MONTANA DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

STATE FOREST LAND MANAGEMENT PLAN

IMPLEMENTATION MONITORING REPORT
FISCAL YEARS 1997-2000

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October 16, 2000

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EXECUTIVE SUMMARY

Since the adoption of the State Forest Land Management Plan (SFLMP) in June 1996, the Forest Management Bureau has coordinated the implementation of its philosophy and standards.

The following were accomplished from July 1996 through June 2000.

PLAN IMPLEMENTATION

- Issued an SFLMP Implementation Checklist to the land offices on January 22, 1997. It has been completed for 79 timber sales.
- Completed Implementation and Monitoring Guidance for all 10 resource areas in the SFLMP (Biodiversity, Silviculture, Road Management, Watershed, Fisheries, Threatened and Endangered Species, Sensitive Species, Big Game, Grazing on Classified Forest Lands, and Weed Management).
- Currently in development is guidance for Silviculture—Soils Monitoring, Biodiversity—Old Growth Management, and updated guidance for T&E Species—Lynx.

MONITORING

Biodiversity

- Completed two Biodiversity Field Reviews in October 1999. They confirmed that silvicultural treatments in the stands fairly closely emulated natural disturbance regimes.
- Updated the estimate of current old growth, based on more complete Stand Level Inventory information.

Silviculture

- A combination of 40 stakelines and regeneration surveys were completed on 1778 acres in 1998-1999. Seedling survival was 84-94%.
- Forest Improvement accomplishments from 1997-2000 included tree planting, tree netting, pre-commercial thinning, herbicide application, brush piling and burning, tree improvement, fireline construction and road maintenance (Table S-1).

- Timber sale annual revenue/cost ratios averaged 1.97 between 1994 and 2000 (Table S-2).

- Logging contracts used tractor-based systems on 91% of the harvest acres from 1998-2000 (as compared to 92% from 1990-1994) (Table S-3).

- Selection and intermediate harvests were used more often than was forecast in the SFLMP, while even-aged regeneration harvests (clearcut, seed tree and shelterwood) were used less (Table S-4).

Watershed and Road Management

- 15 watershed inventories, covering 51,979 acres, were completed in fiscal years 1999-2000. These included 225 miles of existing road, 154 miles of stream channel and 259 stream crossing structures.

- Watershed improvements included road improvements (17.8 miles), stream crossing structures (8), and channel stabilization, reconstruction and streambank protection (0.79 miles) (Table W-1).

- During timber sale contract inspections in 1998-2000, 121 items in need of improvement and 14 contract violations were related to road Best Management Practices (BMPs), Streamside Management Zones and other watershed protection measures. These were only 0.6% of the total items inspected.

- Internal BMP audits on 46 timber sales found that BMPs were applied and effective 95-98% of the time (Table W-2). These results were comparable to statewide audits.

- Project level monitoring was conducted on 6 sites and 4 reference reaches, to evaluate the effectiveness of various mitigation measures.

- New road construction statewide in 1998-2000 averaged 0.9 miles/MMBF, and was slightly below that forecast in the SFLMP (Table R-1).

Fisheries

- Monitoring on the Swan River and Stillwater State Forests found spawning conditions for bull trout and westslope cutthroat trout to be within acceptable limits on 9 of 11 streams (Tables F-1 and F-2). Redd counts were stable in 10 of 11 streams (Tables F-3 and F-4).

- Cottonwood Creek (near Dillon, MT) was found to have one of the highest westslope cutthroat trout populations among comparable streams in SW MT.

- Westslope cutthroat trout densities were also good in Long Creek (near Dillon, MT), but hybridization, competition from brook trout, and poor habitat conditions were threatening the fishery.

Threatened, Endangered, and Sensitive Species and Big Game

- DNRC biologists monitored two bald eagle nest territories in 1999 and 2000 (Table T-1). One new nest territory was located near a DNRC parcel in 2000.

- DNRC biologists participated in Swan Valley Grizzly Bear Conservation Agreement monitoring. A final report was completed and distributed on March 30, 2000.

- Wildlife mitigation measures were reviewed on 6 timber harvest projects during summer 2000 (Table T-2). 94% of the measures were rated to have reasonable likelihood of effectiveness.

- Baseline monitoring found that pre-harvest snag densities were often lower than recommended levels, but that snag recruitment trees were ample to make up the deficit. Pre-harvest levels of coarse woody debris varied from below to above recommended levels. Post-harvest results will be collected in future years.

- Eighty observations on state lands of T&E, sensitive and other species of interest were reported.

- Monitoring of a heron rookery, one osprey nest and two goshawk nests was done for four timber sales (Table T-6).

- 17 lakes were surveyed for occurrence and reproductive success of common loons.

- DNRC biologists also collected 189 hair samples in 2000 as part of the Greater Glacier Area Bear DNA project.

Grazing on Classified Forest Lands

- Twenty-three licenses were inspected for 10-year renewals and 7 were inspected for 5-year reviews. An additional 23 licenses will inspected for 5-year reviews in fall 2000.

- 5 licenses had no riparian habitat; 16 licenses had riparian habitat in good condition; 9 licenses didn't meet riparian standards.
- Management changes were recommended for 5 licenses. The remaining 4 licenses had streambank damage exceeding standards and will need followup management and monitoring.

Weed Management

- Out of 79 timber sales, 42 had noxious weeds on the project areas, mainly along existing roads.
- Integrated weed management practices were applied to all projects, which included requiring the use of weed-free / washed equipment, grass seeding of roads, herbicide applications, and biological insect controls.
- 30 grazing licenses were reviewed for noxious weeds during license reviews. Weed infestations were associated with roads, skid trails, and some open meadows.

PLAN MAINTENANCE

- Old Growth Management: 3 options are out for internal, public and technical review. After reviewing the comments, a recommendation for the final guidance will be made to the Land Board. If old growth continues to be contentious, DNRC may recommend to re-evaluate and revise the old growth standards.
- The guidance for lynx management is being revised to ensure consistency with the federal *Canada Lynx Conservation Assessment and Strategy* (Ruediger et. al. 2000).
- Initial assessments indicate that variable standards, based on watershed sensitivity and beneficial uses, may be more equitable than the current grazing standards. DNRC may recommend revising the standards after more evaluations.
- DNRC is currently managing bull trout under interim measures and westslope cutthroat trout under an interagency Conservation Agreement. Future changes to the SFLMP will incorporate these measures.
- The Silviculture financial standards, as currently written, are unclear and too prescriptive of specific methods of analysis. A rewording of the standards to clarify their intent and accommodate the use of alternate methods may be useful.

INTRODUCTION

The State Forest Land Management Plan (SFLMP), approved by the State Land Board in June 1996, guides the management of the forested trust lands (MT DNRC 1996a). This guidance is provided in the form of a general management philosophy and specific Resource Management Standards (RMS). The strategic guidance provided by the SFLMP is summarized in this excerpt:

Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. Our understanding is that a diverse forest is a stable forest that will produce the most reliable and highest long-term revenue stream. Healthy and biologically diverse forests would provide for sustained income from both timber and a variety of other uses. They would also help maintain stable trust income in the face of uncertainty regarding future resource values. In the foreseeable future, timber management will continue to be our primary source of revenue and primary tool for achieving biodiversity objectives.

Since June 1996, the land offices and the Forest Management Bureau have worked to implement this guiding philosophy on trust lands, primarily through project development, environmental review and monitoring. This document gives an overview of our efforts and accomplishments toward implementation of the SFLMP during fiscal years (July 1 – June 30) 1997-2000.

Purpose of the Monitoring Report

The SFLMP Record of Decision (ROD) was finalized on May 30, 1996 (MT DNRC 1996b). It set forth two general reporting requirements. A Monitoring Report due to the Land Board in October 2000 was mandated in Watershed RMS 24 (ROD page 24). A second report due to the Director of DNRC was required under *Managing the Plan* (ROD page 10). This report was to discuss the current status of Plan implementation and effectiveness, including a recommendation on the need for any significant changes to the Plan. These two reports were to be generated in year 2000 and every 5 years afterwards. This document is intended to fulfill both of these commitments.

Phased-In Implementation of the SFLMP

The Record of Decision of the SFLMP stated that, "We expect implementation to be a learning process. The Department will conduct phased-in implementation of the Plan. The development of implementation guidance and monitoring procedures, as well as the training of personnel, will be an ongoing process" (ROD page 10). A Departmental Memorandum, dated February 3, 1997, outlined how implementation of the SFLMP would be phased-in with timber sales in development. (1) Sales under contract prior to approval of the SFLMP would not be modified. (2) SFLMP standards would be incorporated into projects still in development where the environmental analysis was in process, and where it was reasonable to do so. (3) The SFLMP standards would be fully implemented into sales where scoping was initiated after approval of the SFLMP.

Implementation Checklists

During 1996, an SFLMP Implementation Checklist was developed for timber sales. This was introduced to the field in October 1996, and was released in final form with a Departmental Memorandum on January 22, 1997. The Checklist is comprised of specific SFLMP Resource Management Standards pertinent to timber sale preparation and issues often raised concerning timber harvest. It lists 44 separate items. As stated in the memorandum, the checklist was developed for two purposes: 1) as an internal check to ensure that the SFLMP philosophy and standards are being incorporated in the project; and 2) for external accountability, when presenting our projects to the Land Board.

A SFLMP Implementation Checklist has been filled out for 79 timber sales that have been submitted to the Land Board since January 1997. The checklist lists 44 separate items from 9 of the 10 resource areas analyzed in the SFLMP Final Environmental Impact Statement (MT DNRC 1996a): Biodiversity, Silviculture, Road Management, Watershed, Fisheries, Threatened & Endangered Species, Sensitive Species, Big Game, and Weed Management. (Standards for Grazing on Classified Forest Lands were excluded as not applicable.) All sales complied with the SFLMP, either fully or (for a very few items) partially with a supporting rationale.

Implementation Guidance

The philosophy of the SFLMP is based on "adaptive management." Its intent is to be a guiding document, with enough flexibility for managers to adapt their management practices to changing circumstances. (Examples are the de-listing of the peregrine falcon and the listing of the lynx under the federal Endangered Species Act.) Consequently, the Plan did not list in detail (beyond the Resource Management Standards) management or monitoring procedures. The direction was to issue these as implementation guidance (SFLMP ROD page 11). It has been our intent that this guidance would not require additional review under MEPA as long as it was consistent with the SFLMP EIS analysis (ROD page 10).

Since the release of the Record of Decision for the SFLMP on May 30, 1996, resource specialists in the Forest Management Bureau have worked with foresters and specialists in the field to develop guidance for implementation of the SFLMP. During this period when Implementation Guidance was being developed, decision-makers were to use their judgement in how to best implement the standards.

As of October 2000, most of the planned Implementation Guidance has been completed. Guidance for Silviculture was adopted in 1997, from earlier guidance developed in 1991. Guidance for Biodiversity, Road Management, Watershed, Fisheries, Grazing, T&E and Sensitive Species and Big Game were issued in 1998. Watershed Monitoring and Weeds Management were completed in 1999. Since January 2000, the monitoring guidance for T&E, Sensitive Species and Big Game, and supplemental monitoring guidance for Biodiversity, have been released and implemented.

The guidance for the Soils RMS (under Silviculture) was field tested in 1999 and released in draft form for internal review in August 2000. It is scheduled for issuance in final form in spring 2001. Also in development is Biodiversity—Supplemental Guidance for Old Growth Management. Due to the high level of public interest and concern, this guidance is undergoing a public review process, which was initiated in summer 2000. Additionally, Threatened & Endangered Species guidance is being updated for the federal listing of the lynx.

DNRC will continue to use guidance as a recommended means to meet the Resource Management Standards, however, situations are anticipated where guidance may not apply, or there are other more appropriate means to meet the standards. In these cases, rationale for their use will be provided.

Monitoring Report Format

The monitoring report is subdivided into 8 sections, corresponding to the 10 resource areas analyzed in the SFLMP Final Environmental Impact Statement (MT DNRC 1996a). (Threatened and Endangered Species, Sensitive Species, and Big Game are combined). Under each heading is a brief summary of the Resource Management Standards, followed by the monitoring results. (See the SFLMP Record of Decision for the full texts of the standards; MT DNRC 1996b.) Each monitoring activity is presented with the following general outline:

Introduction—a general description of the monitoring procedure and its purpose

Methods—a summary of the procedures necessary to understand the results

Results—presentation and interpretation of the results

Conclusions—management actions that were or will be made in response to the results

Because there are overlaps in the standards between several of the resources (e.g. between Watershed, Grazing on Classified Forest Lands, Road Management and Fisheries, and between Biodiversity and the wildlife standards), there is corresponding overlap between the reports. Consequently, there are cross-references between the individual resource reports, which appear in **bold text**, and some repetition of information to make each report self-contained.

BIODIVERSITY MONITORING

The State Forest Land Management Plan (SFLMP) uses the "coarse filter" approach to promote biodiversity, by favoring an appropriate mix of stand structures and compositions on state lands based on natural landscape patterns and processes (Biodiversity RMS 1). This would be accomplished through the following practices (RMS 2-7):

- ***manage for a variety of forest conditions;***
- ***employ a "fine filter" approach for threatened, endangered, and sensitive species, which focuses on species' specific habitat requirements;***
- ***manage for a desired future condition characterized by the proportion and distribution of forest types and structures historically present on the landscape;***
- ***pursue cooperative planning where reasonable;***
- ***on scattered tracts, restore a semblance of historic conditions within the State ownership;***
- ***maintain or restore old growth in amounts of at least half the average proportion that would be expected to occur with natural processes on similar sites;***
- ***use current references as guidance for promoting biodiversity.***

These standards would be monitored through Field Reviews of projects and Landscape Evaluations (RMS 8 and 9). Additional monitoring would be done under THREATENED, ENDANGERED AND SENSITIVE SPECIES AND BIG GAME MONITORING. Results of the monitoring would be used to plan future actions (RMS 11).

