

CHAPTER 4

Environmental Consequences

CHAPTER 4**ENVIRONMENTAL CONSEQUENCES****I. INTRODUCTION**

This chapter discloses the environmental consequences of implementing the alternatives. The description of the affected environment found in Chapter 3 provides the baseline for describing the consequences. A comparison of the alternatives is found in Chapter 2.

Chapter 4 focuses on the most significant effects. The chapter also discusses the cumulative, or combined effects, of the actions of the alternatives along with past actions and reasonably foreseeable future actions.

II. PHYSICAL ENVIRONMENT**A. Watershed, Soils, and Aquatic Ecosystems****1. Introduction**

The Tin Cup Dam repair work has the potential to affect Tin Cup Lake and Tin Cup Creek water quantity and quality. Regulation of reservoir storage and releases to streamflow will not be significantly affected by the proposed alternatives. Potential water resource effects are temporary, and sedimentation will be localized during replacement of the outlet pipe in Tin Cup Lake near the outlet and in Tin Cup Creek in the reach immediately downstream of the reservoir outlet. Sampling of the dam or rock sources, rip rap placement, and debris piling and burning will not cause sedimentation of the lake or stream. The analysis includes the effects of dam outlet pipe replacement on soil and water in the localized area of the reservoir outlet.

Pack stock and draft horse access will not cause watershed effects along the trail. Routine trail maintenance and drainage control is designed and planned to mitigate recreational use, and the alternatives will not require additional maintenance or control. Trail stream crossings for horses are three rocky fords with sufficient rock in the channel bed and banks to protect the channel from soil displacement and sediment introduction. Helicopter access will not affect the lake or stream.

An important best management practice to protect water in all action alternatives is that fuel storage will be contained in an impoundment area located away from lake and stream waters to prevent water contamination in the event of fuel spillage. Another important best management practice that will be used at the dam site to mitigate effects to water resources and facilitate repair work is that the reconstruction work will be completed at the end of the summer irrigation season when the reservoir water level will be at the annual minimum. Water may be pumped from the reservoir to the stream to complete some phases of work, possibly resulting in augmented late season stream flows. This is considered a benefit to aquatic ecosystems, or at least, has no effect.

Water pumping will also help keep work areas near the reservoir shore drier, reducing sediment introduction.

An additional best management practice that is proposed in all action alternatives is using a filter cloth just downstream from the outlet of the dam to trap sediment and prevent it from flowing downstream.

2. Consistency with Forest Plan

Forest Plan direction for water and soil resources can be summarized as maintaining soil productivity and favorable conditions of streamflow for instream and downstream beneficial water uses. Beneficial downstream uses include irrigation, fisheries, and healthy aquatic ecosystems. Best management practices (called soil and water conservation practices in the Forest Plan) are legal requirements for meeting these goals. All alternatives are consistent with Forest Plan direction for soil and water resources.

3. Effects by Alternative

a. Effects Common to All Action Alternatives

Minor sedimentation at Tin Cup Lake Reservoir in the immediate lower reservoir vicinity and of Tin Cup Creek at the reservoir outlet for several hundred yards immediately downstream is likely to occur. This increase in turbidity and deposition is expected for several weeks following the activities. Best management practices, including the timing of the activities during lowest flows, will minimize this sedimentation. The effects to soil and aquatic ecosystems of helicopter and trail access and of the dam drilling or soil sampling are negligible among all action alternatives. Stream temperatures will be unaffected by all alternatives.

1) Alternative 1

There would be no effects on the water resource. Soil resources and favorable conditions of streamflow would be maintained for instream and downstream beneficial water uses. Aquatic ecosystems and the availability of irrigation water could be adversely affected if the dam were to fail or be breached. Dam failure is a hypothetical matter of risk, and it would have spatial and temporal effects on stream sedimentation and channel conditions dependent upon how rapidly and completely such failure occurred.

