Beaverhead-Deerlodge National Forest

FOREST MONITORING AND EVALUATION REPORT
FISCAL YEAR 1999

♦ Riparian Health ♦

INTRODUCTION

Monitoring and evaluation are the primary tools the Beaverhead-Deerlodge National Forest uses to assess whether we are accomplishing the goals set forth in the Forest Plans, and also to determine if the Forest Plans need to be changed. Over the last 13 to 14 years, we have identified many ways the Plan could be improved and updated to better address current issues and incorporate new scientific information. We have also found that the Plan is usually flexible enough to allow us to manage consistently with evolving information. The Beaverhead and Deerlodge Forest Plans will be revised in the near future and the preparatory work of pulling together existing data has already begun. Information from all past monitoring reports, as well as the Forest Plan Five Year Review (Beaverhead – 1991, Deerlodge -1994) will be used to help revise the Forest Plans.

In the years since the two Forest Plans were written, new scientific information has become available, public demands have changed, and some agency policy has changed. In 1998, the USDA Forest Service began implementing a "Natural Resource Agenda," which provides a vision for the long-term future of the agency and identifies specific areas for added emphasis now. These emphasis areas are watershed health and restoration, forest road policy reform, sustainable forest management, and recreation. Last years monitoring

and evaluation report highlighted monitoring results and accomplishments in the arena of sustainable forest management, with a focus on ecologically based vegetation treatments. This years Monitoring and Evaluation Report highlights watershed health and restoration, with a focus on riparian systems.

Riparian areas make up less than 2% of the Forest. This coverage greatly underestimates the importance of these communities. Riparian areas support the greatest diversity of plant and animal species of any vegetative community. They provide food and water in a primarily dry landscape. Areas along streams provide a relatively secure area for wildlife to reside and to migrate through the area and between landscapes.

The Riparian areas found across this Forest are quite varied and include lakes, ponds, streams, fens, marshes, springs and seeps. The vegetation found along and within these areas is also quite varied. Most plant species found in riparian areas are there due to their higher moisture requirements. Changes in the water regime will cause a change in the vegetative composition of a site. The health of riparian vegetation is intricately tied to the condition and status of the hydrologic functioning of the creeks, springs, and marshes.

Recent changes in riparian management direction that affect the Forest directly include adoption of the Beaverhead Settlement Agreement to the National Wildlife Federation grazing lawsuit (1995), the Westslope Cutthroat Trout Long Term Strategy (1999), INFISH (1995), and the US Fish and Wildlife Service Biological Opinion of the Deerlodge Forest Plan compliance with bull trout requirements (1998). Changes in management actions include the aggressive schedule to update allotment management plans and elevated National funding priorities for watershed improvement projects.

Previous monitoring reports documented the need to address various riparian issues. The Beaverhead Five Year Forest Plan Review and Deerlodge 1994 Forest Plan Monitoring Report clearly identified riparian management as an area both plans need to change. Since then, Landscape Analysis and project monitoring further validated conclusions of the 5-Year Reports. We amended the Beaverhead Forest Plan in 1997 to address riparian management. This amendment changed several Forest Plan Monitoring Items. We are also implementing improved riparian management through allotment plan updates on the Deerlodge portion of the Forest as required by the Biological Opinion for Bull Trout on that Plan. Monitoring requirements are modified as part of the new allotment management plans for both forests.

This report focuses on 4 questions we need to answer about riparian habitat health, stream channel condition, water quality and fish habitat condition. These questions link to monitoring items in both plans and monitoring required by other legal agreements.

Question 1: Are riparian "standards" being applied through allotment management plans and annual operating plans? (implementation)

Question 2: Are riparian "standards" being met on the ground? (implementation)

Question 3: What are effects of management on the functioning of riparian areas? (effectiveness).

Question 4: What are trout habitat and population responses to improving riparian condition? (effectiveness or validation)

By answering these questions, we hope to:

- evaluate the two new riparian monitoring items on the south zone (Beaverhead)
- provide comparable information for both zones of the Forest operating under different riparian strategies
- evaluate the effectiveness of changing management in riparian habitat and
- consolidate information that will help us answer westslope cutthroat and bull trout concerns.

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QUESTION 1. ARE RIPARIAN "STANDARDS" BEING APPLIED THROUGH ALLOTMENT MANAGEMENT PLANS AND ANNUAL OPERATING PLANS?

Forest Plan Monitoring Requirements: This question does not relate to Forest Plan Monitoring criteria on either Forest. It relates to requirements of the Beaverhead Forest Plan Amendment #7 (Riparian Amendment, 1997) and the Rescission Bill of 1995. Question 1 addresses our progress toward deadlines set in those documents. **Indices** for responding to this question are: number of allotment management plans revised with riparian guidelines, and number of allotments with interim riparian guidance included in annual operating plans.

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Background: The Beaverhead–Deerlodge National Forest implements riparian standards with two strategies developed before the forests were combined. References throughout the document to "The Beaverhead" or "The Deerlodge" refer to those zones of the current Beaverhead-Deerlodge National Forest. Each zone operates under a different legal mandate. The National Wildlife Federation Grazing Law Suit Settlement Agreement and subsequent Beaverhead Forest Plan Amendment #7 drive riparian standard implementation on the southern part of the Forest. The Inland Native Fish Strategy directs incorporation of riparian standards or mitigation measures on the north zone (Deerlodge zone) of the Forest. The Rescission Act of 1995 directs scheduling of Allotment Plan Revision on this zone.

I. ALLOTMENT PLAN REVISION

Beaverhead Zone - Under the Settlement Agreement (1995) of the National Wildlife Federation Law Suit, all allotment plans are to be revised to incorporate riparian management by 2010. This direction was incorporated into Forest Plan direction. Annually, allotments are analyzed and plans developed. Currently, 49 of 166 allotments have revised plans on schedule to include best management strategies and allowable resource thresholds. The remaining allotments under the Law Suit strategy are managed by interim riparian guidelines.

Deerlodge Zone - The Rescission Act of 1995 (P.L. 104-19) requires all allotment plans to be revised within a fifteen year period. Allotment plans revised after 1996 use a variety of site-specific measures or guidelines, all with the intent of progressing toward meeting riparian management objectives. The schedule for completing allotments under the Rescission Act is based on a landscape analyses schedule and allotments that are practical to analyze as a group. Currently, 72 of 92 allotments have improved riparian standards designed to improve riparian conditions. Twenty-seven of these allotments have revised allotment plans.

II. INTERIM RIPARIAN MANAGEMENT

Beaverhead Zone - The Beaverhead Law Suit strategy uses interim riparian grazing standards until the allotment planning process develops site-specific goals and objectives and subsequent allowable resource thresholds and a "Best Management Strategy". These are implemented and monitored for a 3 to 5 year period. If management is in compliance with allowable resource thresholds and resource conditions are acceptable at the end of the 3 to 5 year period, then current management is continued. If management is not in compliance with allowable resource thresholds and resource conditions are not acceptable, then thresholds are adjusted and become an annual compliance standard. If grazing exceeds the allowable resource threshold in streams containing 90% or greater genetically pure westslope cutthroat trout, the threshold may become an annual compliance standard.

Deerlodge Zone - The Deerlodge portion of the Forest developed Interim Riparian Mitigation Measures during the 1996 grazing permit re-issuance effort. These measures were intended to meet the Riparian Management Objectives listed in the Inland Native Fish Strategy. Eighteen allotments were revised under these Measures.

III. CONCLUSIONS AND RECOMMENDATIONS

The Beaverhead-Deerlodge Forest is currently on schedule for compliance with the Beaverhead Settlement Agreement and the Rescission Act of 1995. On the Beaverhead zone, 100 % of allotments are under some riparian management. On the Deerlodge zone, 78% are currently under some riparian management, with the number increasing annually.

Table 1. Incorporation of Riparian Guidelines in Management Direction

	Total # of Allotments	Revised Management Plans	Interim Riparian Guidelines	% Under Some Riparian Management
Beaverhead Zone	166	49	117	100%
Deerlodge Zone	92	27	45	78%
TOTALS	258	76	162	

QUESTION 2. ARE RIPARIAN STANDARDS BEING MET ON THE GROUND?

Forest Plan Monitoring Requirements – This question does not relate directly to Forest Plan level monitoring criteria for either Forest. Forest Plan Monitoring criteria are tied to the effect or responses to riparian standards, assuming successful implementation. Question 2 examines success of implementation - a point that received much discussion during the riparian amendment process. Can we successfully apply guidelines set forth in the Allotment Management Plans or Annual Operating Plans through our annual inspection process and permittee training efforts?

I. ANNUAL MONITORING AND FOREST PLAN COMPLIANCE REPORT

Beaverhead Zone - Either interim standards or site-specific standards from revised allotment plans are implemented annually, on the ground. Since 1995, each allotment is inspected annually to see if Forest Plan Standards, including allowable resource thresholds, are being met. If standards and thresholds are not being met, management is adjusted or adapted the following year to attempt to meet thresholds. An Annual Forest Plan Compliance Report is submitted to all parties as a term of the Settlement Agreement.

Of the 166 allotments on the Beaverhead portion of the Forest, 36 allotments did not meet riparian standards during 1999. Of those, 14 were also out of compliance in 1998, 22 met riparian standards in 1998.

Deerlodge Zone - Either Deerlodge riparian mitigation measures or site specific-standards that meet INFISH requirements are implemented annually, on the ground on 72 allotments. Since 1998, half the allotments on each ranger district of the Deerlodge portion have been inspected to see if Forest Plan standards are being met. If Forest Plan standards are being met then current management continues. If Forest Plan standards are not being met, the annual operating plan is adjusted to insure compliance with Forest Plan standards for the next grazing season. If the same Forest Plan standards are violated, then the grazing permit or portion of the permit may be suspended or cancelled

Half of the allotments, 46, were inspected on the Deerlodge portion during 1999. Seventeen were found not to meet Forest Plan or allotment plan riparian standards

Table 2. Implementation of Riparian Standards on the Ground*

	Total # of Allotments	# Allotments Inspected in 1999	# Allotments in Compliance in 1999	%	# Allotments not in Compliance	%
Beaverhead Zone	166	166	130	78	36	22
Deerlodge Zone	92	46	29	63	17	37
TOTALS	258	212	159	75%	53	25%

*This information varies from the 1999 Status Report for the Settlement Agreement. That report also considers allotments out of compliance if standards not considered here are not met (winter range utilization or deviations from planned management systems).

II. ANNUAL INTEGRATED REVIEW OF SELECT GRAZING DECISIONS

During September of 1998 and 1999 the Forest conducted formal, integrated reviews of implementation of grazing decisions on seven allotments on the Forest (one per ranger district). The review team consisted of Resource Staff Officer and specialists from the Forest Supervisors Office (hydrologist, soil scientist, ecologists, wildlife biologist), and the District Ranger and range allotment administrator for the selected allotments. Allotment permittees were invited and encouraged to attend. The objectives of the review were as follows:

(1) Determine if the decisions made in the range NEPA documents are being implemented.
(2) Determine if standards established for resources on the grazing allotments are being met.
(3) Determine if the standards are being applied consistently across the Forest.
(4) Look for opportunities to improve implementation of grazing decisions across the Forest.

Results of Annual Review – The integrated review produces a list of findings, recommendations, and a summary of the standards applied and measured on the seven allotments reviewed. The recommendations by allotment are too lengthy to include but the Forest wide recommendations and summary for FY99 follow. A comparison of measured versus applied riparian standards is presented in Table 3 and 4 for each allotment.

Forest wide Recommendations (FY99)

Forest wide recommendations as a result of this years review are similar to those made in 1998. Progress was made in some of the areas identified last year, but will take continued effort to improve consistency across the Forest.

1. Hold an annual training workshop to help improve consistency in measuring stream bank disturbance. Continue work on a photo guide to assist with this effort.

2. Rangeland evaluators need to continue to work toward consistency when measuring utilization. Annually clipping plots to calibrate ocular estimates is a must before going to the field to monitor utilization standards.

3. Use of Permit Compliance Guidelines has improved in the past year. The South Zone is required to complete a compliance report on 100% of their allotments, which it has done for the past five years. The North Zone is targeting compliance reports on 50% of their allotments, and for the most part has met that goal this season.

4. If not already done in the AMP, identify key areas within each pasture and select specific standards that apply to these areas. Include numerical standards in the annual operating plans. Most permittees will not reference other supporting documents to search these standards out.

5. Provide additional training sessions to assist permittees in acquiring needed monitoring skills. The "Monitoring for Success" Workshop conducted by Jeff Mosley, Extension Range Specialist, on the Jefferson Ranger District, was quite successful this past year.

6. The declining condition of woody browse species on the Forest continues to be a concern. It appears a combination of factors is contributing to this situation. Some include overuse by wildlife and livestock, as well as encroachment from conifers. An aspen review team was organized on the Forest last year, partially as a result of the range review, and has since made recommendations on how to improve success of aspen treatment projects. The effort should be expanded to include willows and other browse species.

Table 3. FY98 Integrated Riparian Review

ALLOTMENT	MONITORING SITE	STANDARD APPLIED	STANDARD MEASURED	STANDARD MET
South Steel	1	50% utilization	50%	Yes
	2	50% utilization	50%	Yes
	3	50% utilization	65%	No
	4	35% utilization	20-25%	Yes
	5	50% utilization	40%	Yes
	6	50’ bank disturbance	50’	Yes
	7	50% utilization	45%	Yes
North Meadow	1	50% utilization	25-35%	Yes
	2	0% utilization	0%	Yes
	3	50%utilization	60-70%	No
	4	35’ bank disturbance	90’	No
Farley-Dyer	1	35% utilization	80%	No
	2	19’ bank disturbance	90’	No
	3	55% utilization	15-20%	Yes
North Bull Mountain	1	50% utilization	20-35%	Yes
	2	40’ bank disturbance	80’	No
	3	35’ bank disturbance	80’	No
Toomey Creek	1	25’ bank disturbance	35’	No
	2	40% utilization	40%	Yes
	3	4” stubble height	4-6”	Yes
	4	20’ bank disturbance	20’	Yes
	5	40% utilization	35-40%	Yes
	6	4” stubble height	5-6”	Yes
	7	45’ bank disturbance	50’	No
	8	45% utilization	70%	No
	9	3” stubble height	1”	No
	10	25’ bank disturbance	20’	Yes
	11	45% utilization	30%	Yes
	12	4” stubble height	6”	yes
Marshal Creek	1	50% utilization	60-65%	No
	2	65’ bank disturbance	75’	No
	3	40% utilization	35-40%	Yes
	4	28’ bank disturbance	50’	No
	5	50% utilization	30-60%	Yes/no
Dry Cottonwood	1	40% utilization	60%	No
	2	35’ bank disturbance	80’	No
	3	40% utilization	60%	No
	4	35’ bank disturbance	60’	No
	5	40% utilization	0-5%	Yes
	6	35’ bank disturbance	0’	Yes
	7	55% utilization	40%	Yes

Table 4. FY99 Integrated Riparian Review

ALLOTMENT	MONITORING SITE	STANDARD APPLIED	STANDARD MEASURED	STANDARD MET
Hall	1	50% utilization	50%	Yes
	2	50% utilization	60-70%	No
Browns Gulch	1	50% utilization	10-20%	Yes
	2	0% utilization	30%	No
	3	50% utilization	50%	Yes
Clam Valley	1	50% utilization	60-70%	No
	2	50% utilization	50%	Yes
	3	50% utilization	70-80%	No
	4	35% utilization	23%	Yes
	5	50% utilization	60-80%	No
	6	50% utilization	0-15%	Yes
Shineberger	1	50% utilization	30-35%	Yes
	2	50% utilization	50-65%	No
	3	50% utilization	60-70%	No
	4	50% utilization	40-50%	Yes
	5	50% utilization	50-5%	No
	6	50% utilization	50%	Yes
	7	25% bank disturbance	42%	No
Cox Ranch/Anderson Meadows	1	50% utilization	40-50%	Yes
	2	28% bank disturbance	20%	Yes
	3	50% utilization	40-50%	Yes
	4	50% utilization	60-65%	No
	5	50% utilization	20-4-%	Yes
	6	50% utilization	60-70%	No
West Fork Madison	1	50% utilization	60-65%	No
	2	28% bank disturbance	40%	No
	3	50% utilization	50-55%	Yes
	4	28% utilization	60%	No
Hells Canyon	1	50% utilization	50-55%	Yes
	2	50% utilization	60%	No
	3	30% bank disturbance	80%	No

III. ACTIONS RESULTING FROM ANNUAL MONITORING

As a result of annual inspections, various actions are taken to keep or bring non-compliant allotments into compliance with riparian standards. Actions taken by permittees to meet riparian standards on allotments over the last 5 years include voluntary reductions, removing livestock early, extra riding, water development, temporary electric fences, permanent fence construction, and nonuse of grazing permits for resource protection. For example, voluntary reductions in numbers or grazing duration, below permitted numbers, have occurred on virtually every allotment on the Wisdom District that is managed under

the interim Riparian Amendment standards. Actions taken by the Forest Service include removing livestock early and temporary reductions. These actions will continue in most cases until completion of scheduled allotment management plan revisions in 2004.