Biodiversity Implementation

The SFLMP relies on management for biodiversity to accomplish the Plan's fundamental premise. Adopting the SFLMP resulted in the DNRC adjusting our management focus from the stand level to consideration of how individual stands contribute to landscape function. Our efforts at implementing the coarse filter are focused on assessment and management of appropriate stand conditions at the landscape level, and emulation of natural disturbance processes in our selection of proper treatments. We have developed management tools for describing desired future forest conditions and for comparing them to current or existing conditions. Through an ongoing, adaptive management process we are monitoring the utility of these tools and refining them to better fit the lands we manage (MT DNRC 1998c; MT DNRC 2000a).

Biodiversity Field Review Monitoring Process

Methods: In October 1999, an internal audit team composed of the Forest Improvement Section Supervisor, NWLO supervisory wildlife biologist, a lead management forester, and a management forester was formed. The group was augmented with several observers including Staff Wildlife Biologist, NWLO and SWLO silviculturists, MEPA specialist, and NWLO wildlife biologist.

One sale from each of the NWLO and the SWLO, planned and conducted with SFLMP concepts, was selected for review. The audit team reviewed the MEPA documents for the sales selected, reviewed the pertinent RMSs, and reviewed the field form. The team then discussed the projects regarding completeness of the MEPA documents and identified any areas where clarification would be needed during the field review.

Following the office review of documents, the team conducted field site visits guided by the Project Leader. The site visits were to examine first hand the implementation of the MEPA document commitments and to verify the conditions described. For each site the Biodiversity Field Review Form was completed. (A copy of this form is available upon request from the Forest Management Bureau.)

Results:

West Lubrecht: The sale area was predominantly ponderosa pine type with some Douglas-fir and

western larch. The sale fairly closely emulated natural disturbance regime of non-lethal fire. RMSs 1, 2 and 7 were met through the close emulation of non-lethal fire. RMS 4 was met through a restoration type harvest that restored a semblance of natural conditions. RMS 5 was met through close cooperation with the University of Montana, Lubrecht Experimental Forest, although no formal agreements were signed. See **Old Growth Statistics**, below, for information on RMS 6. Treatments were similar to recommendations in RMS 7.

Callahan: The sale covered several different forest types with appropriate treatments corresponding to predominant disturbance regimes. RMSs 1, 2, 4, and 7 were met via selection harvesting in the non-lethal regimes dominated by ponderosa pine and clearcuts with reserves in the stand replacement regimes. Some areas were broadcast burned, while others were not. Although no cooperative agreements were formed, treatments utilized common stands along the boundaries with USFS to enlarge old growth patches; and in ponderosa pine stands on southern slopes, treatments were designed to blend in at the USFS boundaries. See **Old Growth Statistics**, below, for information on RMS 6. This project served as a testing ground for further development of Biodiversity Guidelines, thus meeting RMS 7.

Old Growth Statistics

The data reported here show our commitment to old growth maintenance or restoration per RMS 6. We show both the current number of acres (as of August 1, 2000) by Land Office, west of the continental divide, and committed acres. East of the divide our activities are evaluated at the sale level due to the distances between state parcels, and the amount of Trust land that is inaccessible, so it is not portrayed here. Recent fires across the state will impact the acres shown in some areas.

In addition to the summaries shown below, old growth amounts and effects are evaluated for every sale. Old growth amounts and commitments at the Unit level are also addressed in the appropriate MEPA documents.

For this monitoring report we are using our current working definition of old growth. A similar working definition was used by DNRC to determine old growth effects and amounts in the SFLMP (MT DNRC 1996a), and we have continued to rely on it with minor adjustments since. In the SFLMP the working definition of old growth was based solely on stand age exceeding 140 years. Under the current working definition, "*Old-growth is defined as stands that are 150 years and older (140 for lodgepole pine), contain a minimum of 4 MBF net per acre, and exhibit a range of structural attributes associated with old age.*"

Old growth acres on western Montana state lands were estimated in the SFLMP to total 74,362 acres (MT DNRC 1996a: IV-62). This is compared to the 132,468 acres shown in Table B-3. The most likely source of difference between the two estimates is that the SFLMP had less actual data to draw from, and was forced to extrapolate into non-sampled areas. The estimates from the SFLMP "...should be used with caution (MT DNRC 1996a: IV-62)." The current estimate is a more accurate assessment of current old growth amounts on state lands.

Other age class distributions are shown in the SFLMP that relied on extrapolating Forest Inventory Assessment (FIA) data. The process to determine stand age for the FIA was quite different than that used to estimate old growth amounts in the SFLMP (MT DNRC 1996a: IV-62) and currently. The FIA data relied on a sample of plots that fell within DNRC ownership. Each plot represents approximately 5,000 acres. Compared to the Stand Level Inventory (SLI) where we have ages measured for each stand, the FIA data is a minor sample. In addition, age in the FIA data is estimated as an average for all trees on a plot, while the SLI estimate is based on either all trees over 9 inches dbh or the sawtimber component of the stand. The differences in the age estimation process results in FIA ages being lower in almost every situation.

We are currently engaged in a process to refine our old growth approach. As such, future reports may report on old growth in a slightly different manner.

Table B-1. Summary of Northwest Land Office old growth commitments and current amounts

Old Growth Type	Commitment (acres)	Current (acres)
PP	17,089	12,326
Douglas-fir	385	2,144
L-Douglas-fir	25,959	24,578
LP	464	315
WP	2,340	10,085
MC	4,396	26,384
ALP/NC	2,804	14,683
TOTAL	53,439	90,515

Table B-2. Summary of Southwest Land Office old growth commitments and current amounts

Old Growth Type	Commitment (acres)	Current (acres)
PP	20,459	15,610
Douglas-fir	1,402	13,094
L-Douglas-fir	6,462	8,937
LP	236	1,379
WP	37	0
MC	213	974
ALP/NC	244	1,960
TOTAL	29,053	41,953

Table B-3. Summary of western Montana old growth commitments and current amounts

Old Growth Type	Commitment (acres)	Current (acres)
PP	37,548	27,936
Douglas-fir	1,787	15,239
L-Douglas-fir	32,421	33,514
LP	700	1,694
WP	2,378	10,085
MC	4,609	27,359
ALP/NC	3,048	16,642
TOTAL	82,492	132,468

SILVICULTURE MONITORING

Silviculture is, by definition, the art and science of accomplishing management objectives on forest lands. Thus, accomplishment of RMSs associated with any forest resource occurs through silvicultural practices. The Silviculture RMSs in the State Forest Land Management Plan (SFLMP) established 4 main goals for resource management on forest lands.

- ***Biological: Silvicultural treatments will be designed to protect forest soils and maintain long-term productivity, genetic quality and diversity of forest stands. (This is accomplished through project design and review, and tree plantings.)***
- ***Silvicultural Prescriptions: Written prescriptions will clearly guide the implementation of treatments and provide a record of conformity with the SFLMP. (These records are kept in the project files.)***
- ***Financial: Silvicultural treatments must produce a net return higher than the "no action" alternative; financial merit will be a factor in their selection. (Financial records are maintained in the project files and by the Forest Management Bureau.)***
- ***Integration with Other Resource Management Standards: Treatments will meet other resource management standards in a manner consistent with the other silvicultural standards. (This RMS relates directly to the Biodiversity standards.)***

These goals are monitored through Regeneration and Survival Surveys, Forest Improvement Accomplishment Records, Financial Information on revenues and costs, and Stand Evaluations (refer to BIODIVERSITY MONITORING***). Guidance for Soils Monitoring is in development and will be implemented beginning in Fiscal Year 2001.***

Regeneration/Survival Surveys

Our planting programs are designed to meet SFLMP goals related to the Biodiversity RMSs, in particular the coarse filter approach of favoring an appropriate mix of stand structures and compositions (Biodiversity RMS 1). Generally, seral species are selected for planting due to their decreased representation on the landscape.

Methods: Regeneration surveys and survival stakelines are conducted to determine regeneration success. The number conducted is directly related to the acres regenerated.

Generally, stakelines are installed at the time of planting or shortly thereafter to determine the percentage survival of planted seedlings. Approximately 50 seedlings are marked with a wooden stake or a wire flag in the spring of planting. In September or October of the same year the site is revisited and the seedlings examined to determine 1st year survival. Generally, every planted stand has at least one stakeline installed.

Regeneration surveys are conducted in both planted stands and in areas where natural regeneration is being relied on. The purpose is to determine whether or not the regeneration goals have been achieved. These are usually conducted 3 to 5 years after harvest or planting. They involve a series of fixed area plots being sampled across the site. Two common variables are assessed with regeneration surveys – seedlings per acre, and percent of area stocked with viable seedlings.

Results: In 1998, 28 stakelines and regeneration surveys were conducted on 1349 acres. In 1999, 12 stakelines were conducted on 429 acres. In both years, survival was 84-94%, which is representative of plantations. Also in 1999, 3 additional units (about 25 acres) were sampled without stakelines. They had poor (60%) to very poor survival (10%), which was attributed to poor seedling quality. These areas will need to be revisited in 2 to 4 years to determine if they are adequately stocked.

Forest Improvement Accomplishment Records

The forest improvement program uses fees from harvested timber to improve the health and productivity of trust forests. Uses of these fees authorized by statute include disposal of logging slash, reforestation, acquiring access and maintaining roads necessary for timber harvest, other

treatments necessary to improve the condition and income potential of state forests, and compliance with other legal requirements associated with timber harvest.

Methods: Specific activities include piling of logging slash, prescribed burning, site preparation, seed collection, seedling production, tree planting, thinning, genetic tree improvement, erosion control, and culvert replacement. Net maintenance includes replacing, maintaining, or removing seedling netting. Also included are various road maintenance activities, such as grading, snowplowing, and gate replacement.

Results: Accomplishments in treated acres for fiscal years 1996 - 2000 are reported in Table S-1. Although not tied to specific RMSs this information is included to indicate the numeric accomplishments associated with silvicultural activities.

Table S-1. Forest Improvement Accomplishments (by fiscal year in acres)

ACTIVITY	FY96	FY97	FY98	FY99	FY00
Tree Planting	1,533	351	662	540	307
Tree Netting	546	361	88	339	77
Net Maintenance	0	1,612	2,085	2,276	230
Pre-commercial Thinning	73	418	2,036	2,091	1,322
Herbicide Application	397	34	49	1,509	2,218
Brush Piling (Excavator/Dozer)	1,388	1,504	634	1,004	576
Pile Burning	457	2,351	911	1,319	1,260
Broadcast Burning	105	151	72	385	1,325
Slashing nonmerch (hand brush work)	218	219	145	246	35
Tree Improvement Areas Managed	15	30	30	12	16
Fireline Construction	0	0	2.125	2.8	7.9 miles
Road Maintenance	NA	NA	NA	NA	39.5 miles

Financial Information

Montana's constitution requires that state-owned trust lands be managed so as to raise revenue for the support of public schools and state institutions. DNRC operates under a legal mandate to generate the "largest reasonable and legitimate advantage" from the management of trust lands. This mandate was an important consideration in the development and selection of the Omega alternative.

Timber Sale Annual Revenue/Cost Summary

The revenue / cost summary is based on fiscal year-end costs and Forest Management Bureau records of collected revenue. Table S-2 compares total costs and total revenue for the forest management program statewide. This analysis was first completed for fiscal year 1994.

Table S-2. Revenue/Cost Summary for the Forest Products Sales Program

Fiscal Year	Total Revenue	Total Cost	Revenue/ Cost Ratio
1994	$ 7,094,227	$2,643,898	2.68
1995	$ 5,444,130	$2,636,022	2.07
1996	$ 6,240,064	$3,715,809	1.68
1997	$ 7,327,641	$3,885,585	1.89
1998	$ 8,393,485	$4,887,936	1.72
1999	$ 6,998,847	$5,164,998	1.36
2000	$12,710,311	$4,575,547	2.78
Average			
1994-2000	$ 6,916,399	$3,822,375	1.97
1997-2000	$ 8,857,571	$4,628,517	1.91

It is important to note that a single year's revenue/ cost ratio is not an accurate measure of performance. The ratios should be considered as an average due to anticipated fluctuations in revenue collections. While the amount of timber sold has been fairly stable in recent years, the volume harvested has fluctuated considerably. Revenue is collected at the time of harvest. Timber sale contracts are multi-year, resulting in a variable amount of timber harvested annually. Market conditions are an important factor, affecting both price and amount of timber harvested.

Conclusions: Our objective is to maintain a 2:1 or better revenue cost ratio over the long term. The department has taken steps to help insure the profitability of the program by reducing costs and striving to improve efficiency. Projected revenues and costs will continue to be evaluated and adjustments made to ensure that the forest management program remains economically viable.

Logging Systems and Silvicultural Prescriptions

Major factors that affect the economic return of the timber sale program are the types of logging systems used and the types of silvicultural prescriptions applied. As a general rule, ground-based logging systems are more economical than cable systems, and both are cheaper than helicopter logging. Steep slopes and lack of adequate road access can preclude ground-based logging and require the more expensive systems. Silvicultural prescriptions that result in larger amounts of timber removed per acre (clearcut) are generally more economical than prescriptions that remove less volume per acre (commercial thinning or intermediate harvests).

Logging System Costs: The difference between the mechanical ground based system to a cable (skyline) system for a typical harvesting scenario yields approximately a 24% increase in logging cost. Going from a mechanical ground system to a helicopter system for the same harvest scenario results in a 156% increase in logging cost.

Logging System Prescribed for DNRC Timber Sales: Table S-3 compares the percentage of logging system applied to DNRC timber sales sold in 1990-1994 and sales sold in 1998-2000. This information is compiled from DNRC timber sale contracts.

As evident in Table S-3, there has been little change in the percentages between past and current sales. Approximately 90% of logging from recent timber sales for the Department's timber program is from tractor based systems. For 1998-2000 this includes approximately 5% from soft track logging systems. The remaining is from cable systems (7%) and helicopters systems (2%). Future increases in the amount of cable and helicopter logging systems used would decrease the amount of stumpage value realized.