2) Alternative 2

Small increases in sediment yield to Tin Cup Creek would occur under all action alternatives as a result of replacing or repairing the dam outlet pipe. Differences in the degree of sedimentation caused by the various action alternatives would be small and difficult to quantify. Sediment input from dam outlet repair would be short-term, minor, and confined to a small section of Tin Cup Creek immediately downstream of the dam outlet. Minor sediment input from dam repairs would be restricted to a short time period (several weeks) during and immediately following dam reconstruction. Timing dam repair work to coincide with seasonal low flows would minimize overall sediment input. Dam repairs would occur in early autumn when the reservoir is

at low pool, and streamflows would not be significantly reduced by dam outlet repair. A temporary filter dam would be used downstream of the dam outlet pipe to trap sediments introduced by outlet replacement.

Changes within Tin Cup Lake Reservoir would be negligible. Repair work would occur in autumn when the reservoir is at low pool, and reconstruction activities would not be conducted within the waters of the reservoir.

3) Alternative 3

There is no difference between Alternatives 3 and 2 relative to repair of the outlet pipe and potential short-term sedimentation of Tin Cup Lake and Creek. A temporary filter dam would be used downstream of the dam to trap sediments.

4) Alternative 4

Effects of dam outlet repair to Tin Cup Creek and Lake would be as discussed above for Alternative 2 with the exception that repairing the outlet pipe in place would lessen reservoir and outlet stream turbidity and sedimentation in 1997 compared with the replacement proposed in Alternatives 2 and 3 which disturbs more dam sediments. This disturbance would only be delayed for a year when the pipe liner would be installed. A temporary filter dam downstream of the outlet would be used to catch sediments.

B Wetlands

Dam reconstruction and trail access will not disturb any wetlands. Best management practices discussed for protecting soil and water will also protect wetlands. Project area wetlands will not be adversely affected by any of the proposed alternatives.

III. BIOLOGICAL ENVIRONMENT

A Fisheries

1. Introduction

The Tin Cup Dam Reconstruction project has the potential to affect fish habitat and populations in Tin Cup Creek and Reservoir. Alternatives were evaluated for their potential effects to habitat and populations by comparing predicted changes in sediment yield and streamflows with existing conditions.

2. Biological Evaluation

Bull trout and westslope cutthroat trout (WSCT) are the only sensitive fish species that occur in the Tin Cup drainage. Shorthead sculpin have not been found in the Bitterroot drainage in any collections to date. This project would have **NO IMPACT** on shorthead sculpin, and effects on shorthead sculpin will not be further discussed in this analysis.

A Biological Evaluation (BE) has been incorporated within this chapter documenting the direct, indirect, and cumulative effects of all alternatives on WSCT and bull trout habitat, individuals, and populations (FSM 2672.4).

3. Consistency with the Forest Plan

The Forest Plan states that aquatic habitat will be maintained or improved. Management practices are to have minimal impacts on the aquatic ecosystem and be free from permanent or long-term unnatural imposed stress. A long-term stress is defined as a decline in aquatic habitat and/or fish populations for more than one hydrologic year as determined by Forest Plan monitoring procedures (page IV-7). Indicators used to detect downward trends are fish populations, intergravel sediment, channel structure, and riparian vegetation changes.

The Forest Plan was amended on August 30, 1995, with the signing of the Inland Native Fish Strategy (INFISH). INFISH establishes Riparian Management Objectives (RMOs) for all Riparian Habitat Conservation Areas (RHCAs) across the forest. RHCAs are portions of watersheds where riparian-dependent resources receive primary emphasis, and management practices are subject to specific standards. For this project, all work at the dam would occur within the RHCAs surrounding Tin Cup Creek (Category 1 RHCA) and Tin Cup Reservoir (Category 3 RHCA), and the default RHCA widths and RMO standards listed in the INFISH strategy are in effect. A copy of the default RHCA widths and RMO standards is included in the Project File.

All alternatives would be consistent with the Forest Plan and INFISH. None of the activities proposed within RHCAs would retard the maintenance, attainment, or existing status of RMOs or adversely affect inland native fish.

4. Effects Common to All Action Alternatives

Minor sedimentation of Tin Cup Creek from the dam outlet to approximately 1,000' downstream is likely under all action alternatives. Increases in sediment and turbidity are expected to last 2-3 weeks, during and immediately following outlet pipe replacement/repair. A temporary filter dam would be constructed and filter cloth would be used to trap sediment below the outlet. Sediment deposition would cause minor losses and reductions in WSCT habitat within 1,000' of the dam outlet. Some individual WSCT near the outlet may be temporarily displaced, but significant fish losses and disruption of the population are unlikely. Sediment deposition and turbidity are not likely to affect WSCT and bull trout habitats and populations further downstream. Losses or reductions in WSCT and aquatic insect habitat near the outlet would be short-term, as most sediment is expected to be flushed during high flows the following summer.

