of the skid trail)

Total % of Unit:				
High Risk Code	Slash code	Slash Depth ft.	Slash Effect code	

Oregon Dept. of Forestry 1998 **Crew:** **Unit:** **Landings**

Forest Practices BMPCAP **Date:** **Stream:**

Landings

#	Area ft.^{2}	H. Risk y / n	In RMA y / n	In Chan. y / n	Drain. code	Petrol. code	Notes
1							
2							
3							
4							
5							
6							
7							

Fill **Debris/Waste Material**

#	On >65% y / n	In High W. y / n	Sed. Sheet?	>2' on >65% slope area ft^2	depth ft	In High W y / n	Sed. Sheet?	Notes
1								
2								
3								
4								
5								
6								
7								

Data Sheets: Harvesting near waters of the state

Oregon Dept. of Forestry 1998 **Temporary Crossings**
Forest Practices BMPCAP

Unit: **Date:** p ___ of ___

				Fill Info		Fill Storage			
Stream (size/type)	Crossing #	Loc. (ft)	W.P.?	Removal	Height (ft)	Fill Loc.	Delivery?	Sed. Barrier (code	**Notes**

Oregon Dept. of Forestry 1998 **Yarding Corridors**
Forest Practices BMPCAP

Unit: **Date:** p ___ of ___

Stream(size/type)	Y.C. #	Location(ft)	W.P. ?	Width(ft)	Trees cut?	Trees left?	Over-story Effect	Under story Effect	Delivery ?	**Notes**

Sediment from any of the above sections:

Oregon Dept. of Forestry 1998 **Sediment Delivered**
Forest Practices BMPCAP

Unit: **Date:** **Crew:** p __ of __

Stream (name, size, type)	Sediment Source (side, trans., data sheet)	Sediment Eroded	Sediment Stored	Type

2.8 Compliance Rating Methodology

The project lead will consult with the FPF on the operation. Relevant data from the operations file and the FPF consultation will be documented.

While the BMP field team is collecting detailed information at the site level, the project lead will implement an overall assessment of compliance at the unit level, collecting general data. This will include a brief narrative describing the unit, the operation, resource issues, and volunteer measures. In addition the project lead will rate overall compliance and collect data on a more general scale for each of the divisions addressed in sections 2.1 through 2.7. The project lead will assess all streams, roads, skid trails, landings, high-risk sites and temporary crossings within the unit. Data will be recorded on the compliance rating form (see next page).

The protocol provides a rapid quantitative assessment of compliance with the regulations. For example, unlike the detailed RMA Survey, there are no transects involved and no basal area measurements. However, data parameters are the same as those described in section 2.2. Likewise, problem locations on roads, skid trails, landings, high-risk sites, temporary crossings will be documented. While, these assessments do not involve intensive data collection efforts (i.e. road data every 100 feet), parameters are the same as those described in sections 2.3 through 2.7.

For each rule division described in section 2.2 through 2.7 the project lead will rate compliance as:
EX: Exceeds rule requirements
MT: Meets rule requirements
NC: Noncompliance; Broad infractions throughout the RMA/unit.

The overall compliance data and rating system will be compared with the detailed data to interpret rule and operation compliance.

ODF 1999 BMP Compliance Rating Form.

Site name:

Site # :

Rule Number		Rule Description	Comp. Code	If Noncompliance:			
				Rule	Admin.	Res. Issue	Effect
ORS 527.670 (6)		Notify downstream surface water holders					
629-605-	140	Notification					
	150	When, where, how					
	170	Written Plans					
629-610-	O40	Reforestation Timing (RMA only)					
	O90	LUC Prior Approval					
629-615-	100	Treatment of slash					
	200	Mechanical Site Prep Near WOS					
	300	Prescribed Burning					
629-620-	100	Prevention of Petro. Products Leaks					
	400	Chemical Application Near WOS					
	800	Notification of Community Water Mang.					
629-625-	100	Prior Approval					
	200	Road Location					
	310	Road Prism					
	320	Stream Crossing Structures					
	330	Road Drianage - Design					
	340	Waste Disposal Areas					
	410	Disposal of Waste Materials					
	420	Road Drainage - Construction					
	430	Steam Protection - Crossings					
	440	Stabilization					
	500	Rock Pits and Quarries					
	600	Road Maintenance					
	650	Vacating Forest Roads					
629-630-	100	Skidding and Yarding Practices					
	200	Landings					
	300	Drainage Systems					
	400	Treatment of Waste Materials					
	500	Harvesting on HR Sites in Western OR					
	600	Felling: Removal of Slash					
	700	Yarding: Cable Equiptment Near WOS					
	800	Yarding: Grnd-Based Eqpmt Near WOS					
629-640-	100	Gen. Veg. Ret. Prescptn. For F Streams					
	110	Active management					
	200	Gen. Veg. Ret. Prescpt. For D/N Streams					
	300	Alternative Veg. Ret. Prescriptions					
	400	Site Specific Veg. Ret. Prescriptions					
629-645-	O10	Live Tree Ret. For Significant Wetlands					
	O30	Soil/Hyd.Func. Protect.for Sign.Wetlands					
	O40	Understory Veg. Ret. For Sign. Wetlands					
	O50	Snags/down wood for sign. Wetlands					
629-650-	O10	Live Tree Ret. For Lakes					
	O20	Soil/Hydro. Function Protection for Lakes					
	O30	Understory Veg. Ret. for lakes					
	O40	Snags/down wood for lakes					
629-655-	O00	Protect. of Other Wetlds/Seeps/Springs					
629-660-	O40	Stream Channel Changes					
	O50	Beaver Dams and Natural Obstructions					

APPENDIX B: ROAD CONDITION NUMERIC DATA SUMMARIES

Appendix B: Total Road Length Summary (See legend below for description of headings)

