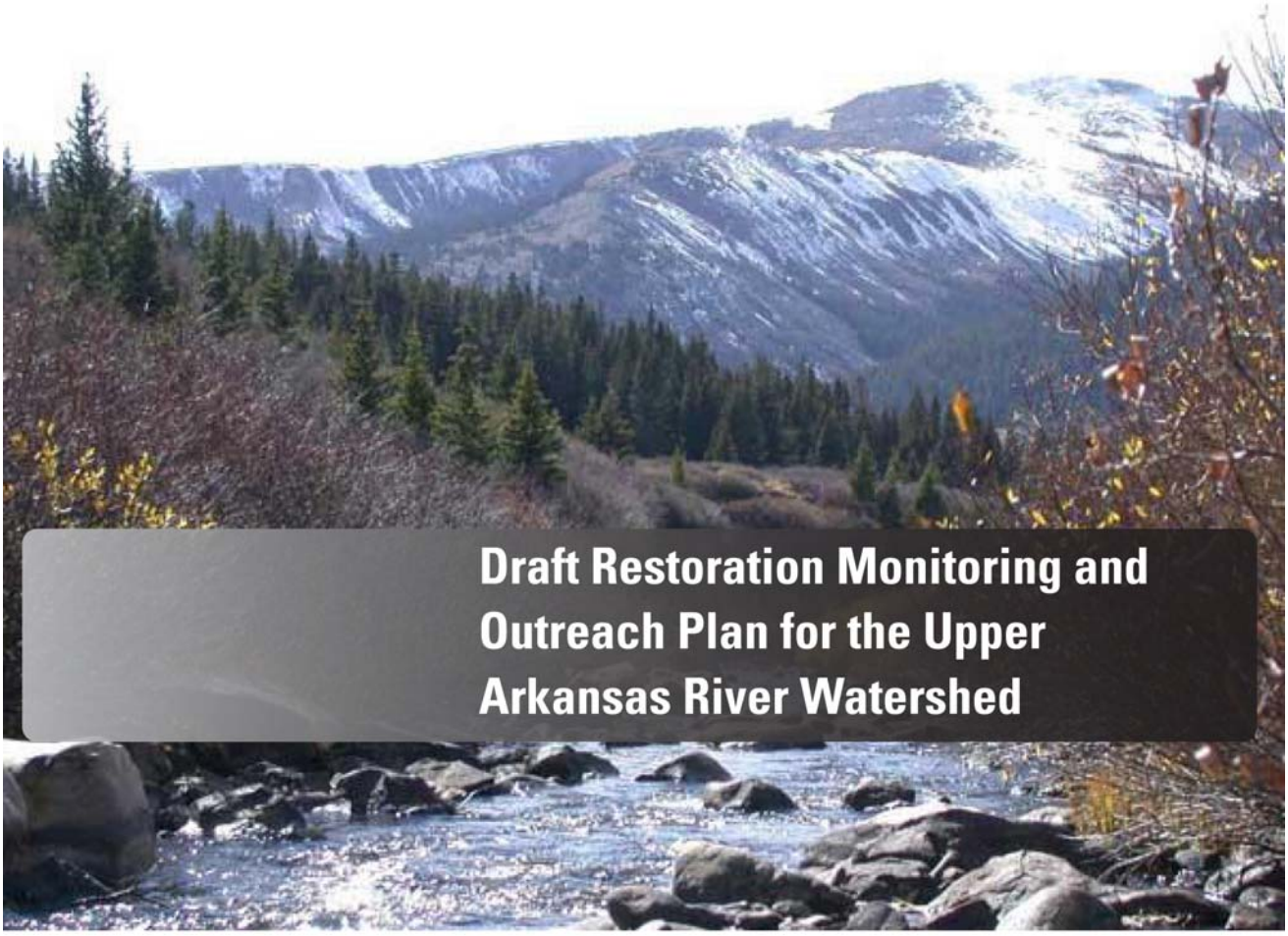

Draft Restoration Monitoring and Outreach Plan for the Upper Arkansas River Watershed

PREPARED FOR

State of Colorado
Department of Natural Resources
Department of Public Health and Environment
Department of Law

U.S. Department of the Interior
U.S. Fish and Wildlife Service
U.S. Bureau of Land Management
U.S. Bureau of Reclamation

PREPARED BY

Stratus Consulting Inc.
PO Box 4059
Boulder, CO 80306-4059
303-381-8000
Contact: Diana R. Lane, PhD
or Allison Ebbets, MS

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April 23, 2010
SC11970

List of Authorities and Responsible Agency Point of Contact

Natural Resource Trustees

- U.S. Department of the Interior
  - U.S. Fish and Wildlife Service
  - U.S. Bureau of Land Management
  - U.S. Bureau of Reclamation
- State of Colorado
  - Department of Natural Resources
  - Department of Public Health and Environment
  - Department of Law

Legal Authority

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (as amended), 42 U.S.C. § 9601, et. seq.
- Federal Water Pollution Control Act (Clean Water Act) (as amended), 33 U.S.C. § 1251, et. seq.
- Natural Resource Damage Assessment Regulation, 43 C.F.R. Part 11

Lead Federal Agency for Restoration Plan

- U.S. Department of the Interior (Region 6, U.S. Fish and Wildlife Service)

Lead Federal Agency for Environmental Assessment

- U.S. Department of the Interior (Region 6, U.S. Fish and Wildlife Service)

Participating State Agencies

- Colorado Department of Natural Resources
  - Division of Wildlife, Division of Reclamation Mining and Safety
- Colorado Department of Public Health and Environment
- Colorado Department of Law

Point of Contact

Laura Archuleta
U.S. Fish and Wildlife Service, Saguache Field Office
46525 Highway 114, Saguache, CO 81149; 719-655-6121

Contents

Exhibits

Acronyms and Abbreviations

AHRA	Arkansas Headwaters Recreation Area
BACI	Before-After-Control-Impact
BLM	U.S. Bureau of Land Management
BOR	Bureau of Reclamation
CDOW	Colorado Division of Wildlife
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CMC	Colorado Mountain College
CSU	Colorado State University
EA	Environmental Assessment
EDRR	Early Detection Rapid Response
EE/CA	Engineering Evaluation and Cost Analysis
EIS	Environmental Impact Statement
GPS	global positioning system
LCCD	Lake County Conservation District
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NRDA	Natural Resource Damage Assessment
O&M	Operations and Maintenance
RP	Restoration Plan
Trustees	U.S. Department of the Interior represented by the U.S. Fish and Wildlife Service, the U.S. Bureau of Land Management and the Bureau of Reclamation; and the State of Colorado, represented by the Colorado Department of Natural Resources, Colorado Department of Public Health and Environment, and Colorado Department of Law
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1. Introduction

This Draft Restoration Monitoring and Outreach Plan for the Upper Arkansas River Watershed presents proposed monitoring actions and outreach activities associated with the restoration projects described in the Restoration Plan/Environmental Assessment (RP/EA) for the Upper Arkansas River Watershed (Stratus Consulting, 2010). This Draft Restoration Monitoring and Outreach Plan is being released for public review and comment. It provides information to the public regarding the type of monitoring that will occur for the restoration projects proposed in the RP/EA, the frequency of monitoring actions, and how the Trustee agencies[1] will use this monitoring information to evaluate restoration success and engage in corrective actions ("adaptive management") if projects are not meeting benchmarks for success.

The Draft Restoration Monitoring and Outreach Plan should be reviewed together with the RP/EA, which provides additional descriptions and information about the proposed restoration projects. These two documents were developed as part of the process for compensating the public for harm to natural resources resulting from releases of hazardous substances from the California Gulch Superfund Site. Restoration projects provide compensation through actions that restore, replace, or acquire the equivalent of lost resources. Restoration projects or actions are designed to bring about specific resource improvements as the compensation to the public, such as increased Arkansas River fish populations. Effective monitoring of restoration projects is necessary to ensure that this compensation results from the project, to help document project success, and to enable the Trustees to identify and correct problems with the projects in achieving their goals.

As described in the RP/EA, the funding to implement and monitor restoration projects has been obtained under the Natural Resource Damage Assessment (NRDA) provisions of CERCLA. The funding comes specifically from (1) a settlement with Resurrection Mining Company[2] and Newmont USA Limited, which have agreed to pay $10.5 million to settle allegations that the companies injured natural resources (under the NRDA provisions of CERCLA) as a result of discharges of hazardous substances from historical mining operations at the California Gulch

1. The natural resource trustee agencies involved in developing this Monitoring Plan are the U.S. Department of the Interior represented by the U.S. Fish and Wildlife Service (USFWS), the U.S. Bureau of Land Management (BLM) and the Bureau of Reclamation (BOR); and the State of Colorado, represented by the Colorado Department of Natural Resources, the Colorado Department of Public Health and Environment, and the Colorado Department of Law (collectively, the "Trustees"). Authority to act on behalf of the public is given to trustees in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) [42 USC §§ 9601 et seq.] and the Clean Water Act [33 U.S.C. § 1251, et. seq.].

2. Resurrection Mining Company is wholly owned by Newmont USA Limited.

Superfund Site; and (2) a $10 million settlement plus interest from ASARCO LLC in bankruptcy proceedings. A Memorandum of Understanding (MOU) among the Trustees stipulates that natural resource damage funds received will be used to restore natural resources in the Upper Arkansas River Watershed, in accordance with federal law. Restoration actions that benefit the harmed resources may be conducted outside of the area directly impacted by the Superfund Site. The restoration projects described in the RP/EA and the monitoring actions described here will be funded, either in part or in whole, from the settlement funds received from these responsible parties. The Trustees also may issue a supplemental RP/EA in the future to fund additional restoration projects. Monitoring plans for any additional projects would be developed at that time.

1.1 Trustee Council Organization and Activities

As described in the RP/EA, a Trustee Council has been working on NRDA activities for this site since 1993. The Council operates according to an MOU that outlines how its members coordinate and cooperate in carrying out their respective responsibilities to restore, replace, or acquire the natural resources injured or potentially injured because of the release of hazardous substances from the California Gulch Superfund Site. The Council approves all actions by unanimous approval.

The Trustee Council is comprised of the heads of the Trustee agencies. These are the Regional Director of the USFWS, representing the BLM, BOR, and USFWS; the Colorado State Attorney General; the Director of the Colorado Department of Public Health and Environment; and the Director of the Colorado Department of Natural Resources. Staff members designated by their respective agencies carry out the Council's routine operations. Through its members acting on behalf of each Trustee, the Council is responsible for all aspects of the restoration process, including developing and selecting final projects, with public input, implementing or overseeing the implementation of those projects, and monitoring and evaluating project effectiveness. The Trustee Council will take an active role in reviewing monitoring reports, deciding on any need for corrective actions for projects, and communicating to the public the status of restoration project implementation and the benefits that have occurred from restoration.

1.2 Public Notification and Comment Period

The Trustees have chosen to provide notification of this Draft Restoration Monitoring and Outreach Plan to the public and any other federal, state, and local government agencies that may have an interest in the activities described in this document and in the RP/EA. The Trustees are to use whatever reasonable means will result in the interested public and other interested parties receiving notice and having ready opportunity to provide comments.

A notice of the availability of the Draft Restoration Monitoring and Outreach Plan will be published in the following local newspaper:

Leadville Herald Democrat
PO Box 980
Leadville, CO 80461
719-486-0641

Copies of the Draft Restoration Monitoring and Outreach Plan will be made available at the following locations:

Colorado Mountain College
Timberline Library
901 US Hwy 24 S
Leadville, CO 80461

Lake County Library
1115 Harrison Avenue
Leadville, CO 80461

An electronic version of the Draft Restoration Monitoring and Outreach Plan will be posted on the California Gulch NRDA website: http://www.fws.gov/mountain-prairie/nrda/LeadvilleColo/CaliforniaGulch.htm.

The public comment period will be 30 days. Written comments can be provided to Laura Archuleta of the USFWS (see "List of Authorities and Responsible Agency Point of Contact" at the front of this document for address and contact details). The due date for receipt of comments will be published in the notice of availability of the Draft Restoration Monitoring and Outreach Plan.

1.3 Responsible Party Involvement

The settling parties chose not to participate in restoration planning and implementation.

1.4 Administrative Record

The administrative record contains the official documents pertaining to the Site NRDA. The administrative record for the NRDA case is housed at the USFWS, Saguache Field Office, 46525 Highway 114, Saguache, CO 81149.

