Lost Creek Watershed Project Final Report

May 11, 2011

Lost Creek Watershed Project, completed Montana Fish Wildlife and Parks (FWP) and NRDP DOJ Contract No. 600122

Approved Project Costs: $1,701,222 Total Cost; $518,382 in Restoration Funds

Project Summary: FWP was approved for $518,382 in Restoration Funds, with an additional $1,182,840 in matching funds, for a total project cost of $1,701,222 in 2000 to implement a four year stream restoration project on Lost Creek. Restoration Funds were used to fund part of fisheries technician, and miscellaneous equipment to design and conduct; steam restoration, bank stabilization, revegetation, fencing, wetland construction, and monitoring. FWP supplied $122,467 for steam restoration and associated tasks and outside sources supplied $993,527 for conservation easement, stream restoration costs, part of the fishery technician position and landowner donations. This totals $1,115,994 in match expended prior to 2006. FWP also supplied post-2006 match for bookkeeping, contract oversight, negotiations/monitoring, coordination, mileage and per-diem by FWP employees, construction of floodplain berms by a contractor, and additional landowner match for a total of $19,433. The total matching funds supplied equaled $1,135,426, which is 68.7% of the total project costs of $1,653,718.

Discussion and Results:

A. Project Participants: FWP and its consultant, Confluence Consulting, planned and implemented the majority of the project. Various other consulting and construction firms contributed as well, such as Land and Water Consulting and Water Consulting, and U of Montana, Dempsey Excavation, Rowe Excavation, and Bitterroot Restoration.

B. Project Goals, Objectives, and Implementation:

The two project goals in the funded application and approved scope of work were:

1) to restore Lost Creek’s water quality, aquatic habitat and riparian conditions to a natural, self-sustaining channel (conducted by FWP using NRDP grant and other fund sources; and

2) to complete a TMDL for sediment and nutrients (conducted by Tri-State Water Quality Council with other fund sources besides NRDP grant funds).

The attached 2005 status report summary from Confluence Consulting summarizes the work conducted between April 2001 and June 2005 for each of the multiple tasks (27 total) specified in the scope of work categorized under the eight project objectives. This report is so well detailed that is serves as the main part of this final grant report. It indicates what changes in scope occurred and why.

1 This final report was jointly completed by Pat Saffel of FWP and Tom Mostad of NRDP
Of the 27 proposed tasks, 18 were completed as of July 2005 when the Confluence report was issued. The following summary indicates the status of the remaining nine tasks that were not indicated as complete in the Confluence report.

1. Objective I, tasks #1 and #2: These tasks, which had no specified budget for either grant funds or match funds, involved FWP providing input to EPA and ARCO on remediation plans for riparian vegetation and management for areas in the Lost Creek/Dutchman drainages. Although the remediation planning process is not completed, FWP provided such input on the remediation plans prepared during the active timeframe for this grant and thus these tasks are considered completed even though they are not indicated as complete in the 2005 Confluence report. FWP will continue to provide input on such plans as the opportunities arise to do so.

2. Objective III, task 1: One of the two diversion structures was replaced to allow fish passage. Fish passage the other structure (called the Dutchman Diversion) cannot be accomplished until all property transfers and instream flow rights have been completed.

3. Objective III, tasks 3 and 5: These tasks both involve fencing parcels on land that have yet to acquired by FWP through the Dutchman CD. Fencing materials were purchased with grant funds but fencing cannot be installed until the Dutchman land transaction is completed.

4. Objective VI, task 3: This task involved installing a jack-leg fence on both sides of Lost Creek to protect a 0.75 restored stream reach of Lost Creek on Matthews property from overgrazing. The Confluence report indicates FWP deemed the initial bids to be excessively high and intended to rebid the project and that some restoration efforts may have been jeopardized by grazing that has occurred in the riparian post-restoration. In March 2006, the Matthews property was fenced as per $19,300 invoice 6/21/06 and this task is 100% complete.

5. Objective VII, task 2: Since the 2005 Confluence report was issued, the fencing covered by the task was installed by the landowner.

6. Objective VII, task 3: This task involved installing a new bridge to access land cut off by restored channel. The materials for the bridge were purchased by this project and the landowner constructed the bridge. NRDP confirmed the construction of the bridge with the landowner.²

7. Objective VIII, task 1: Although the proposed monitoring was not completed when the 2005 Confluence report was issued, it has been subsequently been completed by FWP. Additional monitoring efforts are needed to evaluate success over a longer-time than what was conducted under the grant.

8. Objective VIII, tasks 3: This task, which was not funded by NRDP, involved the Tri-State Water Quality Council conducting water sampling and using the data produced

² Personal communication on May 11, 2011 between Tom Mostad NRDP Staff, and Hans Lampert, landowner.
Task Summary:

As indicated above six of the nine tasks that remained to be completed when the Confluence report was issued have subsequently been either completed or otherwise resolved (Objective I, tasks 1 and 2; and Objective VIII, task 3). Three of the remaining five tasks (Objective III, tasks 2, 3, and 5) will be conducted when the Dutchman land transfer is complete. Funding provided under that consent decree for FWP operation and maintenance would be used to complete these tasks.

C. Project Schedule:

This project was to occur over four years, from 2001 through 2004. As indicated by the 2005 Confluence, the majority of project work was completed by July 2005. The Confluence report and the preceding section of this report explain where delay in project schedule occurred and why.

D. Financial Summary:

See the attached detailed spreadsheet from the 2005 Confluence report showing project budget and expenditures, which is summarized in the table below. Although FWP’s documented match of 68.7% is slightly lower than the required match of 69.5%, FWP’s contributions to future site monitoring will more adequately make up the difference.

<table>
<thead>
<tr>
<th>Proposed Budget</th>
<th>Amount</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Matching Funds</td>
<td>$1,182,840.00</td>
<td>69.5%</td>
</tr>
<tr>
<td>Proposed NRDP Funds</td>
<td>$518,382.00</td>
<td>30.5%</td>
</tr>
<tr>
<td>Total Budget</td>
<td>$1,701,222.00</td>
<td>100.0%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Final Bill</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of NRDP Final Bill</td>
<td>$24,125.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Final Project Accounting</th>
<th>Amount</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match Spent</td>
<td>$1,135,426.52</td>
<td>68.7%</td>
</tr>
<tr>
<td>NRDP Spent Including Payment of Final Bill</td>
<td>$518,292.15</td>
<td>31.3%</td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$1,653,718.67</td>
<td>100.0%</td>
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</tbody>
</table>

This final report serves as the final billing totaling $24,125.15 (see attached) and description of work for the Lost Creek Watershed Project. The billing is for fencing of 1.3 miles of riparian area and stream on Lost Creek (see Map) as part of an easement with the Uelands. The billing is for fence contractor labor and some materials. The fencing of the easement area was not part of the original tasks in the contract with NRDP, but is consistent with the scope of work of the approved grant project in that it protects Lost Creek’s aquatic resources.
The fencing used on this part of the project was previously bought with this contract’s funds for fencing the Dutchman property once the land has transferred to FWP for its Wildlife Management Area (WMA), which is included in this contract’s tasks. Use of this fence material for the easement property was considered appropriate because it was used to protect riparian areas on Lost Creek, a major goal of the restoration project. In addition, fencing materials were needed to be used since the delay in finalizing the land transfer resulted in weathering of stored fencing materials.

Observations/Recommendations of FWP: Water use by landowners has been an issue. At times, Lost Creek has little water in it. Water rights and use should be thoroughly understood prior to implementing projects. For this project, water supply and use changed with different diversions from Warm Springs Creek, so anticipating the changes was difficult, and the change of use may not be legal.

Focus for similar restoration projects should first be on passive restoration efforts, such as on changes in land management or riparian fencing. Riparian areas should be of sufficient size (say 50-100 ft. buffers). Water rights should be understood and water supply confirmed. Channel construction should be done as a last resort and when more immediate results are needed (should be rare), or when a stream has abandoned its original channel and floodplain, and reconnection is desired.

Observations/Recommendations of NRDP

The 2005 Confluence report offers several insights into lessons learned that are applicable to many other stream restoration projects. These include:

- That the fish passage system will require careful management to ensure adequate flows down the irrigation ditch, steps pools, and Lost Creek during various flows. (p.4)

- That significant recovery in one section of Dutchman Creek occurred just due to the removal of cattle (p. 8).