Location (Feet)							Cut and Fill Slopes (Ft)			Surface Drainage (Feet)						
High Risk	High Water	RMA	Slopes >65%	Flood-Plain	Wet-Lands	Other OT	>2' Fill >65%	Unstble Fill	Unstble Cut	Fun. Ditch	Fill. Ditch	Erod. Ditch	Out. Road	Fun. WBars	N.Fun. WBars	Rutted Road
0	0	0	0	0	0	1100	0	0	0	0	0	0	0	1100	0	0
0	0	0	500	0	0	3500	0	0	0	0	0	0	3600	400	0	0
0	0	0	0	0	0	600	0	0	0	0	0	0	600	0	0	0
0	0	500	200	0	0	1100	0	0	0	0	0	0	1600	0	0	200
0	0	0	0	0	0	16400	0	0	0	6400	0	0	4700	5300	0	0
0	0	0	0	0	0	600	0	0	0	300	300	0	0	0	0	0
0	0	200	0	0	0	5800	0	0	0	800	0	0	4000	1200	0	0
0	0	0	0	0	0	200	0	0	0	0	0	0	200	0	0	0
0	0	0	0	0	0	3000	0	0	0	0	0	0	700	400	800	1100
300	0	0	0	0	0	0	0	200	0	0	0	0	0	300	0	0
0	0	0	0	0	0	19800	0	0	0	0	0	0	13500	1400	1600	3300
200	0	0	1500	0	0	6000	200	200	500	2300	0	900	1100	3000	300	100
0	0	0	0	0	0	2000	0	0	0	0	0	0	2000	0	0	0
0	0	0	0	0	0	1200	0	0	0	500	0	0	700	0	0	0
0	0	0	0	0	0	2800	0	0	0	2100	0	0	700	0	0	0
0	0	0	300	0	0	7000	0	0	0	7300	0	0	0	0	0	0
0	0	0	0	0	0	4400	0	0	0	4400	0	0	0	0	0	0
0	0	0	400	0	0	3000	0	0	0	3400	0	0	0	0	0	0
0	0	0	0	0	0	9800	0	0	0	0	0	0	7200	2500	0	100
0	0	1000	0	0	0	23300	0	0	0	21500	0	0	2600	200	0	0
0	0	0	0	0	0	4800	0	0	0	4300	0	500	0	0	0	0
0	0	1400	0	0	0	600	0	0	0	2000	0	0	0	0	0	0
0	0	0	0	0	0	8700	0	0	0	700	0	0	7500	0	0	500
0	0	0	0	0	0	200	0	0	0	0	0	0	200	0	0	0
0	0	0	600	0	0	5600	0	0	0	3600	0	0	2600	0	0	0
200	0	0	200	0	0	2100	0	0	0	800	200	0	1300	0	0	200
0	0	0	0	0	0	1800	0	0	0	1400	400	0	0	0	0	0
0	0	0	0	0	0	8800	0	0	0	8300	0	0	500	0	0	0
0	0	0	0	0	0	3300	0	0	0	3300	0	0	0	0	0	0
100	0	0	600	0	0	2200	0	100	0	2600	0	0	300	0	0	0
0	0	2900	0	0	0	6200	0	0	0	0	0	0	6000	1300	0	1800
0	0	0	0	0	0	7600	0	0	0	3100	0	0	1900	100	100	2400
2000	0	0	7600	0	0	19400	0	0	500	14700	3100	1500	8600	700	0	500
0	0	0	0	0	0	1400	0	0	0	1000	400	0	0	0	0	0
0	0	0	0	0	0	500	0	0	0	0	300	0	200	0	0	0
0	0	0	500	0	0	1600	0	0	0	0	0	0	2100	0	0	0
2800	**0**	**6000**	**12400**	**0**	**0**	**2E+05**	**200**	**500**	**1000**	**94800**	**4700**	**2900**	**74400**	**17900**	**2800**	**10200**
1.4	**0.0**	**2.9**	**6.0**	**0.0**	**0.0**	**89.9**	**0.1**	**0.2**	**0.5**	**45.7**	**2.3**	**1.4**	**35.8**	**8.6**	**1.3**	**4.9**

Appendix B (continued): New Road Length Summary

Location (Feet)							Cut and Fill Slopes (Ft)			New Road Width (Feet)				
High Risk	High Water	RMA	Slopes >65%	Flood-Plain	Wet-Lands	Other OT	>2' Fill >65%	Unstble Fill	Unstble Cut	≤ 13 Feet	13.5-15.5 Feet	15.5-17.5 Feet	17.5-19.5 Feet	20+ Feet
0	0	0	0	0	0	1100	0	0	0	0	0	0	1100	0
0	0	0	500	0	0	2900	0	0	0	3400	0	0	0	0
0	0	0	0	0	0	600	0	0	0	600	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	200	0	0	0	5800	0	0	0	0	6000	0	0	0
0	0	0	0	0	0	200	0	0	0	0	0	200	0	0
0	0	0	0	0	0	3000	0	0	0	0	0	0	300	2700
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	#####	0	0	0	0	0	19800	0	0
100	0	0	0	0	0	2100	200	200	0	0	0	0	2200	0
0	0	0	0	0	0	800	0	0	0	0	800	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2800	0	0	0	0	2800	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2900	0	0	0	0	0	2900	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	5800	0	0	0	0	5800	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	4800	0	0	0	0	0	4800	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	200	0	0	2100	0	0	0	0	2500	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	600	0	0	2200	0	100	0	0	100	600	2200	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	900	0	0	2200	0	0	0	3100	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	200	0	0	600	0	0	0	0	0	0	800	0
400	**0**	**200**	**2400**	**0**	**0**	**59700**	**200**	**300**	**0**	**7100**	**18000**	**28300**	**6600**	**2700**
0.6	**0.0**	**0.3**	**3.8**	**0.0**	**0.0**	**95.2**	**0.3**	**0.5**	**0.0**	**11.3**	**28.7**	**45.1**	**10.5**	**4.3**