1.5 Document Organization

The remainder of the document is organized as follows. Section 2 describes the proposed monitoring actions associated with each proposed restoration project in the preferred alternative in the RP/EA. Section 3 describes reporting requirements and how the Trustees will use monitoring reports to make decisions about corrective actions for restoration projects and communicate with the public. References are provided at the end of the document. The appendix provides example outlines for an implementation report, an effectiveness monitoring report, and a restoration completion report.

2. Proposed Monitoring Actions

Monitoring is an essential element of any NRDA restoration program and provides the following benefits:

- Allows the Trustees to know whether the restoration projects have been implemented as planned or whether the projects have created the intended natural resource benefits.
- Allows the Trustees and the agencies or organizations that are implementing projects to know whether corrective actions might be needed.
- Allows the public to determine whether the Trustees have fulfilled their responsibilities to compensate the public for injuries to natural resources resulting from releases at the California Gulch Superfund Site.

The proposed monitoring actions described in this section will address all of these needs.

As described in Roni (2005), there are six basic types or categories of monitoring that can be conducted for restoration actions:

1. **Baseline monitoring** to characterize existing (pre-restoration) biological, chemical, or physical conditions that can be used either for restoration planning or for future comparisons
2. **Status monitoring** to characterize different biological, chemical, or physical conditions across a given area at a given time
3. **Trend monitoring** to determine how conditions are changing over time
4. **Implementation monitoring** to determine if a project was implemented as planned

5. **Effectiveness monitoring** to determine if a project has had the desired effects on habitat, physical processes, or watershed conditions

6. **Validation monitoring** to evaluate whether the measured effects on habitat, physical processes, or watershed conditions actually resulted from the restoration actions. Thus, validation monitoring evaluates whether the hypothesized logical relationship between the restoration action and the expected response was correct.

The proposed monitoring actions described in this Draft Restoration Monitoring and Outreach Plan focus primarily on baseline monitoring, implementation monitoring, effectiveness monitoring, and trend monitoring. Implementation monitoring will give the Trustees and the public the assurance that projects are proceeding on schedule and in accordance with plans, that restoration treatments are functioning correctly, or if not, that corrective actions are being taken to help projects get back on track. In essence, this type of monitoring focuses on the "operations and maintenance" of a project. Comparing results from the effectiveness monitoring (post-restoration) to results from the baseline monitoring (pre-restoration) will allow the Trustees to determine whether the desired restoration benefits have occurred. Collecting data for effectiveness monitoring over several years (i.e., trend monitoring) allows for the implementing agencies and the Trustees to evaluate the trajectory of ecological recovery from the restoration projects, and can be used to determine the timeframe for full ecological benefits to be realized.

Because of the intensive (and thus expensive) sampling efforts typically required for validation monitoring, this category of monitoring is proposed only for situations where a project is not meeting benchmarks and the reasons for the lack of success are not clear. The specific validation monitoring actions that would be undertaken would depend on the type of failure that a project is experiencing and the relevant hypotheses regarding how a restoration action is intended to result in a particular biological response. For example, if trout populations have not increased as expected after implementation of the in-stream habitat restoration project in the Arkansas River, then validation monitoring could involve more intensive studies evaluating the physical factors (e.g., flow velocities or sedimentation), chemical factors (e.g., nonpoint source heavy metals), or biological factors (e.g., parasites, disease) that may be limiting trout populations. Thus, validation monitoring actions would be developed as necessary at a future time and are not described in this Draft Restoration Monitoring and Outreach Plan.

Below, a draft monitoring framework is presented for each of the preferred restoration projects described in the RP/EA. The monitoring framework includes baseline monitoring, implementation monitoring, effectiveness monitoring during the first five years following implementation, and a proposed less intensive version of effectiveness monitoring during the second five years following implementation. After the first five years following implementation, the Trustees intend to revisit projects to evaluate longer-term success and determine whether further monitoring or adaptive management is needed. At that point, the activities and timeframe

for subsequent monitoring may be revised based on individual project needs and successes to date. For projects with significant construction components, the key implementation monitoring report will be submitted when the major components of the project have been finished. A suggested outline for this report is provided in the appendix. Additional implementation actions that occur after that point would be reported to the Trustees in a supplemental document.

Each project has unique goals and benchmarks for the different monitoring categories. In general, project proponents will have the primary responsibility for conducting monitoring for the first five years after project implementation. Project proponents and/or relevant landowners also have the responsibility to act in a manner that will protect the restoration improvements and to provide reasonable access for monitoring activities. The Trustees plan to issue restoration status reports with descriptions of the outcomes of this monitoring, as well as plans and assignments for additional monitoring beyond the first five years.

The remainder of this section provides monitoring frameworks for the individual restoration projects in the order that they were discussed in the RP/EA.

2.1 Arkansas River In-stream Habitat Restoration

Project overview: To restore injured aquatic and fishery resources, the Trustees will support in-stream habitat restoration on the 11-mile reach of the Arkansas River and the Lake Fork on both public and private lands. Specific actions will include, as appropriate: stabilize stream banks and promote diverse stream morphology; reduce erosion and downstream sedimentation; provide overhead cover for trout; and create diverse in-stream trout habitat including deep-water pools, riffles, and bars. In targeted areas, the work will also include improving riparian habitat. The objective of this work is to increase trout population density and biomass, and to improve body condition and fish health, in the 11-mile reach of the Arkansas River below the confluence of California Gulch and in the Lake Fork. A secondary goal is to improve age and size class structure by increasing spawning areas where possible and providing refuge for juvenile trout and other native fishes in the drainage. Reduced metals pollution from ongoing remedial actions in the watershed in combination with restoration of bank stability and riparian vegetation should also improve conditions for birds and other wildlife using these habitats. For this reason, tree swallow populations will be monitored for reproductive success due to the expected increase in diversity of prey base and improved habitat conditions along the stream banks.

Overview of monitoring steps: Exhibit 2 (at the end of this project section) presents the monitoring framework for this project. Baseline measurements have been collected over the past several years and have been used to inform the design of the specific in-stream restoration plans; these data will be compiled into a baseline monitoring report. The project partners will document the condition of biota (e.g., fish population surveys and benthic invertebrate community

composition) and document baseline habitat conditions (stream morphology surveys and water quality measures). During baseline monitoring, permanent photographic points will be established in areas that will receive intensive habitat treatments and these will be used to qualitatively track habitat improvements associated with the treatments.

For implementation monitoring, two of the agencies involved with implementation [Colorado Division of Wildlife (CDOW), and the Lake County Conservation District (LCCD)] will conduct monitoring surveys on publicly-owned and privately-owned lands, respectively, to inspect the habitat structures, fencing, and riparian vegetation installed during restoration and to ensure that they are performing as expected. Photographs will be taken from the established permanent photographic points every other year.

For effectiveness monitoring, CDOW and USFWS, in cooperation with Colorado State University, Colorado Mountain College, and the U.S. Geological Survey (USGS), will monitor biota including fish populations, benthic invertebrate populations, tree swallow populations, and riparian vegetation. The fish and benthic invertebrate communities monitoring is designed as a replicated Before-After-Control-Impact (BACI) study, allowing the project partners to evaluate changes in the restored river reaches relative to reference reaches before and after work is completed (e.g., Baldigo and Warren, 2008). Work that occurs in other areas (e.g., the Lake Fork) will be monitored in conjunction with monitoring in the 11-mile reach, though some parameters such as tree swallow populations will not be evaluated outside of the 11-mile reach. Biological monitoring will continue for at least 10 years after restoration actions are completed. CDOW will use established and reliable monitoring techniques and the BACI monitoring design to help answer the following questions:

- By year 3 (after implementation), are at least 90% of the habitat improvement structures (e.g., boulders, constructed stream and stream bank structures, fencing, planted vegetation) stable and functional?
- By year 3, has riparian vegetation cover become successfully established and increased by at least 10% over baseline in fenced or replanted areas?
- By year 5, have relevant fish population, fish health, and benthic invertebrate metrics in restored areas improved by a minimum of 10% over baseline conditions (with adjustments made for unusual weather or flow conditions)?
- By year 5, have habitat quality scores for restored areas improved by a minimum of 10% over baseline conditions?

If any of these benchmarks are not met, adaptive management may be required.

Reporting requirements: This project involves several distinct implementation [I] and effectiveness [E] monitoring actions, as listed in Exhibit 1. These various monitoring actions will be staggered to facilitate the comprehensive monitoring plan required for this project. Exhibit 1 provides a proposed reporting schedule for the various measurements; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. In addition, because the implementation of the project will be phased over several years, the timing of different monitoring actions may vary across the different parts of the 11-mile reach. For example, "Year 1" of fish population monitoring may occur in 2011 for the section of river where implementation is planned for 2010. In other reaches, "Year 1" of monitoring may not occur until 2013 (assuming three years of implementation).

Exhibit 1. Proposed monitoring schedule for Arkansas River in-stream habitat restoration project. An "X" indicates each monitoring event.

Monitoring target	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
In-stream structures and fencing integrity (implementation)	X	X	X	X	X	As needed	X	As needed	As needed	X
Photographic survey (implementation)	X		X		X		X			X
Fish population	X	X	X	X	X		X			X
Benthic invertebrates	X	X	X	X	X		X			X
Tree swallows			X		X					X
Physical/chemical habitat quality	X		X		X		X			X
Report submitted	X	X	X	X	X		X			X

Monitoring activities and update reports from each year will be submitted to the Trustee Council by project sponsors [CDOW, Natural Resources Conservation Service (NRCS), and LCCD]. A report will be submitted annually from years 1 through 5 after restoration takes place; two additional reports will be submitted in years 7 and 10 following longer-term monitoring evaluations. Reports for years 5, 7, and 10 will present trends in data over time for both the restored and reference reaches. Monitoring in years 1 through 5 will be completed by CDOW, LCCD, and partners; these agencies will be responsible for submitting the annual reports. Long-

term monitoring (past year 5) may be contracted to other agencies at the discretion of the Trustee Council.

Funding: The total cost for this project is approximately $9.7 million; the Trustees will contribute approximately $8.8 million toward this total, including funding for project planning, implementation, monitoring, and operations and maintenance (O&M) on both public and private land. Monitoring is expected to cost a total of approximately $1.4 million over a 10-year period; this includes $905,000 for monitoring actions and $495,000 for O&M. The Trustees have designated $735,000 of their total contribution to this project to pay for monitoring and O&M costs ($540,000 for monitoring and $195,000 for O&M). CDOW is contributing approximately $330,000 for monitoring and $300,000 for O&M. NRCS and LCCD also are expected to contribute in-kind services for monitoring for O&M.

Monitoring costs include engineering oversight and construction monitoring, implementation monitoring, and effectiveness monitoring. Costs for effectiveness monitoring include study design and management, water quality monitoring, biological monitoring, and habitat monitoring. Some of the funding will be used to support graduate and undergraduate researchers at Colorado State University and Colorado Mountain College (CMC) who will conduct the monitoring work.

Exhibit 2. Proposed monitoring framework: Arkansas River in-stream habitat restoration

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of monitoring	Determine baseline conditions for biota (e.g., fish, benthic invertebrates, birds) and habitat quality.	Determine if in-stream and riparian treatments have been installed successfully.	Determine if habitat conditions have improved and if biota and vegetation have responded positively to treatments.	
Monitoring action description	Compile existing biota survey and baseline habitat data to develop a baseline report (including the baseline habitat information found in the restoration project plans). Establish permanent photography points.	Check integrity of in-stream and riparian treatments. Conduct photographic survey of treatments.	Conduct surveys of fish population and condition; benthic invertebrates; and habitat condition. Conduct tree swallow study as described in RP/EA. Conduct photographic survey.	
Who is responsible for monitoring?	CDOW (fish and invertebrates; habitat on public land); USFWS (birds); NRCS and LCCD (habitat on private land).	CDOW and LCCD conduct (or contract for) surveys on public and private land, respectively.	CDOW, USFWS, Colorado State University (CSU), CMC, and USGS to conduct various parts of the biota surveys on public and private lands (with landowner permission).	Trustees will contract monitoring to an appropriate agency or private contractor. CDOW and USFWS will participate.
Timing of action	Surveys have been completed and are included in restoration plans.	Annual monitoring of in-stream and riparian treatments for years 1-5 post-implementation. Additional monitoring as needed after any major storm or water-release events. Photographic survey conducted in years 1, 3, and 5.	Fish surveys during years 1- 5 post-implementation; benthic invertebrate surveys during years 1, 2, 3, 4, and 5; tree swallow study in year 3 and 4; habitat survey in years 1, 3, and 5.	Fish surveys, benthic invertebrate surveys, and habitat surveys during years 7 and 10 post-implementation.
Location of action	Monitoring sites established in targeted treatment areas in the Arkansas River and the Lake Fork and in reference (untreated) locations. (Note that monitoring locations may vary for the different studies, but some will be co-located, so fish studies can be correlated with habitat changes.)			
Benchmark	Baseline reports submitted to Trustee Council.	By year 3 after implementation, > 90% of the in-stream treatments are intact and functional; fencing is in place and functional; riparian vegetation cover has increased by at least 10% over baseline in fenced or replanted areas.	By year 5 after implementation, relevant fish population and benthic invertebrate metrics in restored areas have improved by at least 10% compared to baseline conditions. (Adjustments to benchmarks will be made for any unusual system-wide factors, such as unusual flows or climate conditions.) Tree swallow study shows adequate food supply of benthic invertebrates and no or minimal impacts from heavy metals. Habitat scores in restored areas have improved by at least 10% compared to baseline conditions.	