Harvest Acreage by Silvicultural Treatment Method

Information on harvest area by silvicultural treatment method was compiled during the analysis for the SFLMP, from timber sales sold during fiscal years 1990-1994. This information was used to quantify the "current condition" and to make forecasts for each management alternative. This information was presented in Appendix SCN of the SFLMP under Silvicultural Treatment Methods. Similar information was compiled for timber sales sold in fiscal years 1998-2000 for this report, in order to make a direct comparison between what was forecast and what has actually occurred. Fiscal years 1995-1997 was a "transitional" period for implementation of the SFLMP, and timber sales sold during that time were excluded from this analysis, in order not to confound the results.

Methods: Silvicultural treatment methods were separated into the following categories in the SFLMP: clearcut, seed tree, shelterwood, selection, and intermediate cutting. Selection of treatment method is based on the objectives they are designed to achieve, emulation of natural processes, public concerns, and visual considerations. Complete

Table S-3. Estimated Percentage of Area Logged by Logging System

Fiscal Year	Estimated Percent Area Sold by Logging System			
	Tractor	Cable	Ground-Lead	Helicopter
1990-1994	92%	6%	1%	1%
1998-2000	91%	7%	0%	2%

descriptions can be found in the SFLMP (MT DNRC 1996a: Appendix SCN, p. 17-18).

Results: For 1998-2000, the application of regeneration harvest was much lower than was forecast in the SFLMP, in favor of more selection and intermediate cuts (Tables S-4 and S-5). Overall, selection cuts were the most used silvicultural prescription.

Under the SFLMP, the choice of treatments is based on both landscape level (biodiversity) and site-specific conditions. According to SFLMP philosophy, a primary consideration when selecting a silvicultural method should be the emulation of natural disturbance regimes. The past 10 years has seen a change in how traditional silvicultural systems are applied. Generally, greater amounts of residual material (trees, snags, and down woody material) are left standing and on the ground. These may be clumps of advanced regeneration, or clumped or scattered snags and mature trees. Often, several prescriptions are applied to a single unit. This causes difficulties in making direct comparisons between the data from 1990-1994 and the current information. Despite the greater amounts of material left behind, the same terms have been applied and they convey the same silvicultural objectives.

The results show a marked deviation from SFLMP expectations in terms of the amount of even-aged regeneration harvests (Table S-4). In particular, in the areas where stand replacement regimes historically dominated, and emulation of natural disturbance regimes would likely call for an even-aged regeneration harvest, we see a high percentage of intermediate treatments being applied (Table S-5). Intermediate treatments are being favored because of financial considerations, public concerns over clearcut and seed tree harvesting, and other factors. In areas where the natural disturbance regime is largely frequent non-lethal fires, our choice of the selection method is appropriate. Interestingly, the pre-SFLMP period from 1990-1994 showed closer correspondence to SFLMP expectations than does the most recent period (1998-2000). The choice of

Table S-4. Percentage of Silvicultural Treatment Method based on Harvest Acreage for Fiscal Years 1990-1994 (pre-implementation SFLMP) and Fiscal Years 1998-2000 (post-implementation SFLMP)

Silvicultural Method	Actual FY90-94	Omega Alternative Estimates	Actual FY98-00
Clearcut	9%	10%	4%
Seed tree	30%	25%	8%
Shelterwood	6%	5%	2%
Selection	33%	40%	55%
Intermediate	22%	20%	31%

Table S-5. Percentage of Silvicultural Treatment Method based on Harvest Acreage for Sales Sold Fiscal Years 1998-2000 (post-implementation SFLMP)

Silvicultural Method	Actual - FY98-00 (%)					
	Central	Eastern	Northeast	Northwest	Southern	Southwest
Clearcut	2%	0%	0%	6%	0%	2%
Seed tree	6%	0%	0%	18%	0%	0%
Shelterwood	0%	0%	0%	1%	0%	5%
Selection	85%	0%	88%	40%	42%	91%
Intermediate	7%	100%	12%	35%	58%	2%

silvicultural method has strong implications on our ability to meet our biodiversity goals, especially as it relates to the coarse filter approach of favoring an appropriate mix of stand structures and compositions on state lands (Biodiversity RMS 1).

Conclusions: The lower than expected use of even-aged regeneration harvests reflects the influence of public concerns on many projects. While most members of the public seem to support the SFLMP's core philosophy of emulation of natural processes, many continue to have concerns with treatments that emulate stand replacement disturbances, such as clearcuts with reserves and seed tree harvests. Consequently, in the design of alternatives through the MEPA process, DNRC foresters often apply lighter harvests than they would if strict adherence to the SFLMP philosophy was the sole consideration. We expect to continue to be responsive to public concerns despite the deviation from SFLMP expectations.

ROAD MANAGEMENT MONITORING

Under Road Management RMS 1-11, the State Forest Land Management Plan (SFLMP) identified two main goals for Road Management on state classified forest lands:

- ***Transportation Planning: Transportation systems would be designed for the minimum number of road miles needed for current and near-term management needs. Road densities and road closures would be planned to meet wildlife, threatened and endangered species and biodiversity needs.***
- ***Road Design and Maintenance: The location, design, construction and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules and other standards and permits. Road construction and maintenance would be implemented primarily under timber sale contract administration.***

Monitoring methods were outlined under Road Management RMS 12-17. They included:

- ***Watershed Inventory—to identify road-related problems;***
- ***Road Construction and Maintenance, and Road Inspections (accomplished as part of timber sale contracts)—to implement maintenance and remedial actions; and***
- ***Internal BMP Audits—to evaluate the application and effectiveness of the actions.***

Watershed Inventory

Watershed RMS 3 requires DNRC to identify the causes of watershed degradation and set priorities for restoration. To accomplish this, DNRC is systematically completing inventories in watersheds that have been prioritized according to a set of established criteria. (See **Watershed Inventory**, under **WATERSHED MONITORING**, for more detailed information.)

Methods: During the inventories, all roads, stream crossings and reaches of stream channel and associated riparian areas were surveyed in order to identify existing or potential sources of erosion and sediment delivery to streams or other water resources. Road closure status and maintenance needs were also noted.

Results: Five watershed inventories were completed in FY1999 and 10 in FY2000 by DNRC forest hydrologists. Another watershed inventory was partially completed in FY2000.

Approximately 51,979 acres of school trust lands have been inventoried within the watershed project areas. The areas inventoried include approximately 225 miles of existing road, 154 miles of stream channel and 259 stream crossing structures. A majority of remedial actions implemented to date consist of road and stream crossing structure improvements, road abandonment and other existing road mitigation measures that have been funded primarily through timber sale contracts. Accomplishments in each watershed project area are summarized in Table W-1 (in **WATERSHED MONITORING**).

Recommendations: As a result of the watershed inventories, corrective actions to treat road related impacts are being planned or implemented. (See **Watershed Inventory**, under **WATERSHED MONITORING**, for details on these projects.) Another goal is to fully automate in GIS the status, condition and maintenance needs of all inventoried roads.

Road Construction and Maintenance

Methods: Statistics for road construction, reconstruction, maintenance, and obliteration were compiled from timber sale contracts that were sold during the period. During fiscal year 1997, sales that were sold were a mixture of pre-SFLMP and post-SFLMP guidance, and for the purposes of this analysis, it was considered a "transition" or phase-in year. Consequently, road construction and maintenance information is reported for fiscal years 1998-2000.

Results: The numbers of road miles scheduled for construction, reconstruction, maintenance actions and obliteration in timber sale contracts are listed in Table R-1. There is some variability in classification and reporting of "reconstruction" versus "maintenance," and routine blading and grading is not specifically listed in the contract prospectus. Consequently, "road maintenance" listed in Table R-1 only reflects maintenance beyond routine actions, and the miles of road receiving routine maintenance is much higher.

Table R-1. Road Construction for Timber Sale Contracts Sold FY98-FY00 (All Land Offices)

	# of Sales	3 Year Total	Average Per Sale	Average Per MMBF
Roads Constructed (mi)	70	105.9	1.51	0.9
Roads Reconstructed(mi)	70	322.4	4.61	2.7
Road Maintenance(mi)	12	86.4	7.20	0.7
Roads Obliterated (mi)	12	20.5	1.71	———
Development Costs ($)	70	3,623,337	51,762	30,820
Net Timber Volume Sold (MMBF)	70	117.553	1.679	———
Total Area Logged (ac)	70	33,294	475.63	———
# of Units	70	451.0	6.44	———

In addition to timber sale contracts, the forest improvement program funds some road maintenance activities, such as grading, culvert replacement, gate replacement, etc. Until fiscal year 2000, these activities weren't quantified. In FY2000, 39.5 miles of roads were maintained with Forest Improvement funds.

Conclusions: These conclusions are based on a comparison between road construction and timber volume harvested. The SFLMP forecast the expected number of miles of new road construction that would occur under the selected (Omega) alternative (MT DNRC 1996a: Appendix SCN, *Road Scenario*). The miles/MMBF are lower in more productive (wetter) climatic zones, where timber volumes are higher. By applying a weighted average, based on percent volume by land office, to the forecasted rates, the expected average miles/MMBF was calculated to be 0.9675. The actual miles/MMBF was 0.9 (Table R-1), which is slightly lower than expected. This is largely due to the NWLO sales, which have the largest volume, having fewer miles of roads than would have been expected. Overall, planned road construction is occurring statewide at approximately the rate forecasted in the SFLMP.

Timber Sale Contract Inspections

Methods: Timber sale contracts are administered by DNRC field personnel. Active timber sales are visited as needed to ensure contract compliance. Inspection reports cover 23 standard items, with opportunity to customize for specific requirements. Results are recorded as "Satisfactory", "Needs Improvement", or "Violation," with an explanation for deficient items and requirements for improvements.

Results: In FY1999, 483 timber sale inspection reports were completed, for which 11,109 standard items were inspected. Forty-eight incidents that were reported as in need of improvement, and 4 contract violations, were directly related to road Best Management Practices. The BMPs most often cited in need of improvement were related to installation and maintenance of adequate road surface drainage.

During FY2000, 539 timber sale inspection reports were completed and 12,397 standard items were inspected. Thirty-six practices that were reported as in need of improvement were directly related to road BMPs; none of the 12 contract violations were related to road BMPs. As in FY1999, most of the practices in need of improvement were related to installation of adequate road surface drainage and maintenance of road drainage and erosion control features.

See **Timber Sale Contract Inspections** under **WATERSHED MONITORING** for additional information.

Internal BMP Audits

Twenty-three internal BMP audits were completed on ongoing and recently completed DNRC timber sales in FY1999 and 23 in FY2000. These audits were conducted by DNRC hydrologists and soil scientists from the Forest Management Bureau and the Northwest Land Office. All DNRC field units with active timber sale programs participated in the audits.

Methods: The DNRC internal audits utilized the same methods and rating system used during the Statewide BMPs that are conducted biannually across the state on all ownership groups (MT DNRC 1998c). Auditors

rate Best Management Practices for proper *application* and for *effectiveness* in preventing sediment impacts.

Results: The amount of DNRC harvest area audited during the two years of internal audits was approximately 5517 harvest acres. The amount of harvest volume contained in the audited area was approximately 28 MMBF. The audits evaluated 74 miles of new road construction, 34 miles of road reconstruction and 66.3 miles of road re-conditioning over the two-year period.

DNRC internal audits completed in FY1999 found that BMPs were properly applied on approximately 95% of the practices rated. (See Table W-2 in **WATERSHED MONITORING**.) Out of 862 rated practices, there were 37 minor departures and 4 major departures in application of road related BMPs. Approximately 96% of the individual practices audited in FY1999 were rated as effective in protecting soil and water resources. Out of 862 rated practices, 30 minor departures and 3 major departures occurred in effectiveness of road related BMPs. Minor departures result in only minor and temporary impacts to soil and water resources. Major departures are those which cause major and temporary, or minor and prolonged, impacts to soil and water resources.

DNRC internal audits completed in FY2000 found a slight improvement over observations made in FY1999 (See Table W-2 in **WATERSHED MONITORING**.) Results from FY2000 indicate that BMP's were properly applied on 97% of the practices rated. Out of 752 rated practices, there were 16 minor departures and 1 major departure in application of road related BMPs. Approximately 98% of the individual practices audited in FY2000 were effective in protecting soil and water resources. Out of 752 rated practices, 14 minor departures and no major departures occurred in effectiveness of road related BMPs.

Conclusions: These results were comparable with the results from DNRC sales evaluated in statewide BMP audits, completed by the Service Forestry Bureau in 1998 and 2000 (Table W-2). See discussion in **Internal BMP Audits** under **WATERSHED MONITORING** for more information.

WATERSHED MONITORING

In response to Watershed RMS 20, and to meet the requirements of Watershed RMS 18-24, DNRC developed a comprehensive monitoring strategy to assess watershed impacts of land use activities and the effectiveness of mitigation measures. Other water quality related monitoring requirements of the State Forest Land Management Plan (SFLMP) are included in several RMSs. In addition to the requirements of Watershed RMS 20, Watershed RMS 3 and 19, Fisheries RMS 9, and Grazing RMS 6 and 7 all relate directly to monitoring the effects of management activities on water quality.

Guidance for developing a Water Quality Monitoring Program was finalized by DNRC on June 30, 1999. This guidance serves as a plan for the implementation of all watershed related monitoring commitments made in the SFLMP. The Water Quality Monitoring Program guidance document defined the goals of DNRC's monitoring program and outlined the steps to meet these goals.

- ***Determine sources of watershed impairment on School Trust land and developed strategies for remedial actions.***
- ***Monitor the implementation of Best Management Practices (BMPs) and other mitigation measures.***
- ***Investigate relationships between land-use activities and watershed integrity of aquatic systems on State land.***

To accomplish Goal 1, DNRC is systematically completing watershed inventories throughout the state in priority drainage basins. Goal 2 is being accomplished primarily through Timber Sale Contract Inspections and Internal BMP audits. To meet Goal 3, DNRC is implementing Project Level Monitoring at several sites.