Table 5 shows what actions were taken during the 1999 grazing season in an effort to meet standards. This table will not reflect actions still in place from previous years or actions taken on allotments that met standards. The 1999 grazing season was one or the worst forage production years since 1996, due to drought. In many places Forest rangeland management specialists estimate forage production was less than 50% of normal. On 6 allotments the Forest Service took permit action (suspension or reduction) to get livestock use compliant with Forest Plan standards.

IV. CONCLUSIONS AND RECOMMENDATIONS

Since 1995 the following changes have occurred:

- 137 allotments have riparian standards or mitigation measures in their allotment plans.
- A high percentage of allotments met riparian standards during most years. During 1999 the allotments administered under the Beaverhead Law Suit had 130 of 166 allotments meeting standards (78%).
- 36 allotments have had permitted use reduced to meet riparian standards.
- 8 permits have been waived and not reissued so standards could be met with current permitted grazing.
- 2 permits are in nonuse for resource protection

Table 2 shows the number of noncompliant allotments for the Beaverhead portion of the Forest. The trend of riparian standard compliance was good until 1999. This may be partially attributed to the poor forage production year. Note the weather records in Table 6. Compare total precipitation for the months of April through September. As expected, maintaining normal permitted grazing use during dry years such as 1999 is hard to do because forage production is lower and during hot, dry weather livestock tend to use riparian areas harder and not use range further from water and/or on steeper slopes. It appears that unless some management changes are made, 14 to 17 allotments will have problems even during good forage production years. Also, another 19 allotments need to adjust management sooner during drought years to meet riparian standards. It appears that closer monitoring of weather and the effects on forage production and livestock distribution is needed.

In general the Beaverhead portion of the Forest has made more progress in implementing riparian improvement, mainly because of the emphasis of the Grazing Lawsuit. The Deerlodge portion is on the Rescission Bill time line, a 15-year schedule for allotment plan implementation rather than the 10-year time line for Beaverhead portion. Of the 258 allotments on the Forest, only 20 do not have riparian standards in their allotment plans or incorporated in the Term Grazing Permit. These allotments are on the Jefferson District

and portions of the Butte District that are not affected by conservation strategies for fish in the Columbia River Basin (INFISH). Riparian standards will be incorporated into these allotment plans by the Rescission Bill time line or sooner depending requirements for westslope cutthroat trout.

The decisions made in the range NEPA documents on the seven reviewed allotments are generally being implemented. The speed of implementation in most cases is dependent on the availability of funds to construct or reconstruct range improvements and on the Districts ability to administer their grazing program.

Again, because the 1999 grazing season was a warm, dry, low forage producing year, it became even harder to meet grazing standards on many allotments. The review indicated that standards were not met in all cases. However, the range units were in better shape than one may have expected in such a year. It was evident on many units that efforts were made to protect the range resource and to achieve standards. In some cases this took the form of fencing to exclude livestock from sensitive riparian areas and in others riders were employed to better distribute livestock. On many units livestock went home early as standards were met. There still is a long ways to go to meet all standards applied on the allotments, but it is encouraging to see that considerable effort is being made to accomplish this goal, and that range managers are educating permittees to make needed adjustments.

Standards are not always interpreted consistently across the Forest. Progress was made in this area from the 1998 grazing season but much work remains to be done. Annual Forest and District level workshops need to continue to improve consistency in measuring utilization and stream bank disturbance standards. Continued annual reviews by an integrated team of specialists will provide accountability for compliance reporting. There is some concern about the accuracy of our reporting of compliance (Table 2) until our annual inspections show we have achieved consistency.

Table 3 indicates utilization standards were met 60% of the time but stream bank alteration standards were only met 23% of the time on allotments inspected in 1998. Hydrologists surveying streams in the south zone found bank trampling is the biggest cause of non-functioning and functioning at risk streams (see page 21, Conclusions). We need to insure standards for utilization levels match standards for stream bank trampling. We need to spend more time assuring implementation of stream bank standards. The Allotment Management Plan revision process and future monitoring need to examine whether a 50% utilization standard is adequate to reverse a downward trend.

Another factor in the effectiveness of riparian improvement on allotments is the time needed to train permittees and/or riders to monitor grazing in riparian areas. As more permittees become proficient in managing riparian, the more time Forest Service range managers will have to spend with new permittees or devote to resolving difficult management situations. Additional permittee monitoring training sessions need to be scheduled and followed through on to help the permittees redeem their responsibility in this area.

Table 5. Actions Taken on Non-Compliant Allotments

District	Non-Compliance Allotments (b)	Livestock Removed Early (c)	Riding (d)	Water Developments	Suspensions, reductions, nonuse for resource protection (e)	Fence constructed & reconstructed (miles)	Temporary Electric Fence (miles)
Dillon	22	4,30,45,6,34 7,14,4,3,22, 18,3,40,36,6	4 Full time 7 Part time		Suspensions: 3	1.2	0.55
Wise River	6	15, 5, 7	3 full time 1 part time		Reduction:25% 10%,26% Nonuse: 24%	1	0.25
Wisdom	7	17,14,3,2	2 part time 1 full time	3 springs	Suspensions 17%, 14%, 14%	1	0.25
Butte	6		2 part time	1 tank w/pipeline			0.25
Pintlar	3		3 Part time	2 springs			0.5
Jefferson	8	8,5,13,7,24, 5	6 Part time 1 full time	7 miles pipeline 11 tanks			1
Madison	1	15	Full time				

Even though riparian standards were not met on these allotments, significant actions were taken towards meeting the standards. This table shows actions taken during 1999. 1999 was a very dry year. Average forage production was between 30% and 60% of what it was in 1998.
(b)# allotments :
(c) Days moved early. Each number represents one allotment, so for example Wise River had 3 allotments that removed livestock early:
(d) # allotments with part time or full time rider:
(e) Percent of permitted use voluntarily reduced, suspended, or nonuse for resource protection. For example Wise River had 3 reductions and 1 nonuse for resource protection.

Use of the grazing Permit Administration Guidelines has been effective and is becoming more effective on the Forest. Since 1995 voluntary adjustments of over 3000 AUM's have been made to better bring stocking in line with capacity and to help meet grazing standards on the Forest. The North Zone has begun using this tool the past two years, and should continue to expand its use where possible and to follow through with documentation and permit actions where needed.

Table 6. Weather Records Relative to Number of Non-compliant Allotments*

	1995	1996	1997	1998	1999	Mean (b)
Noncompliant Allotments **	22	33	14	17	36	
Precipitation inches ***						
April	3.09	0.79	2.10	1.33	1.25	1.36
May	4.32	2.87	2.65	1.72	3.02	2.35
June	3.96	0.54	2.14	3.10	1.68	2.24
July	1.68	0	1.28	0.79	0	1.28
August	1.01	0.17	1.97	0.66	0.84	1.14
September	2.05	0.37	0.71	1.01	0.13	1.19
Total	16.11	4.47	10.85	8.6	6.9	9.5
Precipitation for July - September	4.74	.54	3.9	2.46	0.97	

* Weather data from Western Regional Climate Center
** Beaverhead allotments not compliant with riparian standards
*** Mean monthly precipitation and temperature for a 100-year period
(d) Monthly precipitation totals

QUESTION 3 – WHAT ARE THE EFFECTS OF MANAGEMENT ON THE FUNCTIONING OF RIPARIAN AREAS?

Forest Plan Monitoring Requirements - Deerlodge Forest Plan Monitoring Items related to streams and watersheds are:

- 9-1 Compliance with local, State and Federal Standards
  The indices vary but include Best Management Practices audits or contract administration of timber sales.
- 9-2 Riparian rehabilitation projects
  The index is number of acres completed.
- 9-3 Productivity changes in sensitive soils
  The index is benchmark vs. sampled soils
- 9-4 Adequate water to maintain management options.
  No indices are listed.

The Beaverhead Forest Plan was amended in 1997 to update Goals, Objectives, Standards and Monitoring as they relate to riparian health. Item 2-3 replaced a sediment production standard in the amendment. Because suspended sediment is a highly variable water quality parameter, past monitoring efforts did not adequately determine actual changes in sedimentation. Present stream surveys provide a better overall, long-term assessment of stream condition by integrating all past and present effects on streams.

Beaverhead Monitoring items related to streams and watersheds, updated in 1997, are:

- 2-3 Management effects on the functioning of riparian areas
  The index is number of reaches in functioning, functioning-at-risk, and non-functioning categories, combined with an assessment of the trend.
- 3-2 Impacts of harvest on watershed standards
  The index is planned acres harvested/year
- 3-3 Effectiveness of Best Management Practices
  The indices vary depending on each projects specific requirements.

The following section directly addresses the new monitoring item 2-3, stream condition as measured by its function. Other monitoring items in place since 1986 are reported on briefly in Section III (items 9-1, 9-2, 3-2 and 3-3).

I. EFFECTS ON STREAM FUNCTION

The Beaverhead Forest Plan was amended in 1997 to update Goals, Objectives, Standards and Monitoring as they relate to riparian health. Item 2-3 replaced a sediment production standard in the amendment. Because suspended sediment is a highly variable water quality parameter, past monitoring efforts did not adequately determine actual changes in sedimentation. Present stream surveys provide a better overall, long-term assessment of

stream condition by integrating all past and present effects on streams (Beaverhead Riparian Amendment #7). This approach to monitoring stream function has been adopted Forest-wide.

A. Inventory and Monitoring work being conducted:

1. Landscape Analysis Inventory

Data Collected: Baseline for stream function/reference reaches

The inventorying of stream condition at the landscape level is designed to identify areas within a given landscape that: 1) have been adversely affected by past/current management, or 2) are sensitive to degradation from current management practices. Once these inventories are completed and the data analyzed, recommendations can be made with respect to: 1) changing existing management practices, 2) scheduling of restoration activities, and 3) planning of future management activities.

Data is gathered both in the field and from existing sources. Stream surveys are done throughout the landscape to depict existing condition of stream channels (see below). Existing data sources include water quality measurements taken in the 1970's, qualitative field surveys from previous project/planning efforts, and GIS derived data that describes management history as well as geoclimatic information for the landscape. Combining these data into a comprehensive write-up depicting watershed conditions, and then merging that information with similar inventories of riparian vegetation and fisheries, provides a basis for recommendations concerning future aquatics management. To date, 7 Landscape Analyses are complete on the Forest. Watershed and stream conditions have been inventoried to varying degrees on the other three.

The field surveys of existing stream condition are perhaps the key element in watershed inventory/monitoring. The surveys are designed to determine whether or not a stream reach is "functioning" as it should within the spatial and temporal constraints of the landscape. The stream surveys quantitatively measure morphological characteristics (entrenchment, width/depth ratio, sinuosity, gradient, and particle size) of a reach to determine stream type (Rosgen, 1994). Surveys also include: cumulative width assessment, Channel Stability Rating (Pfankuch, 1975), Bank Erosion Hazard Index (Rosgen, 1996), and Riffle Stability Index (Kappesser, 1993). For a given reach, these surveys provide adequate site-specific information to make both planning level and project level decisions.

Some stream reaches use more than one cross-section to help define the variability in stream function. Typically, one cross-section expresses a desired condition in terms of profile, while the other(s) show an altered state. The desired condition profile typically represents a small portion of the reach, resulting in an overall interpretation of either functioning-at-risk or non-functioning. High variability in stream function

is common in livestock grazing situations where cattle have intermittent access to stream banks.

The data from stream surveys are compared with "reference reaches" from similar valley bottoms. A given valley bottom will generally produce a specific stream type based on the valley's width and gradient, and the size of the watershed (Bengeyfield, 1999). Reference reaches have not been appreciably affected by past or current management activities. Because they exhibit attributes of a channel where natural processes determine stream condition, they can be used for comparison with reaches that might have been affected by management activities. There is no "cookbook" for determining function. Professional judgment is used to integrate and weigh the various components of the stream survey, with more emphasis being placed on the quantitative portions of the survey (stream type determination, cumulative width assessment, RSI). Generally, if the measured and reference reaches had the same stream type, the stream was considered to be "functioning". If the reaches classified as the same stream type, but one or more of the attributes showed appreciable difference from the reference, that reach was considered to be "functioning-at-risk". If the measured reach was a different stream type than the reference, the reach was considered to be "non-functioning."

The density of surveys at the landscape level is designed to give an overall picture of the conditions that prevail across that landscape. It is not expected that this density is adequate to portray conditions within smaller areas of that landscape where individual projects take place. To adequately portray these areas, additional surveys will be necessary.

Historic mining activities play the dominant role in altering stream function on some watersheds in the North Zone. Streams altered by mining occur across a range of stream types. Changes often result from physical channel disturbances, such as placer mining. In some cases, severe changes in water quality have eliminated or altered riparian vegetation, creating high bank instability and non-functioning or functioning-at-risk stream conditions. Stream surveys, along with water quality monitoring, can establish baseline conditions for determining stream function and trend for streams affected by mining.

Results:

Budget and time limitations have not allowed an inventory of all streams on National Forest land, so surveys have been located in areas of known concerns or high vulnerability to disturbance. These are generally, low-gradient, meandering, meadow streams – C and E streams in the Rosgen classification. Consequently, the proportion of streams identified as functioning-at-risk or non-functioning is accurate only for these types of streams. Those stream types that are steeper, straighter and less responsive to livestock grazing are generally in better condition, but are not necessarily as well represented by stream surveys. This is illustrated in Table 7

below. Note that surveys located in stream types A and B are both fewer and in better functioning condition than those in stream types C and E.

Table 7. Sample of Stream Function By Streamtype for 5 Landscapes

	Streamptype A			Streamtype B			Streamtype C			Streamtype E		
	F	FAR	NF	F	FAR	NF	F	FAR	NF	F	FAR	NF
TOTAL #	**31**		**3**	**64**	**10**		**15**	**2**	**7**	**165**	**54**	**101**
Percent	**91**		**9**	**86**	**14**		**63**	**8**	**29**	**51**	**17**	**32**

Table 8 displays the results of stream function by Landscape, based on the number of surveys**. Maps 1-11** display the location of these surveys. GIS mapping techniques varied between the north and south zone. As a result, segments of streams surveyed appear larger on the Beaverhead zone than the Deerlodge. This is not actually the case; reach lengths are similar. On the Beaverhead-Deerlodge National Forest, 1015 miles of stream have been surveyed to determine stream condition and mapped on GIS. Of the stream surveys mapped, 56% are functioning, 20% are functioning at risk, and 24% are not functioning.