2.2 Weed Control in Lake and Chaffee Counties

Project overview: To compensate for injuries to wildlife habitat, the Trustees will provide funding to create an Early Detection Rapid Response (EDRR) program in Lake and Chaffee counties for control of invasive species. In addition, some funding will be used to purchase improved weed control equipment that will allow for better identification, mapping, and control of invasive species. Noxious weeds and other invasive species can degrade habitat quality and even poison livestock and wildlife in some instances. This restoration project will help prevent the spread of novel invasive weeds in ecologically important habitats in Lake and Chaffee counties. Novel weeds are newly discovered or introduced invasive plants that are not included in ongoing weed control programs. The improved control of invasive species will benefit native vegetation, decrease herbicide use over the long-term, and reduce risks to groundwater quality (that result from herbicide use). The project will ultimately maintain native vegetation with minimal impacts from novel invasive species and it will help preserve water quality.

Overview of monitoring steps: Exhibit 4 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will involve the compilation of existing information by the Lake/Chaffee Weed Department and Weed Board, including a description of their current weed control programs, the approximate locations of known novel weed outbreaks, and the approximate volume of herbicide used per acre of weeds treated. Implementation monitoring will involve documentation that improved weed control equipment has been purchased and the EDRR program has been established, following the guidelines outlined in the RP/EA.

For effectiveness monitoring during the first five years of the EDRR program, the Weed Board will use the global positioning system (GPS) technology included on the newly-purchased equipment to map the locations of new weed outbreaks and the locations where weeds are treated. They also will monitor herbicide use per acre of weeds treated, which is expected to decrease with the new equipment. If water quality data with herbicide residues are available from an accessible data source, this information may be included in monitoring reports; however, the Trustees are not requesting the Weed Board to undertake new water quality monitoring. In years 7 and 10, the Trustees will request information from the Weed Board on the status of the EDRR program and the improved equipment, and will compile available data or maps of novel weed outbreaks and levels of herbicide residues in surface water or groundwater, if available.

Effectiveness monitoring for the first five years is designed to answer the following questions:

- By year 5 (after implementation), does the new equipment result in at least a 10% decrease in herbicide used per acre treated compared to baseline conditions?
- By year 5, is the EDRR program effectively identifying and controlling all novel invasive weed outbreaks in Lake and Chaffee counties?

Although the Trustees are providing funding only for five years of the program, they hope that this initial funding will help the Lake/Chafee Weed Department and Weed Board develop additional funding sources that will allow the program to be maintained. Thus, the Trustees will evaluate the effectiveness at year 10 to determine if their initial funding has led to longer-term success, by answering the following questions:

- By year 10, has the EDRR program been maintained with new sources of funding?
- By year 10, is the weed control equipment purchased for this project still in service?
- By year 10, has the EDRR program successfully prevented or managed all "out of control" outbreaks of novel weeds in Lake and Chaffee counties?

Reporting requirements: A proposed reporting schedule is provided in Exhibit 3; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. During years 1 through 5 following implementation, the Lake/Chaffee Weed Department and Weed Board will submit annual reports to the Trustee Council. These reports will include information on the purchase of the improved equipment, the implementation of the EDRR program, and information collected during weed treatments such as a map of treated locations and the size of novel weed outbreaks. Additionally, they will compile information about the amount of herbicide used per area treated and compare this to the amount of herbicide used per area treated before purchase of the new equipment. The Lake/Chaffee Weed Department and Weed Board will be responsible for submitting annual reports during years 1 through 5; the Trustee Council will be responsible for coordinating the monitoring reports in years 7 and 10, with the cooperation of the Lake/Chaffee Weed Department and Weed Board.

Funding: Funds to produce annual program monitoring reports are included in the total project funding. Because the reports are compiled from information gathered during EDRR program operations, it is expected that the costs for producing these reports will not be a burden on the total program budget. The Trustees have allocated $230,000 for this project, including operation, equipment purchase, and monitoring.

Exhibit 3. Proposed monitoring schedule for weed control in Lake and Chaffee counties. An "X" indicates each monitoring event.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target	**Years counted from date funding received**										
	Implementation	X	X (if needed)					X			X
	Years counted from date of implementation										
	EDRR weed control actions (location and size of outbreaks)	X	X	X	X	X		X			X
	Herbicide use per unit area	X	X	X	X	X		X			X
	Herbicide residues in water (if available)	X	X	X	X	X		X			X
	County-level maps of novel outbreaks							X			X
	Report submitted	X	X	X	X	X		X			X

Exhibit 4. Proposed monitoring framework: Weed control in Lake and Chaffee counties				
	Baseline monitoring	**Implementation monitoring**	**Effectiveness monitoring (years 1-5)**	**Effectiveness monitoring (years 6-10)**
Objective of monitoring	Describe baseline conditions for novel weed invasions in Lake and Chaffee counties and baseline information on current weed control efforts.	Determine if improved equipment has been purchased. Determine if EDRR program has been successfully implemented in Lake and Chaffee counties to prevent the spread of novel weeds.	Determine if novel weeds have been controlled and improved equipment has decreased the amount of herbicide used per unit area.	Determine if EDRR program has been maintained and improved equipment is still in use. Determine if novel weeds have spread in Lake and Chaffee counties.
Monitoring action description	Use existing information to report approximate locations and area of outbreaks of novel weeds (i.e., invasive species that are not on the Colorado or federal noxious weed list). Document current level of weed control efforts by the Lake/Chaffee Weed Department and Weed Board and volume of pesticides per unit area currently used in control activities (if information is available).	Provide documentation of equipment purchase. Provide description of EDRR program implementation, including protocols for detection of novel outbreaks and protocols for response.	Describe weed-control actions funded by the EDRR program, including maps of areas treated. Compile information on amount of herbicide used per unit area with improved equipment. If available, compile relevant water quality data for surface water and/or groundwater in areas treated for weeds.	Collect information on status of EDRR program and status of improved equipment. Compile available data or maps of novel weed outbreaks. If available, compile relevant water quality data for surface water and/or groundwater in areas treated for weeds.
Who is responsible for monitoring?	Lake/Chaffee Weed Department and Weed Board (baseline report prepared using existing information).	Lake/Chaffee Weed Department and Weed Board.		Trustee Council.
Timing of action	Before EDRR program is in-place and improved equipment is purchased.	Documentation provided when equipment is purchased and EDRR program is implemented.	Annual reports during 5-year funding period.	Trustees request information in years 7 and 10.
Location of action	Lake and Chaffee counties.			
Benchmark	Baseline report submitted to Trustee Council.	Successful implementation should occur within 1 year of receiving funding allocation from the Trustee Council.	At least 5 novel outbreaks controlled per year; herbicide use per unit area reduced by a minimum of 10% compared to baseline conditions.	Improved equipment is still in use and EDRR program has been maintained. No “out of control” outbreaks of novel invasive species have occurred in Lake and Chaffee counties in the 10 years since program initiation.

2.3 Dinero Tunnel Water Quality Monitoring

Project overview: This project involves providing funding for water quality monitoring to evaluate the success of the Dinero Tunnel bulkhead installation that was funded in part with Trustee settlement funds and described in the Draft Restoration Plan and Environmental Assessment for the Tiger and Dinero Tunnels Restoration (Stratus Consulting, 2009). The entire project involves monitoring actions; the prior bulkhead installation project included one year of monitoring, this project continues that monitoring for 10 more years. Details on the monitoring that will be conducted for this project were provided in the RP/EA and include the following actions:

- Assess whether installation of the bulkhead in the Dinero Tunnel has minimized and controlled water flow from the tunnel

- Conduct hydrologic monitoring of the Sugarloaf Mountain area in the Lake Fork Watershed to determine if the bulkhead has altered water quality or flow conditions.

Overview of monitoring steps: Exhibit 6 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will involve providing the Trustees with a report summarizing the baseline data that already were collected before the bulkhead was installed in the Dinero Tunnel in the fall of 2009. Implementation monitoring is not necessary because the bulkhead has already been installed.

Effectiveness monitoring of the bulkhead installation from 2010 through 2020 focuses on assessing whether the bulkhead is functioning properly, whether the bulkhead has improved water quality in the Lake Fork, and whether flow conditions have been altered in the Sugarloaf Mountain area (e.g., have contaminated seeps or springs emerged?). Monitoring endpoints may include water quality; flow conditions, including annual high-flow and low-flow measurements and continuous flow measurements at tunnels); and biological indicator measurements such as fish populations and fish condition. In addition, the Colorado Division of Reclamation, Mining, and Safety is monitoring water levels within the tunnel. A more complete description of the monitoring elements is included in the RP/EA. The project benchmark is that no contaminated seeps or springs emerge that threaten human health or the environment. If contaminated seeps or springs begin to emerge, adaptive management will be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 5; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The schedule for monitoring of different parameters (including water quality, flow, and biological conditions in the Lake Fork), is being developed by the project sponsors (CMC, USGS, and the Lake Fork Watershed Working Group) as part of the project plans for this work. Annual reports will be submitted to the Trustee

Exhibit 5. Proposed reporting schedule for Dinero Tunnel water quality monitoring. An "X" indicates each reporting event. Monitoring schedules are being developed by the project sponsors.

Monitoring target	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Report submitted	X	X	X	X	X		X			X

Council for years 1–5, 7, and 10. Reports will include a description of annual high-flow and low-flow measurements, continuous flow measurements at tunnels, and biological measurements.

Funding: The Trustee Council is providing partial funding for this monitoring effort over the next 10 years. All monitoring actions and reporting requirements will be met with the funding provided for the monitoring project. The Trustees will contribute $165,000 toward this effort; the remaining funding needed for this project (estimated as up to $470,000) will be provided through outside grants and funding from other agencies.

Exhibit 6. Proposed monitoring framework: Dinero Tunnel water quality monitoring

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of monitoring	Describe baseline conditions for water quality and hydrologic conditions.	Implementation monitoring not necessary because bulkhead in the Dinero Tunnel has already been installed.	Assess whether installation of the bulkhead has altered water quality or flow conditions.	
Monitoring action description	Collect/compile water quality data and hydrologic data.		Collect water quality and flow conditions data. Collect biological monitoring data including fish populations and fish condition (as funding permits). See RP/EA for additional information.	
Who is responsible for monitoring?	CMC, USGS, Lake Fork Watershed Working Group.		CMC, USGS, Lake Fork Watershed Working Group.	
Timing of action	Data already were collected before the bulkhead installation.		Annual high-flow and low-flow measurements; continuous flow measurements at tunnels; biological measurements in May, June, and August. See RP/EA for additional information.	
Location of action	Dinero Tunnel, Sugarloaf Mountain area, Lake Fork Watershed.		Dinero Tunnel, Sugarloaf Mountain area, Lake Fork Watershed. See Figure 3.5 in RP/EA for map of sampling sites.	
Benchmark	Baseline report submitted to Trustee Council.		No contaminated seeps or springs have emerged that threaten human health or the environment.	

2.4 Erosion Control on Roads

Project overview: Non-system roads are created by vehicles traveling off of the established road system. Non-system roads and abandoned mine roads scar the landscape by disturbing soils and causing erosion, resulting in sediment loading in numerous locations upstream of the Arkansas River. The Trustees will fund a restoration project to address erosion from these types of roads. The restoration project will include the following actions and objectives:

- Develop a planning process and implement actions to eliminate non-system travel and rehabilitate non-system roads in the vicinity of the Paddock State Wildlife Area; and implement erosion control actions on high-altitude roads in the Lake Fork Watershed and in other areas identified.