For grazing on classified forest lands, Goal 2 is being implemented by the completion of new supplemental evaluations of riparian vegetation and streambank conditions that are completed during renewal and mid-term inspections of all grazing licenses. (See* GRAZING ON CLASSIFIED FOREST LANDS MONITORING.*)

Watershed Inventory

DNRC is systematically completing watershed inventories throughout the state in drainage areas that have been prioritized according to a set of established criteria. Priority is given to those watersheds that support a sensitive fishery or other sensitive beneficial use, contain streams on the State's 303(d) list of impaired water bodies, have a proposed DNRC project, and/or have other landowners who will commit to conducting similar inventories and will cooperate in the development of a management strategy or restoration plan (TMDL).

Methods: During the inventories, all roads, stream crossings and reaches of stream channel and associated riparian areas were surveyed in order to identify existing or potential sources of erosion and sediment delivery to streams or other water resources. Road closure status and maintenance needs were also noted.

Results: Watershed inventories were completed in 5 watershed project areas in FY1999 and 10 in FY 2000 by DNRC forest hydrologists and contractors (Table W-1). Information from the Foothill Area inventory, and from the partially completed inventory for Lower Swift Creek are not included in this report.

Approximately 51,979 acres of school trust lands have been inventoried within the watershed project areas. The areas inventoried include approximately 225 miles of existing road, 154 miles of stream channel and 259 stream crossing structures. Information collected during inventories regarding existing and potential sources of water quality impacts are being used to prioritize and develop site specific prescriptions designed to address erosion problems and restore water quality. A majority of remedial actions implemented to date consist of road and stream crossing structure improvements, road abandonment and other existing road mitigation measures that have been funded primarily through timber sale contracts. Other watershed improvement projects include riparian grazing exclosures, channel stabilization, streambank protection, and channel reconstruction. Accomplishments in each watershed project area are summarized in Table W-1.

Table W-1. Summary of Watershed Inventory Data and Remedial Actions

Watershed Inventory Project	Watershed Acres Inventoried	Stream Miles Inventoried	Road Miles Inventoried	Stream Crossings Evaluated	Stream Miles Treated	Road Miles Treated	Stream Crossings Treated
Alaska Basin	4,960	9.2	16.0	1	0	0	0
Bear Creek	1,009	3.2	3.0	4	0	0	0
Beaver Creek	1,755	1.6	1.4	3	0	0	0
West Clearwater	4,338	5.9	16.3	7	0.76	15.3	4
E. Fk. Swift Creek	5,465	9.0	13.5	19	0	0	0
Elk Creek	3,040	6.0	6.0	6	0	0	0
Lyman Creek	1,400	9.2	8.6	14	0	0	0
Lyons Creek	5,000	31.0	11.0	15	0	0	0
Praine & Andrews Creeks	2,525	5.6	40.0	50	0	0	0
W. Fk. Swift Creek	7,102	28.3	38.5	70	0	0	0
Whitetail Creek	2,785	10.0	35.0	25	0	0	0
Wolf Creek	3,000	18.3	12.1	19	0.03	2.5	4
Woodward Creek	9,600	17.0	24.0	26	0	0	0
TOTAL:	51,979	154.3	225.4	259	0.79	17.8	8

A summary of the findings of each project are given below. A more complete narrative discussion of the results of each inventory project is available as an Appendix to this report upon request. (Contact the DNRC Forest Management Bureau to obtain a copy.)

Alaska Basin: Many reaches of stream channel had bank sloughing, severe bank erosion and loss of riparian vegetation from intensive livestock grazing. Several unimproved fords were sediment sources. These need remedial action.

Beaver / Bear Creek: An eroding irrigation ditch on State land was the largest identified sediment source. Roads on USFS, State and private lands were also sources of sediment. Improvements to existing roads and stream crossings are planned to be implemented under the proposed Phoenix timber sale.

West Clearwater River: Channel erosion was observed, caused by road encroachment, heavy riparian livestock grazing, and poorly designed or maintained culvert crossings. Two existing culverts have been replaced, and 0.5 miles of existing road will be abandoned and relocated to a more suitable location. Additional culvert replacements are under contract.

East Fork Swift Creek: The majority of surface erosion problems are associated with the USFS road system and secondary roads. Several failed road crossings and poorly designed culverts need remedial action. There are also several natural mass wasting sites in the stream channel.

Elk Creek: Water quality impacts are associated with historic placer mining and the county access road. Water quality impacts from secondary roads on state land are planned to be corrected through a proposed DNRC timber sale.

Lyman Creek: Heavy riparian grazing, poorly located roads, native timber and earth-fill stream crossing structures, and undersized culverts were the identified sources of impairment. The watershed will be re-inventoried due to a high-intensity wildfire event.

Lyons Creek: Stream channels were stable. Upland surface erosion and minor rill erosion resulted from high intensity rain storm events. The majority of surface erosion problems were associated with road stream crossings, which need remedial action.

Praine Creek / Andrews Creek: Road surface erosion and road cut slope instability were identified as problems. Cattle grazing in riparian areas was the most common source of impacts on stream channels. Project Level Monitoring was implemented. (See Praine Creek / Andrews Creek Riparian Restoration, below.) The watershed will be re-inventoried due to a high-intensity wildfire event.

West Fork Swift Creek: A total of 32 sediment source areas on roads, and 9 areas of stream channel instability, were identified. Several stream crossing structures were in need of re-alignment, replacement or cleaning to prevent failures. DNRC is in the initial phases of preparing a watershed restoration plan to address these problems.

Whitetail Creek: 16 stream crossing structures were the primary sediment source in the watershed, due to inadequate road surface drainage or inadequate ditch relief. Improvements are planned under a proposed timber sale.

Wolf Creek: Stream channels were stable in Wolf Creek, but past channel erosion was observed in Gladstone Creek. The majority of surface erosion problems were associated with the road system. Stream crossings, and road fill and cut slope failure, have delivered sediment to streams and need remedial action.

Woodward Creek: Stream channel conditions were stable in Woodward Creek, but some channel erosion was observed in South Woodward Creek. Roads were not delivering measurable levels of sediment in this drainage. Drainage improvements at stream crossings are planned under a proposed timber sale, however, to prevent future risk.

Timber Sale Contract Inspections

Methods: Timber sale contracts are administered by DNRC field personnel. Active timber sales are visited as needed to ensure contract compliance. This can vary from once a day to once every several weeks, depending on the type and amount of activities occurring. Visual, qualitative evaluations determine whether practices are applied correctly during timber harvest and road construction activities and whether these practices are effective in protecting soil and water resources. An inspection report is filled out for each visit. Inspection reports cover 23 standard items, with opportunity to customize for specific requirements. Results are tabulated for each pertinent inspection item. Result categories are "Satisfactory", "Needs Improvement", or "Violation". An explanation for deficient items and requirements for improvements are recorded.

Results: In FY1999, 483 timber sale inspection reports were completed. Out of 11,109 standard items which were inspected, 137 incidents were reported as needing improvement and 16 contract violations were reported. Seventy-two of the 137 incidents and 10 of the 16 violations reported can be directly tied to Best Management Practices (BMPs), Streamside Management Zones (SMZs) and other watershed protection measures. The remaining practices were related to administrative and safety requirements, and hazard reduction.

The Best Management Practices most often cited in need of improvement were related to installation and maintenance of adequate road surface drainage. Other practices more commonly noted in need of improvement were providing adequate drainage for skid trails, rutting of roads from use during wet periods, and skidding operations which were causing compaction and displacement. Four SMZ violations were reported during this time period.

During FY2000, 539 timber sale inspection reports were completed. Out of 12,397 standard items which were inspected, 100 practices were reported as needing improvement and 12 contract violations occurred. Forty-nine of the 100 practices in need of improvement and 4 of the 12 contract violations were directly related to BMPs, SMZs and water resource protection. As in FY1999, most of the practices in need of improvement were related to installation of adequate road surface drainage and maintenance of road drainage and erosion control features. Skidding operations leading to compaction and displacement, or occurring on steep slopes and other sensitive locations, were also noted as a frequent departure. Only 1 SMZ violation was reported in FY2000.

Internal BMP Audits

Twenty-three internal BMP audits were completed on ongoing and recently completed DNRC timber

sales in FY1999 and 23 in FY2000. These audits were conducted by DNRC hydrologists and soil scientists from the Forest Management Bureau and the Northwest Land Office. All DNRC field units with active timber sale programs participated in the audits.

Methods: The DNRC internal audits utilized the same methods and rating system used during the Statewide BMPs that are conducted biannually across the state on all ownership groups (MT DNRC 1998b). Auditors rate Best Management Practices for proper *application* and for *effectiveness* in preventing sediment impacts.

Results: The amount of DNRC harvest area audited during the two years of internal audits was approximately 5517 harvest acres. The amount of harvest volume contained in the audited area was approximately 28 MMBF. The audits also evaluated 74 miles of new road construction, 34 miles of road reconstruction and 66.3 miles of road re-conditioning over the two-year period.

DNRC internal audits completed in FY1999 found that BMPs were properly applied on approximately 95% of the practices rated (Table W-2). Out of 862 rated practices, there were 37 minor departures and 4 major departures in application of road related BMPs. Approximately 96% of the individual practices audited in FY1999 were rated as effective in protecting soil and water resources. Out of 862 rated practices, 30 minor departures and 3 major departures occurred in effectiveness of road related BMPs. Minor departures result in only minor and temporary impacts to soil and water resources. Major departures are those which cause major and temporary, or minor and prolonged, impacts to soil and water resources. No incidents of gross neglect were observed.

DNRC internal audits completed in FY2000 found a slight improvement over observations made in FY1999 (Table W-2). Results from FY2000 indicate that BMP's were properly applied on 97% of the practices rated. Out of 752 rated practices, there were 16 minor departures and 1 major departure in application of road related BMPs. Approximately 98% of the individual practices audited in FY2000 were effective in protecting soil and water resources. Out of 752 rated practices, 14 minor departures and no major departures occurred in effectiveness of road related BMPs. As in FY1999, no incidents of gross neglect were observed.

Table W-2. Comparison of BMP Audit Results on Trust Lands

Audit Cycle	Percent (%) Practices Rated					
	Application			Effectiveness		
	Meet or Exceed	Minor Departures	Major Departures	Adequate Protection	Minor/Temp Impacts	Major Impacts
Internal FY 1999	95%	< 5%	< 1%	96%	3.6%	< 1%
Internal FY 2000	97%	2.5%	< 1%	98%	2%	0
Statewide 1998	96%	4%	0	99%	1%	0
Statewide 2000	97%	2.7%	< 1%	98%	1.8%	< 1%

The results of the DNRC internal audits are comparable with the results from DNRC sales evaluated in recent statewide audits, coordinated by the Service Forestry Bureau (Table W-2). Statewide audits were conducted in 1998 and 2000 on various ownership groups by interdisciplinary teams composed of representatives from government, industry and the conservation community. In 1998, DNRC ranked the highest among all ownership groups in both BMP application and effectiveness. Of the 203 practices rated on five DNRC timbers sales, 96 percent met or exceeded application standards, and 99 percent provided adequate protection of soil and water resources. The remaining 1% were rated to have only "minor and temporary impacts." DNRC also rated highest in the percentage of sites without any impacts and was the only ownership group that had no sites with "major or prolonged impacts".

Table W-3. Comparison of SMZ Audit Results on Trust Lands

Audit Cycle	Percent (%) Practices Rated					
	Application			Effectiveness		
	Meets Requirement	Minor Departures	Major Departures	Adequate Protection	Minor/Temp Impacts	Major Impacts
Internal FY 1999	94%	6%	0%	99%	1%	0%
Internal FY 2000	97%	3%	0%	100%	0%	0%
Statewide 1998	96%	4%	0%	100%	0%	0%
Statewide 2000	98%	0%	2%	98%	0%	2%

Preliminary results from the 2000 statewide audits indicate that DNRC has maintained a high level of BMP implementation (Table W-2). Ninety-seven percent of the practices rated on 5 DNRC timber sales met or exceeded application standards, and 98% provided adequate protection of soil and water resources. The remaining 2% were rated to have only "minor and temporary impacts."

Both the DNRC Internal and Statewide BMP audits also evaluated application and implementation of the Montana Streamside Management Zone (SMZ) law and rules (Table W-3). In FY1999, there were 9 SMZ departures noted during the DNRC internal audits (6% of SMZ practices rated). Most of these practices were rated as having produced no discernable impacts to soil and water resources. Only one of the departures was determined to have a minor impact. In FY2000, there were 5 departures in application of SMZ practices, with no impacts noted.

During the 1998 Statewide audits, two SMZ departures were observed on 1 of the 5 DNRC sites evaluated. Both of these departures occurred in application, but were determined to have no impacts. Preliminary results from the 2000 Statewide audits also show that one SMZ departure occurred on 1 of the 5 DNRC sites evaluated. This departure was due to side-casting of road material into the stream during road maintenance activities.

Conclusions: Results from contract inspection reports and both internal and statewide BMP audits are being used to identify specific or recurring problems. Most of the BMP departures noted on DNRC timber sale inspection reports and on Internal and Statewide BMP audits were associated with road drainage and maintenance of road drainage and erosion control features. Other frequent BMP departures noted during both types of audits were failure to route road drainage through adequate filtration zones before entering a stream, directing road drainage to stream crossings, inadequate stabilization of erodible soils, and roads constructed with unstable cut and fill slopes.

Problems were noted during timber sale inspections that were not observed during either the Internal or Statewide BMP audits. These include compaction and displacement from skidding, inadequate drainage on skid trails and avoiding use of roads during wet periods. It is possible that these problems were observed during ongoing operations and not during post-timber sale audits, because the information collected during the inspections was used to improve, modify or suspend a practice through operator education or changes in the contract.

The BMP implementation monitoring results are used to develop topics addressed during annual BMP training sessions conducted for field staff by the DRNC hydrologists and soil scientist, and to focus specialist design needs. In those cases where BMPs have been determined to be ineffective, the DNRC hydrologists and soil scientist have modified the BMPs or designed new ones to address the problems. DNRC is planning to conduct 20 internal BMP audits during FY2001.