- That the technique of staking trees into the streambed on the section of Lost Creek running through the Heggeland Ranch was very successful in trapping fine sediments and creating a narrower, deeper channel adjacent to revetments.

- That coir logs proved to be effective in reducing bank erosion.

- Planting – Significant failure occurred of willow sprig plants due to late planting time (July/August) in a particularly dry summer of the 2002; better success occurred with spring planting efforts. Willow sprigs harvested earlier in the winter (January and February) survived better than those harvested later during the dormancy period (March and April) (p. 11).

The scope of this project included tasks that, while relevant to the work being conducted under the grant, were to occur under other regulatory processes and with funding from other sources.
Examples include the tasks of FWP providing comment on the Dutchman remediation and restoration plans and Tri-State Water Quality Council conducting its routine water quality monitoring and assisting with DEQ’s TMDL. This added unneeded complexity to the grants management and also put responsibilities unto the grant recipient that belonged with other entities. Such tasks should be recognized in the application under the coordination and integration and ecosystem considerations criteria, but should not be included in the scope of work of the grant project.

This numerous objectives and tasks should have been combined into broader categories to eliminate unneeded complexity to the management and tracking of this project.

Because this project occurred over such a long period of time, it suffered from a lack of continuity of oversight, both at FWP and NRDP. Inefficiencies occurred when new staff who had not participated in the initial project design had to pick up the project mid-way and finish it. While a positive aspect of this project was its comprehensive, watershed-based approach that addressed multiple problems, its broadness and complex set up made it difficult for new staff to know what had occurred.

Better coordination with and oversight of landowner activities is needed to assure that whatever investments are made on the property are not jeopardized by subsequent land management activities, such as grazing.

V. Needed Follow-up:

- Monitoring efforts should be continued to evaluate success over a longer-time than what was conducted under the grant. Some of this future monitoring will be completed and funded by FWP as they continue to conduct fish populations study in Lost Creek which will be used to further evaluate the success of the project.

- FWP will complete the three tasks associated with completion of the Dutchman Consent Decree using funding provided through that Consent Decree.
Lost Creek Watershed Project
NRDP Report

July 15, 2005

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1.0 Introduction

Lost Creek has impaired water quality for drinking water, recreation, fisheries, and aquatic life uses according to the 1998 Montana 303d list of “Waterbodies in Need of Total Maximum Load Development.” Lost Creek’s water-quality issues include nutrient loading, excessive sedimentation, habitat and flow alterations, channelization and loss of woody riparian vegetation. Lost Creek is the largest total nitrogen load contributor among all tributaries to the upper Clark Fork River above Deer Lodge. The Tri-State Council’s Clark Fork River Voluntary Nutrient Reduction Program made Lost Creek the number one priority among non-point nutrient sources in the upper Clark Fork River Basin.

To reduce excessive nutrient and sediment discharge, and improve the degraded channel condition of the lower creek, a major watershed restoration effort was conducted. This effort addressed the large number of cattle dependent on watering in Lost Creek including one large concentrated livestock facility. Manure and sediment washing into the creek from overland flow, the severely damaged riparian habitat and wetlands, and eroding streambanks were addressed to insure a successful watershed restoration project. The project was a comprehensive non-point source pollution control project, which addressed these issues, thereby restoring the water quality and aquatic and riparian habitat of Lost Creek, and reduced a major non-point source of nutrients to the upper Clark Fork River, while maintaining the ranching economy of the area.

Lost Creek is a third order, perennial stream 37.5 miles long draining a 62 sq. mile watershed. Lost Creek originates in the southeastern part of the Flint Creek Range, northeast of Anaconda, Montana. The basin ranges from 9,025 ft to 4,710 ft at its confluence with the Clark Fork River. Lost Creek’s mean annual discharge in 1990-1991 was 31.6cfs at the Interstate 90 frontage road (bankfull discharge 120cfs). The Creek’s headwaters are primarily public lands (US Forest Service and MT State Parks) with the valley reaches progressing to privately owned ranches. The upper reaches of Lost Creek can be characterized as a high gradient, boulder-dominated stream. As it enters the Deer Lodge Valley, it develops into to a low gradient, meandering channel with an excessive sediment bedload.

Five large ranches govern the lower 21 miles of the project reach. The land uses are forestland, rangeland, pasture, irrigated hayland, and recreational lands. Cow-calf operations comprise the primary agricultural resource. Grazing pressure is high along the creek, which is also the sole water source for 2500-3000 cattle, including one large concentrated feeding operation. Lost Creek provides flood and sprinkler irrigation water for grain, hay and pasture crops. The cattle operations and flood irrigation contributed nutrients and sediment to Lost Creek’s poor water quality.

The low gradient reaches were unnaturally widened (width/depth ratios >27), with excessive eroding banks, areas of severe lateral erosion, little woody vegetation and several channelized reaches. These channel problems were primarily related to overgrazing and vegetation removal, severely degrading the riparian conditions, including decimation of willows or other woody species in some stream reaches. The loss of woody vegetation and channelized stream reaches contributed to Lost Creek’s lateral instability, high width/depth ratios, excessive sediment inputs and repressed fish populations.

A series of irrigation diversion structures, culverts and an area of complete channel dewatering fragmented the Lost Creek basin, reducing its fisheries potential. The lower reaches of Lost Creek were entirely dewatered by a dilapidated irrigation structure. This irrigation ditch took all flows and...
provided little or no fisheries benefits. Addressing Lost Creek’s fish passage concerns increased the accessibility of this basin to spawning Clark Fork River brown trout.

MFWP estimates showed over 70% of the study reach stream banks were poorly vegetated and approximately 50% of the stream banks were laterally unstable (Tables 1 and 2). The poorly vegetated and eroding stream banks contributed to nutrient loading and increased sediment input. MFWP estimated that eroding banks contribute approximately 4,180 cubic yards of sediment annually. This estimate does not incorporate the accelerated erosion in the upper stream reaches near the community of Lost Creek due to smelter emissions. The channel instability coupled with the almost six miles of channelized stream reaches limited the trout populations in Lost Creek, and ultimately recruitment to the Clark Fork River.

Table 1: Summary of channel issues by stream reach in Lost Creek.

<table>
<thead>
<tr>
<th>Landowner</th>
<th>Cattle numbers</th>
<th>Miles of stream</th>
<th>Eroding Banks (%)</th>
<th>Channelized length (ft)</th>
<th>Poorly vegetated (%) (est. miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Landowners (EPA/ARCO Reclamation)</td>
<td>?</td>
<td>5.5</td>
<td>Not measured</td>
<td>Not measured</td>
<td>40% (2.2)</td>
</tr>
<tr>
<td>Derzay</td>
<td>?</td>
<td>0.75</td>
<td>10%</td>
<td>unknown</td>
<td>15% (0.1)</td>
</tr>
<tr>
<td>Ueland</td>
<td>1780</td>
<td>6.1</td>
<td>45-50%</td>
<td>6860</td>
<td>65% (4.0)</td>
</tr>
<tr>
<td>Heggelund</td>
<td>210</td>
<td>6.5</td>
<td>40%</td>
<td>1620</td>
<td>100% (6.5)</td>
</tr>
<tr>
<td>Lord</td>
<td>125</td>
<td>4.4</td>
<td>55-60%</td>
<td>2920</td>
<td>100% (4.4)</td>
</tr>
<tr>
<td>Mathews</td>
<td>78</td>
<td>0.75</td>
<td>25%</td>
<td>0</td>
<td>35% (0.3)</td>
</tr>
<tr>
<td>Lamperts</td>
<td>520</td>
<td>3.6</td>
<td>100%</td>
<td>19,000’ dry channel irrigation dewatering</td>
<td>100% (3.6)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2713</td>
<td>27.6</td>
<td>N/A</td>
<td>30,400’</td>
<td>76% (21.1)</td>
</tr>
</tbody>
</table>

Table 2: Summary of proposed restoration in the Lost Creek watershed.