Appendix B (continued): Existing Road Length Summary

Site #	Length	Location (Feet)							Cut and Fill Slopes (Ft)		
	Total Existing	High Risk	High Water	RMA	Slopes >65%	Flood-Plain	Wet-Lands	Other OT	>2' Fill >65%	Unstble Fill	Unstble Cut
2	0	0	0	0	0	0	0	0	0	0	0
3	600	0	0	0	0	0	0	600	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
6	1800	0	0	500	200	0	0	1100	0	0	0
8	16400	0	0	0	0	0	0	16400	0	0	0
11	600	0	0	0	0	0	0	600	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	300	300	0	0	0	0	0	0	0	200	0
21	0	0	0	0	0	0	0	0	0	0	0
22	5500	100	0	0	1500	0	0	3900	0	0	500
23	1200	0	0	0	0	0	0	1200	0	0	0
25	1200	0	0	0	0	0	0	1200	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0
28	7300	7300	0	0	0	0	0	0	0	0	0
29	1500	0	0	0	0	0	0	1500	0	0	0
30	3400	0	0	0	400	0	0	3000	0	0	0
31	4000	0	0	0	0	0	0	4000	0	0	0
32	24300	0	0	1000	0	0	0	23300	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0
34	2000	0	0	1400	0	0	0	600	0	0	0
35	8700	0	0	0	0	0	0	8700	0	0	0
36	200	0	0	0	0	0	0	200	0	0	0
37	6200	0	0	0	600	0	0	5600	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0
39	1800	0	0	0	0	0	0	1800	0	0	0
40	8800	0	0	0	0	0	0	8800	0	0	0
41	3300	0	0	0	0	0	0	3300	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0
43	8900	0	0	2800	0	0	0	6100	0	0	0
44	7600	0	0	0	0	0	0	7600	0	0	0
47	25900	2000	0	0	6700	0	0	17200	0	0	500
48	1400	0	0	0	0	0	0	1400	0	0	0
49	500	0	0	0	0	0	0	500	0	0	0
51	1300	0	0	0	300	0	0	1000	0	0	0
Total	**144,700**	**9700**	**0**	**5700**	**9700**	**0**	**0**	**119600**	**0**	**200**	**1000**
%Total	**100**	**6.7**	**0.0**	**3.9**	**6.7**	**0.0**	**0.0**	**82.7**	**0.0**	**0.1**	**0.7**

Appendix B: Total Road Length Sediment Summary

Site #	Sed. Deliv.	Stream Class	Sed Erod. code	Sed Stor. code	Type code	Notes
2	N					
3	N					
4	N					
6	N					
8	N					
11	N					
14	N					
15	N					
18	N					
19	Y	SN	MD	0	SF	At waterbar, below road
21	N					
22	Y	SN	MD	0	DS	Existing cutslope failure
23	N					
25	N					
27	N					
28	N					
29	N					
30	N					
31	N					
32	N					
33	Y	SN	MD	0	DR	
34	N					
35	N					
36	N					
37	N					
38	N					
39	N					
40	N					
41	N					
42	N					
43	N					
44	N					
47	Y	SN	MD	0	DR	eroding ditch
		SN	SI	GT	SF	eroding ditch & cutslope failure
48	N					
49	N					
51	N					
TOTAL	**36**	**5**				
%TOT.						

Legend for Roads Headings:

Fun. = functional
Fill. =filling ditch
Erod. = eroding
Out. = outsloped
Wbars = waterbars
N.Fun. = nonfunctional
SN = small type N stream
Sed. Erod. = sediment eroded & delivered to stream
Sed. Stor. = sediment stored in stream
NO = none (0 cubic yards)
IN = incidental (0-1 cubic yards)
MD = moderate (1 - 10 cubic yards)
SI = significant (10 - 100 cubic yards)
GT = Great (> 100 cubic yards)
SF = side cast failure
FW = fill washout
DR = drainage
DS = deep seated landslide
SH = shallow failure
OT other

APPENDIX C: STREAM CROSSING NUMERIC DATA SUMMARIES

Appendix C: Stream Crossing Summary (See legend below for description of headings).