Project Level Monitoring

DNRC has implemented several site-specific monitoring projects designed to quantitatively determine the effectiveness of BMPs and other mitigation measures in reducing non-point source pollution. DNRC has also monitored water quality and inventoried selected biological and physical characteristics on several reference stream reaches.

The findings of each project are summarized below. A more complete narrative discussion of the results of each project is available as an Appendix to this report upon request. (Contact the DNRC Forest Management Bureau to obtain a copy.)

Quiet Stems Timber Sale: This project was designed to evaluate mitigation measures used to prevent sediment delivery at road stream crossings. Sediment traps were installed to capture any material eroding from the culvert installations. To date no detectable sediment has been delivered to the draw bottom, and the mitigation measures have been proven to be effective.

Blanchard Creek Riparian / Stream Restoration: This project was designed to evaluate a fenced grazing exclosure and 250 ft. of bank stabilization and channel reconstruction. The bank stabilization work has been successful, and vegetation within the exclosure is showing excellent recovery.

Little Thompson River Grazing Management: This project was designed to evaluate an electric fence grazing exclosure to promote recovery of riparian vegetation and poor channel stability. The electric fence failed to exclude cattle during the first two years of the study. As a result, a permanent fenced exclosure was built, and the study will monitor riparian recovery.

Praine Creek / Andrews Creek Riparian Restoration: This project was designed to evaluate changes in grazing management to promote recovery of riparian vegetation and streambank damage. The project area was subject to an extensive high-intensity wildfire, and the study may be redesigned to document riparian recovery after wildfire.

Skalkaho Timber Sale SMZ Harvest: This project was designed to evaluate the effects of several demonstration SMZ harvest units on stream water temperatures and bull trout habitat. Results are pending.

Stillwater State Forest Water Quality Monitoring: This long-term monitoring project tracks trends in water quality and stream flows in developed and undeveloped watersheds. Parameters measured are discharge, nutrients, and suspended sediment. The values of suspended sediment have been within the range of forested lands elsewhere, and there has been little correlation between nitrate and phosphorus concentrations and forest management activities. (See Flathead Basin Commission 1998 for a summary, or MT DNRC 1998a for the full report.)

Reference Reaches: Reference reaches are used as control sites and have been established on 4 streams. Data collected includes (1) stream channel geometry; (2) large woody debris; (3) composition and structure of riparian vegetation; (4) macro-invertebrate communities; and (5) stream water temperature.

FISHERIES MONITORING

The State Forest Land Management Plan (SFLMP) established several standards and general goals for fisheries management. These included:

- ***Protect fisheries habitat by maintaining fish passage through road crossing structures and large woody debris in streams, implementing Forestry Best Management practices, and complying with the Montana Streamside Management Zone law, the Stream Preservation Act, and other regulations; and***
- ***Implement interagency recommendations for fisheries management, such as the Flathead Basin Cooperative Study and the Governor's Bull Trout Restoration Team.***

Implementation and monitoring of the Fisheries standards would be accomplished through contract administration, compliance with the Watershed and Grazing standards (see* WATERSHED MONITORING and GRAZING ON CLASSIFIED FOREST LANDS MONITORING*), and fisheries monitoring as prescribed in the "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report," Recommendation #17.

The Flathead Basin monitoring program was established in July 1992. DNRC is actively participating on the Flathead Basin Monitoring Committee as well as the Bull Trout Restoration Team and the Westslope Cutthroat Trout Steering Committee. Since implementation of the SFLMP, DNRC has expanded monitoring of fish populations and habitat to streams in the Southwestern and Central land offices. Currently all monitoring work is being done through agreements with Montana Department of Fish, Wildlife and Parks (MFWP). The focus is on high priority streams for bull trout and westslope cutthroat trout on DNRC ownership.

Fisheries Monitoring on the Swan River and Stillwater State Forests

In August 1998 the Flathead Basin Commission sponsored a study to address questions regarding potential impairment of water quality and fisheries from past and present forest management in the Flathead Basin. The fisheries study module was completed in 1991, and showed direct linkages between measures of on-the-ground activity, fish habitat parameters, and fish populations. These results formed the basis for a monitoring agreement between DNRC and MFWP, and monitoring was begun under contract with MFWP in July 1, 1992. Results since July 1, 1996, the date of implementation of the SFLMP, are summarized here. (Earlier results and a description of monitoring methods are reported in MFWP 1997).

Methods: The following parameters were selected for monitoring: substrate scores and streambed core samples within spawning gravels, redd counts, and fish species composition.

A substrate score is an overall assessment of streambed conditions. Particle size and the percentage of fine materials filling the interstitial spaces (embeddedness) at the streambed surface are visually assessed. Low substrate scores occur with smaller streambed particles and greater embeddedness. Streambed coring is a measurement of the size range of materials within the streambed (McNeil and Ahnell 1964). Core samples are taken to a depth of 15.2 cm.

Spawning habitat for westslope cutthroat trout may be considered as "threatened" when the McNeil core sample (percentage of fine particles) is greater than 35%, and "impaired" when greater than 40%. Similarly, spawning habitat for bull trout may be considered "threatened" when McNeil core sample is greater than 35% and the substrate score is less than 10. It may be considered "impaired" when the McNeil core sample is greater than 40% and the substrate score is less than 9.

Fish species composition was collected to establish baseline information for streams where this information was lacking. Redd counts were conducted in streams where spawning by westslope cutthroat trout and bull trout were known or suspected.

Results: Since 1996, habitat conditions have been monitored in 10 streams within the Coal Creek, Stillwater and Swan River State Forests (Tables F-1

Table F-1. Fisheries Monitoring on the Swan River and Stillwater State Forests, July 1996-June 2000 — McNeil Core Results

		McNeil Cores			
State Forest	**Stream**	**FY97**	**FY98**	**FY99**	**FY00**
Coal Creek	Cyclone	31.6	33.8	32.6	in lab
Coal Creek	Swamp	—	—	—	in lab
Stillwater	East Swift	—	31.2	—	—
Stillwater	West Swift	—	31	—	in lab
Stillwater	Lower Stillwater	24.8	29.6	30.8	—
Stillwater	Upper Stillwater	32.3	30.8	31.0	—
Stillwater	Stillwater	—	—	—	in lab
Swan	Soup	34.1	33.9	**35.3***	in lab
Swan	South Lost	23.4	26.8	25.1	in lab
Swan	South Woodward	30	34.1	33.1	in lab
Swan	Woodward	**35.6***	**37.2***	**35.8***	in lab

* value exceeds recommended levels

Table F-2. Fisheries Monitoring on the Swan River and Stillwater State Forests, July 1996-June 2000 — Substrate Score Results

		Substrate Score			
State Forest	**Stream**	**FY97**	**FY98**	**FY99**	**FY00**
Coal Creek	Cyclone	11.3	11.6	11.4	11.9
Stillwater	East Swift	12.2	—	—	12.5
Stillwater	West Swift	11.2	11.6	—	11.8
Stillwater	Lower Stillwater	—	12	12.6	11.8
Stillwater	Upper Stillwater	—	12.9	—	12.7
Swan	Soup	10.9	10.6	10.4	10.8
Swan	South Lost	11.6	11.8	11.7	11.9
Swan	South Woodward	—	**9.6***	**10***	**10***
Swan	Woodward	10.4	10.7	10.9	10.6

* value below recommended levels

and F-2). Overall, streambed habitat conditions for bull trout spawning were within acceptable limits, except in the Woodward Creek drainage. Substrate scores in South Woodward Creek were within the "threatened" category in 1997, and improved to "marginally threatened" in 1998 and 1999. However, McNeil core samples were within acceptable limits. By contrast, McNeil core sample results in Woodward Creek exceeded recommended levels in 1997 and 1999, and crossed the "threatened" threshold in 1998; the substrate scores were within acceptable limits. Stream habitat conditions in westslope cutthroat trout spawning areas were within acceptable limits. (Lab results for McNeil core samples from March 2000 were pending at the time of report preparation.)

Both cutthroat and bull trout spawning runs were stable throughout the monitoring period, except for bull trout in Cyclone Creek below Cyclone Lake (Tables F-3 and F-4). In 1994-1996, 5-7 redds were found in this drainage; no redds were found in 1997-

Table F-3. Fisheries Monitoring on the Swan River and Stillwater State Forests, July 1996-June 2000 — Bull Trout Redd Count Results

State Forest	Stream	Bull Trout Redd Count			
		FY97	FY98	FY99	FY00
Coal Creek	Cyclone	5	0	0	0
Stillwater	East Swift	0	0	—	—
Stillwater	West Swift	2	0	—	9
Stillwater	Swift	0	0	7	6
Stillwater	Lower Stillwater	—	3	—	—
Stillwater	Upper Stillwater	8	13	—	—
Stillwater	Stillwater	—	—	35	24
Swan	Soup	8	12	8	9
Swan	South Lost	28	47	30	24
Swan	South Woodward	—	18	26	10
Swan	Woodward	72	56	55	53

Table F-4. Fisheries Monitoring on the Swan River and Stillwater State Forests, July 1996-June 2000 — Westslope Cutthroat Trout Redd Count Results

State Forest	Stream	Cutthroat Trout Redd Count			
		FY97	FY98	FY99	FY00
Coal Creek	Cyclone	Fry	31	Fry	16
Coal Creek	Swamp	—	—	—	6
Stillwater	Dog	0	—	—	—
Stillwater	Swift	—	—	—	22
Swan	Cilly	0	—	—	—
Swan	Soup	22	29	21	16
Swan	South Lost	19	26	19	12

1999. Since this is a downstream run, it is possible that the surveys were completed too early in the fall in recent years. MFWP personnel plan to make an additional redd survey in late November 2000, if weather conditions are suitable.

Conclusions: Although habitat conditions in the monitored reaches were within acceptable limits, MFWP has expressed concerns about long-term fish population trends in the Coal Creek drainage (including Cyclone Creek) based on data from other sample sites. The two agencies will be working together to evaluate the potential causes. Recent improvements have been made to roads in Coal Creek and Cyclone Creek, including road drainage and creek crossings. These improvements should help improve stream habitat.

Southwestern and Central Land Office Fisheries Monitoring

Since implementation of the SFLMP, DNRC has expanded the fisheries monitoring program to the Southwestern and Central Land Offices. DNRC has developed a cooperative fisheries monitoring program with Regions 2 and 3 of MFWP to collect fisheries data on high priority streams. Cooperative monitoring projects are also being developed with the Dillon Resource Area of the Bureau of Land Management and the Beaverhead-Deerlodge National Forest.

During FY2000, fish population and habitat evaluations were completed on state ownership in the Long Creek and Cottonwood Creek drainages, in

the Blacktail Mountains near Dillon, Montana, and in the Bear Creek and Beaver Creek watersheds, in upper Rock Creek west of Philipsburg. The work was initiated to evaluate the potential effects of proposed timber sales (Long-Cotton and Phoenix) on bull trout and westslope cutthroat trout.

Methods: Fish presence/absence, population and habitat surveys, and bull trout genetic sampling have been completed for state ownership in the Bear Creek and Beaver Creek watersheds. Fish habitat and population surveys, and genetic testing of samples of westslope cutthroat trout were also completed for school trust lands in the Cottonwood Creek and Long Creek watersheds.

Fish habitat surveys completed in Long Creek, Beaver Creek and Bear Creek followed the procedures described for Level II surveys in the R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook (Overton et. al. 1997). A walk- through inventory or abbreviated version of the R1/R4 procedure was used in the Cottonwood Creek drainage. Specific habitat parameters surveyed included pool depth, stream area in pools, percent surface fines in pools, width/depth ratio, bank stability, bank alteration, and percent surface fines in riffles, runs and glides.

Macroinvertebrate samples were also collected from all four streams, to help assess habitat quality. These samples will be analyzed and interpreted according to standard Rapid Bioassessment Protocols (Bukantis 1998); results are not yet available.

Electro-fishing surveys were completed on all four streams to determine population demographics, species composition and the extent of fish distribution. Electro-fishing sections were "nested" within habitat reaches to help associate any population differences with specific stream and habitat conditions. Three stream reaches were sampled in the upper Cottonwood Creek drainage and five sections were sampled in upper Long Creek. One reach was sampled in Beaver Creek and Bear Creek each.

During the fish population surveys completed for these streams, samples were collected from individual fish for genetic testing.

Cottonwood Creek

Results: Only westslope cutthroat trout were captured during electrofishing surveys conducted in upper Cottonwood Creek, indicating that it is the sole species occupying the upper portions of this drainage. Westslope cutthroat trout populations in Reach 1 were estimated at nearly 200 fish per 1000 linear feet of stream, which is one of the highest noted over the last decade for the species in a Southwestern Montana stream. Genetic testing of samples collected from Reach 1 indicated that the westslope cutthroat trout population was genetically pure.

Fisheries habitat in Cottonwood Creek was abundant and of high quality. Spawning habitat was adequately available and of good quality. Fry and juvenile habitat was also abundant. Seventy percent of the habitat was rated as excellent and 30% as good. Nineteen possible barriers to fish movement were identified during the habitat surveys.

Conclusions: The westslope cutthroat trout population in Cottonwood Creek is highly valued. It is also sensitive to disturbance, due to the 19 potential fish barriers. These may fragment the stream into shorter reaches. Should natural events or management impacts impair habitat for critical life stages, fish may not be able to move to other reaches and may eventually be lost from localized areas.

State lands within Cottonwood Creek will be managed by DNRC with considerations for the fisheries resource. All activities proposed in the drainage will be conducted in accordance with the SFLMP fisheries standards and with the *Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana* (MFWP 1999). Fish populations and habitat will be re-evaluated in Cottonwood Creek in the future to monitor trends and the effectiveness of proposed restoration measures.

Long Creek

Results: Total fish densities were fair to good compared to other small steams in southwestern Montana. Fish densities and biomass increased as one moved upstream, then declined again further upstream. Brook trout were dominant in the lower

end of the study area, and westslope cutthroat trout were the most common fish in the middle reaches. Brook trout again outnumbered westslope cutthroat trout near the upper end of the suitable habitat.