<table>
<thead>
<tr>
<th>Landowner</th>
<th>Miles of stream</th>
<th>Channel Restoration</th>
<th>Fencing, Reveg &amp; Grazing Mgmt</th>
<th>Wetland reclamation</th>
<th>Other restoration data:</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPA reclamation</td>
<td>5.5</td>
<td>No</td>
<td>Yes Uplands</td>
<td>N/A</td>
<td>Upland soil amendments reveg. &amp; sediment control</td>
</tr>
<tr>
<td>Derzay</td>
<td>0.75</td>
<td>No</td>
<td>Fish passage</td>
<td>No</td>
<td>Fish passage</td>
</tr>
<tr>
<td>Ueland</td>
<td>6.1</td>
<td>Yes</td>
<td>Fish passage</td>
<td>Yes</td>
<td>Fish passage; off-site water; corral relocation; habitat improvement (15,300’); channel relocation &amp; reconstruction (3,180’)</td>
</tr>
<tr>
<td>Heggelund</td>
<td>6.5</td>
<td>Yes</td>
<td>Fish passage</td>
<td>Yes</td>
<td>30-year NRCS conservation easement on 609 riparian/wetland acres; habitat improvement (12,200’)</td>
</tr>
<tr>
<td>Lord</td>
<td>4.4</td>
<td>Yes</td>
<td>Fish passage</td>
<td>Yes</td>
<td>channel reconstruction (2900’); habitat improvement (10,100’)</td>
</tr>
<tr>
<td>Mathews</td>
<td>0.75</td>
<td>Yes</td>
<td>Fish passage</td>
<td>Yes</td>
<td>Repair irrigation headgate; habitat improvement (3,100’)</td>
</tr>
<tr>
<td>Lamperts</td>
<td>3.6</td>
<td>Yes</td>
<td>Fish passage</td>
<td>Yes</td>
<td>Channel reconstruction (19,000’)</td>
</tr>
</tbody>
</table>
2.0 Summary Report of Lost Creek Watershed Restoration Project

The following section includes a summary of all work completed and all work that remains incomplete for each task of the Lost Creek Watershed Restoration Project. These task summaries include all work accomplished between April 2001 and June 2005. **As of June 30, 2005, the Lost Creek Watershed Project is 90% complete.**

**Goal I:** Restore Lost Creek’s water quality, aquatic habitat and riparian conditions to a natural, self-maintaining channel (state) and complete a TMDL for sediment and nutrients. The restored watershed will support resident salmonids, enhance recruitment to the Clark Fork River, establish a healthy riparian corridor for fish and wildlife attributes, and provide the public with a usable, healthy stream while maintaining the valley’s ranching tradition in the 27-mile reach from the National Forest boundary to the creek’s confluence with the Clark Fork River.

**Objective I:** MFWP will provide technical assistance to EPA and ARCO on the Lost Creek upland and riparian remediation to control sediment inputs on the upper 5.5 miles of the project’s stream reach (NO financial assistance will be provided for this objective);

**Task 1:** Coordinate efforts, technical assistance and data to reduce sediment inputs through sediment catch basin development and upland and riparian revegetation.

**Product:** Upland revegetation, soil stabilization, and sediment catch basins.

**Description of work completed:** MFWP reviewed and commented on EPA and ARCO remedial designs for the Lost Creek area. ARCO is working on soil amendments and revegetation plans for the uplands on the Ueland Ranch. Soil amendments included adding organic material, lime and topsoil through various tilling procedures. Native plant seed or agricultural seed mixes were selected for revegetation. Catch basins (storm water runoff basins) were designed to handle 50-year events and are being vegetated. Implementation is still in-progress.

As of June 2005, this task is 30% complete.

**Task 2:** Provide technical input into plans for riparian vegetation and management.

**Product:** Riparian revegetation.

**Description of work completed:** MFWP provided input to EPA and ARCO on the Lost Creek, Warm Springs Creek, and Dutchman Creek riparian remedial and restoration designs. The airborne arsenic contamination (smelter emissions) is most prominent in the upper 2” of soil but covers an extensive area. Mass removal was not deemed feasible given the area of treatment and disturbance to well vegetated wetlands and riparian areas. The Dutchman Wetland contamination issues will be addressed using institutional controls to restrict access, development and grazing management. Operation and maintenance will be required for the institutional controls.

As of June 2005, this task is 40% complete.
Objective II: Develop a riparian management plan and remove a partial fish passage barrier on the Derzay Ranch to reduce basin fragmentation and sediment inputs.

Task 1: MFWP will replace existing culverts with a clear span bridge.
   **Product:** Bridge.

**Description of work complete:**
The partial fish passage barriers (culverts) were replaced with a clear-span bridge. MFWP supplied bridge beams and decking and the landowner installed the bridge. The bridge was constructed using 4 steel I-beams with a 14’ wide, 3” thick decking. The bridge span is sufficient to allow for a 50-year event and does not disrupt bankfull discharge flows. Removal of the culverts eliminated the partial fish passage barrier and regrading the approaches reduced sediment inputs from the road.

As of June 2005, this task is 100% complete.

Task 2: MWFP and landowner will implement a riparian management plan to protect riparian vegetation.
   **Product:** 7,920 ft. Fencing.

**Description of work complete:**
The landowner decided not to graze the property, and therefore no riparian fencing was installed.

As of June 2005, this task is 100% complete.
Objective III: Eliminate fish passage issues, relocate a concentrated livestock feeding area, implement a riparian management plan and improve stream conditions for 6.1 miles of Lost Creek on the Ueland Ranch to reduce sediment and nutrient inputs, promote woody riparian vegetation and provide a naturally stable channel.

Task 1: MFWP and the landowner will replace two headgate structures and two stream crossings with fish friendly structures.
Product: New headgates with fish ladders and two bridge crossings.

Description of work complete:
Two diversion structures on the Ueland Ranch served as fish passage barriers. The upstream diversion was located approximately 1 mile downstream of the Galen Road. The downstream diversion is the Dutchman dike.

MFWP and the landowner replaced the upper headgate / stream crossing structure with a fish friendly structure. The old culvert headgate system was a complete fish passage barrier and eliminated upstream passage. The culvert headgate system was entirely removed and replaced with a clear-span bridge, which incorporated the headgate. MFWP supplied the materials for the bridge. Bridge beams and decking were provided to the landowner and MFWP and the landowner cost shared bridge installation. The bridge is constructed of 8 steel I-beams with a 16’ wide, 4” thick decking. The bridge span is sufficient to allow for a 50-year event and does not disrupt bankfull discharge flows. The headgate check structure was designed to be lowered during high flows to pass debris. A Denil style fish ladder now provides access to upstream reaches. The fish ladder was installed to be operational at all flows during the irrigation season.

The lower diversion structure on the Ueland Ranch is the Dutchman Diversion (Figure 1). This diversion creates a total fish passage barrier even when not in use. Check boards are placed across a large pipe (shown on the right of Figure 1) and flows are regulated with a headgate control device (shown on the left of Figure 1).

Figure 1. Dutchman diversion fish passage barrier.
Funding was secured for fish ladders (Denil-style) to be installed on the Ueland Ranch at the Dutchman diversion, but construction was delayed due to pending land transfers and potential changes in headgate operation and Lost Creek instream flows. The original design was modified after land transfers were tentatively agreed upon. The new design includes a series of step pools constructed around the Dutchman Dike to provide fish passage at all flows during the year (Figure 2). MFWP met with landowners to ensure the objectives of the structure met both fish passage and irrigation withdrawal. The Dutchman Creek fish passage design was completed and implementation is still pending. Construction should not begin until all property transfers and instream flow water rights have been completed.

**Figure 2.** Aerial photo of the Dutchman diversion on Lost Creek showing existing headgate control structure and proposed location of step pools to provide fish passage.

**Description of work not completed:**
Fish passage was not completed at this site because the step pools have not been constructed. It is important to note, once constructed, this system will need careful management to ensure adequate flows down the irrigation ditch, step pools, and Lost Creek during various flows. The design elevation of the step pools provides fish passage at both high and low flows; however MFWP will need to establish a management plan for the screw gates at the entrance to the irrigation ditch and the dike outlet to ensure the success of this system.

As of June 2005, this task is 80% complete.
Task 2: MFWP and the landowner are reconstructing the corral facilities and pastures away from Lost Creek, providing off-site water (installing wells, power and watering tanks), berming corrals to reduce nutrient runoff and developing a management plan for livestock manure removal over a two-year period.