Site #	Xing #	Stream Class				Filter Dist (in 100')				Feature Type					Diam	Fill		Opening			Drop	Fill Stabilization			Seed.	Slope		Sed.
		SN	SF	MF	LF	0-1	1-2	2-5	5+	RC	AC	LP	BR	FD	Inches	Feet	<15'	Fully	Part.	Obst.	Feet	Veg.	RR	None	Y/N	N	F	Deliv.
4	1		X			X				X					75	6	Y	X			0		X		Y		1	N
8	1	X				X						X			-	4	Y	-	-	-	0	X			-	-	-	N
14	1	X				X				X					18	3	Y	X			0	X			N	5		N
14	2		X			X				X					34	4	Y	X			1	X			N		2	Y
15	1			X		X							X		312	-	-	X			-	X			Y	-	-	N
21	1	X					X			X					18	5	Y			X	1.5			X	N	1		Y
21	2		X						X			X			-	5	Y		X		0			X	Y		2	N
21	3	X						X		X					8	15	N	X			10			X	N	-	-	Y
22	1	X				X				X					18	4	Y	X			0	X			N	4		N
22	2	X				X				X					18	6	Y	X			1	X			N	6		N
27	1			X		X					X				156	14	Y	X			0		X		Y		1	N
28	1	X				X				X					24	17	N	X			0		X		N	8		N
28	2	X				X				X					24	15	N	X			0		X		N	10		N
28	3	X				X				X					24	15	N	X			0		X		N	20		N
28	4	X						X		X					24	9	Y	X			0		X		N	19		N
28	5	X				X				X					18	6	Y	X			4		X		N	18		N
28	6	X					X			X					24	8	Y	X			1		X		N	9		N
28	7	X				X				X					24	3	Y	X			1		X		N	4		N
29	1	X				X				X					24	9	Y	X			2	X			N	3		N
30	1	X				X				X					18	25	N		X		1	X			N	14		N
30	2	X				X				X					18	25	N	X			2.5	X			N	12		N
32	1	X						X		X					12	5	Y	X			3			X	N	15		N
32	2	X					X			X					18	9	Y	X			1.5			X	N	9		N
33	1	X				X				X					24	6	Y		X		2.5	X			N	7		N
33	2	X							X	X					24	6	Y	X			1			X	N	4		Y
33	3	X					X			X					30	6	Y	X			1	X			N	2		Y
33	4	X				X				X					48	8	Y	X			1	X			N	5		Y
33	5	X							X	X					18	4	Y	X			0	X			N	14		Y
34	1		X			X				X					20	5	Y	X			0.5	-	-	-	N		3	N
34	2			X		X				X					72	5	Y	X			1	-	-	-	N		1	N
34	3	X				X				X					18	7	Y	X			1.5	-	-	-	N	13		N
35	1		X			X				X					3.5	7	Y	X			0	-	-	-	N		1	N
35	2	X				X				X					-	10	Y	-	-	-	0	-	-	-	-	-	-	Y
35	3	X				X						X			1	4	Y	X			1	-	-	-	N	5		N
36	1				X	X							X		564	-	-	X			-	X			Y	-	-	N
40	1		X			X				X					30	4.5	Y	X			1	X			N		5	N
40	2	X				X				X					24	12	Y	X			0.5	X			N	15		N
42	1	X						X		X					18	12	Y	X			0	X			N	10		N
44	1	X				X				X					30	5	Y	X			1			X	N	2		N
44	2	X				X								X	-	-	-	X			0			X	Y	4		N
47	1	X				X				X					36	7	Y	X			0		X		N	3		N
47	2	X				X				X					24	11	Y	X			2	X			N	8		N
47	3	X				X				X					24	20	N	X			0		X		N	5		N
47	4	X				X				X					24	15	N	X			0		X		N	4		N
47	5				X	X							X		480	-	-	X			-		X		Y	-	-	N
TOTAL	**19**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**41**	**41**	**41**	**43**	**43**	**43**	**42**	**39**	**39**	**39**	**43**	**31**	**8**	**45**
#XINGS			**34**	**6**	**3**	**4**	**34**	**4**	**5**	**3**	**38**	**1**	**3**	**3**	**1**			**33**	**39**	**3**	**1**		**18**	**13**	**8**	**7**			**8**
AVG.																**8.9**					**1.0**					**8.3**	**2.0**	

Legend for Stream Crossings Headings

Xing = crossing
SN = small type N stream
SF = small type F stream
MF = medium type F stream
LF = Large type F stream
Filter. Dist. = filtering distance in 100 foot increments
- 0-1 = 0-100
- 1-2 = 0-200
- 2-5 = 200-500
- 5+ = greater than 500

RC = round culvert
AC = arch culvert
LP = log puncheon
BR = bridge
FD = ford
part. = partially
Obst. = fully obstructed
Veg. = vegetative
RR = rip rap
Seed. = seeded
N = type N stream
F = type F stream
Sed. Deliv. = sediment delivered to stream

APPENDIX D: LANDINGS NUMERIC DATA SUMMARIES

Appendix D: Landings Summary (See legend below for description of headings).