- Consolidate travel on designated routes, minimize or eliminate non-system travel, and improve road conditions on roads with severe erosion problems.

- Close and rehabilitate non-system roads, and improve roads to decrease erosion and sedimentation and minimize wildlife disturbance. Closures could be berms or gates. Rehabilitation actions could include ripping the compacted areas, re-establishing landscape contours, placing water bars across disturbed areas, and planting native vegetation.

Overview of monitoring steps: Exhibit 8 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring involves collecting information necessary for the restoration planning and design process, before implementation occurs. As part of the project planning process, participating agencies (e.g., USFS, CDOW, BLM) will develop maps identifying non-system roads in impacted areas and identify and map other roads with significant erosion problems in Lake County. These maps will be used to help choose which roads need rehabilitation. The baseline report will be submitted to the Trustees and will include establishing photographic monitoring points to document baseline conditions.

Implementation monitoring will focus on determining whether the project planning process is proceeding on schedule and whether the road closures and erosion control actions have been implemented. Because the planning and National Environmental Policy Act (NEPA) process for road closures can be time-consuming, implementation monitoring may occur for two years or longer.

Effectiveness monitoring during the first five years following implementation will focus on semi-annual or seasonal observations of illegal use of closed roads, annual photographic surveys to document vegetation recovery on closed roads, and any evidence of erosion on improved roads. In years 7 and 10, the Trustees will work with project sponsors (e.g., USFS, CDOW,

BLM) to obtain current information on evidence of illegal road use, revegetation success on closed roads, and evidence of erosion. Available water quality data (e.g., from ongoing sampling in the Lake Fork) may be used to evaluate improvements in water quality parameters such as turbidity that would indicate a decrease in erosion.

Effectiveness monitoring is designed to answer the following questions:

- By year 5 (after implementation), do at least 75% of the closed roads (measured in miles) show no evidence of ongoing use?
- By year 5, has vehicle use been concentrated on legal roads? (Benchmark is no more than 1 mile of newly created non-system roads created by illegal activity.)
- By year 5, has revegetation reached at least 50% success on closed roads?
- By year 5, has erosion been reduced by at least 50% from treated roads? (This benchmark will be estimated based on visual evidence or otherwise-available data.)
- Has downstream water quality improved as a result of road closures? (This will be evaluated only if water quality monitoring data are available through existing sources, such as water quality monitoring in the Lake Fork.)

If any of these benchmarks are not met, adaptive management may be required to reinforce closure or improve revegetation success on closed roads.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 7; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. Until implementation is complete, semi-annual communications to the Trustees will document progress on planning and implementation. These brief progress reports on current project status could be submitted as electronic (e-mail) communications; they do not need to be formal reports.

Following implementation, annual reports for five years will include information from semi-annual monitoring of closed roads, annual photographic surveys of vegetation recovery on closed roads, and any evidence of erosion on improved roads. Monitoring will occur during snow-free months, with a more intensive presence during big-game rifle seasons when illegal activity on closed roads is more likely. Project sponsors will be responsible for submitting annual reports during years 1 through 5; the Trustee Council will be responsible for coordinating the monitoring reports in years 7 and 10, with the cooperation of project sponsors.

Exhibit 7. Proposed monitoring schedule for erosion control on roads. An "X" indicates each monitoring event; two "X"s in one box indicate semi-annual monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target	**Years counted from date funding received**										
	Implementation of road closures and road improvement	XX	XX	XX (if necessary)							
	Years counted from date of implementation										
	Illegal use of closed roads	XX	XX	XX	XX	XX		X			X
	Photographic survey of vegetation recovery and road condition	X	X	X	X	X		X			X
	Report submitted	X	X	X	X	X		X			X

Funding: The funding proposed in the RP/EA is expected to cover project implementation costs and monitoring costs. The Trustees plan to allocate $200,000 toward this project for all activities.

Exhibit 8. Proposed monitoring framework: Erosion control on roads

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of monitoring	Describe and map baseline condition of non-system roads requiring rehabilitation and mining roads requiring erosion control.	Determine if planning process is proceeding on schedule. Determine if road closure and erosion control actions have been implemented.	Determine if non-system travel has been minimized or eliminated. Determine if road improvements have reduced erosion.	
Monitoring action description	Map non-system roads in and around Paddock State Wildlife Area. Map other roads with significant erosion problems in Lake County, if information is available. Establish photographic monitoring points and document baseline conditions.	Provide brief documentation of planning process. Provide documentation of road closure and erosion control actions.	Monitor closed roads for evidence of illegal use. Monitor area for creation of any new non-system travel routes. Provide photographic documentation of road condition to observe evidence of erosion.	
Who is responsible for monitoring?	USFS, CDOW, BLM.			Trustee Council (will develop a long-term monitoring report).
Timing of action	Complete baseline mapping as part of restoration planning and design process, before implementation occurs.	Semi-annual reporting during planning and implementation phases (expected to take 2 years).	Semi-annual monitoring of any illegal use of closed roads for 5 years after implementation. Annual photographic surveys of vegetation recovery on closed roads and road condition for improved roads.	In years 7 and 10 after implementation, data collected on any ongoing illegal use of closed roads and on revegetation success on closed roads. Existing water quality monitoring data used to evaluate trends over time in water quality metrics (such as decreased turbidity) that would indicate decreased erosion and sediment transport into streams.
Location of action	Vicinity of Paddock State Wildlife Area, Lake Fork Watershed, and other areas identified by project sponsors.			
Benchmark	Baseline report (with maps) submitted to Trustee council.	Planning and NEPA process on schedule to be completed in 2 years; road closures and erosion control implemented as described in the preferred alternative under the NEPA process.	> 75% of closed routes (measured in miles) have no evidence of ongoing use. No more than 1 mile of newly created non-system routes observed. Revegetation has reached at least 50% success on closed roads. Photographs indicate no evidence of significant erosion (gullies, etc.) on improved roads. Water quality data suggest decreased erosion and sediment transport.	

2.5 Habitat Protection (Easements, Acquisition, or Land Exchange)

Project overview: To replace lost resources and resource uses such as wildlife habitat, the Trustees will protect habitat in the Upper Arkansas River Watershed that is currently at risk of loss to land development. Protection will be accomplished using conservation easements, fee-title acquisitions, or land exchange. Protected parcels will increase the amount of land held in the public trust, increase the land available for wildlife use, potentially increase public use for natural resource-based activities, and in the long-term, help to maintain wildlife populations. Conservation easements, if used as a land protection tool, will have conditions that preserve wildlife habitat features in perpetuity and, if appropriate, public access in perpetuity.

Overview of monitoring steps: Exhibit 10 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will involve (1) preparing a map detailing the current extent of protected land in the Upper Arkansas River Watershed (including both public land where resource values are protected and privately-held land that is in a permanently protected condition); (2) identifying parcels at risk of development that provide significant resources values, making them priorities for acquisition; and (3) for each parcel, describing the resource values and public uses it provides. A report of the baseline monitoring will be used to help target high-priority land acquisitions. The baseline monitoring will be commissioned by the Trustees as part of the land acquisition feasibility analysis described in the RP/EA.

Implementation monitoring will occur for each protected parcel. When a deal is concluded, a report will be prepared that tracks the acquisitions of priority land parcels, describes the land transaction agreements, and provides a map showing the boundaries of the parcels acquired with NRDA funding (whether in whole or in part). Implementation reports will be prepared by the entity that receives funding for a land transaction. Updated maps showing all land acquisitions and their relationship to other protected land in the area will be prepared by the Trustees.

Effectiveness monitoring for habitat protection will be focused on tracking priority parcel acquisition, maintaining updated maps, and tracking wildlife uses and recreation availability on the acquired lands with available data from appropriate agencies (e.g., Colorado State Parks, CDOW, BLM). Effectiveness reports will be prepared by the entity that receives funding for a land transaction. For conservation easements, annual reports should document the ongoing condition of the protected property and compliance with easement conditions. These annual reports will be prepared by the entity that holds the easement (note that the costs of monitoring, enforcement, and reporting should be included as part of the estimate of the total transaction cost for an easement).

Effectiveness monitoring is designed to answer the following questions:

- Has natural resource damages money increased the amount of high-priority land protected in the Upper Arkansas River Watershed, in response to previous losses of natural resources and associated services? (Benchmark: By 2015, priority acquisitions have been completed and all funding allocated for Tier 1 purchases has been spent.)

- Have recreation and wildlife use levels been maintained or increased as a result of land protection through land purchase (or easements) funded with NRDA funding (Benchmark: By 2020, all funding allocated for Tier 2 has been spent on the remaining priority acquisitions and recreational and wildlife use of protected land is ongoing.)

If either of these project benchmarks are not met, adaptive management may be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 9; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. Status reports for each proposed transaction will be submitted to the Trustee Council quarterly until the transaction is completed. These status reports may be brief electronic (e-mail) communications. After a conservation easement transaction is completed, an annual report detailing the condition of the easement will be submitted to the Trustee Council for 10 years by the agency or group that holds the easement. The Trustees will not require annual condition reports for land that is purchased and held by a state or federal agency.

The Trustee Council will update the map of all land transactions annually. The Trustees will prepare reports in years 5, 7, and 10 that provide a map of all land protected with NRDA funding in the context of other protected land in the Upper Arkansas River Watershed, and provide any available data on recreational and wildlife use of protected parcels.

Funding: The Trustees have proposed to allocate $1.8 million to protect land in the Upper Arkansas River Watershed. This funding will be used to plan purchases, complete purchases or conservation easement agreements, provide for long-term monitoring and enforcement for easements, and produce monitoring reports.

Exhibit 9. Proposed monitoring schedule for habitat protection project. An "X" indicates each monitoring event; multiple "X"s in one box indicate quarterly monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		**Years counted from date funding received**									
	Transaction progress reports	XXXX	XXXX	XXXX (as needed)	XXXX (as needed)						
		Years counted from date of implementation									
	Easement condition	X	X	X	X	X	X	X	X	X	X
	Map of all protected land	X	X	X	X	X	X	X	X	X	X
	Recreational and wildlife use					X		X			X
	Report submitted	X	X	X	X	X		X			X

Exhibit 10. Proposed monitoring framework: Habitat protection (easements, acquisition, or land exchange)				
	Baseline monitoring	**Implementation monitoring**	**Effectiveness monitoring (years 1-5)**	**Effectiveness monitoring (years 6-10)**
Objective of monitoring	Describe and map current extent of public and protected land and acquisition targets in the Upper Arkansas River Watershed (focused primarily on Lake County).	Determine if conservation easement, fee-title acquisitions, and/or land exchange arrangements are proceeding on schedule.	Determine if amount of protected land has increased. Determine if recreational access or wildlife habitat protection has increased.	
Monitoring action description	Develop a map of public and protected land and priority parcels for acquisition in the Upper Arkansas River Watershed (focused primarily on Lake County).	Provide documentation of transaction process. Provide final land transaction agreement and map of protected area.	Develop a map of all land transactions supported with NRDA funding. Document recreational use and wildlife use on protected parcels. Provide annual reports of easement condition with photographic documentation.	
Who is responsible for monitoring?	Trustee Council (map will be prepared as part of the land acquisition feasibility analysis described in the RP/EA).	Each entity that receives funding for a land transaction.	Trustee Council will prepare map with all land transactions. Colorado State Parks and Division of Wildlife will provide documentation of recreational and wildlife use. Entity that holds easement is responsible for easement monitoring.	
Timing of action	Before new land is purchased and added to the existing public lands.	Quarterly until transaction is completed for transaction process monitoring.	Map of all transactions updated annually until funding for this category is completed. Document recreational and wildlife use at least three times over 10-year period. Easement condition reports are provided annually for 10 years.	
Location of action	Upper Arkansas River Watershed (Lake County focus).			
Benchmark	Baseline map and description to be submitted to Trustee Council as part of land acquisition feasibility analysis.	Transactions are completed within 18 months from date of funding allocation.	By 2015, priority acquisitions (as identified in the land acquisition feasibility analysis) have been completed. All Tier 1 authorized spending has been spent. Ongoing recreational and wildlife use of protected parcels occurs. 100% of land-owners comply with legal terms of easement.	By 2020, all Tier 2 authorized spending has been spent on priority acquisitions. Recreational and wildlife use of protected parcels is ongoing. 100% of land-owners comply with legal terms of easement.