Genetic testing of westslope cutthroat trout samples collected from Long Creek found that the population was slightly hybridized with rainbow trout. The very low level of hybridization does not preclude the possibility that there is a segment of the cutthroat trout population that remains genetically pure. As outlined in the MOU and Conservation Agreement, populations of slightly hybridized cutthroat trout are being managed as pure until specific objectives are defined in a sub-basin plan.

Stream function and fisheries habitat were found to be substantially impaired in most of the inventoried reaches of Long Creek. General stream conditions were considered to be 5% good, 20% fair and 75% poor. Streambank alteration by ungulates was prolific. Bank alteration and channel incisement were the main factors associated with bank instability. Sediment deposition levels were likely sufficient to impair westslope cutthroat trout egg and fry survival, and rearing habitat for juveniles and young of the year fish.

Conclusions: Although poor stream conditions don't appear to be threatening the immediate viability of westslope cutthroat trout populations in Long Creek, it is possible they are benefiting brook trout. Over the long term, this may increase the potential for brook trout to compete with and displace cutthroat trout in certain stream reaches. Grazing management under the current DNRC grazing license in the drainage has been modified to address livestock impacts. Additional restoration measures and road improvements have been incorporated under several alternatives included in the proposed Long-Cotton Timber Sale. These activities will be monitored during and after implementation to determine effectiveness in restoring fish habitat as well as preventing additional impairment.

Beaver Creek and Bear Creek

Results: Electro-fishing surveys completed for Beaver Creek found brook trout and westslope cutthroat present. No bull trout were found in over 2000' of stream surveyed, however, several possible bull trout–brook trout hybrids were collected for genetic testing. Surveys completed for this same stream reach in 1995 had found a small number of bull trout present. Electro-fishing surveys in Bear Creek found bull trout, westslope cutthroat trout and brook trout present. Samples were taken of the cutthroat trout and bull trout. Genetic testing results for the samples from Beaver and Bear Creek are not yet available. Fish habitat inventories were completed in Beaver Creek and Bear Creek during June of 1999.

Conclusions: A report summarizing these evaluations will be completed by MFWP in the near future. Management recommendations will be based on this report.

THREATENED, ENDANGERED AND SENSITIVE SPECIES AND BIG GAME MONITORING

The State Forest Land Management Plan (SFLMP) established several standards and general goals for management of threatened, endangered and sensitive species and big game. These included:

- ***participate in recovery of threatened and endangered plant and animal species, including interagency working groups;***
- ***support populations and habitat needs of sensitive species on state land;***
- ***promote a diversity of stand structures and landscape patterns to provide good habitat for wildlife populations, and manage for big game habitat to the extent possible.***

Monitoring standards were also established. These included:

- ***monitor compliance with (mitigation for wildlife species) requirements indicated in project environmental documents;***
- ***participate in annual interagency monitoring of bald eagles and grizzly bears;***
- ***track the health of forest ecosystems through the Biodiversity monitoring standards, as an indicator of the health of wildlife populations. (Refer to* BIODIVERSITY MONITORING.*)***

DNRC Participation in Wildlife Working Groups
(Addresses: T&E Species RMS 2)

Currently DNRC has biologists participating on the following interagency committees: the Grizzly Bear Northern Continental Divide Ecosystem Subcommittee, the Swan Valley Grizzly Bear Conservation Agreement Technical Monitoring Team, the Bald Eagle Working Group, the Montana Common Loon Working Group, and the Montana Bat Working Group.

Bald Eagle Nest Reporting
(Addresses: T&E Species RMS 4)

As a part of DNRC's commitment to participate in recovery efforts of Federally listed threatened and endangered species, DNRC is a participant in Montana Bald Eagle Working Group monitoring efforts and assists with the identification and location of new nests (T&E Species RMS 1, 2, and 4). The Working Group is comprised of interagency members and coordinates state-wide surveys to ensure coverage. Methods and reporting forms are standardized in accordance with the Bald Eagle Management Plan (Montana Bald Eagle Working Group 1994).

Working Group Monitoring

Results: DNRC biologists conducted nest surveys for one nest territory in 1999 and two in 2000 (Table T-1).

Table T-1. Bald Eagle Nest Surveys, FY 1999-2000

Year Surveyed	Territory Name	Successful/Unsuccessful	Number of Juveniles Fledged/Comments
1999	Whitefish Lake	Successful	1
1999	Upper Whitefish Lake	Unsuccessful	1 adult present
2000	Whitefish Lake	Successful	2
2000	Upper Whitefish Lake	Unknown	1 adult present

New Nest Territories

Results: Six new nest territories were located through Working Group survey efforts conducted state-wide in 2000, but no new nest territories were detected on DNRC parcels. However, one new nest territory (#038-027-01, Township 2 North, Range 3 East, Section 35) was located in a parcel that lies adjacent to DNRC ownership (Township 2 North, Range 3 East, Section 36). It would merit future consideration under SFLMP Bald Eagle Guidance should projects be proposed there.

The Whitefish Lake pair noted above relocated their nest onto a DNRC parcel within an existing nest territory during spring 2000 (Whitefish Lake #007-034-04, relocated to Township 32 North, Range 22 West, Section 32). This observation was recorded and submitted to the Working Group.

Swan Valley Grizzly Bear Conservation Agreement Monitoring
(Addresses: T&E Species RMS 5)

The purpose of the Swan Valley Grizzly Bear Conservation Agreement (June 6, 1997) is to outline and implement a strategy through which multi-jurisdictional land owners can comply with the Endangered Species Act as it regards the grizzly bear, while continuing to practice forestry and multiple use management on their timberlands in the Conservation Area. To help ensure continued compliance with the Agreement, the involved parties agreed to cooperatively monitor the application and effectiveness of the Guidelines on an ongoing basis and provide the U.S. Fish and Wildlife Service (USFWS) with results on an annual basis. Primary monitoring commitments include: 1) an analysis of open and total road densities, 2) levels of Administrative Use in Inactive Subunits, and 3) levels of Administrative use on restricted roads within linkage zones during the Spring Period (April 1 to June 15) and fall period (September 1 to November 15). Further refinement of monitoring commitments for the Conservation Agreement were cooperatively developed by the involved parties, and they are documented in the *Monitoring Agreement for the Swan Valley Conservation Agreement* (August 21, 1998). A monitoring report addressing all commitments was developed by a Technical Monitoring Team comprised of four biologists employed by the cooperating entities during winter 2000, which was distributed to all cooperators (including the USFWS) on March 30, 2000.

(The Swan Valley report is available as an Appendix to this report upon request. Contact the DNRC Forest Management Bureau to obtain a copy.)

Project Reviews of Wildlife Mitigation
(Addresses: T&E Species RMS 3, 4; Sensitive Species RMS 8, 9; Big Game RMS 5, 6)

Methods: The intent of this effort is to assess the application and effectiveness of project-level commitments made in MEPA documents concerning wildlife mitigation. DNRC biologists examined pertinent environmental documents for each completed project that was selected for monitoring. Follow-up field reviews were conducted by DNRC Area Biologists as necessary to assist with the evaluation of mitigation implementation and the likelihood of effectiveness.

Results: Six projects were reviewed during summer 2000. Sales reviewed on the NWLO included: Two Crow, Rhodes Draw, Boyer Salvage, and Small Squeezer. Sales reviewed on the SWLO included: West Lubrecht/Greenough, and Chief Looking Glass Salvage (approximately 962 total acres treated for all of these sales combined).

For the six sales, a total of 97 wildlife habitat-related mitigations were reviewed by biologists (Table T-2). In some cases one mitigation was applied, but was included for several species. For example, where flammulated owls and pileated woodpeckers were likely to occur sympatrically, a snag retention mitigation targeted to benefit both species was recorded as one mitigation in both the pileated woodpecker and flammulated owl rows.

Of the reviewed mitigations, 94% were deemed by DNRC biologists to have reasonable likelihood of effectiveness. Biologist recommendations were provided for the remaining 6% of the reviewed mitigations and warranted some modification. Examples of suggested modifications include fencing and signing to reduce risk of snag loss to firewood cutters, modify the distribution of snags,

Table T-2. Number of Timber Sale Mitigations for T&E and Sensitive Species Reviewed by Biologists, FY2000

Mitigation Subject Subject	Two Crow	Rhodes Draw	Boyer Salvage	Small Squeezer	W. Lub./ Greenough	C. Look. Glass Sal.	Total
Bald Eagle	n/a	n/a	n/a	1	n/a	1	2
Gray Wolf	1*	1*	1*	1	1*	1*	6
Grizzly Bear	2	n/a	n/a	4	n/a	n/a	6
Pileated Woodpecker	1	1	3	2	1	1	9
Flammulated Owl	1	n/a	n/a	n/a	1	1	3
Black-backed Woodpecker	n/a	n/a	3	n/a	n/a	n/a	3
Fisher	n/a	n/a	2	n/a	n/a	n/a	2
Elk	n/a	2	2	2	2	n/a	8
Mule Deer	3	2	2	n/a	2	n/a	9
White-Tailed Deer	n/a	2	2	2	2	n/a	8
Other Coarse Filter Mitigation	9	8	2	9	7	6	41
Total	17	16	17	21	16	10	97

* Mitigation addressed in standard contract language for these identified projects.

retain additional snag recruits, retain additional large coarse woody debris, increase diversity of tree species as leave trees, and reduce conifer in-growth in mature ponderosa pine stands.

Snag, Snag Recruitment and Coarse Woody Debris Monitoring

(Addresses: Sensitive Species RMS 9; Biodiversity RMS 8, 11)

The intent of this effort is to obtain information that would allow us to compare pre-harvest and post-harvest abundance of snags, snag recruits and coarse woody debris (CWD), which are important habitat elements for a variety of endangered, threatened, sensitive and common terrestrial wildlife species. Information will be used to evaluate compliance with minimum retention levels for snags, residual live trees, and CWD specified in the Biodiversity Guidance (MT DNRC 1998c: 38-43), and to gain broader insight into the effects of our management activities on these habitat components.

Methods: Sampling was conducted on seven stands within seven sale areas (1 stand per sale area) from June - August 2000. The stands were located on different field offices, and occurred within various cover types and planned treatment types. Pre-harvest data for snags, CWD, and large live trees (potential recruitment trees ≥21 inches dbh) were collected on each selected project. Only non-entered stands scheduled for harvest were sampled during the year 2000 field season to establish baseline conditions for sites that would be sampled again at a later date soon after planned treatments are completed. Sampling of stands that have received treatment will be conducted during the summer 2001 field season and results will be compared for pre and post-harvest abundance, and with snag retention guidance recommendations. If post-harvest stands are unavailable for future sampling due to timing conflicts or extensions in harvest periods, additional pre-harvest stands will continue to be sampled to increase the potential pool of post-harvest stands available for sampling the following year/years.

Snag and snag recruitment tree monitoring procedures incorporate a minimum of three, 1-acre plots per harvest unit. Additional plots are sampled for harvest units that exceed 40 acres. One-acre plots were recommended for snag monitoring by Bull et al. (1990) to optimize accuracy of estimates and sampling efficiency. A plot layout scheme similar to the one described by Bevis (1996) was incorporated to improve sampling efficiency, accuracy and increase analysis options. DNRC SLI data collection procedures with increased sample size were used

to estimate CWD amounts. Tonnage calculations for CWD follow those developed by Brown (1974). Detailed methodology is included in *SFLMP Monitoring Guidance: T&E Species, Sensitive Species, Big Game, and Biodiversity—Snags* (MT DNRC 2000b).

Results: Accurate snag estimates are difficult to obtain with reasonable levels of sampling effort due to their distribution and relatively low density across the landscape (Bull et al. 1990). Snags are typically not evenly distributed (Harris 1999), and it will take several years of data collection and analysis to be able to reasonably assess pre-harvest snag abundance and post-harvest snag retention. The information presented in Table T-3 serves as a preliminary set of baseline data intended to initiate this effort.

Reported snags/acre values by size class suggest that existing snag densities on pre-harvest sites are occasionally lower than guidance recommendations before planned treatments occur. This is not surprising as factors that may contribute to this include (but are likely not limited to): past harvest in some stands that emphasized the removal of unhealthy and larger trees, stand age, firewood cutting, and natural variation in distribution such as that noted by Harris (1999).

Results for existing pre-harvest levels of large, live trees suitable for future snag recruitment (Table T-4) indicate that ample numbers are present to meet snag recruitment guidelines for all stands sampled (a minimum of 1 to 2 large trees per acre depending on cover type; MT DNRC 1998c: Appendix D). The stand sampled on the Greenough project area had the lowest estimate of large live trees. Current large tree abundance is likely low there, at least in part, because medium and large-sized trees were

Table T-3. Summary Results of Pre-harvest Sampling of Snags for Timber Sales, FY2000

Sale Name	Area Office	Cover Type*	Plots Sampled Recorded	Total Snags (sd)	Snags/acre 15"-20.9" dbh (sd)	Snags/acre 21" - 27.9" dbh (sd)	Snags/acre ≥27" dbh
Chicken-Werner	NWLO	L/DF	3	17	5.3 (6.7)	0.3 (0.6)	0
Coal Creek	NWLO	MC	3	12	1.7 (1.5)	1.0 (1.0)	1.3 (0.6)
Fish Trap	NWLO	L/DF	4	11	1.3 (1.3)	1.0 (0.8)	0.7 (0.6)
Good Long Boyle	NWLO	L/DF	4	1	0.3 (0.5)	0	0
Red Owl	NWLO	PP	4	12	3.0 (1.2)	0	0
Flat Pardee	SWLO	PP	4	20	4.0 (4.8)	0.8 (1.0)	0.3 (0.5)
Greenough	SWLO	L/DF	3	2	0.7 (0.6)	0	0

* Cover type codes are as follows: L/DF = larch/Douglas-fir, MC = mixed conifer, PP = ponderosa pine.
(sd) = standard deviation

Table T-4. Summary Results of Pre-harvest Sampling of Potential Snag Recruitment Trees for Timber Sales, FY2000

Sale Name	Total Large Trees Recorded on Plots	Ave. Live Trees/acre ≥21" dbh (sd)	Species Composition Live Trees Sampled >21" dbh
Chicken-Werner	17	5.7 (3.2)	WL 65%, DF 29%, GF 6%
Coal Creek	77	25.7 (6.7)	SP 47%, WL 40%, DF 8%, WP 5%
Fish Trap	12	3.0 (2.5)	DF 83%, PP 17%
Good Long Boyle	16	4.0 (2.2)	WL 75%, DF 25%
Red Owl	43	10.8 (3.5)	DF 58%, PP 42%
Flat Pardee	25	6.3 (4.4)	DF 64%, PP 32%, WL 4%
Greenough	4	1.3 (2.3)	DF 75%, WL 25%

* Cover type codes are as follows: WL = western larch, DF = Douglas-fir, GF = grand fir, SP = spruce, WP = white pine.