			Condition					Fill			Debris/Waste >2'.>65% Slopes			
Site #	Land. #	Area (ft2)	H. Risk (Y/N)	In RMA (Y/N)	In Chan. (Y/N)	Drainage (Y/N)	Petrol. (Y/N)	On>65 % (Y/N)	In High W (Y/N)	Sed. (Y/N)	Area (ft2)	Depth (Ft)	In High W. (Y/N)	Sed. Deliv.
2	1	3500	N	N	N	FU	N	N	N	N	0	-	N	N
3	1	11000	N	N	N	FU	N	N	N	N	0	-	N	N
3	2	1300	N	N	N	FU	N	N	N	N	0	-	N	N
3	3	6500	N	N	N	FU	N	N	N	N	0	-	N	N
3	4	1000	N	N	N	FU	N	N	N	N	0	-	N	N
4	1	7500	N	Y	N	FU	N	N	N	N	0	-	N	N
5	1	21000	N	N	N	FU	N	N	N	N	0	-	N	N
8	1	2000	N	N	N	FU	N	N	N	N	0	-	N	N
11	1	1200	N	N	N	FU	N	N	N	N	0	-	N	N
14	1	600	N	N	N	FU	N	N	N	N	0	-	N	N
14	2	1000	N	N	N	FU	N	N	N	N	0	-	N	N
18	1	4800	Y	N	N	FU	N	N	N	N	100	2	N	N
18	2	1200	Y	N	N	FU	N	N	N	N	350	2.5	N	N
18	3	2300	N	N	N	FU	N	N	N	N	0	-	N	N
18	4	6000	N	N	N	FU	N	N	N	N	0	-	N	N
19	1	6000	N	N	N	FU	N	N	N	N	0	-	N	N
21	1	10000	N	N	N	FU	N	N	N	N	0	-	N	N
21	2	9500	N	N	N	FU	N	N	N	N	0	-	N	N
21	3	5000	N	N	N	FU	N	N	N	N	0	-	N	N
21	4	10000	N	N	N	FU	N	N	N	N	0	-	N	N
21	5	15000	N	N	N	FU	N	N	N	N	0	-	N	N
21	6	4500	N	N	N	FU	N	N	N	N	0	-	N	N
21	7	2300	N	N	N	FU	N	N	N	N	0	-	N	N
21	8	3000	N	N	N	FU	N	N	N	N	0	-	N	N
21	9	12000	N	N	N	FU	N	N	N	N	0	-	N	N
21	10	3000	N	N	N	FU	N	N	N	N	0	-	N	N
21	11	15000	N	N	N	FU	N	N	N	N	0	-	N	N
21	12	400	N	N	N	FU	N	N	N	N	0	-	N	N
21	13	4000	N	N	N	FU	N	N	N	N	0	-	N	N
21	14	1000	N	N	N	FU	N	N	N	N	0	-	N	N
21	15	1400	N	N	N	FU	N	N	N	N	0	-	N	N
21	16	3200	N	N	N	FU	N	N	N	N	0	-	N	N
21	17	25000	N	N	N	FU	N	N	N	N	0	-	N	N
21	18	7000	N	N	N	FU	N	N	N	N	0	-	N	N
21	19	5700	N	N	N	FU	N	N	N	N	0	-	N	N
21	20	2000	N	N	N	FU	N	N	N	N	0	-	N	N
21	21	1500	N	N	N	FU	N	N	N	N	0	-	N	N
21	22	4800	N	N	N	FU	N	N	N	N	0	-	N	N
22	1	10000	N	N	N	FU	N	N	N	N	0	-	N	N
22	2	3300	Y	N	N	FU	N	N	N	N	0	-	N	N
22	3	4200	N	N	N	FU	N	N	N	N	0	-	N	N
22	4	4000	N	N	N	FU	N	N	N	N	0	-	N	N
22	5	5000	N	N	N	FU	N	N	N	N	0	-	N	N
22	6	4500	N	N	N	FU	N	N	N	N	0	-	N	N
22	7	3950	N	N	N	FU	N	N	N	N	0	-	N	N
23	1	1000	N	N	N	FU	N	N	N	N	0	-	N	N
23	2	600	N	N	N	FU	N	N	N	N	0	-	N	N
25	1	10000	N	N	N	FU	N	N	N	N	0	-	N	N
26	1	2000	N	N	N	FU	N	N	N	N	0	-	N	N
26	2	2700	N	N	N	FU	N	N	N	N	0	-	N	N
27	1	10000	N	N	N	FU	DP	N	N	N	0	-	N	N
28	1	3200	N	N	N	FU	N	N	N	N	0	-	N	N
28	2	6500	N	N	N	FU	N	N	N	N	0	-	N	N
28	3	2800	N	N	N	FU	N	N	N	N	0	-	N	N
29	1	3500	N	N	N	FU	N	N	N	N	0	-	N	N
29	2	12000	N	N	N	FU	N	N	N	N	0	-	N	N
30	1	7000	N	N	N	FU	N	N	N	N	0	-	N	N
30	2	1125	N	N	N	FU	N	N	N	N	100	2	N	N
31	1	1200	N	N	N	FU	N	N	N	N	0	-	N	N
31	2	1000	N	N	N	FU	N	N	N	N	0	-	N	N
31	3	4500	N	N	N	FU	N	N	N	N	0	-	N	N

			Condition					Fill			Debris/Waste >2'.>65% Slopes			
Site #	Land. #	Area (ft2)	H. Risk (Y/N)	In RMA (Y/N)	In Chan. (Y/N)	Drainage (Y/N)	Petrol. (Y/N)	On>65 % (Y/N)	In High W (Y/N)	Sed. (Y/N)	Area (ft2)	Depth (Ft)	In High W. (Y/N)	Sed. Deliv.
31	4	1800	N	N	N	FU	N	N	N	N	0	-	N	N
31	5	4000	N	N	N	FU	N	N	N	N	0	-	N	N
31	6	800	N	N	N	FU	N	N	N	N	0	-	N	N
31	7	1000	N	N	N	FU	N	N	N	N	0	-	N	N
31	8	3500	N	N	N	FU	N	N	N	N	0	-	N	N
33	1	3000	N	N	N	FU	N	N	N	N	0	-	N	N
33	2	12000	N	N	N	FU	N	N	N	N	0	-	N	N
35	1	2500	N	N	N	FU	N	N	N	N	0	-	N	N
35	2	1200	N	N	N	FU	N	N	N	N	0	-	N	N
36	1	2025	N	N	N	FU	N	N	N	N	0	-	N	N
38	1	15000	N	N	N	FU	N	N	N	N	0	-	N	N
38	2	8000	N	N	N	FU	N	N	N	N	0	-	N	N
38	3	3000	N	Y	N	FU	N	N	N	N	0	-	N	N
38	4	4000	N	N	N	FU	N	N	N	N	0	-	N	N
38	5	9000	N	N	N	FU	N	N	N	N	0	-	N	N
40	1	1800	N	N	N	FU	N	N	N	N	0	-	N	N
41	1	8000	N	N	N	FU	N	N	N	N	0	-	N	N
41	2	7000	N	N	N	FU	N	N	N	N	0	-	N	N
41	3	3000	N	N	N	FU	N	N	N	N	0	-	N	N
41	4	6000	N	N	N	FU	N	N	N	N	0	-	N	N
41	5	1000	N	N	N	FU	N	N	N	N	0	-	N	N
42	1	3200	N	N	N	FU	DP	N	N	N	0	-	N	N
42	2	2500	N	N	N	FU	N	N	N	N	0	-	N	N
42	3	2400	N	N	N	FU	N	N	N	N	0	-	N	N
44	1	500	N	N	N	FU	N	N	N	N	0	-	N	N
44	2	7200	N	N	N	FU	N	N	N	N	0	-	N	N
47	1	9000	N	N	N	FU	N	N	N	N	0	-	N	N
47	2	1000	N	N	N	FU	N	N	N	N	0	-	N	N
47	3	2000	N	N	N	FU	N	N	N	N	0	-	N	N
47	4	1500	N	N	N	FU	N	N	N	N	0	-	N	N
47	5	2500	N	N	N	FU	N	N	N	N	0	-	N	N
47	6	10000	N	N	N	FU	N	N	N	N	0	-	N	N
47	7	4000	N	N	N	FU	N	N	N	N	0	-	N	N
47	8	3000	N	N	N	FU	N	N	N	N	0	-	N	N
47	9	2000	N	N	N	FU	N	Y	N	N	100	3	N	N
47	10	1500	N	N	N	FU	N	N	N	N	0	-	N	N
47	11	1500	N	N	N	FU	N	N	N	N	50	5	N	N
47	12	1200	N	N	N	FU	N	N	N	N	0	-	N	N
47	13	5000	N	N	N	FU	N	N	N	N	0	-	N	N
47	14	3500	N	N	N	FU	N	N	N	N	0	-	N	N
47	15	1000	N	N	N	FU	N	N	N	N	0	-	N	N
47	16	500	N	N	N	FU	N	N	N	N	0	-	N	N
47	17	600	N	N	N	FU	N	N	N	N	0	-	N	N
49	1	8000	Y	N	N	FU	N	N	N	N	150	5	N	N
51	1	3500	N	N	N	FU	N	N	N	N	0	-	N	N
51	2	800	N	N	N	FU	N	N	N	N	0	-	N	N
51	3	500	N	N	N	FU	N	N	N	N	0	-	N	N
51	4	12000	N	N	N	FU	N	N	N	N	0	-	N	N
TOTAL	**30**	**109**	**514300**	**109**	**109**	**109**	**109**	**109**	**109**	**109**	**109**	**109**	**6**	**109**	**109**
#LAND.				**4**	**2**	**0**	**0**	**0**	**1**	**0**	**100**	**6**		**0**	**0**
AVG.		**3.6**	**4718**										**3.2**		