2.6 Native Plant Propagation at Hayden Ranch

Project overview: In support of long-term re-vegetation efforts in the Upper Arkansas River Watershed, the Trustees will help fund project planning and implementation for establishing a native plant propagation center on the Hayden Ranch. The project will include development of a greenhouse and nursery facility to propagate locally-adapted forestry and wetland plants. The new facility will provide inexpensive, locally-adapted species that will be available for remediation and restoration activities in Lake County and surrounding areas.

Overview of monitoring steps: Exhibit 12 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will involve development of a baseline report that describes the current cost and availability of nursery stock for remediation and restoration and provides an evaluation of current flow rates in Box Creek, which would supply water for the propagation center and receive runoff from the facility. This report will be submitted to the Trustee Council before the greenhouse facility is constructed.

Implementation monitoring will focus first on whether the project planning (including a full feasibility analysis) is proceeding on schedule and then on whether implementation of the project is proceeding on schedule (assuming a positive result for the feasibility analysis) and is completed.

Effectiveness monitoring will include an evaluation of the types and quantity of plants produced at the new facility, the use of these plants in remediation and restoration projects, and flow data and water quality data for Box Creek (consistent with any requirements by regulatory agencies). It will be designed to evaluate the change in availability of locally-adapted plant stock to be used in remediation/restoration projects, the amount of use of plant stock produced at the facility in local and regional remediation/restoration work, and any changes in the water quality or quantity in Box Creek.

Effectiveness monitoring is designed to answer the following questions:

- Is successful propagation of desirable, locally adapted species occurring at the rates/amounts identified in the project planning documents?
- Are at least 75% of propagated plants being used in projects that benefit the public interest?
- Are hydrologic and water quality impacts to Box Creek from the facility minimized (within levels acceptable to regulatory agencies)?

If any of these benchmarks are not met, adaptive management may be required.

Exhibit 11. Proposed monitoring schedule for native plant propagation at Hayden Ranch. An "X" indicates each monitoring event; multiple "X"s in one box indicate quarterly monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		**Years counted from date funding received**									
	Feasibility study process	XXXX	XXXX	XXXX	XXXX						
		Years counted from date of implementation									
	Propagation rates for plants	X	X	X	X	X					X
	Use and cost of plants	X	X	X	X	X					X
	Water quantity and quality in Box Creek (annual or as required by regulatory agencies)	X	X	X	X	X	X	X	X	X	X
	Report submitted	X	X	X	X	X					X

Reporting requirements: A proposed reporting schedule is provided in Exhibit 11; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. Documentation of the feasibility analysis process will be submitted quarterly until the final feasibility analysis report is completed. The final feasibility analysis is expected within 18 months from the date of funding allocation.

Annual reports will be prepared by CMC and submitted to the Trustee Council for the first five years of the facility operations on propagation rates, percent of propagated species used in projects benefiting the public interest, and hydrologic and water quality data for Box Creek.

A long-term monitoring report will be prepared and submitted in year 10 after the facility becomes operational. This report will include the same elements as the annual reports for years 1 through 5. The Trustee Council will develop the report with information provided by CMC.

Funding: The Trustees plan to provide $200,000 to CMC to complete the Feasibility Analysis, to help with project implementation, and for monitoring and reporting requirements.

Exhibit 12. Proposed monitoring framework: Native plant propagation at Hayden Ranch

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of monitoring	Understand current cost and availability of wetland and forestry nursery stock for Leadville-area remediation projects. Document flow rates in Box Creek.	Determine if feasibility analysis is proceeding on schedule. Determine if implementation is proceeding on schedule (assuming positive results for the feasibility analysis).	Determine if forest and wetland species are available for remediation and restoration activities. Determine if impacts to Box Creek water quality or quantity have occurred.	
Monitoring action description	Provide a baseline report describing costs and availability of nursery stock and flow rates in Box Creek.	Provide documentation of feasibility analysis process and implementation process and milestones.	Monitor use and cost of forest and wetland species propagated at Hayden Ranch. Monitor water quality and quantity in Box Creek.	
Who is responsible for monitoring?		CMC.		Trustee Council, information provided by CMC.
Timing of action	Before greenhouse facility is constructed.	Quarterly during feasibility analysis and implementation process. Final report describing start-up of facility.	Annual reports of use of propagated plants for 5 years after facility start-up and again in year 10 after implementation. Annual monitoring of Box Creek (or as required by regulatory agencies).	
Location of action	Leadville.		Hayden Ranch.	
Benchmark	Baseline report submitted to Trustee Council.	Feasibility analysis completed within 18 months from date of funding allocation. Implementation proceeds on schedule according to process laid out in feasibility analysis.	Successful propagation of desirable, locally-adapted species occurring at rates/amounts specified in feasibility study. At least 75% of propagated species are used in projects that benefit the public interest. Water quality and hydrologic impacts to Box Creek within levels acceptable to regulatory agencies.	

2.7 Development and Implementation of an Engineering Evaluation and Cost Analysis (EE/CA) for the Venture Mine and Sugarloaf Mine Dumps

Project overview: To address impacts to groundwater and surface water, the Trustees expect to contribute funding to support development of an EE/CA for remediating contamination at the Venture Mine and the Sugarloaf Mine dumps and help support implementation of the selected alternative. The EE/CA will describe actions to contain mine waste in a repository and eliminate sources of contamination to surface water and groundwater. The project sponsor, BLM, anticipates securing additional remediation funds following identification of the selected alternative through the EE/CA process. Implementation of remedial work will improve aquatic habitat and associated terrestrial habitat quality and reduce metals loading to the Lake Fork and Arkansas River.

Overview of monitoring steps: Exhibit 14 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will involve the compilation of existing baseline water quality data for the Lake Fork and tributaries impacted by the Venture Mine and Sugarloaf Mine dumps.

Implementation monitoring will focus first on whether the development of the EE/CA is proceeding on schedule and then on whether implementation of the selected alternative from the EE/CA is proceeding on schedule. This portion of the project will be considered successful if the EE/CA is completed within three years after funding is allocated and if the selected remedy is fully implemented within three years of the EE/CA final publication.

Effectiveness monitoring will include regular monitoring of water quality in the Lake Fork and relevant tributaries. Water quality monitoring for this project may be incorporated into other water quality monitoring actions in the Lake Fork.

Effectiveness monitoring is designed to answer the following question:

- Is there a measurable improvement in water quality under both low-flow and high-flow conditions in the Lake Fork and tributaries?

If this benchmark is not met, adaptive management may be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 13; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The baseline monitoring report will be submitted to the Trustee Council by the project sponsor (BLM) before work begins on implementation of the selected remedial actions. The baseline report can consist of the EE/CA or

Exhibit 13. Proposed monitoring schedule for development and implementation of an EE/CA for the Venture Mine and Sugarloaf Mine dumps. An "X" indicates each monitoring event; two "X"s in one box indicate semi-annual monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		**Years counted from date funding received**									
	EE/CA development and implementation	XX	XX	XX	XX	XX	XX				
		Years counted from date of implementation									
	Water quality monitoring	X	X	X	X	X	X	X	X	X	X
	Report submitted	X	X	X	X	X		X			X

equivalent project planning document that includes baseline water quality and habitat conditions. During EE/CA development and implementation of the selected remedy, the BLM will submit semi-annual progress reports to the Trustee Council. After the selected remedy is implemented, water quality data will be collected regularly (likely as part of an established water quality monitoring program). Timing of water quality reports will be determined by the ongoing monitoring program schedule. A copy of each monitoring report will be submitted to the Trustees.

Funding: The Trustees plan to provide $200,000 to BLM to complete the EE/CA, to help with project implementation, and to comply with reporting requirements.

Exhibit 14. Proposed monitoring framework: Development and implementation of an EE/CA for the Venture Mine and Sugarloaf Mine dumps

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of action	Understand baseline water quality conditions for the Lake Fork and relevant tributaries.	Determine if an EE/CA has been successfully developed for the Venture Mine and Sugarloaf Mine dumps. Determine if the preferred alternative has been implemented.	Determine if implementation of preferred alternative has improved water quality in the Lake Fork and relevant tributaries.	
Monitoring action description	Compile water quality data for the Lake Fork and relevant tributaries.	Provide documentation of EE/CA development process. Provide draft and final EE/CA to the Trustees. Provide documentation of EE/CA implementation process.	Collect water quality data in the Lake Fork and relevant tributaries. These efforts will likely be merged with the Dinero water quality monitoring project for ongoing water quality monitoring efforts in the Lake Fork Watershed.	
Who is responsible for monitoring?	BLM.			Trustee Council and BLM.
Timing of action	These data have already been collected as part of ongoing water quality monitoring projects.	Semi-annual reports of EE/CA development process until EE/CA is finished. Semi-annual reports of EE/CA implementation process until project is completed.	Timing of data collection will fit in with ongoing water quality monitoring projects in the Lake Fork.	
Location of action	Lake Fork and relevant tributaries.			
Benchmark	Provide relevant reports with existing baseline data to Trustee Council.	EE/CA completed within 3 years from date of funding allocation. Implementation completed within 3 years of publication of final EE/CA.	A measurable improvement in water quality occurs under low-flow and high-flow conditions in the Lake Fork and relevant tributaries	

2.8 Hayden Ranch Revegetation

Project overview: To address wildlife habitat losses, the Trustees expect to fund revegetation activities that will take place on 222 acres of BLM-managed land on the Hayden Ranch. These activities will increase the cover of native vegetation to help prevent erosion, minimize the risk that invasive plant species will become established, and attract a broad array of wildlife, including elk.

Overview of monitoring steps: Exhibit 16 (presented at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will include the results from a standard vegetation survey, following methods such as those provided in the Remedial Work Plan for California Gulch Operable Unit 11 (U.S. EPA, 2007, p. 50). For example, the vegetation survey could include species identification, percent cover of different species, percent cover of native vs. non-native vegetation, above-ground biomass (used to estimate the carrying capacity for livestock and wildlife), evidence of plant reproduction and succession, and observations of current wildlife and livestock use. Existing data may be used to generate the baseline conditions report. Additionally, permanent photographic points will be established and used to document pre-seeding baseline conditions.

Implementation monitoring will involve documenting the number of acres seeded with native vegetation, the seed source, the species mixture, the manner of seeding, and the related treatments (e.g., watering, protective fencing), if undertaken. The project sponsor (BLM) will prepare the baseline and implementation reports.

For effectiveness monitoring during the first five years after implementation, annual monitoring actions will include vegetation surveys completed for baseline monitoring, photographic surveys, and compiled information about wildlife and livestock use. The Remedial Work Plan (U.S. EPA, 2007) also provides benchmarks that may be useful for effectiveness monitoring.

Effectiveness monitoring is designed to answer the following questions:

- By year 5 after implementation, do non-native species make up less than 40% of plant cover?
- By year 5 after implementation, is the total cover of live vegetation within the range of cover values found at appropriate well-managed reference sites?
- By year 5 after implementation, has native vegetation persisted? Do native species account for a minimum of 60% of total vegetative cover? Is there evidence that native seedlings are reproducing? For the species that were included in the seed mix, is the

species richness and evenness comparable to similar reference sites? Is aboveground biomass greater than 250 g/m^2?

- By year 10, has native vegetation persisted? Do native species account for a minimum of 90% of total vegetative cover? Is there evidence that native seedlings are reproducing? For the species that were included in the seed mix, is the species richness and evenness comparable to similar reference sites? Do biomass levels match those in reference areas (~ 750 g/m^2)?

If any of these benchmarks are not met, adaptive management may be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 15; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The baseline report will be submitted to the Trustee Council before seeding begins. A post-implementation report, detailing the number of acres seeded with native vegetation, the seed source, the species mixture, the manner of seeding, and the related treatments (e.g., watering, protective fencing), if undertaken, will be submitted to the Trustee Council after seeding is completed.

After seeding is completed, BLM will prepare annual monitoring reports for five years, including vegetation surveys, photographic surveys, and wildlife use (if available). Depending on the timing of seeding and the timing of vegetation emergence, vegetation surveys may begin in the same year following seeding or may begin in the year following seeding. These reports will be submitted to the Trustees. The Trustees will prepare a long-term monitoring report 10 years after seeding is completed; BLM and Trustee contractors may contribute to preparation of the long-term report.

Exhibit 15. Proposed monitoring schedule for Hayden Ranch revegetation. An "X" indicates each monitoring event.