Product: Cattle feeding corrals, power, 5 livestock wells, 21 watering tanks, 5,500 ft. of water lines, barns and other facilities to relocate 2,500 head off the creek.

Description of work completed:
MFWP and the landowner reconstructed the corral facilities away from the active channel to reduce sediment and nutrient inputs to Lost Creek. MFWP installed 5 wells and the landowner two (wells 40’- 65’ deep with >20 gpm and wells 55’- 75’ deep with >18 gpm, respectively), brought in power to each well and installed pumps (0.75 hp). A sixth MFWP well was drilled and a solar powered pump was installed (NCAT cost share). The cost to bring power to the sixth well location (0.8 miles, >$15,000) made solar power a more cost-effective option. Twenty-four, 1000-gallon water tanks were installed. Each tank is constructed of concrete and fitted with an automatic drain level and a frost-free spigot. The tanks were placed 6” below ground level on compacted gravel pads. PVC pipe (2” mainlines and 1” secondary lines) were buried 6-feet deep, bedded in ARCO-supplied, black smelter slag and top marked with 1-foot deep caution marking tape. Shut-off valves were installed on each water supply line near the well for emergency shut off. Although this system has removed most pressure from the riparian area, periodic line failures disrupted the system. The lines should have been blown clean prior to fitting of the spigots. Also the lines were bedded in 8”-12” of slag and that should have been increased to a thickness of at least 18”.

Description of work not completed:
Two bunks of wood fence posts and 19 rolls of barbed wire were delivered to MFWP’s Warm Springs Wildlife Management Area. The materials will be stored at this location until the fence locations are decided upon. This area is part of a land acquisition associated with NRDP, EPA (Superfund), ARCO and MFWP. Until boundaries are surveyed and recorded and the transaction is complete, the fence should not be installed.

As of June 2005, 98% of this task has been completed.

Task 3: MFWP and the landowner will install riparian fencing for grazing exclosures, design and install fencing for riparian pastures and develop off-site water and water gaps.

Product: 30,170 ft. fencing to protect 6.1 miles of stream, and develop riparian pastures and exclosures, plus 6 watering facilities.

Description of work completed:
MFWP has purchased the fencing materials necessary to complete this task (wood and steel posts, barbed and smooth wire, brace rails and gates). The materials were delivered to MFWP’s Warm Springs Wildlife Management Area. The materials will be stored at this location until the fence locations are decided upon. This area is part of a land acquisition associated with NRDP, EPA (Superfund), ARCO and MFWP. Until boundaries are surveyed and recorded and the transaction is complete, the fence should not be installed.
**Description of work not completed:** MFWP has not installed the fence and this task will not be completed until boundaries are surveyed and recorded and the transaction is complete. It is MFWP’s responsibility to install the fencing.

As of June 2005, 50% of this task has been completed.

**Task 4:** MFWP will reconstruct and stabilize channel in regions with unnatural lateral migration and install habitat improvement structures and vegetation after other infrastructure is complete.  
**Product:** 22,104 ft. of stabilized stream channel.

**Description of work completed:**  
Due to the length of channel targeted for restoration on the Ueland Ranch, this task was split into an upper and lower reach. These reaches will be referred to as “Ueland Upper” and “Ueland Lower” for the purposes of this report.

**Ueland Upper Reach**  
This portion of the project included restoring a 2,400 foot reach of Lost Creek which exhibited channel incision, severe bank erosion, channelization and poor riparian vegetation. MFWP developed conceptual and final designs for this reach of Lost Creek. The project included relocating 980 feet of the creek to a newly constructed channel. The newly constructed channel provided increased sinuosity, improved fish habitat, improved bank stability and allowed Lost Creek access to its floodplain. The floodplain elevation was lowered 0.5 – 2.0’ to provide the creek access to its floodplain in reaches where the channel was severely incised. Eroding banks were resloped to a 3:1 ratio and revegetated using transplanted sod mats from the project site.

In reaches of the creek abandoned due to channel relocation, a series of shallow wetlands were established using plugs from material excavated out of the new channel (Figure 3). Five new wetlands were constructed with depths not exceeding 3 feet. The wetland edges were revegetated using floodplain sods and willow transplants. These wetlands are excellent for waterfowl production and amphibian habitat.
Fish habitat improvement included the placement of 27 rock and wood habitat structures, pool construction and regrading, and overhead cover placed throughout the project reach. These structures included root wads, logs positioned parallel to the channel and log barbs to establish overhanging cover and habitat complexity (Figure 4). Pool construction and regrading provided additional pool tail-out areas for salmonid spawning.
Revegetation included transplanting approximately 40 mature willows and alders adjacent to the restored channel to promote bank stabilizing root mass and additional shade. An additional 10,000 willows were sprigged throughout the project reach. All willows were harvested locally during dormancy along the Clark Fork River and Lost Creek. The unit cost of the channel restoration project on the Ueland Upper reach was $25/foot.

**Ueland Lower Reach**

The lower portion of the Ueland channel restoration included the reach of Lost Creek between the Dutchman dike and the Ueland/Heggelund property boundary. Survey results of the 22,600 foot project reach indicated this reach had 5,015 feet of eroding banks, 3,280 feet of channelized stream, and abundant areas with little woody vegetation primarily due to overgrazing.

Restoration plans and cost estimates were developed for this reach to prioritize construction needs. The final design included relocating three channelized reaches of Lost Creek to its historic location to increase channel length for channel stability and fish habitat, reslope and vegetate eroding banks to reduce sediment inputs, and enhance fish habitat by increasing pool complexity and exposing additional spawning gravels.

The channel was relocated to its historic location from an abandoned ditch, which captured the majority of Lost Creek’s flow (Figure 5). The channel capacity of the dewatered reach of Lost Creek between the diversion structure and the ditch return was enlarged to convey the entire flow of the creek. The material excavated to enlarge the channel was not sufficient to fill the entire ditch, and therefore two shallow wetlands were constructed near the relocation reach. These groundwater fed wetlands created excellent habitat for waterfowl and amphibians. Another relocation in a channelized reach increased the channel length from 850 to 2,700 feet, adding and additional 28 pools to a formerly channelized riffle (Figure 6). Three channel relocations increased the total channel length in the Ueland Lower project reach by 2,500 feet and created another 45 pools. Prior to filling the old stream channels, fish salvage operations were performed, and all fish captured were transferred to the new channel.
Figure 5. Channel relocation #1 in the Ueland Lower reach of Lost Creek.

Figure 6. Channel relocation #3 in the Ueland Lower reach of Lost Creek.
A different restoration technique was utilized in this reach of Lost Creek, which focused on using materials native to the stream channel and relied on heavy revegetation of newly constructed and existing unstable banks. No hard habitat features were constructed using large boulders or logs such as was used in the Ueland upper project reach. Fish habitat improvements focused on constructing undercut banks, increasing pool density, transplanting mature vegetation for overhanging cover and increasing the availability of spawning gravels in pool tails. The restoration design incorporated a reference reach approach to develop a range of appropriate pool and riffle widths, depths, lengths and slopes. Eroding banks were resloped to a 3:1 ratio and covered with dense sod mats and mature willows. Sod mats were densely vegetated with sedge and rush species. Approximately 850 small willow clumps were transplanted to the stream banks (younger rooted willows 1-2’ high). Some well-established willows over 15’ tall were also transplanted. In addition to these transplants, an additional 37,000 willow sprigs were planted on the outside bends of unstable meanders. Several Montana Conservation Corps (MCC) crews participated in this massive willow harvesting and sprigging effort. Figure 7 and Figure 8 show examples of the relocated channel in the Ueland Lower reach with riparian vegetation transplants, natural sinuosity patterns and pool enhancement. The Ueland Lower project was completed at a cost of $10/foot.

As of June 2005, 100% of this task has been completed.
**Task 5:** Dutchman Creek - MFWP and the landowner will install riparian fencing for grazing exclosures, design and install fencing for riparian pastures, develop off-site water and water gaps.

**Product:** 19,500 ft. fencing to protect 3.7 miles of stream, and develop riparian pastures and exclosures, plus 4 watering facilities.