Table 8. Summary of Stream Function By Landscape

Total	**Functioning**		**Functioning at Risk**		**Non Functioning**		**Total**	
#	#	%	#	%	#	%	#	
Tobacco Roots	16	69	2	9	5	22	23	
Gravelly	65	55	25	21	29	24	119	
Pioneer	99	59	28	17	40	24	167	
Lima Tendoy	77	65	18	15	24	20	119	
Big Hole	98	72	17	13	21	15	136	
Boulder	8	32	7	28	10	40	25	
Clark/Flints	2	6	9	29	20	65	31	
Rock Creek	6	21	15	54	7	25	28	
Elkhorn	5	62	2	16	1	12	8	
N Tobacco Roots	1	20	2	40	2	40	5	
Jefferson	2	17	9	75	1	8	12	
Upper Clark Fork	3	25	4	33	5	42	12	
Total	**382**	**56**	**138**	**20**	**165**	**24**	**685**	

ADDENDUM

Table 8A. STREAM FUNCTION BY MILES SURVEYED

(12/20/00 data base update)

Landscape	BIG HOLE		GRAVELLY		LIMA/TENDOY		PIONEERS		TOBACCO ROOTS		SOUTH ZONE TOTALS		
Condition	#sites	Miles	#sites	Miles	#sites	Miles	#sites	Miles	#sites	Miles	**#sites**	**Miles stream**	**%**
F	98	52.7	65	33	77	39.3	99	43.4	16	13.7	**355**	**182.1**	**65**
FAR	17	6.3	25	12.6	18	7.3	28	12.6	2	0.9	**90**	**39.7**	**15**
NF	21	6.3	29	13.7	24	11.9	40	21.2	5	2.4	**119**	**55.5**	**20**
Unsurveyed		1118.3		1747		755.5		843.1		322		**4785.9**	
Total	136	1183.6	119	1806	119	814	167	920.3	23	339	**564**	**5063.2**	

Landscape	BOULDER		ELKHORN		ROCK CREEK		CLARK/FLINTS		UPPER CLARK		JEFFERSON (+troots)		NORTH ZONE TOTALS		
Condition	**#sites**	**Miles**	**#sites**	**Miles**	**#sites**	**Miles**	**#sites**	**Miles**	**#sites**	**Miles**	**#sites**	**Miles**	**#sites**	**Miles stream**	**%**
F	8	2.7	5	1	6	2.9	2	0.8	3	1.4	3	1.1	**19**	**7.2**	**20**
FAR	7	2.6	2	0.4	15	8.7	9	3	4	1.1	11	3.5	**41**	**16.7**	**47**
NF	10	4.2	1	0.1	7	3.8	20	5.5	5	1.4	3	0.8	**36**	**11.6**	**33**
Unsurvey		374.5		109.5		617.3		1158		365.7		628.7		**2880**	
Total	25	384	8	111	28	632.7	31	1168	12	369.6	17	634.1	**96**	**2915**	

Conclusions:

South Zone (Beaverhead National Forest) - On National Forest system lands in the south zone, classifications of non-functioning or functioning at risk were most often a result of livestock grazing. Only in rare instances did timber harvest or mining play a part in a determination of diminished function. A combination of stream bank trampling by livestock, coupled with a reduction in riparian vegetation that is resistant to erosion (willows and sedges), have caused streams to become more entrenched and/or have greater width/depth ratios. Consequently, impacts to riparian areas are concentrated in stream reaches that are flat, meandering, and in reasonably wide valley bottoms (C and E stream types in the Rosgen Classification.) These changes often cause a shift in stream type from E to B, C, or F depending on the severity of the effect.

This alternation of entrenchment and width/depth ratio means that the functioning relationships between the channel and its floodplain have been altered so that flows over bank-full (approximately the 1.5 – 2.0 year flood) are contained in the channel instead of being spread out on the floodplain. Often, accelerated channel erosion and increased sedimentation are the results. Changes of this magnitude in stream channels lead to changes in vegetative and biologic values of riparian areas.

North Zone (Deerlodge National Forest) - On the North Zone, livestock grazing often plays a significant role in affecting stream function, similar to the South Zone. However, in many places, mining and travel management play dominate roles in loss of stream function. Past mining activities along with accompanying road systems, have caused of a loss of stream function on many North Zone watersheds. Many of these problems are decades old, and still persist today. Increased sediment, changes in stream channel morphology and reduced water quality are common effects. Livestock grazing and timber harvest may exacerbate the impacts of mining and/or roads. Stream channel morphology effects due to mining occur across a wide range of stream types. Timber harvest and off-road vehicle use affect stream function on some watersheds.

2. Low level flight photo mosaics of riparian corridors:

Data collected:

-Detailed Geospatial data on stream channels and vegetation

Traditional data collection efforts for determining riparian health are often costly and time-consuming. The Forest has been actively seeking more timely and affordable methods. Remote sensing and geographic information system (GIS) technologies provided us an opportunity to gather data for three riparian resources in an integrated fashion: stream attributes, riparian vegetation, and aquatic habitat features.

GIS specialists on the Forest developed a methodology to assess these conditions using the color-infrared digital camera (McNamara, Brohman and O'Neil, 2000). The methodology was tested in an initial project on Rock Creek. The purpose of these low level infrared flights in general is to 1) establish baseline for long term monitoring, trackable on GIS and, 2) provide site specific existing condition data for NEPA project analysis.

In the Rock Creek project, the Beaverhead-Deerlodge NF and the Remote Sensing Applications Center cooperated in an effort to test the repeatability and cost-effectiveness for collecting and interpreting digital camera imagery and assessing instream and riparian habitat. Continuous high-resolution color-infrared digital camera imagery was acquired along more than 120 miles of river. Imagery was mosaicked, georeferenced, and manually interpreted for hydrologic and vegetation features. Specific project objectives include:

Collecting and processing color-infrared digital camera imagery.
Generating current vegetation and hydrologic geospatial data layers.
Analyzing geospatial data with bull trout radio telemetry data and identifying potential habitat.

Results and Conclusions

Using large-scale digital color infrared camera imagery proved to be an effective and affordable method for mapping and analyzing watershed condition in western Montana. Compared to traditional surveys, this process offers several advantages for efficiently mapping large areas and reducing costly on-site field surveys. This method also produced highly detailed geospatial layers that are GIS compatible and can be analyzed with other digital layers stored in the forest's database.

An added benefit in using a remote sensing platform is the resulting imagery documenting what the stretch of river looked like at the time of the flight. Therefore, this imagery can be used as a benchmark for future change analysis. Even without mapping specific stream features or vegetation types, the low level photos serve as useful benchmarks. Finally, using these methods assessing riparian and watershed conditions is enabling resource specialists to develop sustainable management alternatives that will not conflict with the habitat of threatened indicator species.

APPENDIX A contains the report "Assessing Riparian and Watershed Condition Using the Color-Infrared Digital Camera", by Jim McNamara, Ron Brohman, and James O'Neil, USDA Forest Service , Beaverhead-Deerlodge National Forest; and Haans Fisk and Henry Lachowski, Remote Sensing applications Center (RSAC), Salt Lake City, Utah (unpublished to date, 2000).

3. Section 7 Baseline Assessments for bull trout in Rock Creek, Flint Creek, and Clark Fork

Data collected:

-Water quality (temperature, sediment, chemical/nutrients,)
-Channel condition and dynamics (average wetted width/Maximum Depth, stream bank condition, floodplain connectivity)
-Flow/hydrology (change in peak/base flows, increase in drainage networks)
-Watershed conditions (road density and location, disturbance history)

Results:

In May of 2000, the Forest completed Watershed Baselines for 6th code watersheds west of the Continental Divide. These watersheds lie within Rock Creek, Clark Fork and Flint Creek subbasins. The baselines were required to comply with the Biological Opinion for the effects to bull trout as amended by INFISH, but they also provide the Forest with a monitoring base against which we can compare effects of future activities as well as a base for predicting risk of actions

As a result of compiling available data for each of these 6th code watersheds, we now have documented and interpreted data related to:

- Context for each watershed in relation to Findings of the Interior Columbia Basin Ecosystem Management Project (ICBEMP) and Subbasin Review or Landscape Analysis.
- Human influences within the watershed
- Distribution and status of fish species and habitat condition and trend
- Environmental baselines (see data collected, above)
- Integrated Baselines for each 6th code
- Cumulative effects

While the baselines are designed to provide information primarily for fish habitat and population changes, they necessarily include a thorough discussion of watershed and stream conditions as well. Each element, e.g. water temperature, stream bank condition., are rated and integrated into a single baseline rating for each of the three watersheds. Detailed results of the baseline assessments are included in Question 4, section I. A. 4.

Conclusion :

Averaged ratings for the set of parameters indicating watershed condition indicate Rock Creek is functioning acceptably in 40% of the sub-watersheds, functioning at acceptable risk in 31% and functioning at unacceptable risk in 26%. Upper Clark is functioning acceptably in 20% of the sub-watersheds, functioning at acceptable risk in 53% and functioning at unacceptable risk in 27%.

4. Project Surveys

Data Collected: Physical data describing stream function for sites critical to evaluating project effects.

Project surveys are designed to fill in gaps left by the landscape surveys. They include the same parameters, and provide the same level of information for a given site, as landscape level surveys. All project surveying does is increase the number of surveyed sites within the project area.

However, surveying at the project level does allow for some modification of the existing surveys by adding parameters that may be germaine to a specific area, or by re-surveying sites done for the landscape analysis if a sufficient time period has passed. Project level surveying necessitates a thorough field review of the project area to determine where additional sites may be placed.

Results

A number of project level analyses have been completed following landscape level analyses. Each one has led to the establishment of new survey sites for a more complete picture of the project area. Some examples are:

Landscape	Project	New Sites	Re-Reads
Pioneer	West Face AMP	1	2
	Anderson Meadows AMP	0	4
	Farley Dyer Monitoring	0	2
	Pole Ck. AMP	3	0
	East Face AMP	3	0
Lima	Simpson AMP	3	0
	Big Sheep AMP	3	4
	Shineberger AMP	0	4
Gravelly's	North Gravelly AMP	3	1
West Big Hole	Mussigbrod Fire	2	0

Conclusions

Project surveys have provided data on stream function for reaches that are critical for evaluating the effects of the proposed action. They are directly comparable to landscape surveys, and supplement them within the project area. Together, they form the basis for Chapter 3 in the NEPA document, and serve as a basis for monitoring. Project surveys have increased the knowledge of stream conditions in the project area, and have provided trend information at previously surveyed reaches (see Trend Surveys below).

5. Trend Surveys (rereading Landscape or Project Level Surveys

Data collected: rereading the already established stream survey sites from landscape level or project analyses. All stream survey sites establish permanent cross-sections and elevational benchmarks to facilitate this type of monitoring. The same parameters are measured using the same methodologies for the same reach of stream. All the parameters are then comparable over time.

In recent years the Beaverhead-Deerlodge National Forest has implemented a process for determining standards that would provide a trigger for moving livestock from pasture to pasture within an established grazing system (Bengeyfield and Svoboda, 1998). The process involves using four indicators to determine when livestock should be moved off a riparian zone: riparian forage utilization, stubble height, woody browse and stream bank alteration. In the last two years, we have monitored four sites where these standards have been in effect for a period of time. In addition to revisiting these four sites, we conducted grazing "use-level" analysis during Environmental Assessment (EA) of Allotment Management Plan updates. Information from those EA's about past utilization levels and stream bank alteration contributes to our knowledge of trend.

The basic monitoring vehicle is a survey of physical stream components reach by reach (described in detail in the section on Landscape Analysis inventories 2 pages earlier). Since 1991, the Beaverhead-Deerlodge has concentrated on establishing a network of these survey sites throughout the Forest for the purposes of characterization of existing reach condition and long-term monitoring. These sites provide a mechanism for tracking the effects of a given project or management plan over long periods of time by establishing permanent measuring points. By 1999 there were over 500 survey sites in place. Beginning next year, we expect to shift the bulk of monitoring to re-measuring existing sites as projects are implemented and Allotment Management Plans become effective. As that effort progresses, we will accumulate more data describing the effects of the recommended riparian standards. Currently, there are approximately forty survey sites on allotments where these standards have been recommended.

Results:

There are a limited number of streams on the Forest where riparian grazing standards have been in place a full four or five years. At present, there are four re-measured survey sites on allotments where the standards have been in effect for at least four years.

Short Ck. - This is a small, first order stream on the Upper Ruby Allotment. The standards were initiated in 1990 as a result of an EIS, and have been successfully implemented since. Two cross-sections were established on the stream at the time of implementation. These were re-measured in 1996. The greatest change was the amount and vigor of riparian vegetation along the channel (Dallas, 1996), but physical measurements show that the channel became narrower and deeper over the same period.

Short Creek

Year	Cross Section 1	Cross Section 2
1990	3.7	5.0
1996	3.2	3.6

Arasta Ck. - This is a stream on the Wigwam Allotment in the north Gravelly mountains. The initial survey was done in 1995 as part of the Gravelly Landscape Analysis, and showed the reach was a G4b stream type when it should be an E4b. The standards were voluntarily implemented by the permittee in 1996, and the site was re-measured in 1999.

Arasta Creek

Year	Ent	w/d	sinuosity	gradient	D50	W50	CS
1995	1.3	9.9	1.4	3.3	35	5.5	100
1999	2.9	9.3	1.4	2.5	29	4.5	86

All of the indicators show that the channel is moving toward recovery. The change in entrenchment from 1.3 to 2.9 suggests the re-establishment of a floodplain along stream margins that will assist in the dissipation of stream energy and deposition of sediments. The decrease in w/d ratio shows the channel is getting narrower and deeper, and the decrease in W50 shows that is happening along the entire reach and not just at the measured cross-section. Sinuosity, gradient and D50 fit the E4 stream type category in 1995, and remained unchanged in 1999. Channel Stability showed a slight improvement. In general, the channel seems to be moving in the right direction in order to re-establish the stream type that should exist in this valley bottom.

Timber Ck. - This is a stream on the Warm Springs Allotment in the Gravelly Mountains. The initial survey was done in 1995 as part of the Gravelly Landscape Analysis, and the reach was determined to be a B4a stream type when it should be an E4a. The standards were voluntarily implemented by the permittees in 1994, and the site was re-measured in 2000.

Timber Creek

Year	Ent	w/d	sinuosity	gradient	D50	W50	CS	BEHI
1995	2.2	17.8	1.2	8	7.0		95	
2000	3.9	3.3	1.2	9.2	19.8	1.5	70	17.3

Indicators are that the reach is moving toward a stream type that is more representative of the valley bottom. In 1995, entrenchment was on the border of B and E stream types, while the w/d ratio was well into the B range. Both these parameters changed considerably in 2000, with the channel becoming less entrenched and having a much smaller w/d ratio.

There were no W50 or BEHI measurements taken in 1995, but the W50 of 1.5 taken in 2000 is indicative of a stream width that depicts a functioning situation. It compares favorably with the W50 of 2.0 for the functioning reach of Timber Ck. that is downstream. Similarly, the BEHI score of 17.3 in 2000 depicts Low bank erosion hazard. Channel Stability measurements between 1995 and 2000 show a slight improvement. In 1995, stream bank alteration at the survey site was 50%, about double the standard of 25%. In 2000, stream bank alteration was 17%, well within the standard.

Coyote Ck. - This is a stream in the same pasture as Timber Creek., with the same history of grazing. The 1995 survey showed a reach that was a B5a, when the correct stream type would be an E5a. Although the same standards (25% stream bank alteration) were assigned this reach, implementation was not as good as in Timber Creek. In 2000, stream bank alteration was 50%. Consequently, the measured parameters do not indicate any shift toward a change in stream type to an E5a.

Coyote Creek

Year	Ent	w/d	Sinuosity	Gradient	D50	W50	CS	BEHI
1995	1.4	36	1.1	8.6	35	3.5	73	20.5
2000	1.34	51	1.2	10.7	50	3.8	97	25.4

In contrast to the other reaches, none of these parameters indicate that the reach is moving toward recovery. Entrenchment has remained much the same, and width/depth ratio has actually become greater. W50 is essentially the same, and both Channel Stability and BEHI show a worse situation in 2000 than in 1995.