Monitoring target	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Seeding implementation	X									
Vegetation survey	X	X	X	X	X					X
Photographic survey	X	X	X	X	X					X
Wildlife use (if available)	X	X	X	X	X					X
Report submitted	X	X	X	X	X					X

Funding: The total project cost is estimated as $25,000. The Trustees plan to allocate $20,000 for this project. Funding will be used for project implementation and monitoring.

Exhibit 16. Proposed monitoring framework: Hayden Ranch revegetation

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of action	Document pre-restoration conditions in the targeted restoration area.	Document implementation of revegetation project.	Determine if the seeded vegetation has established and the cover of native vegetation has increased.	Determine if native vegetation has persisted.
Monitoring action description	Conduct a standard vegetation survey, including identity and cover of different species and percentage of native vs. non-native species. Compile any existing information on wildlife use. Establish permanent photographic points and conduct a photographic survey of baseline conditions.	Document number of acres planted, including seed source and species mixture.	Same as for baseline monitoring (conduct vegetation survey, compile available information on wildlife use, conduct photographic surveys).	
Who is responsible for monitoring?	BLM.			Trustee Council and BLM.
Timing of action	Collect/compile data before restoration actions begin.	At conclusion of restoration activities.	Annually for 5 years following revegetation and again in year 10.	
Location of action	Hayden Ranch.			
Benchmark	Baseline report submitted to Trustee Council.	222 acres of the Hayden Ranch should be seeded with certified weed-free seed for an appropriate mix of native vegetation. Seedling density at least 40 stems/m^2. At least 15% of seeded perennial species observed; at least 4 seeded species with cover > 1%.	By year 5 after implementation, native species account for a minimum of 60% of total vegetative cover. For seeded species, richness and evenness are comparable to reference sites. Aboveground biomass > 250 g/m^2. Evidence of reproduction: new young plants, existing plants flowering/seeding.	By year 10 after implementation, native species account for a minimum of 90% cover of native species. For seeded species, richness and evenness are comparable to reference sites. Biomass levels match those in reference areas (e.g., 750 g/m^2). Evidence of reproduction: new young plants, existing plants flowering/seeding.

2.9 Canterbury Tunnel Rehabilitation

Project overview: To address ground water contamination and loss of use, the Trustees expect to contribute to the planning and construction of a well and pipeline to pipe groundwater from the Canterbury Tunnel to the Parkville Water District. Restoring the flow of groundwater to the water treatment plant will help the water district provide a clean, sustainable supply of drinking water to Leadville and reduce the risk that the water mains in Leadville will freeze.

Overview of monitoring steps: Exhibit 18 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring will consist of the information that will be developed for an Environmental Impact Statement (EIS, or the regulatory required equivalent) for the project. The water district will describe current water use from the Canterbury Tunnel, current water supplies and operational factors, and the current incidence of freezing water mains (tracked during the remainder of the 2010 winter) before Canterbury Tunnel groundwater is added to the water supply.

Implementation monitoring will involve monitoring hydrologic and environmental conditions near the drilling and pipeline site and completion of the project portion that the Trustees fund.

Effectiveness monitoring for the Canterbury Tunnel rehabilitation is designed to evaluate whether the project has been successful in meeting the project goals of restoring the Canterbury Tunnel as a significant drinking water source for the Parkville Water District and decreasing the incidence of frozen water mains. The water district will monitor water use from the Canterbury Tunnel and will document the incidence of freezing pipes after Canterbury Tunnel groundwater is added to the water supply.

Effectiveness monitoring is designed to answer the following question:

- Within the first year after construction, does the Parkville Water District use at least 1 acre-foot of water per day from the Canterbury Tunnel during the winter and do water mains in Leadville not freeze in the winter?

If these benchmarks are not met, adaptive management may be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 17; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The baseline report (EIS) will be submitted to the Trustee Council before drilling begins. The Parkville Water District will submit hydrologic and environmental monitoring reports quarterly during drilling operations.

Exhibit 17. Proposed monitoring schedule for the Canterbury Tunnel rehabilitation. An "X" indicates each monitoring event; multiple "X"s in one box indicate quarterly monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		**Years counted from date funding received**									
	Well and pipeline construction	XXXX	XXXX								
		Years counted from date of implementation									
	Water use data	X	X	X	X	X					X
	Pipe freezing data	X	X	X	X	X					X
	Report submitted	X	X	X	X	X					X

After the well is completed, the Parkville Water District will submit annual water-use and water main status reports to the Trustee Council for the first five years. A long-term monitoring report, including the same information provided in annual reports (water use from Canterbury Tunnel, incidence of water main freezes in Leadville) will be submitted 10 years after the well is completed. The long-term report will be prepared by the Parkville Water District and the Trustee Council.

Funding: The Trustees plan to provide $200,000 (or not more than 10% of total project costs) for this restoration project. The funding is intended to help cover the costs of planning, implementation, and monitoring actions.

Exhibit 18. Proposed monitoring framework: Canterbury Tunnel rehabilitation

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of action	Understand hydrologic and environmental conditions in the vicinity of the Canterbury Tunnel drilling site.	Construct a well and pipeline to pipe water from the Canterbury Tunnel to the Parkville Water District.	Determine if groundwater from the Canterbury Tunnel has been restored to the Parkville Water District. Determine if winter water distribution problems have resolved.	
Monitoring action description	Develop an EIS and document pre-drilling environmental and hydrologic conditions. Or produce appropriate documentation required by regulatory agencies.	Monitor hydrologic conditions and environment near the drilling site.	Collect/compile data on the use of water from the Canterbury Tunnel in the Parkville Water District water supply.	
Who is responsible for monitoring?		Parkville Water District.		Parkville Water District and the Trustee Council.
Timing of action	Before implementation (drilling and construction).	Quarterly during drilling operations or as required by regulatory agencies.	Annually for 5 years after completion of well and pipeline and again in year 10.	
Location of action		Canterbury Tunnel drill site and surrounding landscape.		
Benchmark	Pre-implementation report (EIS) submitted to Trustee Council.	EIS completed within 18 months of receiving funding. New well and pipeline completed within 3 years of receiving funding.	Parkville Water District uses at least 1 acre-foot of water per day from the tunnel during the winter. Water mains in Leadville do not freeze during the winter.	

2.10 Habitat Management for Land Protected by Trustees

Project overview: The Trustees may provide funding for conservation easements on private lands to protect habitat (see Section 2.5). On some easements, management plans for grazing or forestry may be necessary to protect or enhance resource management. The Trustees will provide funding to develop and implement grazing and forestry management plans. The improved management on these lands will protect habitat, help diversify species, and improve overall ecological function. Over time, this project will help support a broad array of native vegetation and wildlife and it may also help reduce the fire risk from expected future mountain pine beetle damage.

Overview of monitoring steps: Exhibit 20 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring will include a compilation of readily-available information on the natural resource values for each parcel, including land use, habitat quality and type, wildlife use, and ecological function. Permanent photographic points and potential reference sites on public land will be identified as part of the baseline monitoring.

Implementation monitoring will focus first on documenting that management plans have been developed and then on annual reporting of management plan implementation. Development and implementation of management plans may be required by the Trustees as part of the conditions of an easement supported with NRDA funding. Baseline and implementation monitoring will be conducted by the entity that has received funding for the land transaction and/or that holds the conservation easement.

Effectiveness monitoring will examine whether management plans developed for particular parcels have been successful in maintaining or improving natural resource values compared to baseline conditions. Data about natural resource values on protected land may include photographic surveys, habitat quality, vegetation surveys, wildlife populations, wildlife use, and assessment of fire risk. Other data may be necessary depending on the land use and management plan. The Trustees will conduct effectiveness monitoring in year 5 and year 10 with the cooperation of the private landowner.

Effectiveness monitoring is designed to answer the following question:

- By year 5 and year 10 after implementation, do habitat condition metrics demonstrate that the implemented management plans have maintained or improved natural resource values compared to pre-acquisition baseline conditions or compared to reference sites on well-managed public land?

If benchmarks are not met, adaptive management may be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 19; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The baseline conditions report will be prepared by the purchasing entity and submitted to the Trustee Council after easement acquisition is completed but before a management plan is developed. The same entity will submit a management plan (developed by an appropriate agency such as the Colorado State Forest Service) to the Trustee Council within six months after the transaction is completed and will submit annual reports regarding the implementation of the management plan.

Natural resource value monitoring will be completed five and 10 years after the transaction is completed. The Trustee Council will prepare these reports with the cooperation of private landowners and appropriate agencies.

Exhibit 19. Proposed monitoring schedule for habitat management for land protected by Trustees. An "X" indicates each monitoring event.

Monitoring target	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Management plan development and implementation	X	X	X	X	X	X	X	X	X	X
Photographic survey	X		X		X		X			X
Habitat condition; vegetation survey; wildlife survey; as appropriate					X					X
Report submitted	X	X	X	X	X	X	X	X	X	X

Funding: The Trustees plan to spend $100,000 on habitat management plans; this funding is expected to support design of the management plan, implementation of management actions, and monitoring.

Exhibit 20. Proposed monitoring framework: Habitat management for land protected by Trustees

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of action	Establish baseline data on newly acquired land protected with NRDA funding.	Determine if appropriate habitat management plans have been developed for private land protected with NRDA funding. Determine if management plans are being implemented.	Determine if management plans have successfully maintained natural resource values of parcels.	
Monitoring action description	Develop a baseline report based on readily-available information, including possible land use, habitat, wildlife use, and ecological function. (Note: relevant information may be available from the Land Acquisition Feasibility Analysis being prepared by the Trustees). Establish permanent photographic points. Identify public land sites that could be used as reference sites.	Provide documentation of management plan development. Provide annual reports of management plan implementation, including photographic surveys of land condition. (These reports may be combined with annual reports of easement condition.)	Collect or compile data on natural resources values on protected land. Data could include habitat quality, vegetation surveys, wildlife population status and use, and assessments of fire risk.	
Who is responsible for monitoring?	Each entity that receives funding for a land transaction.		Trustee Council with cooperation of private landowners.	
Timing of action	Submitted after the acquisition is completed and before a management plan is developed.	Within 6 months of easement transaction being completed for management plan development. Annually for reports of management plan implementation.	Five years and 10 years after majority of easement transactions have been concluded.	
Location of action	Newly acquired land protected using NRDA funds.		Newly acquired land, protected using natural resource damage funds. The Trustees may select a subset of these lands for this monitoring effort. Well-managed public lands may also be monitored to establish benchmarks.	
Benchmark	Baseline report submitted to Trustee Council.	Submit management plan to Trustee Council for approval.	Habitat condition metrics demonstrate maintenance or improvement of natural resource values compared to pre-acquisition baseline conditions. Habitat condition metrics on private land are within the range of values for reference sites on well-managed public land.	

2.11 Colorado Gulch Wetland and Upland Restoration

Project overview: The Trustees expect to support restoration of approximately 3.5 acres of wetlands on private land in Colorado Gulch. These wetlands need restoration to recover habitat quality, improve downstream water quality, and increase wildlife use in the area. In order to achieve restoration at this site, a project implementation plan will be developed in which the following actions will be taken: remove excess sediments; reclaim eroding, unimproved roads; restore degraded wetland habitat; and create in-stream and riparian habitat. (A full evaluation of the presence of contaminants in the sediments has not yet been completed; sediments may be contaminated with iron, zinc, or other heavy metals). Long-term benefits include improved water quality, improved habitat quality, and access for aquatic and riparian wildlife.

Overview of monitoring steps: Exhibit 22 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will include collection of the data necessary to develop a project implementation plan. Data collected will include the location and volume of excess sediments in the wetlands, evaluation of any contaminated sediments on-site, and in-stream and riparian habitat conditions. As part of this data collection, permanent photographic points will be established at the restoration site and in appropriate reference locations. Downstream water quality data will be compiled from ongoing monitoring programs.

Implementation monitoring will provide documentation of the planning and permit approval process, documentation of restoration activities, and annual habitat condition reports for revegetated areas. Annual habitat condition reports will focus on whether revegetation efforts meet the benchmarks that will be established in the project plan for vegetation cover and survival. Baseline and implementation monitoring will be conducted by the project sponsor in cooperation with the private landowner.