**Description of work complete:**
MFWP has purchased the fencing materials necessary to complete this task (wood and steel posts, barbed and smooth wire, brace rails and gates). The materials were delivered to MFWP’s Warm Springs Wildlife Management Area. The materials will be stored at this location until the fence locations are decided upon. This area is part of a land acquisition associated with NRDP, EPA (Superfund), ARCO and MFWP. Until boundaries are surveyed and recorded and the transaction is complete, the fence should not be installed.

**Description of work not completed:** MFWP has not installed the fence and this task will not be completed until boundaries are surveyed and recorded and the transaction is complete. It is MFWP’s responsibility to install the fencing.

As of June 2005, 50% of this task has been completed.
Task 6: Dutchman Creek - MFWP will reconstruct and stabilize channel in regions with unnatural lateral migration, install habitat improvement structures, improve vegetation, reclaim 2 wetland areas and construct 1 wetland.  
Product: 9,300 ft. of stabilized stream channel, 2 reclaimed wetlands and 1 constructed wetland.

Description of work complete:
Surveys of Dutchman Creek in 2003 indicated the majority of banks were healing naturally after the landowner removed cattle from this portion of the ranch. Riparian vegetation including willows and sedges were rejuvenating along banks that had previously been denuded by livestock. The riparian fencing in Task 9 will protect this reach from livestock in the future. As a result, a portion funds for this task were allocated to Task 8 to enhance the channel restoration work on the Ueland Lower portion of Lost Creek. MFWP planted 6,500 willow sprigs on the outside bends of unstable meanders in the lower portion of Dutchman Creek. Several MCC crews participated in harvesting these willows.

As of June 2005, 100% of this task has been completed.
**Objective IV:** Develop conservation and grazing management strategy for 6.5 stream miles of Lost Creek on the Heggelund Ranch to reduce sediment and nutrient inputs, increase the regeneration of woody riparian species and restore the area’s wetland hydrology.

**Task 1:** MWFP will support and provide technical assistance NRCS’s Wetland Reserve Program’s establishment of a 30-year conservation easement on 609 acres of riparian and wetland habitat. The conservation easement will cover the entire riparian corridor on the Heggelund Ranch.

**Product:** Landowner compensation (WRP) for 609 ac. On 30 year conservation easement and over 4 miles of fencing to protect 6.5 miles of stream from grazing impact.

**Description of work completed:**
The NRCS established a 30-year Wetland Reserve Program conservation easement on 609 acres of riparian and wetland habitat on the Heggelund Ranch riparian corridor in the fall of 2002. The conservation easement excludes livestock use until the riparian and wetland areas have recovered. NRCS will control all management within the easement area for the duration of the contract (30 years).

As of June 2005, 100% of this task has been completed.

**Task 2:** MWFP will support NRCS on wetland reclamation and filling of the wetland drainage ditches.

**Product:** 2 restored wetlands inside conservation easement.

**Description of work completed:**
The NRCS and MFWP worked with the landowner on a wetland restoration plan. The plan addresses drained and overgrazed wetlands and included filling some ditches to direct runoff and wetland restoration and revegetation. NRCS will control all management within the easement area for the duration of the contract (30 years). The landowner is not grazing the wetland/riparian area at this time.

As of June 2005, 100% of this task has been completed.

**Task 3:** MWFP will restore channel conditions to establish a naturally stable channel with a proper width/depth ratio.

**Product:** 2.6 miles of restored channel.

**Description of work completed:**
MFWP utilized several techniques to restore bank stability and proper width/depth ratios throughout the Heggelund reach of Lost Creek. These techniques included placing several hundred trees in over-wide portions of the channel, placing straw bales wrapped in coir fabric to protect eroding banks, and installing coir logs at severely undercut banks to discourage
further erosion. These techniques were all performed using hand labor; no mechanized equipment was utilized other than vehicles to transport materials. MFWP used several technicians and MCC crews to complete the channel restoration project on the Heggelund Ranch. No mechanized equipment was used to reduce width/depth ratios, stabilize eroding banks or revegetate the channel.

**Placing trees in channel**

MFWP secured tree harvest permits from Beaverhead Deerlodge National Forest to collect several hundred trees ranging from 6-20’ high. All trees were transported via a flatbed truck and were washed prior to bringing them to the project site. The trees staked in over-wide reaches of the channel (Figure 9). Additional trees were placed strategically to encourage point bar deposition and increase sinuosity in straight reaches. All trees were secured in place by tying them to 2x4 stakes with coir twine. The 2x4 stakes were driven into the streambed with sledgehammers to prevent their transport downstream. This technique was very successful in trapping fine sediments and creating a narrower, deeper channel adjacent to the revetments. During the second and third years of revetment construction, MFWP used 1,500 Christmas trees donated by EcoCompost, a Missoula composting company, and the City of Missoula. This reduced the time required to harvest and transport trees from National Forest lands. A total of 2,500 trees were placed in the stream channel over a period of three years. A sediment transport and deposition study is underway to evaluate the effectiveness of these tree revetments.

Figure 9. Narrowed width/depth using tree revetments at over-wide reaches.
**Coir-wrapped straw bales**

MFWP staked straw bales wrapped in coir fabric adjacent to unstable banks to reduce erosion, at over-wide reaches, and at places where the flow split due to very high width/depth ratios (Figure 10). Over 100 straw bales were placed in this reach of Lost Creek. This technique was somewhat effective in reducing width/depth ratios; however spring flows tore out some of the bales, transporting them downstream. The time to wrap and install the straw bales was excessive, and therefore this technique was not used after the first year. It was abandoned in favor of additional tree revetments.

![Image of staked straw bales](image)

**Figure 10. Staked straw bales at a reach of Lost Creek on the Heggeland Ranch. These bales caused all of the flow in Lost Creek to the left channel rather than allowing a very shallow split flow.**

**Coir Logs**

MFWP installed coir bio-logs at several severely undercut and eroding bank areas to reduce additional bank failure and sediment inputs. Coir logs were 12” and 16” in diameter and 10’ long and had a 5-year life expectancy. Each coir log was set in place using wooden stakes and rebar to prevent downstream transport. The bio-logs were first soaked in the channel to reduce floating and increase their flexibility. This enabled the logs to be bent to conform to the bank irregularities. In most locations, willows were sprigged behind the coir logs to establish additional bank stabilizing root mass while the bio-logs held the bank in place (Figure 11). A total of 320 bio-logs were installed, to protect approximately 1,600 feet of unstable banks. This technique proved effective in reducing bank erosion.
MFWP utilized several technicians to complete the channel restoration project on the Heggelund Ranch. No mechanized equipment was used to reduce width/depth ratios and stabilize eroding banks. This project was completed over four years at a cost of $12/foot. As of June 2005, 100% of this task has been completed.

**Task 4:** MWFP will work with NRCS on establishing woody vegetation and monitoring of the riparian corridor.

**Product:** 12,700 ft. of stream revegetated with woody vegetation.

**Description of work complete:**
In 2002, MFWP began revegetating the riparian corridor on the Heggelund Ranch by sprigging locally harvested willows. All willows were harvested during dormancy to improve survival rates. The willow-sprigging project commenced for three years using various techniques for harvesting and planting. Approximately 10,000 willows were sprigged in the first season using MFWP technicians and Trout Unlimited volunteers. These sprigs had a low survival rate (approximately 26%) due to a very hot, dry summer and a late planting time (July and August). Many of the willows probably did not have an adequate water supply and desiccated.
Also in 2002, 1,800 rooted tube plants (T-10, 10 cubic inch containerized plants) were planted along the riparian corridor with dipple bars and immediately watered. These plants were purchased from a local nursery and included woods rose (800 plants) and various native willow species (1,000 plants). These plants did not survive well due to the extremely dry summer of 2002. Their roots were likely not well developed and could not reach the groundwater table for much of the season. Numerous woods rose survived but are not achieving the growth rates the MFWP had hoped for.