Conclusion

Based on a small sample size of only four sites, it seems that where the standards have been met, they are having a positive effect on stream channels. The measured parameters that are showing positive change (entrenchment, w/d ratio, W50), are those that are most affected by livestock grazing. Qualitative assessments (Channel Stability, BEHI) seem to support the quantitative measurements. In Coyote Ck., where the standards weren't met, there was either no change, or a negative change, in these parameters. In the future, additional re-measurements of sites where the standards have been met will give us a better feel for their overall effectiveness.

Evaluation of the four indicators used to trigger movement on livestock from riparian areas (riparian forage utilization, stubble height, woody browse and stream bank alteration) during the Allotment Management Plan (AMP) update process has provided us with some preliminary conclusions. The North Gravelly AMP found that "past experience has shown that on non-functioning and functioning-at-risk streams, stream bank alteration is often the most limiting parameter in the use level analysis (Upper Ruby EIS, 1992; West Fork Madison EIS, 1994; Dallas, 1996; West Face EA, 1997; Shineberger EA, 1997; Toomey EA, 1997; Anderson Meadows EA, 1999; North Gravelly EA, 1999)." "By effectively

addressing stream bank trampling in C and E stream types, there is a far better chance that the individual reaches would progress from one step to the next in their recovery process, rather than be stalled for an extended period of time in their recovery". This conclusion is supported by the annual inspection measurements provided in Table 3 and 4. In Table 3, utilization standards were met 60% of the time, but bank alteration standards were only met 23% of the time. We need to continue monitoring and adjust standards to match the appropriate utilization levels and stream bank alteration standards.

While this holds true in the situations listed above, range specialists point out the need to hold to the AMP revision process outlined in the Riparian Amendment. This calls for full analysis, site-specific standards, a good monitoring program and then using adaptive management approaches to refine site-specific standards where they are not working.

II. EFFECTS ON VEGETATION FUNCTION

A. Inventory and Monitoring work being conducted

1. Landscape Analysis Inventory

Data Collected: Baseline for valley bottom condition

Riparian valley bottom surveys have been conducted during the inventory phase of some Landscape Analyses. Vegetation inventory measurement includes total species by life form, canopy cover by species, mean height, size class for woody components, riparian shrub (and/or deciduous tree) browse evaluation, and potential and existing vegetation classification. Dry weight production of each vegetative life form is either measured or estimated.

Valley bottom characteristics determined include valley bottom type, gradient, width, adjacent land type, site type, stream type, stream substrate, bank substrate, bank conditions, downcutting, key area community, percent willow cover on banks, and soil type (subgroup and family). Site data (by reach) inlcudes land form classification, geology, erosion status and type, and ground cover.

Methods include the U.S. Forest Services' "Riparian, Aquatic, and Wetland Sampling Methods" (1991), using the database structure of "Ecodata" (Ecosystem Inventory and Analysis (USFS, 1992). Since the Forest Service converted computer systems, ecodata databases and programs are no longer available and the substitute is ORACLE, although this still leaves a void for analysis software. Browse evaluation is by the method of Keigley and Frisina (1998); soil field sampling and description methods are from "Field Book for Describing and Sampling Soils" (Schoenneberger, et al., 1998); community and habitat type classification follows Hansen, et al. (1989), Pfister, et al. (1977), Mueggler and Stewart (1980), and Mueggler (1988). Plant taxonomy follows Hitchcock and Cronquist (1973); stream type classification follows Rosgen (1994); Soil taxonomy follows USDA (1999); and land form and land type terminology follows Ritter (1978), Birkeland (1974), and USDA (1976).

Monitoring involves two phases, annual and long-term. Annual monitoring is designed to meet incremental standards in order to reach desired future condition. Long-term monitoring determines whether desired future condition has been reached, and the rate and direction of trend. Annual monitoring typically considers forage utilization, browse utilization, streambank stubble height, and bank disturbance. The monitoring protocol commonly follows "Riparian Guidelines" or "Allowable Use Guidelines" (Svoboda, 1989; and Bengeyfield and Svoboda, 1998, respectively). Long term monitoring typically considers various valley bottom resources and processes including geomorphic process, soil, vegetation, stream type, and fisheries. Specifically for vegetation, long-term monitoring includes (utilizing the inventory measures noted above) the calculation of community similarity to reference communities. The methods follow Magurran (1988) and generally include

Jaccard's, Sorenson's, Shannon's, and/or Simpson's indices of similarity and diversity.

This data is used at the valley bottom reach scale to assist the riparian ecologist in making an interdisciplinary determination of "riparian function". "Function" is determined by comparing a specific watershed to a similar reference watershed in which riparian function is minimally disturbed by management activities. These interpretations are compiled at the landscape scale as a planning tool to prioritize opportunities and to highlight risks.

Results:

Since the riparian classification work in the 1980's, and the valley bottom inventory work in the 1990's, the Forest has used these products to stratify, inventory, and monitor approximately 300 reaches in more than 100 drainages across the Forest, especially on the southern portion of the Beaverhead-Deerlodge Forest. Data from 1986 through 2000 show some clear trends in riparian features including conversion of wetland plant communities, soil compaction, stream bank shearing, aspen, willow, and other riparian shrub browsing intensity, valley bottom entrainment, and conifer succession.

While many data have been reviewed and analyzed for National Environmental Policy Act assessments for individual projects, especially rangeland grazing, these analyses have not been compiled into a single monitoring assessment. The results contributed here are a summary of these assessments and are not a comprehensive nor complete compilation of the ongoing work.

Wetland plant communities: Obligate wetland plant communities are affected by herbivory, soil effects, and water table effects resulting from stream bank disturbance and soil compaction. Overuse of valley bottom forage resources, especially key areas, has converted moist and wet site communities to drier, upland type and disturbance type communities. These sites typically have fewer native species, fewer total species, less cover, and more bare soil. Soil organic matter and large soil pore space is generally very low compared to minimally disturbed references. Soil bulk density is usually much higher.

As stream bank soils are sheared, bank angles become flatter and channels wider. This reduces the surface area contact between the valley bottom soils and the stream. The water table is lowered as a result. A lower water table affects the function of the valley bottom by altering soil moisture, soil chemistry, plant communities, and late season stream flows. As the banks are disturbed and the channel is straightened, less of the valley is entrained, meaning that less of the valley bottom is connected with the flow and the valley bottom stores less water.

Vegetation is an important component of all riparian areas, especially those with B, C, E, and F stream types. Natives, especially sedge and willow species, are the most

effective at maintaining and interacting within dynamic fluvial processes. Unlike rip-rap, riparian vegetation regenerates, expands and contracts with changes of the stream. It is plastic and resilient as well as merely resistant to a single type of erosive force at a single location. It does work and adds energy to the riparian ecosystem by producing biomass that is converted to organic matter in both the soil and the stream. It collects sediments and organic detritus which is incorporated into both the biogeochemical and physical components of the stream and valley bottom.

2. Allotment Management Plan Updates

Data Collected: ECODATA plots, use surveys

Riparian valley bottom surveys for Allotment Management Plan updates are designed to fill in gaps left by the landscape surveys. They include the same parameters and provide the same level of information for a given site as landscape level surveys.

In addition, sampling using ECODATA methods is being used in preparation for Allotment Management Plan (AMP) updates. That sampling gathers plant composition and abundance numbers. Those plant composition numbers are then used to fill out ecological scorecards. Existing vegetative conditions are compared to potential vegetation communities on like habitats, and the nearness of the existing community vegetation to potential vegetation communities is determined. A numerical value is assigned that indicates to both the manager and the permittee the relation between the existing stand condition and potential for that site. Scorecards are grouped by habitat type and a mean is calculated to determine the average ecological status by habitat types. Changes in grazing practices are implemented if the situations are warranted.

Other monitoring of riparian management on grazing allotments has taken place the past three falls, after most of the grazing has been completed. Reviews of grazing practices and how well new standards have been met have been meet have been conducted by the Resources Staff, Forest specialists, and representative district range scientists. *See Question 2.*

Results:
Sampling results and scorecards are included in AMPs, usually in the appendix as supporting documents. Standards for grazing are included in the body of the Environmental Assessment and AMP. Implementation success is starting to be monitored by range managers but few results are available at this time.

The range reviews document successes and shortcomings. To date many permittees are not committed to the new standards and consequently little progress of riparian improvement has been made on those allotments. The permitting process is taking steps to ensure compliance. Other permittees are working to stay within standards and riparian improvement is occurring.

3. Low Level Flight Photo Mosaics of Riparian Corridors

See the description of low level digital flight Rock Creek project in Section I. Page #. Along with mapping stream features, riparian vegetation was delineated and classified down to ¼ of an acre on the riparian corridors flown in Rock Creek. In the North Gravelly, Lima Tendoy, West Fork Madison, and Big Hole areas, vegetation polygons were not delineated but the low level flights provide a digital photo base of riparian vegetation that can be manipulated on computer GIS systems.

The intent of this tool is to provide a means to easily map riparian areas. In the past we did not have detailed enough information, such as maps at small enough scale to detect riparian areas. With this tool, pixel size from six inches to a foot, details as small as individual small logs or sand bars can be noted and remeasured with subsequent flights. Not only small features can be mapped but polygons can be delineated and acreage of habitats can be computed at the click of a button.

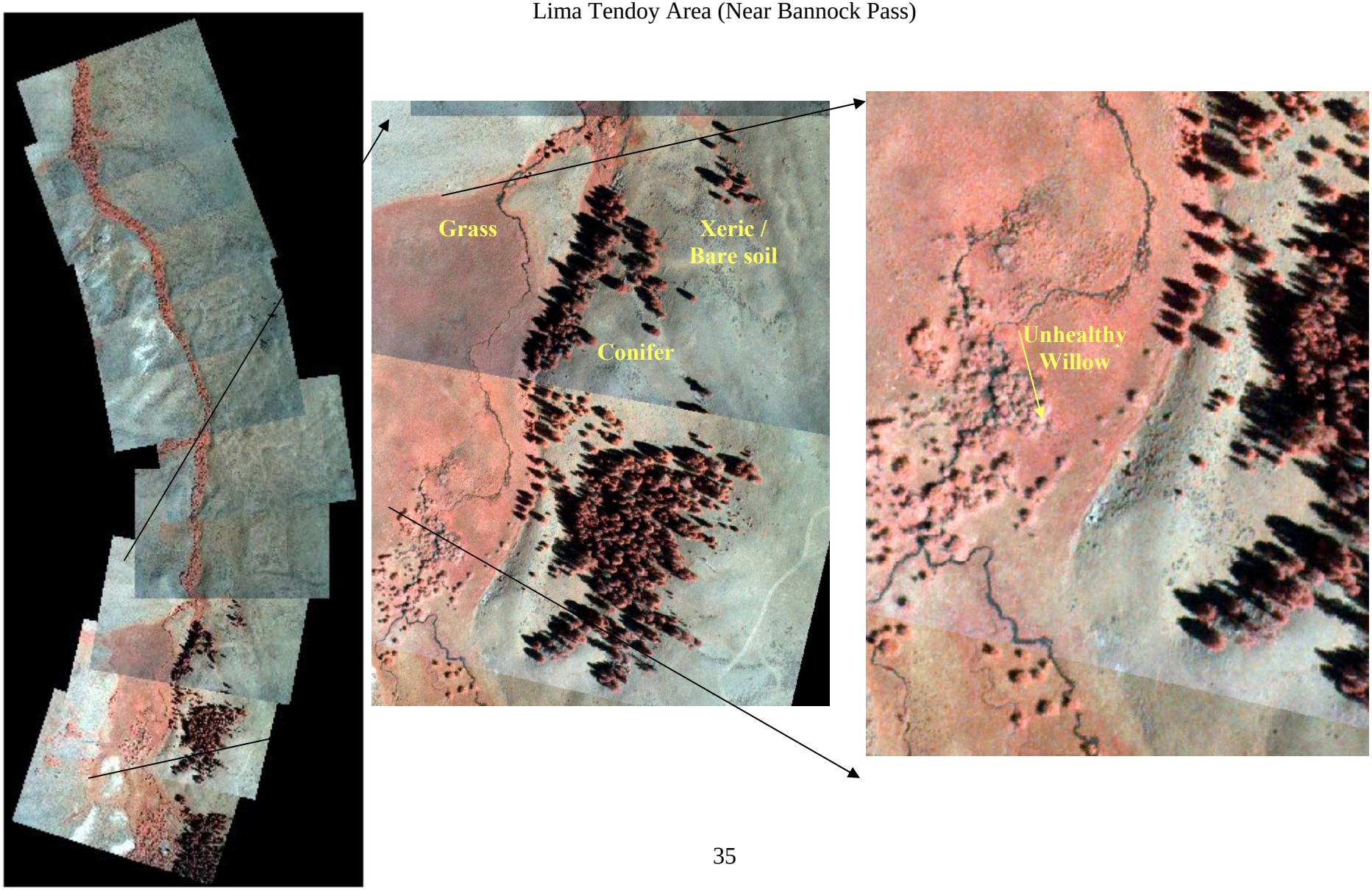
Results:

For the first time we have a tool that can accurately and quickly give us the amounts of riparian habitat types in a drainage to aid in management of that vegetation. Repeated flights will allow monitoring of vegetative communities and help managers maintain the desired condition, successional stage, and trend. Both the maps and the photo base provide a benchmark for future change analysis, of particular importance in continued monitoring of the effectiveness of riparian grazing standards. Specialists can use this imagery as field sheets - or field screens – on which to base riparian inventory and monitoring studies.

4. Trend Surveys

The Forest is still in the process of collecting baseline data for each landscape. Priorities and funding have not allowed for returning to read trend surveys while collecting baseline data.

Figure 1.Examples of Digital Infrared, Low Level Imagery
Deadman and Rock Creeks on Dillon District
Lima Tendoy Area (Near Bannock Pass)



Conclusions

Through inventory and monitoring, we have found that vegetation functions are stressed or severely disturbed and limited on a large number of our relatively wider and flatter valley bottoms where grazing occurs. While livestock over-use has altered normal wetland plant communities and hydric soils as noted above, other users are influencing and altering vegetation and riparian function as well. Since about 1986, we have seen browsing intensity on aspen, willow, dogwood, and other riparian shrubs to a degree that appeared unsustainable to the survival of the stands. We labeled these observations "over-browsed" or "hedged". More recently, browse evaluation by analysis of growth form has shown that this browse intensity has become so severe that whole stands have arrested height growth and stands have become dying out as a result.

While livestock are known to browse on riparian woody species and mechanically damage them by rubbing, currently the major factor in willow and aspen growth form appears to be moose. Valley bottoms with willow stands are limited today compared to 50, 20, or even 10 years ago. Livestock grazing, beaver trapping, and conifer succession have reduced the amount of reaches with willow stands. Concurrently, moose populations have become relatively large compared to available habitat.

The consequences of willow and other riparian woody species are serious both at the reach and the landscape level. As willows decline, banks become more available and vulnerable to livestock trampling. This typically leads to excessive soil shearing and channel alteration, causing the situations noted earlier, producing non-functional reaches. On a landscape level, the lack of riparian shrub dominated stands and at-risk or non-functional reaches are causing numerous watersheds to become non-functional from both an ecosystem process and value perspective. If too much alteration occurs as a result of the loss of willow cover and bank protection, we often see downcutting as a result, causing geomorphically unstable and non-functional watersheds and a large habitat loss to both aquatic and upland wildlife.

II. Specific Riparian Vegetation Concerns - *concerns highlighted through Landscape Analysis or specific project NEPA, not tracked specifically through F Plan M&E items*

A. Noxious Weeds

Forest Plan Monitoring Requirements –

Beaverhead 6-3	*Noxious Weed Infestations and Control Indices: Acres Infested, Acres Treated*
Deerlodge 7-3	*Noxious Weed Infestations Indices: Acres Infested*

Issue – Occupation of native habitats by noxious weeds is the #1 ecological health threat identified in Landscape Analyses across the Forest. The Northern Region Overview identifies noxious weeds as the greatest risk to grass and shrublands on National Forests. Noxious weeds arise as a concern in riparian habitats on this Forest because our riparian habitats are considered "at risk".