Legend for Landings Headings

H. Risk = high risk site
In RMA = within riparian management area
Chan. = channel
Petrol. Petroleum or other chemical found on landing
DP = drops
PL = pool
OD = observed delivery
MT = metal in channel or wetland from current operation

High W. = High water mark
Sed. = sediment
Sed.Deliv. = sediment delivery to channel

APPENDIX E: SKID TRAILS LENGTH NUMERIC DATA SUMMARIES

Appendix E: Skid Trails Length Summary

			Location (Feet)						Drainage (Feet)				Sediment Delivery					
	Site #	Total Trails	High Risk	35' of Type F	Type N High W.	Slope >35%	In RMA	Other	Func.	Excess Spacing	By-Passed	Not Installed	Sed. (y / n)	StrDist. (Feet)	Steam (size/type)	Eroded (code)	Stored (code)	Type (code)
	4	1400	0	0	0	0	0	1400	1400	0	0	0	N					
	8	3500	0	0	0	0	0	3500	3500	0	0	0	N					
	11	400	0	100	0	0	200	100	400	0	0	0	N					
	14	5300	0	0	0	500	300	4500	5300	0	0	0	N					
	15	400	0	0	0	0	0	400	0	0	0	400	N					
	21	56500	0	0	0	0	500	56000	55500	0	1000	0	N					
	23	1200	0	0	0	0	0	1200	1200	0	0	0	N					
	26	2400	0	0	100	0	0	2300	1800	0	0	600	N					
	28	5500	0	0	0	4500	0	1000	5500	0	0	0	N					
	31	6000	0	0	0	0	0	6000	6000	0	0	0	N					
	33	1900	0	0	0	0	100	1800	0	0	0	1900	N					
	34	1000	0	0	0	200	0	800	1000	0	0	0	N					
	35	5000	0	0	0	0	0	5000	5000	0	0	0	N					
	36	1900	0	100	0	0	800	1000	1900	0	0	0	N					
	38	2900	0	0	100	0	300	2500	400	0	2500	0	Y	30	MF	SI	0	DR
	42	600	0	0	0	0	300	300	600	0	0	0	N					
	44	1700	0	0	0	0	0	1700	1200	0	0	500	Y	100	SN	SI	0	DR
	47	500	0	0	0	0	0	500	500	0	0	0	N					
Total	18	98100	0	200	200	5200	2500	90000	91200	0	3500	3400	2					
%of Total		100	0.0	0.2	0.2	5.3	2.5	91.7	93.0	0.0	3.6	3.5	11.1					

Legend for Skid Trail Headings

35' of Type F = within 35 feet of Type F stream
Func. = functional
Sed. = sediment dilvered to stream
Str. Dist. - distance to stream
SN = small Type N stream
MF = medium Type F stream

Sed. Erod. = sediment eroded
Sed. Stor. = sediment stored
NO = none (0 cubic yards)
IN = incidental (0-1 cubic yards)
MD = moderate (1 - 10 cubic yards)
SI = significant (10 - 100 cubic yards)
GT = Great (> 100 cubic yards)

SF = sidecast failure
FW = fill washout
DR = drainage
DS = deep seated landslide
SH = shallow failure
OT other

APPENDIX F: RIPARIAN MANAGEMENT AREA NUMERIC DATA SUMMARIES

Appendix F: RMA Summary (See legend below for description of headings).