The following season, an MCC crew was hired to plant all of the willows in May. MFWP collected the willow sprigs and they were stored in a cold storage/freezer unit until planting season. The willows were removed from storage and soaked in water at least 3 days prior to planting. Willow sprigs were set at least 18” in the ground to ensure that they will be in contact with the water table during summer months. Willow springs were trimmed to within 10” of the soil surface to promote better survival. Approximately 40,000 willow sprigs were harvested and planted by MFWP technicians and MCC crews. This series of sprigs showed a higher survival rate (approximately 72%) due to their ability to root during the wetter weather in the spring, higher summer flows and revised planting locations. Willows harvested later in the dormancy period (March and April) fared worse than those harvested earlier in the winter (January and February). Willows planted on the outside of meander bends and on straight reaches had a higher survival rate then those planted on the inside of meander bends. No survival was recorded on plants placed on point bars, possibly due to anaerobic soil conditions.

Another 50,000 willows were sprigged in a third and forth seasons, again during the spring to take advantage of the spring rains. These willows have shown good survival rates thus far (approximately 91% after 2 years). Over 150,000 willows were sprigged throughout the Heggelund Ranch, and they were primarily located on eroding banks and outside meanders. As all restoration techniques on the Heggelund property were accomplished by hand, no mature willows were transplanted along the banks.

Vegetation monitoring included tracking the survival rates of willows harvested in each year and noting the potential reasons for lower/higher survival rates for each planting season.

As of June 2005, 100% of this task has been completed.
Objective V: Restore the channel hydrology, wetland habitat and riparian community along 4.4 miles of Lost Creek on the Lord Ranch through grazing management, elimination of channelized reaches, channel stabilization and wetland reclamation which will improve water quality and aquatic and terrestrial habitat.

Task 1: MFWP will relocate Lost Creek in its original channel, create wetland habitat in the channelized reaches and repair the eroding stream banks on the Lord Ranch. 
**Product:** 2,920 ft. of restored channelized stream and 13,940 ft. stabilized channel.

Description of work completed:
MFWP retained the services of Confluence Consulting, Inc. to design and construct the channel restoration project on the Lord Ranch. The primary purpose of the project included reactivating a historic channel due to a 1,485-foot channelized reach (Figure 12), stabilizing 1,424 feet of eroding banks, improving habitat within the newly activated channel, and protecting railroad infrastructure.

Project construction began in December 2004. Fine sediment and encroaching wetland vegetation was excavated out of the historic channel to provide an adequately sized cross section to convey the entire flow of Lost Creek. The channel was excavated on average 0.5’ to the existing gravel layer. Flow was restored to the new channel to flush any remaining fine material. All material excavated from the historic channel was used to fill the deactivated channel. Over time, the channelized reach had enlarged due to lateral and vertical erosion; therefore the fill material available was not adequate to fill the entire deactivated reach. A series of four plugs were placed in the deactivated channel to allow the establishment of three shallow wetlands (Figure 13). These wetlands can be utilized for stock water and provide excellent waterfowl and amphibian habitat.
Habitat improvement included increasing pool density, constructing undercut banks, transplanting mature willows for shade and overhanging cover, and increasing available spawning gravels. Reactivating the historic channel created another 27 pools (Figure 14) and increased to total channel length on the Lord Ranch by 800 feet. The restoration design incorporated a reference reach approach to develop a range of appropriate pool and riffle widths, depths, lengths and slopes. Approximately 50 mature willows were transplanted to banks with poor riparian vegetation to establish stabilizing roots and cover. These willows included mature specimens over 15’ tall and younger, rooted willows 1-2’ tall.

This project also stabilized 1,424 feet of eroding banks. These unstable banks were resloped to a 3:1 ratio and heavily revegetated using dense sod mats and approximately 250 willow transplants gathered on-site. At two locations, additional mature willows were transplanted to discourage avulsion potential and resultant habitat loss. The restoration plan included planting an additional 2,000 willow sprigs; however warm temperatures in February and March of 2005 caused most willows to break buds earlier than expected. Willow sprigs have much lower survival rates when harvested post dormancy, therefore additional mature willows were transplanted on resloped banks to provide bank stabilizing root mass.

The reactivated reach of Lost Creek flows fairly close to a railroad grade near the downstream end of the Lord Ranch. A rock toe was installed on meanders of the creek near the railroad grade to discourage the creek from meandering closer to the railroad grade. In addition, a rock toe was installed at the upstream end of the reactivated reach to discourage flows from being captured by the deactivated channel. A grade control structure was placed at the downstream end of the project reach immediately upstream of the frontage road bridge. This grade control
structure is composed of 24” riprap rock and will protect the restored channel from any headcuts due to scour from the bridge infrastructure.

Figure 14. Newly excavated pool in reactivated reach of Lost Creek on the Lord Ranch.

All reclaimed areas on the Lord Ranch were harrowed and reseeded using a native upland/wetland seed mix approved by MFWP. Springs rains and warm temperatures have provided excellent seed germination conditions. Transplanted willows and sod clumps also benefited from the wet spring conditions. This channel restoration project was constructed at a unit cost of $11/foot.

As of June 2005, 100% of this task has been completed.

Task 2: MFWP and the landowner will install the riparian fencing and implement the riparian pasture grazing management system.
Product: 2.3 miles of jackleg and barbed wire riparian fencing.

Description of work completed:
MFWP retained the services of T & C Fencing to complete the fencing requirements for this task. The jackleg fence was constructed in April 2005 to protect the riparian corridor of Lost Creek on the Lord Ranch. Livestock access to the restored portion of Lost Creek is restricted and a water source is available via the constructed shallow wetlands as described in Task 1. As of June 2005, 100% of this task has been completed.

Task 3: MFWP will stabilize an eroding gully and revegetate to eliminate sediment input and reduce nutrient inputs to Lost Creek.
Product: Stabilized gully.
**Description of work complete:** MFWP worked with the landowner to address the eroding gully area. The runoff was redirected to avoid further erosion, and then the area was revegetated. The gully no longer inputs sediment into Lost Creek.

As of June 2005, 100% of this task has been completed.

**Objective VI:** Relocate 0.75 miles of Lost Creek in its original channel and stabilize the channel through headgate repair, grazing management and revegetation on the Mathews Ranch. The irrigation canal captures all of Lost Creek’s flow.

**Task 1:** MFWP will replace the headgate and return Lost Creek to its original channel after stabilizing and revegetating the old channel.

**Product:** New irrigation headgate, 0.75 miles of stabilized, re-watered natural channel.

**Description of work completed:**
In 2002, MFWP contracted with a consultant to produce a design for the restoration of Lost Creek on both the Matthews and Lampert Ranches. The design incorporated the replacement of a failed headgate structure, channel reactivation, revegetation, and habitat enhancement throughout the entire reach of Lost Creek on the Matthews property. During the design, the consultant discovered contaminated soils near the channel. The project was postponed to address these contamination issues.

Project construction commenced in 2005 after the soil issues had been addressed. The primary purpose of the project included reactivating Lost Creek’s historic flow downstream of a failed headgate structure. The channel migrated around the headgate structure and all of the flow was captured in a large irrigation and livestock-watering ditch. All of Lost Creek on the Matthews Ranch downstream of the headgate had excessive siltation and encroachment of wetland vegetation in the historic channel.

Prior to reactivating flows past the headgate to the historic channel, the majority of fine sediment and encroaching vegetation was removed and deposited on adjacent uplands. The channel was roughly excavated to an existing gravel layer, typically 1-2’ underneath the layer of silt deposited due to the channel being dewatered. Once the majority of silt was removed, the majority of flow was released into the channel to allow the remaining fine material to flush downstream.

The habitat enhancement portion of the project commenced after three days of flushing flows. Habitat enhancement included the creation of pool, run and riffle habitat, creating undercut banks, transplanting several willows to provide overhanging cover, and reshaping pool tails to encourage spawning. The restoration design incorporated a reference reach approach to develop a range of appropriate pool and riffle widths, depths, lengths and slopes. All willows were harvested on-site and included mature willows up to 15’ tall and smaller, rooted willows 1-2’ tall. For some pools, mature willows were pushed over the thalweg to provide additional
cover and shade for fish. Approximately 50 taller willows and 150 shorter, rooted willows were transplanted from an adjacent wetland to the stream bank to encourage bank stabilizing root mass.

All unstable banks were resloped to a 3:1 ratio and revegetated with mature willows and dense sod mats. Approximately 700 feet of banks on the Matthews property were previously unstable and contributing fine sediments to the stream channel. The majority of eroding banks occurred upstream of the ditch, where the full flows of Lost Creek remained in the channel.