Impacts of noxious weeds to both riparian and upland habitats are a concern because:

-Aggressive, non-native weeds displace desirable native plants, reducing vegetation diversity

-These same non-native weeds reduce the ability of wildland communities to serve as desired wildlife habitat, reducing wildlife diversity.

1. Inventory and monitoring work being conducted

Forestwide Database and Mapping Effort

The Beaverhead-Deerlodge Forest assessed the level of noxious weed invasion into habitats across the Forest as a preliminary step toward preparing a Noxious Weed Environmental Impact Statement. Each District on the Forest mapped their weed infestations in 1999 and updated them in 2000. A Geographic Information System (GIS) map layer and database tell us where infestations are, what weed species occupy the site, and their density on the site. Information on weed infestation acreages shown under "Results" comes from the most current version of this Noxious Weed Map.

Annual Monitoring

Each District annually updates maps and reports on: new infestations, acres of weeds treated, type of treatment, and date of treatment. These records are kept on the District. The Forest aggregates treatment acres into an annual accomplishment report. Table 9 reflects the acres reported by District over the last 5 years.

2. Results

Neither Forest Plan describes the actual number of acres infested by noxious weeds although they do project target acres. The Beaverhead Forest completed an EIS for the Forestwide noxious weed control program in 1987. In 1987, the EIS reports 7687 gross acres of weeds on the Forest and projects a treatment program of 7680 acres/year. The Deerlodge Forest completed an EIS in 1989. The EIS reported 4091 gross acres of weeds and projects a treatment program of about 1575 acres . The two EIS documents update Forest Plan information on weeds.

Table 9. Acres of Noxious Weeds on the Beaverhead-Deerlodge Forest**

District	Dillon	Wisdom	Wise River	Butte	Madison	Jefferson	Pintlar	TOTAL
Acres of Weeds	848	750	1700	2485	2473	6606	13614	**28,575**

*** Acres calculated from Forestwide Noxious Weed Inventory Map 5/2000 based on a forestwide uniform mapping protocol.*

Since the Plans were written, infestations have spread from neighboring forests and private lands into areas not infested in 1986. A total of 28,575 acres of Forest lands are now affected by noxious weeds, compared to around 12,000 in the late 80's. While it appears infestations have nearly tripled since the late 80's, some of this increase is due to changes in mapping techniques and inclusion of more weed species in mapping efforts. Knapweed and leafy spurge remain the primary concern.

Levels of treatment on both zones have grown over the last 10 years from 1792 acres to 6586 acres. These acres do not reflect the biological control program.

Table 10. Acres of Noxious Weeds Treated

	Forest Plan Projections	1995	1996	1997	1998	1999
Acres Treated TOTAL		**6175**	**7417**	**6072**	**6480**	**6586**
Beaverhead	2500	3072	2607	3406	3419	*
Deerlodge	1575	3103	4810	2666	3061	*

*Figures not available by zone.

Table 11 displays the acres of noxious weeds occurring in riparian zones. Less than two percent of the noxious weed infestations occur in riparian zones. Riparian habitats represent less than 2% of the Forest, so infestation of these habitats appears equivalent to their occurrence on the landscape.

A recent (1/18/00) GIS analysis of the relationship between noxious weed occurrence and roaded areas shows 93% of the Forest's weeds lie in roaded areas. Only 7% are in roadless areas.

Table 11. Acres of Noxious Weeds in Riparian Zones

LANDSCAPE	RIPARIAN ZONES*WITH NOXIOUS WEEDS	TOTAL RIPARIAN
Big Hole	146	19816
Boulder River	347	8827
Elkhorns	55	1047
Gravelly	169	16618
Jefferson River	229	7314
Lima Tendoy	90	6548
Clark/Flints	440	17147
Madison	32	4814
Pioneer	159	18486
Rock Creek	66	8701
Tobacco Root	87	8633
Upper Clark Fork	108	3599
TOTAL ACRES	**1928**	**121,550**

**Acres calculated by overlaying SILC Riparian polygons or stream buffers on the Forestwide Noxious Weed Inventory Map (2000) using GIS processes.*

Cooperative Programs

The Beaverhead-Deerlodge Forest aggressively participates in cooperative weed management and treatment programs with other agencies and landowners. Some examples of those programs include:

▪Noxious Weed Seed Free Forage Program – A program requiring all visitors with livestock to bring certified wee-free products onto the forest. The program was initiated in 1993 and has been enforced annually. Public compliance 7 years later is excellent.

▪Beaverhead County Weed Management Plan – participating agencies coordinate crew locations and treatment, exchanging spraying on road sections to make crews more efficient.

▪Beaverhead County Weed Day – a cooperative public-interagency weed eradication and education effort.

▪Granite County Cooperative Spray Program – the Pintlar District and Granite County weed crews improve effectiveness by exchanging spraying on road sections.

▪Idaho/Montana Interstate Weed Agreement – coordination and collaboration between the Targhee and Beaverhead-Deerlodge Forests and other agencies.

▪Monida Pass Weed Spray Day(s) – a cooperative public-interagency weed eradication effort involving up to 50 spray crews.

▪Madison Valley Ranchlands Weed Committee – a cooperative public-interagency weed eradication and education effort involving a large number of landowners from recreational ranches to small subdivision lots. This group has successfully conducted fundraisers to purchase a trailer mounted spray rig available free to landowners in the area.

▪Wall Creek Weed Day – a collaborative public-interagency weed eradication effort to keep the Wall Creek Elk Winter Range free of knapweed.

▪Ruby Reservoir Weed Day – a collaborative public-interagency weed effort.

Conclusions:

The Beaverhead-Deerlodge Forest has solid information about the level of our weed infestations. With the advent of our database and GIS map layer, we can produce accurate data on species, densities and spatial locations. The improvement in mapping technique accounts for some increase in acres of noxious weed infestations. However, we know infestations of noxious weeds and the array of noxious weed species on our Forest have increased significantly since the Plans were written in 1986 and 1987. This trend reflects what is happening all over the Northern Region and the West. This trend can be related to increased vectors, particularly increased numbers of Forest users and increased numbers of people living in the dry rangeland/forest environment surrounding our Forests.

The level of increase in acres infested and acres treated triggers a need for re-evaluation or action of this monitoring item (Beaverhead Forest Plan, IV-12; Deerlodge Forest Plan, V-10). We met the level of output predicted by the Plans and weed infestations continue to grow. Most of the weed increases are in areas too distant from a road and/or too large for effective or affordable ground-spraying. These new infestations, which account for 30% of the total, are largely untreated. The Forest is in the process of re-evaluating the weed program as part of the current Noxious Weed EIS. That EIS will look at alternatives for accelerating our noxious weed treatment program.

Districts in the Beaverhead zone are in the position of being able to contain many of their infestations, although the threat of new weeds is ever present. Districts in the Deerlodge zone are closer to some of the State's worst weed seed sources and closer to population centers. These Districts are struggling to contain weed infestations in the back country

where treatment methods are costly. Having an aerial spraying option will improve the chances or containing or eliminating these infestations.

Funding - One of the barriers to staying on top of noxious weed infestations is the cost of treatment. Funding for noxious weed treatment remained fairly static over the last five years. At the same time, we have experienced increases in infestations, increased cost of salaries, vehicles, equipment and chemical. Current funding is inadequate to eradicate existing infestations and catch up with new infestations. The Forest program relies primarily on hand spraying with truck or backpack sprayers. The cost per acre of hand spraying larger areas of infestation is high. The Forest's Noxious Weed EIS will evaluate the effects of aerial spraying noxious weeds in an attempt to maximize the number of acres we can treat for the dollars we spend. The cost per acre of treatment can be reduced more than half.

Education - Awareness of the noxious weed problem has grown considerably in the last three years. Concern about the effects of rapidly growing noxious weed infestations is not confined to the Forest Service. All of the County governments we work with are concerned about the issue and we are working together. The BLM and State agencies are working with us. Organizations like the Rocky Mountain Elk Foundation and Greater Yellowstone Coordinating Committee provide us with some grant money for noxious weed spraying. Many private landowners are involved in cooperative programs like the Madison Valley Ranchlands Group Weed Committee.

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Concern about noxious weeds has mobilized some of the most effective collaborative work our Forest does.

That collaboration has spawned many education efforts – including weed seed car washes and noxious weed calendars. Many of the cooperative education programs the Forest engage in focus on awareness about vehicular spread of weeds.

Riparian - Acres of noxious weeds infesting riparian zones appear to be in line with riparian habitat coverage Forestwide. Presence or absence of weeds in riparian zones may be correlated to presence or absence of roads or trails in the area rather than vulnerability of the habitat to invasion. Upland grass/shrub habitats continue to be the most vulnerable to weed infestation.

Noxious weeds are and will continue to be the greatest ecological threat this Forest deals with. It is also one of the most difficult to control. As long as weeds are found on adjacent lands and as long as people move across our landscapes, the threat of new infestations will be there. We will need to be "eternally vigilant" in detecting new infestations and new weeds.

B. Neotropical Birds

Issue – Neotropical migratory birds are species that summer and breed here, and winter in western Mexico or Central American tropical forests. Neotropical migratory birds have attracted national public attention due to a well-documented decline in eastern hardwood forests.

The Beaverhead Forest Plan Riparian Amendment found that riparian areas are critical for the breeding success of neotropical migrant birds and that of several groups of wildlife addressed in the analysis, migrant birds are likely the most effected by alteration of riparian areas (September 1997, Final EIS, Ch IV-32). It also found that riparian habitats are one of the most limited in coverage throughout the Forest (and Region). The EIS evaluated alternatives based on potential effects to bird species linked closely to riparian areas. No specific monitoring of neotropical migrants or any other obligate riparian species was required as part of the Amendment.

Inventory and Monitoring Work Being Conducted - Neotropical migrant birds are monitored regionally in cooperation with the University of Montana through the "Northern Region Landbird Monitoring Program". The program was initiated in 1993 to monitor population trends of landbirds as an indicator species and to establish habitat relationships of landbirds that breed in the Northern Rocky Mountains. During 1994, 24 transects were surveyed on the Deerlodge Forest. In 1995, 79 transects were surveyed across the Deerlodge, Beaverhead and BLM lands. During 1996, 51 transects were surveyed. In 1998, the fourth year of region-wide monitoring data was collected with half of the points on Forest Service lands selected for continued monitoring. In 1999, the monitoring program focused on vegetation classification of all previous permanent transects. Studies in 2000 and 2001 will again monitor bird presence by species.

In addition to the Landbird Program, the Forest established approximately 15 transects in riparian habitats found throughout the Forest. This was done at the request of the Regional Office. Surveys were scheduled to repeat every 3 years. These transects have yet to be re-surveyed because of changing regional priorities and budget limitations.

Results - In 1995, the US Forest Service and University of Montana produced a report entitled "Distribution and Habitat Relationships, based on 1994 field data. This report summarized the data and gave bird frequency distributions by habitat types. It also identified species and habitat that needed additional attention. This information has been important for Forest level work. Because this monitoring project was conducted in all Forests in the Region, sample sizes are numerous enough to develop a statistically valid species-habitat model.

In 1999, the US Forest Service and University of Montana produced an additional report "Habitat Relationships of Landbirds in the Northern Region, USDA Forest Service" (General Technical Report RMRS-GTR-32). That report identifies Landbird species

restricted in their habitat distribution to specific environments, including riparian habitat. For each species, the report describes the pattern of cover type use as well as making specific comments on management implications of that distribution pattern. Those species shown to be relatively restricted to the shrubs and deciduous trees associated with riparian environments include: Ruffed Grouse, Western Wood-Pewee, Willow Flycatcher, Cordilleran Flycatcher, Red-eyed Vireo, Cedar Waxwing, Yellow Warbler, American Restart, Northern Waterthrush, and Song Sparrow. Additional species that are restricted to riparian bottomlands, but for which the survey obtained insufficient data to develop models, include the Belted Kingfisher, Bank Swallow, Least Flycatcher, Veery, Gray Catbird, and American Goldfinch. The report also observes that species restricted to upland riparian streamside vegetation may be especially sensitive to so-called "best management practices", whose effects on a wide variety of riparian-dependent terrestrial wildlife species have not been well evaluated yet.

Conclusion - Neotropical migratory birds and their associated habitats are monitored annually on the Forest as part of the Regional Landbird Monitoring Project. The regional project confirms and adds data to the more detailed evaluation of bird species dependent on riparian areas completed by the Forest in the Beaverhead Riparian Amendment EIS in 1997. This database will help us focus future monitoring on species dependent on restricted habitats like riparian areas. The Landbird Monitoring Project will continue to add to our information base here on the Beaverhead-Deerlodge Forest as it continues to predict and monitor the effects of management activities on bird species for almost all major vegetation types in the Region.

The report does not yet reach any conclusions about species trends or changes in population numbers. It does not generate information about some of the other obligate riparian bird species on the Forest that are not neotropical migrants. Because riparian areas in several landscapes on Beaverhead-Deerlodge Forest are the most "at risk" community represented, we need more information on obligate and near-obligate riparian species than the Landbird Project offers. Given that we have already established 15 transects in riparian habitats throughout the Forest, that a Region 1 protocol has been developed, and a database is already in place, we need to begin these surveys. Our needs would best be met by conducting annual surveys until Forest Plan Revision is complete, then conducting these every two years.

IV. MANAGEMENT ACTIONS IN RIPARIAN HABITAT

Forest Plan objectives for fish and riparian areas center around preventing adverse effects to riparian habitat by maintaining riparian flora, fauna and water quality. This section discusses specific activities and monitoring associated with timber harvest, construction, fire management and watershed restoration projects in riparian areas, all of which can affect riparian function. Implementation and monitoring of riparian grazing standards was discussed separately in Sections I and II.

A. TIMBER MANAGEMENT ACTIONS IN RIPARIAN HABITAT – report on State Best Management Practices (BMP) audits and effectiveness of mitigation.

Forest Plan Monitoring Requirements –

Deerlodge Forest Plan monitoring items related to harvest effects on riparian:

9-1 Compliance with local, State, and Federal soil and water standards
Index: Varied (Contract administration of timber sales or BMP audits)

Beaverhead Forest Plan monitoring items related to harvest effects on riparian:

3-2 Impacts of harvest on watershed standards
Index: Planned acres harvest/year

3-3 Effectiveness of Bump's
Index: Varies depending on project specific requirements

Timber sales are generally designed to avoid riparian areas in order to prevent adverse effects on fisheries or other riparian values. However, some sales are designed to accomplish a specific purpose in or near riparian areas. In other cases, operation in riparian areas is unavoidable. In any of these situations, State Forestry Best Management Practices (BMP's) and Streamside Management Zone (SMZ) law applies.

The Montana Department of Natural Resources (DNRC) annually monitors compliance with Forestry BMP's and SMZ law. We provide to them a list of the sites that involve harvest in riparian areas. They choose some of those sites for on-the-ground monitoring audits. Individual site audits are summarized into a Montana-wide report (Montana Department of Natural Resources 1998).

In 1998, at the State's request, we prepared a more formal comprehensive list of sites harvested during the last several years. This report shows each unit harvested and whether the unit included harvest within 200 feet of a stream or a stream crossing. During fiscal years 1996, 1997, and 1998, the Beaverhead and Deerlodge National Forests harvested on 4,743 acres in 116 units. Out of 116 units harvested in those years, 9 units (8%) either included harvest within 200 feet of streams, or required stream crossings. The actual acreage of riparian harvest is smaller than 8% of the total, since riparian presence in a unit is nearly always a small percent of the total unit area.