										Prescription				10' No-Touch			
RMA #	Length (Ft)	Stream Class SF	MF	LF	RMA Harv.	20' Regen.	RMA Regen.	Slash Clear	Felling Away	GE BW	GE BA	Site Spec.	Alt. HWC	Length (Ft)	Veg. % Ret.	Soil % Ret.	Sed. Deliv.
2a	1300	X			-	-	-	X	X	X				1300	100	100	N
2b	1300	X			-	-	-	X	X	X				1300	100	100	N
2c	900	X			-	-	-	X	X	X				900	100	100	N
2d	200	X			-	-	-	X	X	X				200	100	100	N
2e	400		X		-	-	-	X	X	X				400	100	100	N
2f	1000		X		-	-	-	X	X	X				1000	100	100	N
2g	200		X		-	-	-	X	X	X				200	100	100	N
4a	1400	X			-	-	-	X	X	X				1400	100	100	N
4b	100			X	-	-	-	X	X	X				100	100	100	N
5A	900		X		-	-	-	X	X	X				900	100	100	N
5B	900		X		-	-	-	X	X	X				900	100	100	N
5C	2500			X	-	-	-	X	X	X				2500	100	100	N
6A	400			X	-	-	X	X	X	X				400	100	100	N
6B	120		X		X	-	X	X	X	X				120	100	100	N
8A	2500		X		X	-	-	X	X			X		2500	100	100	N
11A	680	X			X	-	X	X	X		X			680	100	100	N
11B	680	X			X	-	X	X	X		X			680	100	100	N
14A	400		X		-	-	X	X	X	X				400	100	100	N
14B	500	X			X	X	X	X	X		X			500	100	100	N
14C	1350	X			X	X	X	X	X		X			1350	100	100	N
15A	200		X		-	-	-	X	X	X				200	100	100	N
15B	200		X		X	-	-	X	X		X			200	100	100	N
17A	1800			X	-	-	-	X	X	X				1800	100	100	N
18A	800	X			-	-	X	X	X			X		800	100	100	N
19A	1200		X		-	-	-	X	X	X				1200	100	100	N
20A	300			X	-	-	-	X	X	X				300	100	100	N
21A	3100	X			X	X	X	X	X		X			3100	100	100	N
25A	1200		X		X	X	X	X	X			X		1200	100	100	N
27A	2400		X		-	-	-	X	X	X				2400	100	100	N
28A	4000			X	-	-	-	X	X	X				4000	100	100	N
30A	2600			X	X	-	X	X	X		X			2600	100	100	N
30B	1200			X	X	-	X	X	X		X			1200	100	100	N
31A	2500	X			-	-	-	X	X	X				2500	100	100	N
31B	1000		X		-	-	-	X	X	X				1000	100	100	N
32A	700			X	-	-	-	X	X	X				700	100	100	N
32B	200			X	-	-	-	X	X	X				200	100	100	N
33A	800	X			X	-	-	X	X	X				800	100	100	N
33B	800	X			X	-	-	X	X	X				800	100	100	N
34A	2000		X		X	-	-	X	X			X		2000	100	100	N
34B	2000		X		X	-	-	X	X			X		2000	100	100	N
35A	1625	X			-	-	-	X	X	X				1625	100	100	N
35B	1625	X			-	-	-	X	X	X				1625	100	100	N
36A	2300			X	X	-	-	X	X	X				2300	100	100	N
37A	1200	X			X	-	-	X	N			X		1200	100	100	N
37B	1200	X			X	-	-	X	N			X		1200	100	100	N
37C	1800	X			X	-	-	X	X			X		1800	100	100	N
37D	1000	X			X	-	-	X	X			X		1000	100	100	N
38A	1500		X		X	-	X	X	X		X			1500	100	100	N
38B	1890		X		X	-	X	X	X		X			1890	100	100	N
40A	740	X			X	-	-	X	X	X				740	100	100	N
40B	2000	X			-	-	-	X	X	X				2000	100	100	N
41A	2000	X			-	-	-	X	X	X				2000	100	100	N
43A	6000	X			X	-	-	X	X			X		6000	100	100	N
43B	6000	X			X	-	-	X	X			X		6000	100	100	N
44A	3400		X		X	-	-	X	X	X				3400	100	100	N
44B	3400		X		-	-	-	X	X	X				3400	100	100	N
47A	500			X	X	-	-	X	N			X		500	100	100	N
49A	650			X	-	-	-	X	N	X				650	100	100	N
51A	2700	X			-	-	-	X	X	X				2700	100	100	N
51B	1200		X		-	-	-	X	X	X				1200	100	100	N
52A	600			X	X	X	X	X	X				X	600	85.7	75	N
52B	200			X	X	X	X	X	X				X	200	100	100	N
52C	550			X	X	X	X	X	X				X	550	100	100	N
TOTAL	**63**	**90810**	**26**	**21**	**16**	**30**	**7**	**17**	**63**	**59**	**38**	**10**	**12**	**3**	**90810**	**63**	**63**	**63**
Avg		**1441**							**100**							**99.8**	**99.8**	