The old headgate (Figure 15) had been abandoned and rusted shut. A new, 18” headgate was installed to provide stock water down the ditch while allowing the majority of water to pass the diversion and continue down the newly reactivated lower portion of Lost Creek.

![Figure 15. Old headgate on Matthews property shown after removal.](image)

A rock grade control structure was constructed at the upstream end of the Matthews project, immediately downstream of the Interstate 90 bridges. This grade control structure was built using 24” riprap and will protect four structures crossing Lost Creek including two interstate bridge, one railroad bridge, and a frontage road bridge.

All reclaimed areas on the Mathews Ranch were harrowed and reseeded using a native upland/wetland seed mix approved by MFWP. Springs rains and warm temperatures have provided excellent seed germination conditions. Transplanted willows and sod clumps also benefited from the wet spring conditions.

As of June 22, 2005, 100% of this task has been completed.
**Task 2:** MFWP will replace a stream channel crossing with a bridge.
*Product:* 1 bridge over Lost Creek.

**Description of work completed:**
Bridge beams were constructed by Rowe Excavation and delivered to the project site for placement. Once the channel restoration work was complete on the Matthews property, the bridge was completed. The landowners agreed to the location of the bridge just downstream from the replaced headgate near an existing access road. The new headgate also provides a new ditch crossing, therefore no land access was removed.

As of June 22, 2005, 100% of this task has been completed.

**Task 3:** MFWP and the landowner will construct the riparian fencing and implement the grazing management plan.
*Product:* 7,920 ft. of riparian jackleg fencing.

**Description of work complete:**
MFWP and the landowner agreed to a riparian fencing plan on both sides of Lost Creek to protect streambanks from livestock trampling, reducing sediment and nutrient inputs. The fence line was flagged for a contractor to develop a bid. MFWP Design and Construction Bureau received bids are deemed that the bids were excessively high due to time and materials constraints. None of the bids was accepted.

**Description of work not complete:** The fence has not been constructed to protect the habitat enhancement and bank stabilization work completed in Task 1. The consultant hired for Task 1 witnessed livestock on the north side of Lost Creek in June of 2005, which may reduce the success of restoration efforts on this property. MFWP will contract the fencing requirements for this task. The jackleg fence will be constructed to protect the riparian corridor of Lost Creek. The fence will be constructed using fully treated jacks and rails. MFWP Design and Construction Bureau has the exact locations and cost estimates

As of June 20% of this task has been completed.
**Objective VII:** Relocate 3.6 miles of Lost Creek in its original channel and stabilize the channel through grazing management and revegetation on the Lampert Ranch to increase fisheries habitat and improve water quality and quantity.

**Task 1:** MFWP will prepare the old Lost Creek channel for water by reconstruction, stabilization and revegetation.  
**Product:** 3.6 miles of restored and revegetated channel with habitat improvement structures installed.

**Description of Work Completed:**  
In 2002, MFWP contracted with a consultant to produce a design for the restoration of Lost Creek on both the Matthews and Lampert Ranches. The design incorporated channel reactivation, revegetation, and habitat enhancement throughout the entire reach of Lost Creek on the Lampert’s property. During the design, the consultant discovered contaminated soils near the channel. The project was postponed to address these contamination issues.

Contaminated soils (metal tailings – EPA sampling) were discovered on site, and MFWP, EPA and ARCO negotiated removal of these soils. The contaminated soils appeared to be fluvial deposits from a past Clark Fork River overbank flow. When addressed during Clark Fork River cleanup these soils will not jeopardize the Lost Creek Watershed Project on the Lampert property.

Construction of the stream channel commenced in March, 2005. The primary purpose of this project included reactivating the lower 3.6 miles of Lost Creek, revegetation, and stabilizing several poorly vegetated stream banks. A beaver dam caused the entire flow of Lost Creek to be captured in a large stock water ditch upstream of the Lampert property. The only water available in the lower portion of Lost Creek was due to groundwater seepage and periodic flooding from beaver activity upstream. The lower portion of Lost Creek remained dewatered, and the resulting channel filled with silt and wetland vegetation (Figure 16). Grazing impacts on this portion of the creek removed much of the riparian vegetation and bank stabilizing root mass on meander bends. Cattle access also caused hoof shear and excessive sedimentation and nutrient inputs at several locations.
Figure 16. Dewatered portion of Lost Creek on the Lampert property. Note excessive siltation and wetland vegetation encroachment in the channel.

The reactivation of this channel required removal of fine sediment accumulation throughout 6,670 feet of channel. All material removed from the channel was graded out across adjacent upland areas. Once fine sediment excavation was complete, the flow of Lost Creek was restored to the creek and allowed to flush for 3 days. In order to reduce sediment inputs to the new channel, several eroding banks were resloped. In all cases, banks were graded to a 3:1 slope and revegetated with dense sod mats. This technique was applied to approximately 1000’ of poorly vegetated and unstable banks on the Lampert property (Figure 17).
Habitat enhancement measures included excavating pools down to existing gravel, creating undercut banks, and transplanting several hundred willows for overhanging cover. All willows were transplanted on-site and included mature willows up to 15’ tall and smaller willows 1-2’ tall. In some locations, willows were transplanted to lean over the channel to provide shade and cover for fish. In addition to pool habitat, riffles were excavated to existing gravels and pool tails graded to provide spawning habitat.

The restoration plan included planting an additional 1500 willow sprigs; however warm temperatures in February and March of 2005 caused most willows to break buds earlier than expected. Willow sprigs have much lower survival rates when harvested post dormancy, therefore additional mature willows were transplanted on resloped banks to provide bank stabilizing root mass.

A cobble toe was placed along approximately 500’ of Lost Creek on the Lampert property in close proximity to exposed tailings. This toe was composed of rock approximately 6” in diameter, which is larger than most substrate naturally occurring in Lost Creek. This rock toe will prevent these meanders from migrating into tailings and eliminate the possibility of tailings being transported downstream. No tailings were discovered on, or immediately adjacent to, the stream channel.

All disturbed areas along the channel and graded material was reseeded using a native seed mixture approved by the landowner and MFWP. All areas were harrowed following seeding. The reseeding occurred in early May, taking advantage of spring rains to encourage first year growth. Springs rains and warm temperatures have provided excellent seed germination.
conditions. Transplanted willows and sod clumps also benefited from the wet spring conditions.

As of June 22, 2005, this task is 100% complete.

**Task 2:** MFWP and the landowner will develop a riparian pasture grazing management system and implement the system by installing riparian fencing.

**Product:** 15,900 ft. of repaired and new riparian fencing for 3 riparian pastures.

**Description of work completed:**
MFWP delivered most of the fencing materials to the landowner in April 2005. The landowner agreed to install the fencing material across an existing pasture to reduce livestock impacts on the riparian area. The landowner has developed a grazing management strategy for the riparian pastures. An electrical fence will be used to protect the newly constructed areas until the vegetation has become established.

**Description of work not complete:**
The fence has not been completed to protect the habitat enhancement and bank stabilization work completed in Task 1. The landowners have begun fencing and are planning on having it completed by the end of the summer. MFWP still needs to provide 15,000 feet of electrical fencing material with solar panels and batteries. Although the landowner agreed to weed control, it is MFWP responsibility to provide the chemicals for the weed control (spotted knapweed and white top). This weed control was in exchange for using their property to access the project site.

As of June 2005, 85% of this task has been completed by MFWP, although the fence has not been constructed by the landowner.

**Task 3:** MFWP will install a new bridge to access land cut off by restored channel.

**Product:** 1 bridge.

**Description of work completed:**
The landowner agreed to place two culverts across the stock water ditch rather than replace an existing ditch across Lost Creek. The culverts still need to be provided to the landowner (corrugated metal pipe, 20’ long and 48” diameter). The landowner will place the culverts. Bridge beams were delivered by Rowe Excavation to the project site for placement. All decking and runners have been delivered to site. Concrete footing blocks still need to be delivered by MFWP.

**Description of work not completed:**
The culverts have not been placed to protect the habitat enhancement and bank stabilization work completed in Task 1. MFWP still needs to provide the culverts, concrete footing blocks for the bridge and any additional beams that may be needed.