In fiscal year 1999, the Forest harvested on 2246 acres (ITEM 3-2). While we have not broken units out by riparian situation, the percentage of units is similar to previous years (pers. comm. Lee Harry, Forest Silviculturist, 2000).

Monitoring - The State of Montana has selected two sites on the Beaverhead-Deerlodge for riparian BMP and SMZ monitoring since 1996. They are Sawmill Timber Sale Unit #4 on the Pintlar Ranger District and Toll Mountain Aspen Unit #1 on the Jefferson District.

The State's monitoring is aimed at compliance with law, but parts of the individual site reports are useful for inferring effects of management on riparian vegetation.

The audit looks at road planning and location, road design, road drainage, road construction/reconstruction, maintenance, harvest design, log skidding, slash disposal, and site preparation. The team also checks to see if legal requirements of the SMZ law were met. Each item is rated first, as to its application (was it meeting requirements of the Best Management Practice) and secondly, its effectiveness (was the mitigation effective to protect soil and water)?

Results - These two audits indicate that the Beaverhead-Deerlodge is following State Best Management Practices and the SMZ law in most cases. Infractions include inadequate numbers of leave trees and broadcast burning in SMZ. These departures were considered minor with temporary effects on soil and water quality.

The Sawmill audit noted that soil compaction was a concern, but that the FS rearranged operating season to minimize problems. Skid trails were located in excellent sites. Long skid trails could have had water bars, but application and effectiveness of mitigation was adequate. There was a minor infraction of the SMZ law (inadequate width marked into the zone and some broadcast burning in the SMZ), but the effectiveness of the mitigation was adequate. The audit team summary for the site was "Nice sale, extremely long skids… minimum disturbance."

Toll Mountain Aspen audit summary was, "Given potential risks, this project was implemented extremely well, resources protected, existing road improved with surfacing/new pipe". Existing roads were improved with surfacing. However, more drainage features should have been added. This was a minor departure from the BMP, even though effectiveness of mitigation was adequate. Skidding was carried off well with no rutting. Stream crossings were well done. One culvert had inadequate armoring at inlet. This led to scouring and created "minor and temporary impacts on soil and water resource".

Literature Cited: Montana Department of Natural Resources. 1998. Montana Forestry Best Management Practices Monitoring, The 1998 Forestry BMP Audits Report. [report prepared by Norm Fortunate, et al]. Forestry Division, Missoula, MT, 40 p.

B. PRESCRIBED BURNING

Forest Plan Monitoring Requirements –
There are no monitoring items related to prescribed burning in either the Beaverhead or Deerlodge Forest Plans.

Prescribed management-ignited fires on the Beaverhead-Deerlodge Forest from 1995 to 1999 have targeted upland vegetation and avoided riparian areas in order to prevent adverse effects on fisheries. In fact, most NEPA documents and burn plans include mitigating measures to keep fire out of the riparian areas. These include requirements for a buffer between the burn and riparian zone ranging from 150 to 300 feet, depending on the stream, slope, vegetation type, fish species, allotment plan, etc. Other requirements include: no foam in or close to streams, containment barriers around pumps, no flushing tanks near water and specified locations for helispots, and fuel sites. All burn designs are done with input from range, wildlife and fisheries specialists.

Results - Prior to 1995 the Forest conducted trial burns to restore willows. Initial monitoring of the West Fork Madison Willow Burn (1992) showed a slower willow response than expected. Further willow burning was postponed. Continued monitoring showed a 50% increase in basal area of willow plants at the ground but also increased moose browsing which decreased maximum yearly growth. There was still a net increase in height growth but less than predicted.

Conclusions - While we have traditionally avoided burning in riparian areas, we are finding through our Landscape Analysis that many of these riparian areas burned historically. Restoration of younger willow stands was identified as a primary concern in most of the Landscape Analysis completed on the Forest. Future fire management on the Beaverhead-Deerlodge NF will need to consider using prescribed fire in riparian areas to restore natural disturbance patterns. The difficulty in restoring willows and other woody species will be balancing restoration with the potential for browse damage by wildlife.

C. WATERSHED RESTORATION AND REHABILITATION

Forest Plan Monitoring Requirements -
Deerlodge Forest Plan monitoring requirements for restoration work include:

6-2	Riparian rehab projects	Acres
9-2	Soil and Water rehab projects	Acres

Beaverhead Forest Plan monitoring requirements for restoration work include:

2-1	Fish habitat improvement	Structures, Acres

Monitoring - Over the last five years (1996-2000) the Beaverhead-Deerlodge Forest has completed a large number of watershed restoration projects funded through multiple sources, including private. Primary sources of funding include capital investment stream improvement funding, the "10 percent fund" for watershed improvement on roads and trails, abandoned mine program funding for watershed restoration, trail improvement funding, fish habitat improvement funding, range improvement funding, and road management funding. The total cost of these projects over five years is approximately 4 million dollars. The specific projects, their purpose and cost are itemized in the tables on in Table 13.

In July 1999, a Forest Team reviewed a selected number of these watershed improvement projects completed with Capital Investment Stream Improvement funding (NFSI). The intent was to determine if the projects implementation met their objectives and to identify any opportunities to improve performance in the future. Results of this review are summarized in Table 12 below.

Results -

Table 12. Results of Watershed Improvement Project Review

PROJECT	OBJECTIVE	OBJ. MET	RECOMMENDATIONS
Thompson Park Road Obliteration (1996)	-Eliminate motorized vehicle use -Reduce sediment delivery	Yes Yes	Expand project to treat noxious weeds.
Blodgett Gulch Watershed Improvement (1994)	-Trap sediment & raise water table -Exclude livestock access -Reestablish willows	Yes Yes In some places	Install additional structures to speed up water table restoration.
Flume Gulch Watershed Improvement (1998)	-Trap sediment & raise water table	Yes	Install additional V-weir lifts to accelerate restoration .
York Gulch Ditch & Watershed Improvement (1998)	-Eliminate chronic ditch blowout with pipeline -Stabilize/revegetate intermittent drainage	Too early to confirm success	
North Fork Greenhorn Creek Rehab (1998)	-Obliterate road & crossings -stabilize streambank and channel	Yes Yes	Continue to monitor following spring runoff events

Table 13. WATERSHED RESTORATION PROJECTS 1996-2000

Index of District codes in column 2 (D) .

1	*Dillon*	*6*	*Madison*
2	*Wisdom*	*7*	*Jefferson*
3	*Wise River*	*8&9*	*Pintlar (was Deerlodge and Philipsburg)*
4	*Butte*		

Capital Investment Program - Stream Improvement (NFSI$)

Yr	D	Project	Purpose	Cost
96	1	Middle Fk Sheep	Rebuild streambed for one mile to restore hydrologic function. Replant native vegetation, rest from grazing. Partnership with MtFWP, FWS	20,000
96	2	Mono Grade Restoration	Eliminate sediment from cut/fill slopes on abandoned Wise River Road. Recontour slopes, place matt, reseed native species	20,900
96	2	Primitive Road	Reduce sediment on primitive roads in the Melrose area	11,000
96	3	Mud Lake	Improve drainage on primitive non-constructed roads in – soil loss prevention	3,875
96	3	Flume Gulch	Reduce sediment to Steel Cr, maintain water table, riparian vegetation, site productivity. Stabilize several headcuts with gabions	3,875
96	3	West Big Hole Stream Xing Rehab	Reduce erosion – harden sites where primitive rds and trails cross streams and boggy areas.	6,195
96	3	Salefsky Creek Stabilization	Stabilize gully and headcuts with rock, gabions and erosion mat. Fence & reseed.	5,000
96	3	Sunshine Mine	Reduce sediment, reconstruct stream channel, transplant willow, reseed with native species	3,875
96	3	Steel/Stanley Jeep Trails	Improve drainage on several mile primitive road with waterbars and rock placement	5,000
96	4	American Gulch	Prevent erosion, improve drainage on road by resurfacing and installing culverts	20,000
96	4	Thompson Park	Reduce erosion by obliterating roads, restoring to natural contour,.	4,000
96	6	Willow Creek Demonstration Watershed	Provide for more efficient water use, instream flow, crop yield. Coop study with Indiana Univ., install monitoring equipment to provide data for water mgt, analyze data.	14,675
96	6	West Fork Landon Fence	Stabilize streambank, improve riparian vegetation by constructing fence on 1 mile of stream.	3,875
96	6	Basin Creek	Prevent soil loss, erosion. Block traffic, rip and reseed 1.5 miles of spur road to a mine.	11,500
96	6	West Fork Buford Fence	Stabilize streambank, improve riparian veg by constructing on 2 miles of stream.	6,200

96	6	Notch Road Obliteration	Prevent soil loss, erosion. Obliterate, rip and reseed .5 miles of abandoned road.	5,000
96	7	Marsh Mine	Reduce erosion on Big Pipstone, waterbars, bridge	5,000
96	8	Airplane Park	Protect headcut stabilization structures from livestock with fencing	5,000
96	9	Frog Pond Basin	Reduced erosion. Fenced and closed old trail through wet area	5,000
96	9	Stream Crossings	Reduced sediment input from primitive roads. Stabilized crossings and stream channel in Sawmill Creek and Sagebrush Flats.	15,900
96	9	Smart Creek Medicine Lake	Reduce erosion from washouts on Smart Creek, install erosion control on primitive rd	22,000
96	6	Gravelly trail closures	Reduce impacts of unauthorized vehicle use in sensitive watersheds. Improve travel plan compliance by through signing.	1,000
			TOTAL	**198,870**
97	1	Middle Fork Sheep	Complete restoration of first mile of stream – coop.	7,500
97	2	Trapper Creek Roads	Reduce erosion and sediment production on 4 wheel roads. Install culverts, reconstruct section, install erosion control measures.	7,500
97	4	Lime Kiln	Reduce erosion and sediment production on road with surfacing, culverts, filtering.	5,000
97	6	Spring Branch	Phase II of '92 project, protect ¾ mile riparian spawning area from grazing, trailing and OHV use by fencing.	5,000
97	6	Gorge Creek	Rehab 150 yard gully & headcut in wilderness with riprap and handwork.	5,000
97	7	Indian Creek	Reduced surface erosion, replaced culverts.	5,000
97	8	Blum Ditch	Stabilize headcut from ditch washout. Recontour 150' of ditch banks and reseed	5,000
97	9	Lower Willow	Stabilize streambanks with willow planting	5,000
97	9	ATV Rehab	Reduce erosion on unauthorized ATV trails around East Fk Res and Georgetown Lake	5,000
97	9	Rock Cr Monitoring	Monitor stream quality, macroinvertebrate & pebble counts & stream function surveys	12,848
97	B-D	Trail Rehab SWECO	Reduce erosion on existing trails by putting to grade and installing erosion control devices	5,000
			TOTAL	**67,848**
98	1	Middle Fk Sheep	Rebuild 2nd mile of stream. Rebuild channel for one mile to restore hydrologic function. Replant native vegetation, rest from grazing. Coop project	17,700
98	2	York Gulch Ditch		31,850
98	3	Ruby/Cow Meadow	Reduce erosion, restore site. Remove ruts, restore stream crossings, reseed.	10,625
98	3	West Face		8,850

98	6	Wall Creek Coop	Improve veg condition and riparian areas by rebuilding 2 miles fence.	7,100
98	6	N. Fk Greenhorn	Restore stream channel after road washout. Removed debris from stream channel, closed road w/ rock weiers. Revegetate road bed.	26,575
98	7	Road obliteration	Restore user created trails to natural state- Elkhorns	10,625
98	8	Middle Fk Fence & willow spiking	Reduce erosion and protect stabilization projects installed after 81 floods with fencing	7,975
98	9	Dexter Basin Rd	Reduce erosion. Closing road with slash, install erosion control.	10,625
			TOTAL	**131,925**
99	1	Middle Fk Sheep	Rebuild 3rd mile of stream to restore hydrologic function. Replant native vegetation, rest from grazing.	23,000 fish 6,500
99	2	Monitoring	Monitor and maintain past NFSI projects	850
99	3	Monitoring	Monitor and maintain past NFSI projects	850
99	4	Nez Perce Trail obliteration	Reduce erosion, obliterate abandoned section of trail and restore to contour	6,000
99	6	Monitoring	Monitor and maintain past NFSI projects	850
99	7	McGovern Creek Watershed Rehab	Restored water table to meadow. Installed structures in stream, planted willows. Fenced from wildlife and cattle to allow willow, aspen recovery.	12,000
99	8	Debris Removal Headwater Lakes	Reduce erosion on breached dams by removing debris from outlets and stabilizing.	17,000
99	9	Monitoring	Monitor and maintain past NFSI projects	850
				67,900
00	1	Bear Gulch/Swamp C	Obliterate 1 mile unclassified rd in Swamp and 2 miles in Bear Gulch	5,000
00	2	Intermittent Drainage	Armor cutbanks of intermittent drainages in 5 locations w/ woody debris	15,000
00	3	Placer Cr Restoration	Install V wiers and gabions, plant willows	11,960
00	4	Herman Gulch Rd Obliteration	Obliterate 3 miles of road	15,000
00	6	North Willow Creek	Install electric fence to exclude livestock from 80 acres of heavy use area on stream	7,000
00	7	Elkhorn Road Obliter.	Obliterate 13 miles unclassified road	15,000
00	8	Dunkleberg Creek	Install and armor a water gap and plant willows	5,000
00	9	Lower Willow	Temporary fence to exclude livestock form head cut	6,000
				79,960
			TOTAL	**$546,503**

10% FUND – Watershed Improvement on Roads and Trails, Established in 1998

Yr	D	Project	Purpose	Cost
98	7	Muskrat Creek Rd #441	Reduce sediment delivery into WCT stream by surfacing, installing drainage on road #441.	5,500
98	4	Lime Kiln Road	Reduce sediment delivery into Blacktail Creek by improving drainage and sufacing parts of the road.	27,500
98	9	Middle Fk Rock Cr Watershed	Reduce sediment from runoff on system roads into bull trout streams, improve drainage harden fords, surface or resurface sections near streams.	62,700
98	2	Odell Creek Trail	Reduce sediment in Odell Creek from 2 miles of trail in Skull Meadows RNA with reconstruction.	72,000
98	All	SWECO watershed rehabilitation	Reduce erosion from existing motorized trails usable & manageable for ORV use. Install drivable water bars with a SWECO dozer on ~160 miles	25,000
98	2,3	Big Hole River Watershed Sediment Reduction, I	Reduce sediment from 93 culverts, bridges, and other sediment contributing areas that impact WCT and fluvial arctic grayling.	184,792
99	9	Upper Willow Ck Rd #88	Resurface 7 miles of Road #88 where it intersects small streams that flow into Upper Willow Creek to reduce sediment delivery to the stream.	62,500
99	2,3	Big Hole River Watershed Sediment Reduction, II	Reduce sediment from 20 culverts, bridges, and other sediment contributing in the Big Hole watershed to complete work started in '98	50,000
99	4	German Gulch Bridge	Reduce sediment in WCT streams from erosion around bridge site.	6,000
00	2	Trail Improvement for WCT	Reroute segments, harden crossings, install drainage devices and puncheons, revegetate	40,000
00	3	Big Lake Creek Trail	Harden crossings, install drainage devices, reroute trail and revegetate	6,000
00	4	Spring Cr Tr Bridges	Install two bridges over Spring Creek	21,000
00	6	Upper Madison Road Impr for WCT	Improve drainage and resurface several roads in WCT drainages	30,000
00	6	Upper Madison Trail Impr for WCT	Relocate segments, harden crossings, install puncheons and drainage devices	31,000
00	7	Muskrat Creek Rd	Resurface road, install drainage devices	6,000
00	8	Racetrack St Crossing	Replace puncheons on Trail #56	11,000
			TOTAL	**$640,992**

WATERSHED RESTORATION PROJECTS – Abandoned Mine Program (NFSI$)