Minor sediment deposition and turbidity in a small, shallow portion of Tin Cup Reservoir near the inlet pipe is likely during and immediately following outlet pipe replacement/repair. Turbidity would be local and temporary and would have no significant impact on WSCT individuals and habitat in the reservoir.

Water temperatures and discharge in Tin Cup Creek would be similar to existing conditions. Replacement/repair of the outlet pipe would occur in late summer when the reservoir is at low pool. Stored water would be gradually released early in the summer to ensure adequate drawdown of the reservoir prior to outlet pipe work. Core drilling, debris removal from the headgate and dam face, and helicopter access would have no detectable effects on the aquatic ecosystem.

Pack stock use of the trail would not cause detectable sediment inputs to Tin Cup Creek. All trail stream crossings are stable, cobble-boulder fords.

5. Effects by Alternative

a. Alternative 1

Fish habitat, populations, and INFISH RMOs in Tin Cup Creek and Reservoir would remain at or near existing levels. In the event of a sudden, massive failure or breach in the dam, significant losses in fish habitat and populations are likely to occur. The probability of dam failure is difficult to predict and is based on hypothetical risk. The severity of fish habitat and population losses would depend on the speed and magnitude of the failure.

Direct and Indirect Effects

WSCT - None likely.

Bull trout - None likely.

Cumulative Effects

WSCT - Over time, the probability of dam failure would slowly increase. Sudden dam failure and the resulting flash flood could significantly reduce WSCT populations in the Tin Cup drainage, but complete extirpation would be highly unlikely due to the abundance and widespread distribution of WSCT throughout the drainage, both above and below Tin Cup Reservoir.

Bull trout - Over time, the probability of dam failure would slowly increase. Unlike WSCT, bull trout are uncommon in Tin Cup Creek and their distribution is much more restricted. Bull trout are also not present above Tin Cup Reservoir. Under a worst-case scenario (full pool with heavy run-off), a flash flood caused by a sudden dam failure could severely reduce the bull trout population in Tin Cup Creek.

Determination of Impact of Alternative 1

WSCT - WSCT habitat and populations would remain at or near existing levels. Although the threat of dam failure would increase over time, this threat is too unpredictable in its timing and potential damage to warrant an adverse call on WSCT population viability. Therefore, Alternative 1 would have **NO IMPACT** on WSCT habitat, individuals, or populations. Alternative 1 would have no significant effect on the viability of WSCT on a local, regional, state, or range-wide basis because local populations are not expected to decrease, and there would be no impacts to populations or habitat outside the area.

Bull trout - Same determination (NO IMPACT) and rationale as WSCT

Recommendations for Mitigations - Follow all INFISH standards and guidelines.

b. Alternative 2

Under Alternative 2, sediment deposition within 1,000' of the outlet is likely to cause: (1) minor filling of pool habitats; (2) short-term losses of aquatic insect habitat near the outlet; and (3) scattered, short-term losses of WSCT spawning and rearing habitat. Some WSCT may be temporarily displaced within this 1,000' section, but significant fish losses and population disruption are unlikely. Sediment deposition and turbidity are not likely to affect WSCT and bull trout habitat and populations further downstream. Losses or reductions in WSCT and aquatic insect habitat near the dam outlet would be temporary.

Direct Effects

WSCT - Sedimentation would directly impact WSCT habitat in Tin Cup Creek within 1,000' of the dam. There would be no direct effects on WSCT habitat and individuals downstream of this 1,000' section. Direct effects to WSCT habitat would include: (1) minor sediment filling of pool habitats; (2) sedimentation of spawning gravels in scattered locations such as pool tailouts; and (3) minor sedimentation of juvenile rearing cover along low velocity stream margins and other depositional areas. These direct effects on WSCT habitat are expected to last until high flushing flows the following summer. Pulses of sediment and turbidity may cause the temporary displacement of individual WSCT from areas near the outlet, but they are not likely to cause the immediate mortality of any fish. No direct effects would occur in Tin Cup Reservoir.