As of June 2005, MFWP has completed 68% of this task; however, the landowner has not constructed the bridge.
Objective VIII: Design, evaluate and monitor and alter (where necessary) the riparian management strategies to insure improved riparian conditions (aquatic and terrestrial), water quality, water quantity and increased fisheries and wildlife habitat.

Task 1: Aquatic parameters will be sampled to monitor fish population trends.
   Product: Fish population estimates, redd counts, whirling disease samples, sediment samples and stream stability estimates every two years.

Description of work completed:
MFWP was going to collect trout population counts at same locations on Lost Creek as the 1996 population samples. Unfortunately, situations arose that prohibited MFWP from collecting this data. First, MFWP needed approval from the Montana Department of Justice, Natural Resources Damage Program, prior to conducting fish population surveys to ensure that the activity did not interfere with the State of Montana v. ARCO lawsuit. MFWP did not receive written permission from NRDP, and therefore fish population estimates were not collected. Second, the biologist’s backpack electrofishing unit was stolen, and therefore electrofishing estimates were not repeated.

Fish population monitoring surveys were completed in conjunction with restoration efforts associated with channel relocations and fish salvage operations. Salvage operations were completed on the Ueland Lower and Lords restoration reaches. No rescue operations were needed on the Mathews’ or Lampert’s reaches because the reaches were never completely dewatered. Irrigation flows remained in the canal during and post construction.

MFWP monitored grazing operations, willow sprig and transplant survival and sod placement success where restoration activities occurred. The upper portion of the Ueland Ranch and the Matthews Ranch restoration projects are the only locations where livestock operations appeared to interfering with restoration efforts. The University of Montana and MFWP retained a graduate student from the University system collect pre-project data on Lost Creek (Harris, Jim 2000. Baseline condition, TMDL recommendations and potential benefits of restoration on Lost Creek. Masters Thesis, University of Montana, Missoula). These efforts should be repeated through another graduate study.

Bank stability, sediment transport and deposition, and restoration success is being studied. A study was designed and initiated to monitor these changes on restoration activities. Sediment input, deposition on point bars, channel morphology (cross-sections) and bank stability indices are being recorded. Data will be collected for one more year, and then the results will be analyzed and a report produced. The study will determine the effectiveness of the restoration efforts and provide insight to further actions and management directions.

A booth was constructed for the Tri-County Fair in Deer Lodge, MT. The booth displayed restoration work, and live trout were provided to attract children and educated adults about agencies efforts to restore fisheries on private lands in the Upper Clark Fork River Basin. The booth was very successful at informing the public of restoration efforts and generating support for local projects. The Tri-County Fair invited MFWP back a second year to display the booth, which was also a success.
Description of work not completed:
MFWP should complete fish population estimates in the summer of 2006 and 2008, repeating the 1996 sampling protocols. The instream flows water rights should be monitored, as well as their affects on the fish populations.

University of Montana and MFWP had a graduate student from the University system collect pre-project data on Lost Creek. These efforts should be repeated through another graduate study. The study should be conducted in 2007 and mimic Jim Harris’ efforts to determine channel and vegetation changes.

One more year of sediment data will be collected and analyzed to evaluate bank stability, sediment transport and deposition, and restoration success. This product will be completed by summer 2006.

As of June 2005, 60% of this task has been completed.

Task 2: Grazing management systems will be designed, monitored, evaluated and adjusted, as necessary, to promote the regeneration of woody vegetation and erosion control. Cultural resource evaluations will be conducted on all newly managed areas and reaches of channel construction.

Product: Cultural resource evaluations. Riparian vegetation, pebble counts, vegetation monitoring and streambank erosion surveys every year for three years.

Description of work completed:
Cultural resources evaluations were conducted on the entire Lost Creek project area. Secondary cultural resource evaluations were completed just prior to any construction activities. MFWP monitored grazing operations, willow sprig and transplant survival and sod placement success where restoration activities occurred. The upper portion of the Ueland channel restoration project is the only location where livestock operations appeared to interfering with restoration efforts. MFWP is in negotiations on purchase of a portion of the Ueland Ranch wetlands; therefore, livestock management plans in this reach have been postponed until these land acquisition negotiations are complete.

Riparian vegetation, pebble counts, vegetation monitoring and streambank erosion surveys were conducted with design reports. This information was used to prioritize restoration needs and for future monitoring of restoration activities.

Bank stability, sediment transport and deposition, and restoration success is being studied. A study was designed and initiated to monitor these changes on restoration activities. Sediment input, deposition on point bars, channel morphology (cross-sections) and bank stability indices are being recorded. Data will be collected for one more year, and then the results will be analyzed and a report produced. The study will determine the effectiveness of the restoration efforts and provide insight to further actions and management directions.
Description of work not completed:
University of Montana and MFWP had a graduate student from the University system collect pre-project data on Lost Creek. These efforts should be repeated through another graduate study. The study should be conducted in 2007 and mimic Jim Harris’ efforts to determine channel and vegetation changes.

One more year of sediment data will be collected and analyzed to evaluate bank stability, sediment transport and deposition, and restoration success. This product will be completed by summer 2006.

As of June 2005, 60% of this task has been completed.

Task 3: The Tri-State Council will sample and analyze before/after water quality to document control of nutrient inputs to Lost Creek.
Product: Monthly water quality samples (nutrients and metals) for two years (starting in second year—prior conditions data already exists), 24 water quality samples.

Description of work completed:
The Tri-State Council has designed a water quality monitoring study on Lost Creek to assess nutrient factors associated with the Anaconda sewage system, groundwater input, irrigation withdraws and restoration success. University of Montana and MFWP had a graduate student from the University system collect pre-project data on Lost Creek. These data and the pre-project water quality data should be compared to the data Tri-State data to monitor changes. This task has been implemented and will be completed FY05.

Description of work not completed:
Tri-State Council is collecting water quality monitoring data to assess nutrient factors in Lost Creek. This task has been implemented and will be completed FY05. The Tri-State Council will produce and deliver the final water quality report to DEQ and MFWP. The Tri-State Council has been paid for this task.

As of June 2005, 80% of this task has been completed.
**Task 4:** The Tri-State Council will develop and complete a Total Maximum Daily Load (nutrients and sediment) plan for Lost Creek.

**Product:** A nutrient and sediment TMDL submitted to the State and EPA for approval.

**Description of work completed:**
MFWP has offered data on Lost Creek fish populations, vegetation, surveys and water quality samples to the Tri-State council for TMDL development.

**Description of work not complete:**
The TMDL is not complete, and Tri-State Council will need to be contacted concerning this task. During earlier discussions with DEQ, it was determined that a TMDL most likely could not be produced for this basin with the data being collected.

As of June 2005, 10% of this task has been completed.
**INVOICE**

**Billed to:**

Name: Kathy Coleman  
Address: NRDP - Justice  
City: 

**Date:** 7/26/2010  
**Project:** 32017  
**please reference proj #**

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$2,226.33

**TOTAL** $2,226.33

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*Sandy Crawford, Accountant*

**NOTE:** This bill was held pending Submittal of Final report by FDP and FDP approval. Final report required several revisions.

Received 5-18-11

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Please make checks payable to:  
Montana Fish, Wildlife & Parks  
Attn: Sandy Crawford  
Tax ID # 81-0302402
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### Part C: Current Month Detail Expense Transactions

- **Account**: 62771
  - **Description**: 02/02/2010 0009619 0009619
  - **Amount**: 21,000.00
  - **Vendor Name**: STOTT CONSTRUCTION CORPORATION

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## INVOICE

**Billed to:**
- Name: NRDP  
  Dept of Justice  
- Address:  
- City:  

**Date:** 7/29/2008  
**Project:** 32017  
please reference proj #

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$21,898.82

**TOTAL** $21,898.82

**Sandy Crawford, Accountant**

Please make checks payable to:  
Montana Fish, Wildlife & Parks  
Attn: Sandy Crawford  
Tax ID # 81-0302402

RECEIVED  
MAR 09 2010  
NATURAL RESOURCE  
DAMAGE PROGRAM

\[FOR: This bill was held pending submittal of final rep, revisions w/it, and approval by NRDP.\]  
\[CAB# 5-13-11\]
Estimates of match for work done on the Lost Creek Project from 2006 and after.

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Estimates of match for work done on the Lost Creek Project from 2006 and after.

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