Table T-5. Summary Results for Pre-harvest Sampling of Coarse Woody Debris for Timber Sales, FY2000

Sale Name	CWD Tons/acre (sd)	Ave. No. Large Pieces/acre {≥15.5" Large End Dia.} (sd)	Ave. No. Small Pieces/acre {≤15.4" Large End Dia.} (sd)
Chicken-Werner	6.1 (3.0)	1.0 (1.7)	14.3 (3.5)
Coal Creek	26.0 (1.8)	11.3 (2.1)	24.7 (13.9)
Fish Trap	14.5 (4.0)	3.0 (2.2)	50.3 (18.2)
Good Long Boyle	5.6 (2.6)	2.0 (2.3)	23.0 (14.2)
Red Owl	1.5 (0.2)	0.3 (0.5)	5.5 (2.6)
Flat Pardee	16.5 (1.1)	8.7 (4.0)	27.0 (20.7)
Greenough	4.1 (1.4)	0.7 (1.2)	13.7 (9.1)

intensively harvested on the Greenough project area (including the Lubrecht Experimental Forest) by the Anaconda Company in the 1930's. Planned prescriptions for this project were designed to retain a sizable portion of the largest trees on site (some approaching 21 inches dbh), promote growth, and emulate natural conditions in ponderosa pine stands, which historically experienced frequent fire events. Such prescriptions are desirable for promoting future snag and large tree recruitment.

Pre-harvest coarse woody debris tons-per-acre estimates (Table T-5) suggest that at least one of the seven sites sampled (Red Owl) maintained lower amounts of downed wood (1.5 Tons/ac) than that recommended by Graham et al. (1994) for maintenance of site productivity (~4.5 to 9 Tons/ac). Three of the seven sample areas were at the lower end of Graham et. al.'s recommended ranges (Chicker-Werner, Good Long Boyle, Greenough), and three fell well within or exceeded Graham et. al.'s recommended ranges (Coal Creek, Fish Trap, Flat Pardee). Factors that may have contributed to lower levels of coarse woody debris detected on some sites include (but are likely not limited to): past harvest in some stands that emphasized the removal of unhealthy trees and older trees; stand age, amount, type and timing of past natural disturbances; firewood cutting; and natural variation in distribution of downed wood.

(Expanded data tables for the above summaries are available as an Appendix to this report upon request. Contact the DNRC Forest Management Bureau to obtain a copy.)

Reporting of Terrestrial Species Observations
(Addresses: T&E Species RMS 4; Sensitive Species. RMS 8)

Methods: In June 2000, DNRC initiated an effort to gather and compile recent notable terrestrial species observations reported by DRNC biologists and field personnel. Most of these observations were obtained incidentally while conducting normal work-related activities. Data entries documenting: species, observation date, observer, number of adults and young, general habitat association, location of sighting, associated project area and unit office will be reported annually to the Montana Natural Heritage Program (by October 30) for inclusion in their state-wide data repository. Such data will continue to be collected and reported in a cooperative effort to improve understanding of the distribution and occurrence of terrestrial species of interest.

Results: Fifty-three records were reported from the Northwest Land Office, which contained sightings obtained from the early 1990's to present. Of the 53 records reported, 40 were of threatened and endangered species, 5 were of DNRC listed sensitive species, and 8 were of other species of interest. A summary list of the species reported and number of records is as follows:

T&E Species
Bald Eagle (10)
Grizzly Bear (20)
Gray Wolf (7)
Canada Lynx (3)

DNRC Sensitive Species
Fisher (1)
Pileated Woodpecker (4)
Black-Backed Woodpecker (2)

Other Species
Northern Goshawk (2)
American Marten (1)
Mountain Lion (1)
Wolverine (4)

Thirty-seven records were reported from the Southwest Land Office, which contained sightings obtained primarily from the 1998-2000 field seasons. Of the 37 records reported, 2 were of threatened and endangered species, 9 were of DNRC listed sensitive species, and 26 were of other species of interest. A summary list of the species reported and number of records is as follows:

T&E Species
Bald Eagle (2)

DNRC Sensitive Species
Black-Backed Woodpecker (1)
Pileated Woodpecker (8)

Other Species

Williamson's Sapsucker (3)
Bobolink (1)
Cooper's Hawk (2)
Golden Eagle (3)
Pygmy Nuthatch (3)
N. Goshawk (2)
Rough-Legged Hawk (2)
N. Pygmy Owl (1)
Western Bluebird (1)
Brown Creeper (2)
Willow Flycatcher (1)
Winter Wren (1)
N. Three-Toed Woodpecker (4)
Olive-Sided Flycatcher (1)

Follow-up Monitoring for Miscellaneous Mitigation

(Addresses: T&E Species RMS 3; Sensitive Species RMS 9; Big Game RMS 5; Biodiversity RMS 8, 11)

Occasionally, situations arise where mitigations are developed for specific nest sites, rookeries or other habitat elements. Reviewing the application and effectiveness of such mitigations is important for determining if adjustments are necessary to recommendations made in the future in order to achieve desired results. In spring of 1999, DNRC began monitoring and collecting information on selected sites following treatment to evaluate the application and effectiveness of specified mitigations pertaining to wildlife habitat. Methods and timing of monitoring efforts were tailored to the specific species, site and habitat element (e.g. nest, cover patch, etc.) to be monitored by the DNRC biologist on the project ID Team. The project biologist was responsible for developing and maintaining a monitoring schedule, and compiling results of monitoring efforts. Summarized results are in Table T-6.

Other Wildlife Monitoring

DNRC field staff participated in two additional cooperative interagency monitoring efforts. DNRC NWLO area biologists and volunteers surveyed 17 local lakes for occurrence and reproductive success of common loons during summer 2000. Five loon pairs, one sub-adult and one chick were observed and were reported to the Common Loon Working Group. Collected information will aid in tracking the local abundance, status, and distribution of common loons through time. Approximately five man-days were expended on this effort.

DNRC personnel also cooperated in grizzly bear population monitoring efforts conducted by the Greater Glacier Area Bear DNA Project (U.S. Geological Survey, Kate Kendall — principle investigator) during the 1999 and 2000 field seasons. During the 2000 field season, DNRC personnel established and checked barbed wire hair snagging sets within 7 area-grid cells during 5, 2-week trapping sessions. Participants collected 189 hair samples and submitted them for DNA analysis to determine species, sex and individual identification of bears that visited sets. This information will be used to develop minimum counts and a baseline index of population size, and will be used to design a non-intrusive population monitoring scheme. Results will be obtained from the U.S. Geological Survey as project funding becomes available. DNRC personnel expended approximately 55 man days on this effort.

Sensitive Plant Species Monitoring
(Addresses: Sensitive Species RMS 6)

Results: 79 timber sale project records were reviewed. On all projects, the Montana Natural Heritage Program (MNHP) database was referenced for sensitive species occurrence in proposed project areas. Eleven sensitive plant surveys were completed. Where the MNHP and surveys noted sensitive species occurrence on 9 project areas, biologists were consulted for specific plant biology and mitigation options. Only seven sites occurred in or adjacent to timber harvest areas. Mitigation measures were designed and implemented on all sites where sensitive species occurred to avoid potential disturbance of plants.

Table T-6. Summary of Monitoring of Mitigation for Special Habitat Elements

Area Office	Project Name	Target Species	Habitat Element Monitored	Review Period	Estimated Man Days Spent	Mitigation Evaluated	Effectiveness
NELO	Middle Bench T.S.	Great Blue Heron	Rookery within harvest unit	5/3/99 to 6/30/00	7.0	No-harvest nest buffer and timing restrictions for operations	Unknown *
SWLO	Quiet Stems T.S.	Osprey	Nest near harvest unit	6/12/00 to 6/27/00	1.0	No-disturbance nest buffer	Successful - young fledged. No apparent disturbance.
SWLO	Luke Warm T.S.	N. Goshawk	Nest within harvest unit	7/6/00	0.5	No-harvest nest site buffer and timing restrictions	N/A **
SWLO	Luke Warm T.S.	N. Goshawk	Nest within project area	6/25/98 7/13/00	1.0	N/A ***	N/A ***

* The rookery was experiencing relatively high juvenile mortality prior to implementation of harvest activities. Six-eight nesting birds were observed in the rookery on May 3, 1999, following project completion. All nests apparently failed that spring and no activity has been observed on the rookery since June 15, 1999. Other disturbance factors undetectable through monitoring efforts may have been present and contributed to the apparent abandonment. Monitoring will continue through July 2001. Prescribed activity restrictions were deemed effective for minimizing disturbance.

** Harvest not yet completed. Effectiveness not yet evaluated for this nest.

*** This nest was documented and site characteristics were described. No specific mitigations were developed for this nest as the nearest harvest unit was >0.5 miles distant with ample forested visual and noise buffer present. The nest was not being used during summer 2000 and had apparently been abandoned due to unknown causes. Harvest activities have yet to occur in this parcel, but are planned for Summer 2001.

GRAZING ON CLASSIFIED FOREST LANDS MONITORING

Three goals were established in the Resource Management Standards (in Grazing RMS 4) of the State Forest Land Management Plan (SFLMP) to prevent nonpoint source pollution and maintain functional riparian areas in areas licensed for grazing:

- ***restore herbaceous and woody vegetation in riparian-wetland plant communities;***
- ***leave sufficient vegetation to filter sediment and protect streambanks from erosion;***
- ***prevent unacceptable levels of structural damage to streambanks.***

These were quantified as monitoring objectives in Grazing RMS 6 and 7, with the following standards:

- ***continuous season-long grazing will only be authorized when the levels of forage utilization do not exceed 60% and healthy riparian function is maintained;***
- ***no shrubs will be in the heavily hedged form class and <25% of the shrubs will be in the moderately hedged form class;***
- ***streambank disturbance induced by livestock trampling will be limited to <10% alteration.***

Methods: Guidance for grazing management on classified forest lands was issued to the field offices on May 28, 1998. This guidance recommended that the following standardized methods and procedures be used for 10-year renewals and 5-year midterm reviews of grazing licenses on classified forest lands.

Range Evaluation for Stocking Rates: Existing plant species composition is estimated by weight and compared to the potential climax species expected to occupy a specific range site. This is based on methods referenced by the USDA Natural Resources Conservation Service in their publications *Guide for Determining Range Condition and Initial Stocking Rates*, *Range Site Criteria*, and *Guides to Determine Forest Understory Vegetation Condition and Recommended Stocking Rates*.

Range condition: This is occularly assessed to compare current conditions to the results of the previous detailed range evaluation (see above) completed at the last renewal inspection. Problems are noted, such as the presence of noxious weeds, erosion, and the condition of range improvements (water developments and fencing).

Riparian area evaluation: Either the entire stream within the licensed area or a representative segment is surveyed. Ocular assessments are made within a 6 ft. band centered on the Green Line (the first perennial vegetation above the stable low water line of a stream or water body; Bauer and Burton 1993). Riparian forage utilization, woody browse utilization, streambank disturbance, and riparian tree and shrub age classes are recorded, using standardized methods (Bauer and Burton 1993, Kinney and Clary 1994).

Riparian woody vegetation is recorded where it occurs or has the potential for occurring. Browse utilization is placed into 1 of 5 classes: None (0-5%), Light (5-25%), Moderate (25-50%), Heavy (>50%), and Unavailable (due to location or too high). The percentage of woody vegetation in each of 5 classes is recorded: Seedlings (1 stem), Young/sapling (2-10 stems), Mature (>10 stems), Decadent (>30% of canopy dead) or Dead (100% of canopy dead).

Results: The following inspections were completed in 1998 through 2000, after completion of the monitoring guidance.

Table G-1. Number of Licenses Inspected in 1999-2000

	10 year License Renewals	5 year Midterm Reviews
NWLO	10 inspections 8 leases	7 inspections 6 leases
SWLO	27 inspections 15 leases	(none)*
CLO	(none)	2 inspections 1 lease

* A contract has been let to conduct twenty-five 5-year midterm reviews in the Southwest Land Office. Fire closures in August 2000 delayed this work; it will be completed in fall 2000.

Five licenses had no riparian areas or streams on the state ownership. A total of 10.6 miles of stream riparian area was surveyed in the remaining 25 licenses. The lengths of stream that were surveyed varied from representative reaches (100-500 ft.) to the entire stream segment within the allotment, up to 1 mile. Streambank damage ranged from 0% to 100%, and was <10% in 16 licenses. Utilization of forage exceeded 60% in only 4 licenses. Browse utilization exceeded the standard (25% in Moderate or 0% in Heavy) in only 4 licenses; however, riparian areas in 5 licenses had no woody vegetation.

Table G-2. Results of Supplemental Riparian Monitoring during Lease Inspections

Leases with No Riparian Areas:	5
Leases with Riparian in Good Condition:	16
Leases with Riparian exceeding Standards:	9
Leases with changes recommended:	5
Leases w/o recommendations:	4
Leases with changes for upland conditions:	3

Out of 25 licenses with riparian areas, 16 had riparian areas within the standards. In most cases, these showed no impacts at all, with streambank damage 0-5%, forage utilization slight (0-20%), and browse utilization none or light (0-25%). In the remaining licenses where impacts were noted, streambank damage exceeded the standard (10%) before vegetation impacts were noticeable (above 25%). Streambank damage is generally considered the most sensitive parameter and the most difficult to meet.