Effectiveness monitoring will occur five and 10 years after restoration and will be directed by the Trustees with the cooperation of the project sponsor and private landowner. Data will include vegetation surveys, habitat quality assessments, and compilation of downstream water quality data. Restoration will be considered successful if revegetated areas continue to meet benchmarks established in the project plan, habitat metric conditions meet acceptable standards (compared against appropriate reference sites), and downstream water quality shows a decrease of at least 10% in turbidity. If these benchmarks are not met, adaptive management may be required.

Exhibit 21. Proposed monitoring schedule for Colorado Gulch wetland and upland restoration. An "X" indicates each monitoring event; two "X"s in one box indicate semi-annual monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		**Years counted from date funding received**									
	Planning and implementation	XX	XX								
		Years counted from date of implementation									
	Habitat condition	X	X	X	X	X					X
	Long-term monitoring (habitat, vegetation, water quality)					X					X
	Report submitted	X	X	X	X	X					X

Reporting requirements: A proposed reporting schedule is provided in Exhibit 21; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The baseline report will be submitted to the Trustee Council before restoration actions begin. Implementation progress reports will be submitted to the Trustee Council twice each year while planning and restoration implementation is ongoing. Annual habitat condition reports will be submitted to the Trustee Council for the first five years following completion of the restoration project. A long-term monitoring report will be developed five and 10 years after restoration actions are complete.

Funding: The Trustees expect to contribute $300,000 toward this restoration project. The total estimated costs are estimated as $600,000. Project planning, implementation, and monitoring are included in this cost estimate. [Note that this funding was designated as Tier Three funding in the RP/EA. Funding will be provided subject to funding availability after Tier One and Tier Two projects are funded. Funding also is subject to Trustee review and approval of specific project plans.]

Exhibit 22. Proposed monitoring framework: Colorado Gulch wetland and upland restoration

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of action	Determine baseline conditions for biota (e.g., fish, benthic invertebrates, birds) and habitat quality.	Determine if in-stream and wetland restoration actions, including contaminated sediment removal, have been implemented successfully.	Determine if habitat conditions have improved and if sediment transport downstream of the wetland has been reduced.	
Monitoring action description	Collect data necessary for developing a project implementation plan, including location and volume of contaminated sediments and condition of wetland, in-stream, and riparian habitat. Establish permanent photographic points at project site and suitable reference sites. Compile downstream water quality data if available from ongoing monitoring programs.	Provide documentation of planning and permit approval process. Provide documentation of implementation. Provide annual report of habitat condition and revegetation success with photographic survey.	Conduct habitat quality assessment and vegetation surveys in areas revegetated after restoration work and in suitable reference sites. Compile data on downstream water quality collected through other ongoing monitoring efforts.	
Who is responsible for monitoring?	Project sponsor.		Trustee Council with cooperation of project sponsor.	
Timing of action	Before restoration actions begin.	Twice a year report during planning and implementation phases. Annual habitat condition reports for 5 years after implementation.	Five and 10 years after implementation.	
Location of action	Project site.		Project site and suitable reference sites if available.	
Benchmark	Baseline report submitted to Trustee Council. Baseline report may be equivalent to the project implementation plan.	Planning process on schedule to be completed within 18 months of funding allocation. Project implemented as described in the project plan. Revegetation efforts meet benchmarks established in project plan for vegetation cover and survival.	Revegetated areas continue to meet benchmarks established in project plan. Habitat condition metrics are within the range of values for suitable reference sites. Water quality downstream of site shows a decrease of at least 10% in turbidity.	

2.12 Remediation of Acid Mine Drainage in Tributaries to the Arkansas River

Project overview: The Trustees expect to contribute funding for the planning and implementation of remediation work at abandoned mine sites that have a hydraulic connection to the Arkansas River; two high-priority abandoned mine restoration sites are Chalk Creek and St. Kevin's Gulch. Remediation and restoration activities may include installing bulkheads, constructing mine waste repositories, and treating acid mine drainage in treatment systems. The objective is to improve water and habitat quality, and benefit aquatic populations in tributaries to the Arkansas River.

Overview of monitoring steps: Exhibit 24 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will include collection or compilation of water quality data for relevant tributaries that is necessary to develop a project implementation plan, along with an EE/CA or similar plan for selecting the remedial alternatives. This project differs from other projects described in this document because the baseline monitoring report will be produced after the first phase of implementation (development of project plans) is completed.

Implementation of the project consists of two parts: (1) development of project plans, and (2) implementation of selected alternatives. Thus, implementation monitoring also will proceed in two separate phases, focusing first on whether the development of project plans is proceeding on schedule and second on whether implementation of selected alternatives is proceeding on schedule. This portion of the project will be considered successful if implementation plans and permits are completed within three years after funding is allocated, and if the selected remedies for the sites are fully implemented within three years of final EE/CA or project plan development.

Effectiveness monitoring will include regular monitoring of water quality in relevant tributaries, as well as site stability and vegetation/habitat quality. Water quality monitoring for this project may be incorporated into other water quality monitoring efforts if possible.

Effectiveness monitoring is designed to answer the following question:

- Is there a measurable improvement in water quality under both low-flow and high-flow conditions in relevant tributaries?

If this benchmark is not met, adaptive management may be required.

Exhibit 23. Proposed monitoring schedule for remediation of acid mine drainage in tributaries to the Arkansas River. An "X" indicates each monitoring event; two "X"s in one box indicate semi-annual monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		Years counted from date funding received									
	EE/CA development and implementation	XX	XX	XX	XX	XX	XX				
		Years counted from date of implementation									
	Water quality monitoring	X	X	X	X	X	X	X	X	X	X
	Report submitted	X	X	X	X	X		X			X

Reporting requirements: A proposed reporting schedule is provided in Exhibit 23; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making for each site. The baseline monitoring report will be submitted to the Trustee Council by the project sponsor after completion of project plans, but before implementation of selected remedial alternatives. During project plan development and implementation of the selected remedy, the project sponsor will submit semi-annual progress reports to the Trustee Council. These progress reports may be brief electronic (e-mail) communications. After the selected remedy is implemented, water quality data will be collected regularly (likely as part of an established water quality monitoring program). Timing of water quality reports will be determined by the ongoing monitoring program schedule. A copy of each monitoring report will be submitted to the Trustee Council.

Funding: The Trustees expect to contribute $400,000 for these remedial actions. The total estimated project cost is $1,450,000. Funding will support project planning, remedial actions, and monitoring activities. [Note that this funding was designated as Tier Three funding in the RP/EA. Funding will be provided subject to funding availability after Tier One and Tier Two projects are funded. Funding also is subject to Trustee review and approval of specific project plans.]

Exhibit 24. Proposed monitoring framework: Remediation of acid mine drainage in tributaries to the Arkansas River

	Baseline monitoring	Implementation monitoring	Effectiveness monitoring (years 1-5)	Effectiveness monitoring (years 6-10)
Objective of action	Understand baseline water quality and relevant environmental conditions at selected project locations.	Determine if implementation plans have been successfully developed for project location. Determine if selected remediation alternatives have been implemented.	Determine if implementation of preferred alternative has improved water quality in relevant tributaries.	
Monitoring action description	Collect or compile water quality data for relevant tributaries.	Provide documentation of project plan development process. Provide project plans (EE/CA or equivalent) to the Trustee Council. Provide documentation of implementation process.	Collect or compile water quality data in relevant tributaries.	
Who is responsible for monitoring?	Project sponsor for each project location.		Trustee Council working with project sponsor for each project location.	
Timing of action	Before restoration actions are implemented.	Twice yearly reports of implementation plan development process until plans are finished. Twice yearly reports of implementation process until project is completed.	Timing of data collection will fit in with ongoing water quality monitoring projects, as appropriate.	
Location of action	Abandoned mine sites selected for remediation activities.			
Benchmark	Baseline report submitted to Trustee Council. [The baseline report may be equivalent to the project planning documents – EE/CA or equivalent).	Implementation plans and permits completed within 3 years from date of funding allocation. Implementation completed within 3 years of publication of final EE/CA or project plans.	A measurable improvement in water quality occurs under low-flow and high-flow conditions in relevant tributaries.	

2.13 Erosion Control on the Arkansas Headwaters Recreation Area

Project overview: The Trustees have proposed to provide funding to control erosion in the Arkansas Headwaters Recreation Area. The project sponsor, Colorado State Parks, is in the process of developing a comprehensive watershed plan for the Arkansas Headwaters Recreation Area (AHRA). The Trustees expect to help fund implementation for site-specific erosion control projects in the recreation area that are identified through the watershed plan. For example, insufficient road maintenance and associated degraded vegetation can be a contributing factor to erosion and sedimentation in certain watersheds. The objective of the project is to reduce erosion, which will lead to healthier terrestrial vegetation, reduced sediment loading into the river, and improved aquatic habitat.

Overview of monitoring steps: Exhibit 26 (at the end of this project section) presents the monitoring framework for this project. Baseline monitoring for this project will consist of the watershed monitoring plan already being developed for the AHRA. This report will be used to evaluate the areas most in need of restoration to minimize erosion.

Implementation monitoring will involve documentation of site-specific erosion control actions completed that are consistent with the watershed management plan, using photography and other relevant monitoring techniques. The project sponsor, Colorado State Parks, will be responsible for baseline and implementation monitoring.

Effectiveness monitoring will include specific observations that will depend on the site-specific projects implemented pursuant to the watershed plan. Overall, monitoring will be designed to answer the following questions:

- By year 5 after implementation, has erosion been reduced in the project area because of the site-specific actions taken?
- By year 5 after implementation, are vegetation conditions improved in the project area because of the site-specific actions taken?
- By year 5 after implementation, has water quality improved downstream of the project area because of the site-specific actions taken?

Appropriate monitoring data may include evidence and amounts of erosion (such as rills or gullies), vegetation surveys, and downstream water quality. Monitoring data will be collected annually during the first five years after a project is completed. Long-term monitoring will be conducted 10 years after the project is completed. Restoration will be considered successful if projects are intact and meeting the benchmarks developed in project plans for treated road

conditions, vegetation cover, water quality, and other appropriate metrics. If these benchmarks are not met, adaptive management may be required.

Reporting requirements: A proposed reporting schedule is provided in Exhibit 25; this schedule may be modified if necessary, as long as the revised schedule also provides the Trustees with sufficient information for evaluation and decision-making. The watershed management plan, which will also serve as a baseline conditions report, will be submitted to the Trustee Council before restoration planning begins. The Colorado State Parks will submit implementation progress reports twice each year while projects are ongoing. After restoration is completed, the Colorado State Parks will prepare annual reports detailing the results of monitoring actions; this report will be submitted to the Trustee Council. Ten years after the restoration is completed, the Trustee Council will work with the Colorado State Parks (and/or appropriate contractors) to prepare a long-term monitoring report.

Exhibit 25. Proposed monitoring schedule for erosion control on the Arkansas Headwaters Recreation Area. An "X" indicates each monitoring event; two "X"s in one box indicate semi-annual monitoring.

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring target		**Years counted from date funding received**									
	Erosion control implementation	XX	XX	XX							
		Years counted from date of implementation									
	Effectiveness monitoring (e.g., vegetation surveys, water quality monitoring)	X	X	X	X	X					X
	Report submitted	X	X	X	X	X					X

Funding: The Trustees plan to provide $100,000 for planning, implementation, and monitoring in support of these erosion control restoration projects. [Note that this funding was designated as Tier Three funding in the RP/EA. Funding will be provided subject to funding availability after Tier One and Tier Two projects are funded. Funding also is subject to Trustee review and approval of specific erosion-control projects.]

Exhibit 26. Proposed monitoring framework: Erosion control on the Arkansas Headwaters Recreation Area

	Baseline monitoring	Implementation monitoring	5-year effectiveness monitoring	10-year effectiveness monitoring
Objective of action	Describe baseline conditions that demonstrate need for erosion control projects in the AHRA.	Determine if erosion control actions have been implemented.	Determine if erosion control measures have been maintained. Determine if sediment loading to the Arkansas River has been reduced.	
Monitoring action description	Baseline evaluation will consist of watershed management plan already being developed for the AHRA, identifying key areas in need of restoration.	Provide documentation of erosion control actions, including photographic surveys.	Monitoring actions will depend on specific projects implemented, but may include vegetation surveys for areas where vegetation cover was improved and documentation of evidence and amounts of erosion, such as rills or gullies. If feasible, water quality measurements will be conducted to document trends in turbidity or other relevant measures of erosion.	
Who is responsible for monitoring?	Project sponsor (Colorado State Parks).			Trustee Council working with project sponsor.
Timing of action	Watershed management plan will be completed before restoration projects are implemented.	Twice a year report during implementation phase until projects are completed.	Annually for 5 years after restoration projects completed and again in year 10.	
Location of action	Arkansas Headwaters Recreation Area.			
Benchmark	Watershed management plan submitted to Trustee Council.	Projects completed on schedule determined in watershed management plan or other planning documents.	Projects are intact and meeting benchmarks in project plans for increased vegetation cover, decreased erosion, and/or other appropriate metrics. If measured, water quality shows a decrease over time in turbidity or similar parameters.	