Yr	D	Project	Purpose	Cost
96	9	Brooklyn Mine	Reclaim mill tails and mine waste from stream and riparian habitat	842,000
98	7	Basin/Cataract Watershed	Reduce contribution of sediment and toxic chemicals streams in the watershed. Close 6 abandoned mines, conduct resource surveys in coop with USGS.	147,700
98	6	Mill Creek Water Quality Project	Monitor water quality and develop baseline data. Project GLOBE with Sheridan School	400
98	2	Elkhorn I	Remove tailings from historic elkhorn cr steam channel. Divert acid mine drainage from creek. Reshape waste rock dump to prevent future acid mine drainage.	450,000
99	7	Buckey/Enterprise & Crystal/Bullion	Peliminary planning work – prep for removal	15,000
99	7	Basin Cataract Watershed	Reduce contribution of sediment and toxic chemicals streams in the watershed. Close 6 abandoned mines, conduct resource surveys in coop with USGS, preparatory planning.	85,000
99	7	CERCLA –removing abandoned mine waste	Reduce movement of toxic chemicals into streams. Remove and haul toxic waste from abandoned mines	20,000
99	2	Elkhorn II	Reconstructing historic stream channel altered by past mining. Remove tails from channel.	235,000
99	4	Highland Mill removal		480,400
00	2	Pinedale and Elkhorn		9,700
00	7	Basin Cataract Watershed	Continue 99 project, Homestake and Pipestone closures	20,000
			TOTAL	**$2,305,200**

WATERSHED RESTORATION PROJECTS – Abandoned Mine Program, Minerals $

Yr	D	Project	Purpose	Cost
97	2	Calvert Mine Reclamation		7,000
97	3	Moosehorn Mine Recl.	Reduce erosion, reveg , waterbar road, close adit	3,200
97	3	Franklin Mine Rest.	Remove old bridge, reveg site, reduce erosion, install bat gat and grate on shaft	4,887
98	3	Morgan Jones Mine Restoration	Reduce erosion, reveg reclaimed site, collapse adit	13,919
99	3	Carney Mine Restoration	Reduce erosion, reveg reclaimed site, stabilize stream crossing	944
99	1	Trout Creek Mine	Removed mine dump from the flood plain	4,700
			TOTAL	**$34,650**

WATERSHED RESTORATION PROJECTS - Other $ (fish, range, roads)

Yr	D	Project	Purpose	Cost
96	1	Blue Creek Trail Reconstruction	Reduce sediment in stream	64,000
96	2	Sawlog Crossing	Reduce sediment in stream, coop with users	5,000
96	2	Lambrecht and Lacy Bridges	Reduce sediment in streams,	Private
96	2	Johnson Cr Exclosure	Protect riparian habitat from grazing impacts	5,000
96-99	3	Trail improvement	Level 3 trail maintenance to reduce semint production and erosion: bridge construction, dranage, crossing hardening, reroutes, etc.	10,000*
96	6	Bell Lake Trail Imp.	Improve drainage, reduce grade on OHV trail to reduce erosion	5,000
97	1	Swamp Creek Headcut- range	Fence headcut to allow it to heal naturally	
97-99	2	Mt Haggin Road Obliteration	Reduce sediment from unnecessary roads	10,000
97	2	Harriet Lou Crossing	Reduce sediment in stream	5,000
97	2	Sawlog Cr Exclosure	Protect riparian habitat from grazing impacts	1,500
97	6	Spring Branch	Phase II of '92 project, protect ¾ mile riparian spawning area from grazing, trailing and OHV use by fencing.	4,000
97	6	Albro Lake Trail Imp.	Reduce grade, improve drainage, reroute creek crossings to reduce sediment in creek and move trail out of wet areas	8,000
98	1	Browns Hill Road Closure	Divert traffic off of a steep section of road onto better grade to prevent erosion	100
98	2	Jerked Prairie Trail Relocation	Reduce sediment in stream	
98	2	Jerked Prairie Exclosure Fence	Protect riparian habitat from grazing impacts, cooperative project with users	
98	2	York Gulch Exclosure and water system	Cooperative project with permittees	6,000
98	3	Englebaugh Cr	Install headcut control structure to reduce erosion and sediment production in creek	500
98	6	Jack Creek Crossing	Rebuild bridge, recrib trail above creek to prevent sloughing of sediment into creek	5,000
99	1	French Cr Road Imp -FSTE	Move road back from creek, recontour, reseed	67,011
99	1	Bear Gulch	Road obliteration $$, Jim Mickelson	
99	1	Smith Creek pipeline	Reduce grazing in riparian zone.	
99	1	Middle Fk Sheep	Contribute to NFSI project – rebuilding one mile stream channel, restoring vegetation.	6,500
99	3	West Pioneer	Fence riparian areas to arrest gullying and protect	5,000

		Allotment exclosures	spring sources.	
99	3	Skinner Meadows Roadwork	Reduce erosion on 80 meter stretch along Big Hole River, gravel, ditch, drain and erosion cloth.	1,000
99	6	Snowcrest Trail Reconstruction	Reduce erosion by hardening 4 stream crossings, installing turnpike and drainage structures and reducing grade	20,000
99	6	Tepee Creek - fish $	Installed head structures to prevent erosion on two tributaries	2,000
99	6	Ledford Creek Reconstruction	Install turnpike, culvert, reroute trail around wet areas, harden 5 crossings, close and rehab steep eroding sections.	18,000
99	6	N. Fork Willow Creek Trail	Close and rehab steep eroding trail to reduce sediment in streams. Improve drainage, reroute.	4,000
00	9	Westside S. Boulder trail	Reduce sediment from 4 wheel ATV trail crossings in bull trout stream, armor crossings.	?
00	2	Big Hole Watershed Road Obliteration	Obliterate 8.6 miles of roads contributing to watershed problems	29,250
00	3	Big Hole Watershed Road Obliteration	Obliterate 4.4 miles of roads contributing to watershed problems	15,000
00	6	Upper Madison Road Obliteration	Obliterate 10 miles of roads contributing to watershed problems	34,000
00	7	Miscellaneous roads	Obliterate roads contributing to watershed problems	20,000
00	8	Flint/Rock Watershed Road Obliteration	Obliterate 5 miles of roads contributing to watershed problems	17,000
			TOTAL	**$361,861**

In addition to the projects listed, Wise River District installed about 25 puncheon bridges in the last 10 years. About 1/3 were installed with cooperative labor from local ATV groups. Another 10 designed trail bridges have been installed on system trails in addition to the puncheon bridges.

*accounts for $$ associated with watershed concerns only.

Conclusions - The Beaverhead-Deerlodge Forest has an active watershed restoration program, averaging nearly $1,000,000 per year, originating from a number of funding sources. Forest Plan Monitoring indices are acres and structures, which don't always fit well with stream, trail, or road restoration projects. The Beaverhead Forest Plan projects an output of 250 acres/year and 21 structures/year for fish habitat improvement. After one year of monitoring, the 1987 Beaverhead Forest Plan Monitoring and Evaluation Report identified a problem with reporting accomplishment of restoration using acres and recommended describing project details instead. Narratives describing accomplishments have been used since.

Based on the number and breadth of projects accomplished over the last 5 years, the Forest is on track with projected outputs for watershed restoration. The Deerlodge zone, which reported being behind Forest Plan targets for restoration in 1994, has accelerated restoration work. Ninety percent of the Abandoned Mine Program money for watershed restoration has gone to repairing mining impacts on the Deerlodge zone.

With a national emphasis on watershed restoration, funding sources for watershed restoration projects have increased in the last 3 years. In addition to the projects included in the tables that look at direct benefits to streams, watersheds and streams accrue indirect benefits from improved grazing management, management of recreation use, and other activities not accounted for here.

A review of representative watershed improvement projects in 1999 indicate they are meeting the goal of improving watershed conditions and the specific objectives tied to each project.

QUESTION 4 - WHAT ARE TROUT HABITAT AND POPULATION RESPONSES TO IMPROVING RIPARIAN CONDITION?

Forest Plan Monitoring Requirements – Deerlodge Forest Plan Monitoring Items related to fish habitat and fish populations are:

5-1 Pools formed by instream debris
The index is # of pools.

5-2 Intragravel sediment & fish numbers
The index is % of material < ¼ inch in diameter

5-3 Aquatic invertebrate populations
The index for this established as variable.

The Beaverhead Forest Plan was amended in 1997 to update Goals, Objectives, Standards and Monitoring as they relate to riparian health. Item 2-3 replaced a sediment production standard, this item is tightly linked to stream condition, also see section I under Question 3.

2-1 Fish habitat improvement
The indices are acres and structures

2-2 Westslope cutthroat trout and grayling
The indices are number of fish

2-2.5 (New in 1997) Habitat and population response to improved condition
The indices are number and quality of critical habitat features

2-3 (New in 1997) Management effects on functioning riparian areas
The indices are number of reaches in functioning condition

For the Beaverhead zone, this section primarily addresses 2-2.5 and 2-3, the two new monitoring items. All three Deerlodge monitoring items in place 1987 are also reported on.

Background - High quality sport fisheries are common and well distributed across the Forest. A large percentage of our streams also provide water for blue ribbon trout fisheries below Forest boundaries. Current fisheries issues, however, revolve around Bull Trout (listed under the Endangered Species Act as "Threatened"), Westslope cutthroat trout, and Arctic Grayling. Thus, most inventory and monitoring is focused on answering questions regarding these species and their habitat. Each is significantly restricted with respect to its historic range, but combined, their distribution across the Forest lends significance to land management decisions in every sub-drainage.

I. EFFECTS ON FISH HABITAT

A. Inventory and Monitoring work being conducted:

Monitoring Item 2-2.5 was added in the Beaverhead Forest Plan Amendment in 1997. Its focus is to determine trout population responses to changes in riparian condition. Fish habitat and population inventories will be conducted on 5 streams per year and monitored at 5-year intervals. Streams will be stratified to include "functioning", "functioning-at-risk" and "non-functioning" stream reaches. Low gradient stream types are favored since they have the greatest potential to show a response within the 5-year timeframe between collection of baseline information and follow-up monitoring. This monitoring item drives much of the inventory and monitoring process on the Beaverhead zone. Direction from the US Fish and Wildlife Service Biological Opinion of the Deerlodge Forest Plan compliance with bull trout requirements directs much of the inventory and monitoring on the Deerlodge zone. The work is accomplished through the projects described below.

1. Landscape Analysis Inventory

Fisheries inventories conducted over broad landscapes were designed to answer a variety of questions pertaining to stream conditions, habitat quality and associated fisheries values. Fish habitat attributes, coupled with descriptions of stream channel conditions have been collected in varying intensity over the last 5 years, depending on National, Regional and Forest level priorities, and funding/staffing levels. Habitat information has been evaluated against fish distribution and population attribute data to help understand the current status of, and potential risks to fisheries within each landscape. Properly functioning streams and riparian areas are a prerequisite for maintaining diverse, high quality habitat for different life stages of all fish species. The results continue to help define management recommendations, prioritize fisheries improvement projects and define overall progress toward fisheries goals and objectives.

Fish habitat inventories have targeted various parameters important in individual drainages and for different species. In limited cases stream or riparian function was defined and summarized as part of fisheries inventories. In others, the data doesn't lend itself to a determination of "functioning" or "non-functioning". Non-the-less, where fish habitat inadequacies are apparent, they commonly result from undesirable sediment and bedload transport capabilities. These, in turn, reflect the status of the stream channels and the riparian zones. As such, the information allows inference regarding stream/riparian function. A discussion of population levels and riparian conditions and trend allows some determination of where we're at, relative to riparian and fisheries goals and objectives.

Since conservation of westslope cutthroat trout currently represents the most far-reaching fisheries issue related to riparian management in the Beaverhead Forest Plan, inventory reaches on the Beaverhead zone are being selected based on their presence. On the Deerlodge zone, priority reaches also include bull trout. Parameters such as maximum pool depth, bank shape, woody debris, width/depth ratio, and abundance of pools are

measured throughout the selected reach. Since attainment/maintenance of abundant, high quality habitat is dependant on riparian condition, changes in these parameters should coincide with changes in riparian condition. Population inventories are also being conducted to define the response by the fishery, to changing conditions.

Baseline stream inventories were successfully completed through 1999 as part of the Landscape Analysis effort. Unfortunately, an unprecedented fire season prevented collection of similar data in 2000. Since the initial 5-year period has not elapsed between collection of baseline information on the first streams (in 1998) and follow-up monitoring (2002), no trend information can be presented.

Results - Habitat inventories have been beneficial in helping to formulate management recommendations for Landscape Analysis and all project level analyses; including recent AMP revisions. Since 1996, population inventories have occurred on nearly 30 miles, representing 375 inventory reaches on 230 streams. Habitat inventories were conducted over 220 miles and redd counts have occurred over 51miles of stream. Westslope cutthroat and bull trout were the species of interest on the majority of all inventory sites.

Data representing one-third of the stream length inventoried on the south end of the Forest (approximately 45 miles out of 125) is currently summarized in a format compatible with determination of "properly functioning condition". ***Based on these results, approximately 48% is considered properly functioning; 35% is functioning at risk and 17% is non-functioning.***

2. Low level flight photo mosaics of riparian corridors:

See Appendix A and Question 3 item 2 for a description of projects using remote sensing and GIS technologies to inventory and monitor stream attributes, riparian vegetation, and aquatic habitat features.

3. Rock Creek Macro invertebrate surveys

Aquatic invertebrate surveys in Rock Creek have continued annually over the last 10 to 15 years. Aquatic invertebrates are a significant component of aquatic ecosystems and are commonly used to help evaluate water and habitat quality.

Results - Collections were analyzed by the USFS National Aquatic Ecosystem analysis Lab in Provo Utah. Results indicate some year-to-year variation in habitat or water quality conditions. However, the significance of annual differences has not been determined. There seems to be no definitive trend. Whether differences reflect natural variation or results from disturbance is difficult to interpret. The Forest needs complete a thorough analysis of all available data, then to consider the value of continuing this monitoring approach.

4. Section 7 Baseline Assessments for Bull Trout in Rock Creek, Flint Creek, Clark Fork

Watershed Baseline Reports were completed this year for Rock Creek and the upper Clark Fork River. Reports describe physical and biological characteristics for approximately 100 6th code hydrologic sub-watersheds. Data is provided on: sub-watershed acreages, extent of change in elevations, description of vegetation, geology, road and trail densities, number of stream crossings, number of mines, water quality, acreage of past timber harvest, acres contained in livestock grazing allotments, length of perennial and intermittent streams, fish species present, abundance, and where possible, a description of stream and riparian conditions.

A matrix of species and habitat indicators help relate the status of bull trout populations in individual drainages to existing habitat conditions and current/past activities. Ratings were primarily derived from an understanding of conditions on the ground acquired from habitat and fish inventories, existing reports, public databases, and qualitative assessments. Ratings for stream conditions are provided separately below for Rock Creek and the Upper Clark Fork River Drainage (includes Flint Creek).

Results

Table 14. Baseline Assessment Rating for ROCK CREEK

RATINGS	FUNCTIONING ACCEPTABLY	FUNCTIONING @ ACCEPTABLE RISK	FUNCTIONING @ UNACCEPTABLE RISK
Temperature	36%	36%	14%
Substrate Conditions	31%	31%	39%
Pool Frequency	39%	26%	34%
Streambank Stability	31%	33%	36%
Channel Entrenchment	42%	39%	19%
Water Quality	61%	21%	18%
Integrated Bull Trout Baseline	**11%**	**43%**	**46%**

Table 15. Baseline Assessment Rating for UPPER CLARK FORK RIVER

RATINGS	FUNCTIONING ACCEPTABLY	FUNCTIONING @ ACCEPTABLE RISK	FUNCTIONING @ UNACCEPTABLE RISK
Temperature	32%	35%	32%
Substrate Condition	8%	49%	43%
Pool Frequency	22%	53%	25%
Streambank Stability	24%	59%	18%
Channel Entrenchment	14%	63%	23%
Water Quality	18%	59%	24%
Integrated Bull Trout Baseline	**0%**	**18%**	**82%**

Several things are noteworthy within the data. Water quality is obviously a greater issue in the upper Clark Fork than in Rock Creek. About 450 miles of stream are reported as impaired or partially impaired for beneficial uses in the upper Clark Fork, due to water quality issues. It is among Montana's highest priority streams that will be incorporated into the Total Maximum Daily Load (TMDL) process in the upcoming year. McGuire (1993) and US EPA (1993) report slightly improving trends due to more strict standards and cleanup measures.