In the licenses where management changes were recommended because of riparian impacts, the riparian standards had been exceeded in all three categories (streambank damage, forage utilization and browse utilization), and the impacts were noted as severe. The inspectors recommended fencing out the riparian areas and/or developing a grazing management plan. There were also three licenses where changes in management were recommended to address impacts to upland vegetation. The inspectors recommended either a reduced grazing season or a reduction in Animal Unit Months (AUMs).

In 3 of the 4 licenses where management changes were not recommended, the vegetation impacts were within the standards and only the streambank damage standard had been exceeded. One of these was for a very large license with nine separate tracts. Eight of the tracts met all of the standards and only one had streambank damage which exceeded the standard (10%). The 4th license had severe flood damage from the previous year, which it was thought had contributed to the observed streambank damage of 50%, and also severe forage utilization (60-80%).

Conclusions: The Supplemental Riparian Monitoring Form is an effective tool to document impacts in riparian areas. Continued monitoring and follow up will be done for the licenses where riparian impacts were noted, to ensure that changes in management are implemented and effective in improving riparian conditions.

WEED MANAGEMENT MONITORING

In the State Forest Land Management Plan (SFLMP), the main goal of the Weed Management standards is to prevent or control the spread of noxious weeds. Specific standards include:

- ***use integrated pest management for weed control;***
- ***require measures such as use of weed free equipment, prompt revegetation of roads and reduction of ground disturbance; and***
- ***attach stipulations and control measures to limit spread of weeds to timber sales contracts. Where specified, continue weed control measures for two years following land disturbance.***

Monitoring: On DNRC forest projects where weeds are a concern, field staff and specialists would review implementation of noxious weed control and mitigation measures. Deficiencies would be remedied. On grazing licenses, weed infestations would be mapped, and license holders would participate in weed control.

Methods: As part of ongoing forest management activities, DNRC administrators review the implementation of noxious weed control measures on all timber sales. Continued monitoring is planned for two years after timber projects as part of follow-up actions. Weed infestations are to be mapped for all timber sales.

DNRC administrators also record weed infestations, as part of license renewal and midterm inspections. (See **GRAZING ON CLASSIFIED FOREST LANDS MONITORING**.) When weeds are noted during these reviews, administrators are to fill out a Weed Monitoring form.

Results: Seventy-nine timber sale project records were reviewed, of which 42 sales had existing weeds on the project areas. In project areas where weeds occurred, the infestations were mainly along existing roads. Mapping of weed infestations was completed on recent projects. Integrated weed management practices were applied to all projects, which included prevention, requiring use of weed-free / washed equipment, and grass seeding of roads. All grass seed mixtures included native species.On competitive sites, more resilient introduced grasses comprised a higher percentage of grass mixes.

Stipulations and control measures, as needed and designed for, were included in all timber management projects where considerable ground disturbance occurred. Herbicide control measures were used on portions of roads and selected sites to reduce existing weeds and promote preferred species. Biological insect control for knapweed was released on five sites in order to control spread of weed species and to establish insectaries for future implementation.

Supplemental lease agreements outlining weed control remedies were completed for two timber project areas with weed problems.

From 1998 to 2000, 30 grazing leases were reviewed, as part of license renewal and midterm inspections. (See **GRAZING ON CLASSIFIED FOREST LANDS MONITORING**.) Weeds were noted in 16 licenses. Weed infestations were primarily associated with roads and skid trails, and secondarily in open meadows. A weed management plan was recommended for one license area, and in another it was noted that the ongoing weed management was effective.

RECOMMENDATIONS

The Record of Decision (ROD) for the State Forest Land Management Plan (SFLMP), under Manag-ing the Plan (ROD page 10), described circum-stances under which the SFLMP might be revised. It stated that minor changes or additions to the SFLMP, or changes in management direction, could be made as long as they didn't violate the fundamental intent in the SFLMP and EIS. Part of our responsibilities are to identify emerging issues and challenges to implementing the SFLMP, and evaluate the potential need for amendments to the SFLMP to adapt to these circumstances. Issues that have been encoun-tered during the first four years of implementation are discussed below.

Old Growth Management

Since the SFLMP was adopted in 1996, the Forest Management Bureau has been involved in developing and implementing guidelines for how to meet old growth commitments from the SFLMP, specifically Biodiversity RMS 6. The complexity of this issue was unforeseen by DNRC when the SFLMP was adopted. While the Department remains dedicated to meeting the old growth commitments in the SFLMP, it must be noted that these commit-ments have and will continue to pose direct costs (time, personnel, and reduced revenues) to the forest management program, while providing non-market benefits for overall biodiversity and wildlife objectives.

Initial biodiversity/old growth guidelines, consistent with direction from the SFLMP and adopted by the Forest Management Bureau in 1998, have been a source of controversy. In August 1999, the Forest Management Bureau embarked on a strategy to address internal and external old growth concerns. Initially, we contracted with the Montana Consensus Council to conduct a Situation Assessment, in order to identify all of the issues and concerns surrounding old growth management on school trust lands. Following the completion of the Situation Assessment (11/99), DNRC decided to embark on an agency-directed process to revise the 1998 Biodiversity Guidelines. Between January and June of 2000, the DNRC Old Growth Working Group worked diligently to address the identified concerns, and produced two different options for revising the Biodiversity Guidance. Additionally, DNRC received additional input from a public interest group to develop a third option. All three options are currently out for public and technical review, and can be viewed at http://www.dnrc.state.mt.us/eis_ea.html. After reviewing technical and public comments, DNRC will make a recommendation to the Land Board for how to proceed in adopting the Supplemental Guidance.

If this process does not result in general resolution of the old growth issue, DNRC may recommend re-evaluation and revision of the SFLMP Biodiversity standards related to old growth.

Threatened and Endangered Species

DNRC is currently updating the guidance for lynx in response to its listing as threatened under the federal Endangered Species Act (on March 21, 2000). The lynx was analyzed as a sensitive species in the SFLMP, and Implementation Guidance was developed prior to the federal listing (February 17, 1998). Upon listing, field personnel were notified of the status change from sensitive to federally threatened. The guidance is being updated to ensure consistency with the federal *Canada Lynx Conservation Assessment and Strategy* (Ruediger et. al. 2000). The updated guidance will be submitted to U.S. Fish and Wildlife Service (USFWS) for review and feedback. Following this, monitoring guidance for lynx will be developed. DNRC will work closely with USFWS to ensure that our management is consistent with the conservation of lynx.

The peregrine falcon was determined to be "recovered", and was removed from federally threatened status on August 25, 1999. A memoran-dum was released to the field on December 16, 1999

that notified field offices of the status change and directed personnel to continue to follow existing guidance.

Grazing Standards

The grazing monitoring standards (Grazing RMS 7) contains quantitative standards for riparian shrub utilization and streambank disturbance that apply universally to all streams. Initial assessments indicate that variable standards, that are dependent on watershed sensitivity and beneficial uses, may be a more equitable process for evaluating riparian grazing. Further evaluations will likely point toward revising the standards based on watershed variables.

Fisheries Management

The bull trout has been listed as a threatened species since the SFLMP was adopted. The Bull Trout Immediate Actions (Peterman 1994) were adopted as interim measures to protect bull trout habitat (Fisheries RMS 8). The Bull Trout Immediate Actions will remain interim measures until replaced with more current guidance. The Montana Bull Trout Restoration Plan will reportedly be available soon. The Management recommendations from the restoration plan will be reviewed and incorporated into our forest management activities as appropriate. The same will be done with the federal restoration plan when it is completed. Changes to our SFLMP guidance will be completed as necessary to ensure consistent implementation.

DNRC has entered into a Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout (MFWP 1999) since the SFLMP was adopted. The westslope cutthroat trout is a sensitive fish species (Fisheries RMS 6). The conservation actions in the Conservation Agreement apply to DRNC management activities. Any future changes to the SFLMP will reflect this.

Silviculture Financial Standards

The financial standards for Silviculture (RMS 6 and 7) outlined specific procedures for forecasting the present and future potential effects of proposed projects. The prediction of future effects is quite uncertain, due to the dynamic nature of politics, markets, natural events and other influences. Also, the language in the financial standards is unclear and too prescriptive of specific methods of analysis. A rewording of these standards to clarify their intent and accommodate the use of alternative methods may be useful.

REFERENCES

Bauer, S. B. and T. A. Burton. 1993. Monitoring protocols to evaluate water quality effects of grazing management on western rangeland streams. EPA 910/R-93-017. Seattle, WA: Environmental Protection Agency, Region 10. 179 p.

Bevis, K. 1996. Rectangular plot snag inventory method. Unpublished document. Toppenish, WA: Yakama Indian Nation. 5 pp.

Brammer, James. 1999. Long and cottonwood creek fisheries: a preliminary report to Montana DNRC. Bozeman, MT: Montana Fish, Wildlife and Parks, Region 3. 19 p.

Brown, J. K. 1974. Handbook for inventorying downed woody material. General Technical Report INT-16. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 24 pp.

Bukantis, Robert. 1998. Rapid bioassessment macroinvertebrate protocols: sampling and sample analysis SOPs (standard operating procedures). Unpublished report. Helena, MT: Montana Department of Environmental Quality. 37 p.

Bull, E. L., R. S. Holthausen, and D. B. Marx. 1990. How to determine snag density. Technical Note. Western Journal of Applied Forestry 5(2): 56-58.

Flathead Basin Commission. 1998. Flathead Basin Commission, 1997-1998 biennial report. Kalispell, MT. 60 p.

_____. 1991. Flathead Basin forest practices water quality and fisheries cooperative program final report. Kalispell, MT. 215 p.

Graham, R. T., A. E. Harvey, M. F. Jurgensen, T. B. Jain, J. R. Tonn, and D. S. Page-Dumroese. 1994. Managing coarse woody debris in forests of the Rocky Mountains. General Technical Report INT-RP-477. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 14 p.

Harris, R. B. 1999. Abundance and characteristics of snags in western Montana forests. General Technical Report RMRS-GTR-31. Ogden UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 19 p.

Kinney, J. W. and W.P. Clary. 1994. A photographic utilization guide for key riparian graminoids. General Technical Report INT-GRT-308. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 13 p.

McNeil, W. J. and W. H. Ahnell. 1964. Success of pink salmon spawning relative to size of spawning bed materials. U.S. Fish and Wildlife Service, Special Scientific Report. Fisheries 469. 15 p.

Montana Bald Eagle Working Group. 1994. Montana bald eagle management plan, July 1994. Billings, MT: USDI, Bureau of Reclamation. 104 p.

Montana Department of Fish, Wildlife and Parks (MFWP). 1999. Memorandum of understanding and Conservation agreement for westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in Montana. Helena, MT: MFWP. 28 p.

_____. 1997. Fisheries monitoring on Swan River and Stillwater State Forests. Unpublished report, March 1997. Kalispell, MT: MFWP Region 1. 9 p.

Montana Department of Natural Resources and Conservation (MT DNRC). 2000a. State forest land management plan implementation guidance—draft: old growth management on school trust lands. Unpublished document, August 7, 2000. Missoula, MT: DNRC Forest Management Bureau. 72 p.

_____. 2000b. State forest land management plan implementation guidance: T&E species, sensitive species, big game, and biodiversity—snags monitoring guidance. Unpublished document, August 2, 2000. Missoula, MT: DNRC Forest Management Bureau. 24 pp.

_____. 1999. State forest land management plan implementation guidance: water quality monitoring program. Unpublished document, June 30, 1999. Missoula, MT: DNRC Forest Management Bureau. 30 p.

_____. 1998a. Biennial report on surface water quality of the Stillwater State Forest. Unpublished report, April 22, 1998. Missoula, MT: DNRC Forest Management Bureau. 30 p.

_____. 1998b. Montana forestry best management practices implementation monitoring: the 1998 forestry BMP audits final report. Missoula, MT: DNRC Forestry Division. 40 p.

_____. 1998c. State forest land management plan implementation guidance: biodiversity implementation guidance. Unpublished document, May 15, 1998. Missoula, MT: DNRC Forest Management Bureau. 44 p.

_____. 1996a. Final environmental impact statement, state forest land management plan. Helena, MT: DNRC. 2 vols., various pagination.

_____. 1996b. Record of decision, state forest land management plan. Helena, MT: DNRC. 42 p.

Overton, C. Kerry, Sherry P. Wollrab, Bruce C. Roberts, and Michael A. Radko. 1997. R1/R4 (Northern/ Intermountain Regions) fish and fish habitat standard inventory procedures handbook. General Technical Report INT-GTR-346. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 73 p.

Peterman, Larry. 1994. Immediate actions (for bull trout restoration). Internal Memo, September 9. Helena, MT: Montana Department of Fish, Wildlife and Parks, Fisheries Division.

Ruediger, B., J. Claar, S. Mighton, B. Naney, T. Rinaldi, F. Wahl, N. Warren, D. Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, and S. Gniadek. 2000. Canada lynx conservation assessment and strategy. Unpublished document, January 2000. U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, Bureau of Land Management; and U.S. Fish and Wildlife Service. 120 p.

ACRONYMS

BMP	Best Management Practices
CWD	coarse woody debris
dbh	diameter at breast height
DNRC	Montana Department of Natural Resources and Conservation
ESA	Endangered Species Act
FI	Forest Improvement
FIA	Forest Inventory Assessment
GIS	geographic information system
Land Board	Montana State Land Board
MBF	thousand board feet
MEPA	Montana Environmental Protection Act
MFWP	Montana Department of Fish, Wildlife and Parks
MNHP	Montana Natural Heritage Program
MMBF	million board feet
MOU	Memorandum of Understanding
NWLO	Northwest Land Office
RMS	Resource Management Standards
ROD	Record of Decision
sd	standard deviation
SFLMP	State Forest Land Management Plan
SLI	stand-level inventory
SMZ	streamside management zone
SWLO	Southwest Land Office
T&E	threatened and endangered (species)
TMDL	total maximum daily load
USFWS	United States Fish and Wildlife Service

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