3. Project Oversight and Communication

The Trustees have developed reporting requirements for restoration monitoring to provide information and data important for oversight, decision-making, and public communication about restoration successes and failures. As described in Section 2, each project will submit regular reports (determined by the type of project and types of monitoring required) to the Trustees. This section describes briefly how monitoring reports will be used for oversight and for communication.

3.1 Project Oversight

A depiction of the way that the Trustees will use the different types of monitoring for ongoing oversight and decision-making about restoration projects is provided in Exhibit 27. This process diagram indicates that failure to meet implementation benchmarks will result in a request from the Trustees to a project sponsor for a corrective action plan. If significant implementation problems continue, the Trustees may suspend implementation funding for a project. If effectiveness benchmarks are not being met, the Trustees will review results with the project sponsor and help create a plan for overcoming obstacles. This plan may include corrective actions ("adaptive management") to improve project outcomes, or validation monitoring if the reason for the lack of project success is not clear. Interpretation of data from validation monitoring may suggest additional ways that projects can be modified to help achieve expected results.

3.2 Restoration Monitoring Communication

The Trustees intend to engage in regular communication with the public about implementation progress and the success (or challenges) of restoration projects in meeting objectives. Information from implementation monitoring will be used to communicate with the public about whether projects are being implemented according to proposed plans and schedules. Effectiveness monitoring in the first five years, carried out primarily by project sponsors, will provide snapshots of whether individual projects are trending toward success and meeting benchmarks established for that project. Longer-term effectiveness monitoring at approximately five- and 10-year milestone points will be carried out by the Trustees and will look both at individual project success and at the "portfolio effect" resulting from the suite of restoration projects implemented by the Trustees. Communication with the public will occur through a variety of media, including website updates, press releases, public tours, issuance of fact sheets, presentations at public meetings, and preparation of written monitoring status reports.

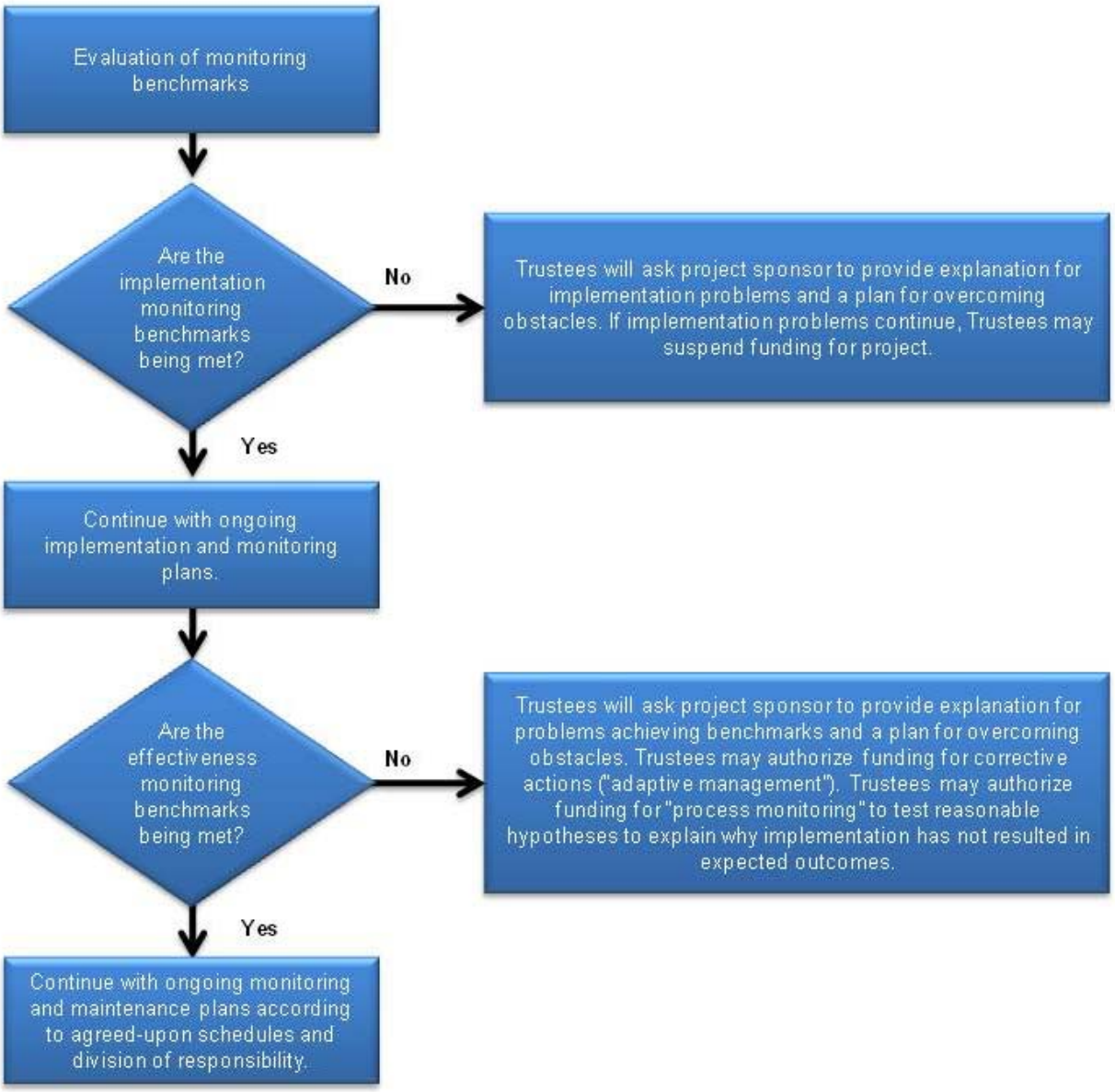

Exhibit 27. Process diagram depicting how Trustees will use monitoring information for decision-making.

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Appendix. Restoration Monitoring Reports – Suggested Outlines

The outlines provided below are suggested methods for organizing monitoring information provided to the Trustee Council. The first outline is for a preliminary restoration implementation report. This report should be completed at the end of the preliminary implementation stage of major components of the restoration (e.g., once construction is complete, purchases have been made, population supplementation has been initiated) as delineated in the restoration plan. In the case of multiple-component or multiple-site restoration projects, multiple implementation reports may be completed in a manner that complements the timeline and milestones established in the restoration plan.

The second outline is for an effectiveness monitoring report. These reports should be completed according to the schedule given in Section 2 of this monitoring plan. The third outline is for a final restoration completion report.

A.1 Restoration Implementation Monitoring Report

1.0 Introduction

1.1 Injured resources (at the restoration site)

1.2 Restoration goals and objectives

2.0. Modifications to Restoration Objectives or Actions

2.1 Explain any modifications to the restoration plan objectives or restoration actions, including why modifications were necessary

3.0 Restoration Actions Completed and Associated Costs

3.1 Within an outline of restoration objectives, list each restoration action that supported each objective, document its completion and that it met the performance standards established in the restoration plan. If deviations from planned performance standards were accepted, document each modification or deviation, the reason for each, and its influence on obtaining the restoration goal.

3.2 In a separate list or table, provide actual cost for completion of each restoration action.

4.0 Monitoring Requirements and Ongoing Actions

4.1 Document post-implementation monitoring activities that will be performed. If there are no changes from the monitoring plan outlined in the restoration plan, simply indicate such with no further documentation necessary. If modifications of the plan have been made, document them, and provide the reason for the change (e.g., change in objective, change in restoration action, change in performance standard or criteria).

4.2 If there are further site modifications anticipated during the post-implementation stage of the restoration (e.g., controlled burns, ongoing invasive species control), document them and the anticipated timetable for their completion.

5.0 Photo Documentation

5.1 Provide before and after photographs for sites where restoration actions have been performed, photographs of parcels subject to easement or management, education displays developed, etc., as prescribed in the restoration monitoring plan.

6.0 Certification

6.1 The case manager for the lead trustee certifies the findings presented in the preliminary restoration implementation report.

A.2 Effectiveness Monitoring Report

To be completed according to the monitoring schedule presented in this monitoring plan.

1.0 Executive Summary

1.1 Provide a condensed summary of the highlights of monitoring activities, findings, and corrective actions occurring during the current monitoring period.

2.0 Introduction

2.1 Provide an abbreviated introduction that documents the goals and objectives for the restoration. Include findings and corrective actions from previous monitoring periods as appropriate and relevant to the current monitoring period.

3.0 Modifications and Corrective Actions

3.1 Document any modifications to the restoration objectives or actions made during the time since the preliminary implementation report or the previous monitoring report for this restoration. In the case of corrective actions, reference the section that documents the monitoring findings leading to the actions. Provide performance standards and performance criteria for restoration actions without previous application within this restoration. If restoration actions were completed during this monitoring period, document their implementation and meeting of performance standards.

3.2 Document the implementation of corrective actions that were initiated but not completed during previous monitoring periods.

4.0 Monitoring Activities

4.1 Document monitoring activities (including or referencing measures, previously undocumented methods, frequency, dates, locations, participants, etc.) evaluating the outcome of all restoration actions taken to assess attainment of restoration objectives. Provide summary statistics and data summaries with sufficient detail to allow evaluation of performance criteria for restoration actions. When findings indicate failure to meet performance criteria, describe actions taken to rectify deficiencies or further evaluate causation of failure.

4.2 Describe other findings since the previous monitoring period that are relevant to the progression of the restoration process.

4.3 Provide photographic documentation of the progression of site recovery, specific monitoring endpoints, corrective actions, and other topics that help clarify the findings of the monitoring report.

4.4 Describe other monitoring activities (not currently part of the restoration) that might provide improved insight into the restoration process, the breadth of the resource recovery, or additional benefits resulting from restoration activities.

5.0 Recommendations

5.1 Provide recommended modifications of restoration objectives or actions for the upcoming monitoring period that have not already been implemented during the current monitoring period. Reference monitoring findings or project conditions upon which the recommendations are based. Provide methodological and scheduling recommendations for their implementation and performance standards

and criteria for their assessment if they are actions not previously implemented in the restoration.

6.0 Certification

6.1 The case manager for the lead trustee certifies the findings presented in the monitoring report.

A.3 Final Restoration Completion Report

To be submitted upon completion of restoration objectives and meeting of restoration goals.

1.0 Executive Summary

1.1 Provide a condensed summary of the highlights of the restoration, documenting the initial condition of the resource, the primary goals of the restoration, and the condition of the resource at the time of completion of the restoration.

2.0 Introduction

2.1 Provide an abbreviated introduction that gives a complete and updated list of goals and objectives for the restoration.

3.0 Completion Status of Restoration Objectives

3.1 Document the completion of each of the restoration objectives. For each objective, provide a reference to previous monitoring reports documenting the attainment of performance criteria for each restoration action taken to reach the objective. Include all restoration actions implemented as corrective actions beyond the scope of the original restoration plan. Where appropriate and sufficiently documented, a simple tabular format may suffice.

3.2 In the case where individual restoration actions or restoration objectives are not completed or attained and this deficiency is not documented in previous monitoring reports, provide an explanation and reason for the deficiency.

3.3 Provide photographic, tabular, and/or statistical documentation, as most appropriate for the restoration, that documents the progression of the resource's recovery.

4.0 Achievement of Restoration Goals

4.1 Confirm that the restoration goals, as described in the restoration plan, were achieved with the completion of the restoration objectives.

4.2 If any of the stated restoration goals were not achieved, explain why they were not met (e.g., insurmountable or unanticipated logistical/monetary impediments, natural disasters).

5.0 Future Management of the Restored Resource

5.1 Document the identity and contact information of the party responsible for future management of the restored resource. If the party and their contact information is the same as that documented in the restoration plan, state only that there is no change from the restoration plan.

5.2 Describe any special conditions or recommended actions relevant to the future management of the resource that have not been documented since the previous monitoring report.

6.0 Certification

6.1 The Administrative Official for the restoration certifies the findings presented in the restoration completion report and that all performance bonds, contingency funds, escrow accounts, etc., have been released.