Substrate condition, pool frequency, stream bank stability and entrenchment tend to reflect the adequacies of stream process and riparian function. It is doubtful, where several of these factors are "functioning at unacceptable risk" the stream and riparian are properly functioning. Eighteen to forty percent of the sub-watersheds evaluated in the Upper Clark Fork represent elements of habitat conditions that are undesirable. In Rock Creek the range is 14% to 39%. Thus, it is probable the percentage of non-functioning streams falls somewhere in the range above.

There is an extreme difference between the "integrated bull trout baseline rating" and ratings for habitat conditions. In the upper Clark Fork, 82% of the HUCs represent conditions for bull trout that are at an unacceptable level of risk (FUR), while habitat conditions suggest only 18% - 40% of the HUCs represent habitat conditions are non-functioning.

Obviously, factors other than habitat play a significant role in determining integrated bull trout ratings. Factors such as subpopulation size, growth and survival, life history, diversity, isolation and genetic integrity are important components when considering viability risks. In all, a total of 4 species indicators and 19 habitat indicators helped define risks facing populations in individual 6th code HUCs for the Watershed Baseline Reports.

A comparison of integrated bull trout baseline ratings to habitat ratings in Rock Creek suggests less disparity. This is primarily due to the fact that bull trout in Rock Creek face fewer risks and remain relatively strong in portions of the drainage. In general, the integrated ratings above provide some basis for understanding viability risks to bull trout in and around the Forest.

5. Big Hole Watershed Fisheries Data Base

A fisheries database was created for the Big Hole drainage in 1999. All previously collected, fisheries data was entered and linked to GIS by dynamic segmentation. This provides opportunities for prioritization of subbasins for westslope cutthroat and grayling conservation efforts; as well as watershed restoration projects.

II. EFFECTS ON FISH SPECIES NUMBERS AND DISTRIBUTION

A. Bull Trout

Populations of bull trout (*Salvelinus confluentus*) have been greatly reduced throughout the Columbia River basin largely due to their sensitivity to habitat loss. In a status review of Montana, bull trout were found to occur in less than 50 percent of the total stream reaches they once occupied (Thomas 1992). Thomas' review sited the Rock Creek watershed as being one of the best drainages in Montana for bull trout conservation. Since that time the Rock Creek watershed has been identified as a bull trout core area (MBTSG 1995) and a priority watershed by the Beaverhead-Deerlodge and Lolo National Forests.

Section 7 Baseline Assessments for Bull Trout in Rock Creek, Flint Creek, Clark Fork

The Watershed Baseline Reports described in the previous section consolidated what we know about the status of bull trout populations in Rock Creek and the upper Clark Fork River. A Forestwide GIS layer can display this status by 6th code sub-watersheds by either Landscape or Subbasin.

Redd Count Surveys

Bull trout population trends are commonly tracked using annual redd-count surveys. Surveys consist of walking relatively long reaches of stream to count the number of redds. The locations and times redds are created are considered with redd size to allow a reasonable degree of species certainty, and thus used to quantify spawning activity by bull trout. An increase or decrease in the number of redds in a specific stream indicates a corresponding increase or decrease in adult spawning pairs. Data for the Rock Creek drainage was collected in conjunction with Montana Fish, Wildlife and Parks. Results are presented below.

Middle Fork Rock Creek

Carpp Creek

Year	R1 I	R2 I	R3	R4	R 5	R6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1993	0						0	0.5	1	0	0
1994		6	0				6	2.1	2	2.9	3
1995	4	3	0				7	5.7	3	0.8	2.3
1996	6	8	6	0			20	7.2	4	2.8	5
1997	0	4	6 (5)	0			10 (15)	7.15	4	1.4 (2.1)	2.5 (3.75)
1998	25 (16)	19 (2)					44 (52)	3.75	2	11.7 (13.9)	22 (26)
1999	9	19 (1)	0				28 (29)	5.75	3	4.86 (5.04)	9.33 (9.66)
2000	11	21	-	-	-	-	32	3.75	2	8.5	16

Copper Creek

Year	R1 I	R2	R3	R4	R5	R 6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1996	7	1			4	1	16	8	5	2	3.2
1997	20 (3)				0	0	20 (23)	5.6	4	3.6 (4.1)	5 (5.8)
1998	23 (2)		2	(2)	0	0	25 (29)	9.3	6	2.68 (3.12)	4.16 (4.83)
1999	7 (1)						7 (8)	2.85	1	2.46 (2.8)	7 (8)
2000	8	-	-	-	-	-	8	2.85	1	2.8	8

Meyers Creek

Year	R1 I	R2	R3	R4	R5	R 6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1997	5 (5)						5 (10)	2	1	2.5 (5)	5 (10)
1998	8 (2)						8 (10)	2	1	4 (5)	8 (10)
1999	2 (3)						2 (5)	2	1	1 (2.5) (	2 (5)
2000	10	-	-	-	-	-	10	2	1	5	10

Middle Fork Rock Creek

Year	R1-2	R3	R4 I	R5 I	R6 I	R7 I	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1996		0	3	6	6	10	25	11.7	5	2.1	5
1997			1	4	22 (6)	9 (2)	36 (44)	7.7	4	4.7 (5.7)	9 (11)
1998			1	10	15	20 (1) (1)	47	7.7	4	6.1	11.6
1999				8	19 (2)	6 (2)		6.37	3	3.92 (4.24)	8.33 (9)
2000	-	-	3	3 (1)	12 (2)	14	32 (35)	7.7	4	4.2 (4.5)	8 (8.75)

West Fork Rock Creek

West Fork Rock Creek

Year	R1 - 3	R4 -6	R7	R 8	R9	R10	R1 1	Total Redds	Total Miles	Total Reache s	Redds/ Miles	Redds/ Reach
1996	1	0	0	0	0			1	15	7	.1	.1
1997	0 (4)							(4)	5.9	3	(0.7)	(1.3)
1999			0	0	0	0	0	0	9.82	5	0	0
2000												

North Fork Rock Creek

Year	R1	R2	R3	R4	R5	R6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1997	0	0					0	4.2	2	0	0

Bowles Creek

Year	R1	R2	R3	R4	R5	R6	Total Redds	Total Miles	Total Reache s	Redds/ Miles	Redds/ Reach
1996	0	0					0	2.2	2	0	0
1999	0	0	0				0	2.26	3	0	0

Crystal Creek

Year	R1	R2	R3	R4	R5	R6	Total Redds	Total Miles	Total Reaches	Redds/M iles	Redds Reach
1997	0						0	1.4	1	0	0

East Fork Rock Creek

East Fork Rock Creek

Year	R1	R2	R3	R4 I	R5 I	R 6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1996				73	8		81	3.6	2	18	40.5
1997				33 (1)	0		33 (34)	3.6	2	9.3 (9.6)	16.5 (17)
1998				31 (1)	7 (1)		38 (40)	3.6	2	10.7 (11.2)	19 (20)
1999				11	(2)		11 (12)	2.0	1.5	5.5 (6)	7.3 (8)
2000	-	-	16	dry	6 (1)	-	6 (1)	2.25	1	2.7 (3.1)	6 (7)

Page Creek

Year	R1	R2	R3	R4	R5	R 6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/R each
1997	3						3	.4	1	1.2	3
1998	3						3	.4	1	1.2	3

Meadow Creek

Year	R1	R2	R3	R4	R5	R 6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/R each
1996											
1997		(2)					(2)	1	1	(2)	(2)
1998			2 (2)				2 (4)	1.5	1	1.3 (2.7)	2 (4)
1999	5	0	(1)				5 (6)	4	2.5	1.25 (1.5)	2 (2.4)

Ross Fork Rock Creek

Ross Fork Rock Creek

Year	R1	R2	R3	R4	**R5 I**	R6	**Total Redds**	Total Miles	Total Reaches	Redds/ Miles	Redds/Re ach
1996			0	0			**0**	5	2	0	0
1997			0	0	**3 (1)**	2 (1)	**5 (7)**	16.9	5	.3 (.4)	1 (1.4)
1998					**19 (1)**		**19 (1)**	3.7	1	5.3	20
1999		0	0		**6 (3)**	1	**6 (9)**	10.7	4	0.56 (0.84)	1.5 (2.25)
2000	-	-	-	-	**4**	-	**4**	3.7	1	1.1	4

Stony Creek

Stony Creek

Year	R1	**R2 I**	**R3 I**	R4	R5	R6	**Total Redds**	Total Miles	Total Reaches	Redds/ Miles	Redds/Re ach
1996			**18**				**18**	2.5	1	7.2	18
1997		**3 (2)**	**20 (6)**	2			**25 (33)**	7.9	4	3.2 (4.2)	6.3 (8.3)
1998		**7 (1)**	**43 (3)**				**50 (54)**	4.2	2	12 (13)	25 (27)
1999		**29 15**	**2 (1)**				**31 (47)**	4.16	2	7.45 (11.3)	15.5 (23.5)
2000	1 (7)	**6 (2)**	**8 (5)**	-	-	-	**15 (29)**	5.8	3	2.6 (5)	5 (9.7)

Little Stony Creek

Year	R1	R2	R3	R4	R5	R6	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/Re ach
1998	9	20					29	3	2	9.7	14.5
1999	6 (2)										
2000	3 (2)	9 (1)	-	-	-	-	12 (15)	1.6	1+	7.5 (9.4)	

Boulder Creek Watershed

Boulder Creek

Year	R4	R5	R6	R7	Total Redds	Total Miles	Total Reaches	Redds /Miles	Redds/ Reach
1999	3	(1)	13	1 (2)	17 (20)	4.5	4	3.8 (4.4)	4.25 (5)
2000	2	-	0	3	5	4	3	1.25	1.33

South Boulder Creek

Year	R2	R3	R4	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1999	0	0	0	0	3			

Warm Springs Creek Watershed

Warm Springs Creek

Year	R1	R2	R3	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1998	15	17 (8)	0	32 (40)	5	3		
1999	5 (6)	9	0	14 (20)	6	3		
2000	6	1	-	7	5	2	1.4	3.5

Twin Lakes Creek

Year	R1	R4	R5	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1999	0	2 (2)	25	27 (29)				
2000		3	4 (2)	7 (9)	1.75	2	4 (5.1)	3.5 (4.5)

Foster Creek

Year	R1	R2	R3	Total Redds	Total Miles	Total Reaches	Redds/ Miles	Redds/ Reach
1998	6 (2)			6 (8)		1		
1999	12 (4)			12 (4)		1		
2000	1	1 (3)	-	2 (5)				

Rock Creek radio telemetry project

The Federal Energy Regulatory Commission relicensing process for Milltown Dam on the Clark Fork River prompted initiation of a study to determine seasonal movement patterns using radio telemetry, establish temperature profiles, and characterize instream and riparian habitat within the Rock Creek drainage. The Forest became a partner in the movement research by providing input to study design and assisting with funding.

Figure 1. Bull trout

Approximately 40 bull trout were collected and surgically fitted with radio transmitters throughout the Rock Creek watershed. Fish locations were monitored using a triangulation methodology from either vehicles or on foot. Samples were recorded twice a week during April through November and only once a week from December to March. Water temperature was collected using continually recording thermographs. These units were deployed at 60 stations occurring in larger tributaries of the Rock Creek drainage. The temperature data were compiled and used to profile water temperature and detect significant contributions to the temperature budget. Habitat characterization was accomplished through the analysis of airborne digital camera imagery.

Results – Results from this study are currently unavailable, but are expected in the next few months.

B. Westslope Cutthroat

Population inventories are conducted in conjunction with Landscape Analysis. Since 1996, populations have been inventoried on nearly 30 miles representing 375 inventory reaches on 230 streams. Genetic samples have been collected from approximately 60 streams for analysis at the University of Montana's Wild Trout and Salmon genetics lab, to help define the presence/absence of hybridization. This genetic sampling verified the presence of 11 genetically pure cutthroat populations on the Forest. A full understanding of westslope cutthroat distribution and the status of individual populations is critical to the conservation of this species in the Upper Missouri River Basin.

The ability to track long-term trends in distribution and fish numbers has been greatly facilitated by the Montana Rivers Information System (MRIS) database. It was created by MFWP to serve as a statewide repository for fisheries data and stream information. Fish data from the Forest has been input into the database every 2-3 years since the early 1990's.

Results - Westslope cutthroat trout status is mapped by Landscape and broken down to 6th code sub-watershed level displaying whether the population is currently 1) Strong, 2) Depressed, 3) Known Absent, or 4) Present Status Unknown

C. Fluvial Arctic Grayling

The Forest has participated in the conservation and restoration of fluvial arctic grayling (*Thymallus arcticus*) for many years. This species' native range included the Missouri River and its tributaries: the Sun, Smith, Teton, Madison, Gallatin, Jefferson, Beaverhead and Big Hole Rivers. During the 20th century, it dwindled such that it only occurred in the Big Hole River. Cooperative efforts between the Forest and Montana Fish, Wildlife and Parks to research the cause of declining numbers in the Big Hole River began in 1985. Financial assistance toward grayling recovery has been provided since the early 1990's as has constant participation on the Montana Fluvial Arctic grayling work group. This group of technical specialists from various agencies and public interests, identified the Ruby River as the first site to try and help meet the restoration goal of four self-sustaining populations, by the year 2020. Restoration efforts began in 1997, when MFWP planted 30,000 young of the year grayling above Ruby Reservoir. Poor survival, led to stocking age-1 grayling in subsequent years (1998-2000). Survival of 1998 and 1999 plants is encouraging. Data results from the 2000 plant are not yet available. Montana Fish, wildlife and Parks biologists feel management direction in the Upper Ruby River drainage on the Forest is adequate to meet habitat requirements of grayling and facilitate recovery.

III. CONCLUSIONS ABOUT FISH HABITAT, FISH DISTRIBUTION AND NUMBERS

Indicators show there is still progress to be made in improving stream channel and riparian function, since the desired quality, quantity and diversity of fish habitat has not been attained on a significant percentage of the stream reaches. Other sections of this report indicate improvement is occurring in streams and riparian areas. Unfortunately, an adequate determination of trends in the condition of fisheries habitat is not possible, until 2002 when initial baseline inventories can be reread.

A reduction in distribution and numbers of genetically pure westslope cutthroat trout, on the Forest, is presumed to have occurred over the last decade. This, however, is difficult to prove, largely because limitations in funding and staffing have required long intervals between baseline data collection and follow-up monitoring on most streams. A reduction in the number of spawning age grayling in the Big Hole River has been documented by MFWP, over the last 4 years. Reasons for this decline are not fully understood. There is insufficient information to determine trends in distribution and numbers of bull trout over the last 5 years.

Efforts toward attainment of conservation and restoration objectives for westslope cutthroat, bull trout and arctic grayling are critical. They should continue to be guided by legal ramifications of the Endangered Species Act, the National Forest and Land Management Act, the Beaverhead Lawsuit Settlement Agreement as well as National and Regional Policy and partnerships and agreements. All of which are compatible with meeting Forest Plan fisheries goals and objectives.

Forest Plan The Beaverhead and Deerlodge Forest Plans should provide adequate guidance for fisheries over the next year. The Riparian Amendment to the Beaverhead Forest Plan, and INFISH for the Deerlodge Forest Plan strengthened direction for management of riparian areas on the Forest and should benefit fisheries if we are successful with implementation. Additional consultation is required for several allotments on the Pintlar district, where terms and conditions of the Biological Opinion were not met.