		20' No-Cut		Buffer Widths		Basal Area				RMA Ret. (BW + BA)			
RMA #	Length (Ft)	Length (Ft)	20' % Ret.	Length (Ft)	RMA % Ret.	Length (Ft)	#Trees % Ret.	Tot.BA % Ret.	LiveBA % Ret.	Length (Ft)	Trees % Ret.	Soil % Ret.	Sed. Deliv.
2a	1300	1300	100	1300	100	-	-	-	-	1300	100	100	N
2b	1300	1300	100	1300	100	-	-	-	-	1300	100	100	N
2c	900	900	100	900	100	-	-	-	-	900	100	100	N
2d	200	200	100	200	100	-	-	-	-	200	100	100	N
2e	400	400	100	400	100	-	-	-	-	400	100	100	N
2f	1000	1000	100	1000	92.0	-	-	-	-	1000	92.0	100	N
2g	200	200	100	200	95.0	-	-	-	-	200	95.0	100	N
4a	1400	1400	100	1400	100	-	-	-	-	1400	100	100	N
4b	100	100	100	100	100	-	-	-	-	100	100	100	N
5A	900	900	100	900	100	-	-	-	-	900	100	100	N
5B	900	900	100	900	100	-	-	-	-	900	100	100	N
5C	2500	2500	100	2500	100	-	-	-	-	2500	100	100	N
6A	400	400	100	400	100	-	-	-	-	400	100	100	N
6B	120	120	100	120	52.9	-	-	-	-	120	52.9	100	N
8A	2500	2500	100	-	-	-	-	-	-	-	-	100	N
11A	680	680	100	-	-	680	-	100	100	680	100	100	N
11B	680	680	100	-	-	680	-	100	100	680	100	100	N
14A	400	400	100	400	100	-	-	-	-	400	100	100	N
14B	500	500	100	-	-	500	-	100	100	500	100	98.5	N
14C	1350	1350	100	-	-	1350	-	100	100	1350	100	100	N
15A	200	200	100	200	100	-	-	-	-	200	100	100	N
15B	200	200	100	-	-	200	100	100	100	200	100	100	N
17A	1800	1800	100	1800	100	-	-	-	-	1800	100	100	N
18A	800	800	100	-	-	-	-	-	-	-	-	100	N
19A	1200	1200	100	1200	100	-	-	-	-	1200	100	100	N
20A	300	300	100	300	100	-	-	-	-	300	100	100	N
21A	3100	3100	99.1	-	-	3100	-	100	100	3100	100	100	N
25A	1200	1200	100	-	-	-	-	-	-	-	-	100	N
27A	2400	2400	100	2400	100	-	-	-	-	2400	100	100	N
28A	4000	4000	100	4000	100	-	-	-	-	4000	100	100	N
30A	2600	2600	100	-	-	2600	87.5	74.6	71.8	2600	74.8	100	N
30B	1200	1200	100	-	-	1200	100	100	100	1200	100	100	N
31A	2500	2500	100	2500	100	-	-	-	-	2500	100	100	N
31B	1000	1000	100	1000	98.1	-	-	-	-	1000	98.1	100	N
32A	700	700	100	700	100	-	-	-	-	700	100	100	N
32B	200	200	100	200	100	-	-	-	-	200	100	100	N
33A	800	800	100	800	96.8	-	-	-	-	800	96.8	89.6	N
33B	800	800	100	800	92.0	-	-	-	-	800	92.0	99.6	N
34A	2000	-	-	-	-	-	-	-	-	-	-	100	N
34B	2000	-	-	-	-	-	-	-	-	-	-	100	N
35A	1625	1625	100	1625	100	-	-	-	-	1625	100	100	N
35B	1625	1625	100	1625	100	-	-	-	-	1625	100	100	N
36A	2300	2300	100	2300	91.5	-	-	-	-	2300	91.5	100	N
37A	1200	-	-	-	-	-	-	-	-	-	-	100	N
37B	1200	-	-	-	-	-	-	-	-	-	-	100	N
37C	1800	-	-	-	-	-	-	-	-	-	-	100	N
37D	1000	-	-	-	-	-	-	-	-	-	-	100	N
38A	1500	1500	100	-	-	1500	100	100	100	1500	100	100	N
38B	1890	1890	100	-	-	1890	100	100	100	1890	100	100	N
40A	740	740	100	740	97.2	-	-	-	-	740	97.2	100	N
40B	2000	2000	100	2000	100	-	-	-	-	2000	100	100	N
41A	2000	2000	100	2000	100	-	-	-	-	2000	100	100	N
43A	6000	6000	100	-	-	-	-	-	-	-	-	100	N
43B	6000	6000	100	-	-	-	-	-	-	-	-	100	N
44A	3400	3400	100	3400	98.6	-	-	-	-	3400	98.6	99.8	N
44B	3400	3400	100	3400	100.0	-	-	-	-	3400	100.0	100	N
47A	500	500	100	-	-	-	-	-	-	-	-	100	N
49A	650	650	100	650	100	-	-	-	-	650	100	100	N
51A	2700	2700	100	2700	100	-	-	-	-	2700	100	100	N
51B	1200	1200	100	1200	100	-	-	-	-	1200	100	100	N
52A	600	-	-	600	100	-	-	-	-	600	100	100	N
52B	200	200	100	200	100	-	-	-	-	200	100	100	N
52C	550	-	-	550	100	-	-	-	-	550	100	100	N
63	**90810**		**55**	**41**	**41**		**5**	**10**	**10**		**51**	**63**	**63**
	1441		**99.9**	**97.9**	**97.9**		**97.5**	**97.5**	**97.2**		**97.8**	**99.8**	**100**

LEGEND for RMA Table Headings

RMA# = unique site identification number
Length = length of RMA
RMA Harv = harvest took place in the RMA
20' Regen. = conifer seedlings planted within 20 ft of the high water mark
RMA Regen. = conifer seedlings planted in the RMA
Slash Clear = Slash was cleared out of the stream
Felling Away = trees were felled away from the stream
GE BW = General prescription with a no-cut buffer width
GE BA = general prescription managed to meet a basal area target
Site Spec. = site specific plan for management within the RMA
Alt. HWC = Alternative prescription, RMA managed with a hardwood conversion
10 no-touch and 20' no-cut =
    Length = length in total compliance,
    Veg %ret. & Soil %ret.= % of RMA length in compliance with vegetation retention & soil disturbance rules
    Sed. Deliv. = if sediment was delivered to the stream from the RMA
Buffer widths RMA %Ret. = percent of no-cut buffer retained
Basal Area =
    #Trees %Ret. = % compliance with number of trees/thousand feet
    Tot.BA %Ret. = Percent retention of basal area requirements including snags and hardwoods where applicable
    Live BA %Ret. = Percent retention of live conifers only.
RMA Ret. (BW + BA) = Summarizes compliance for
    Trees ret. = both basal area &/or buffer width,
    Soil %Ret. = soil disturbance in the RMA
    Sed. Deliv. = sediment delivery from the RMA