Bull trout - None likely. Sedimentation would be confined to the 1,000' section directly below the dam outlet. The nearest known or suspected bull trout are located at least three miles below the dam. At that distance, sediment and turbidity effects are expected to be negligible.

Indirect Effects

WSCT - Minor losses and reductions in habitat would indirectly impact individual WSCT within 1,000' of the dam. Indirect effects would possibly include: (1) reduced reproductive success for the summer 1998 age-class; (2) mortality of a few WSCT as a result of displacement from pool and rearing habitats; and (3) temporary reductions in aquatic insect drift near the dam. Indirect effects are expected to be temporary, lasting until high flows in summer 1998. There would be no indirect effects on WSCT habitat, individuals, or populations in Tin Cup Reservoir or further downstream.

Bull trout - None likely. Indirect effects would occur at least three miles above the nearest known or suspected bull trout.

Cumulative Effects

WSCT - Cumulative effects are discussed in Section F. Alternative 2 has the potential to contribute additional sediment to the elevated levels already present in Tin Cup Creek below the dam outlet. As a result, Alternative

could also contribute to minor reductions in WSCT carrying capacity and reproductive output in this section. Alternative 2 would not contribute to any existing cumulative effects caused by low winter streamflows.

Bull trout - Cumulative effects are discussed in Section F. On a drainage-wide scale, the sediment accumulations below the dam are insignificant, and have not had an adverse affect on downstream bull trout habitat. Therefore, Alternative 2 is not expected to contribute to any existing cumulative effects on bull trout habitat, individuals, or populations.

Determination of Impact of Alternative 2

WSCT - Alternative 2 would cause minor reductions in WSCT habitat quality and quantity. These reductions may result in the indirect mortality of a few WSCT due to displacement, but losses of habitat and fish would not occur on a large enough scale to threaten population viability. Therefore, Alternative 2 **MAY IMPACT INDIVIDUAL WSCT AND HABITAT, BUT WOULD NOT LIKELY CONTRIBUTE TOWARDS FEDERAL LISTING OR RESULT IN A LOSS OF POPULATION VIABILITY.** Alternative 2 would have no significant effect on the viability of WSCT on a local, regional, state, or range-wide basis because losses of fish and habitat would be minor, and would not impact populations or habitat outside the analysis area.

Bull trout - Alternative 2 is not expected to have any direct, indirect, or cumulative effects on bull trout habitat or individuals. Impacts would be restricted to a small section of stream at least three miles above the nearest known or suspected bull trout. Therefore, Alternative 2 would have **NO IMPACT** on bull trout habitat, individuals, or populations, and no significant effect on the viability of bull trout on a local, regional, state, or range-wide basis. Local populations are not expected to decrease, and there would be no impacts to populations or habitat outside the analysis area.

Recommendations for Mitigations - Follow all INFISH standards and guidelines.

c. Alternative 3

Effects on fish habitat and populations would be the same as Alternative 2. Alternatives 2 and 3 would disturb similar areas of sediment in the lake bed (above the inlet) and stream channel (below the inlet) and would produce similar sedimentation of Tin Cup Creek.

The use of draft horses would eliminate the need to fly the backhoe in and out, which is an operation that can pose risks to water quality. The use of draft horses would also reduce the amount of fuel that would need to be flown in and stored at the site, from 200 gallons to approximately 50 gallons. Fuel transport and storage can provide risks from spills.

Direct, Indirect, and Cumulative Effects

WSCT - Same as Alternative 2.

Bull trout - Same as Alternative 2

Determination of Impact of Alternative 3

WSCT - Same determination and rationale as Alternative 2.

Bull trout - Same determination and rationale as Alternative 2

Recommendations for Mitigations - Same as Alternative 2

d. Alternative 4

Patching the existing outlet pipe would significantly reduce the potential sediment effects on WSCT habitat and individuals described for Alternatives 2 and 3. Under Alternative 4, sediment impacts on WSCT individuals and habitat would be confined to the immediate vicinity (within 100') of the dam outlet. Alternative 4 may reduce the threat of outlet pipe failure for several years.

Direct, Indirect, and Cumulative Effects

WSCT - Similar to Alternative 2, with the duration, area, and magnitude of sediment impacts being significantly reduced under Alternative 4, and confined to the immediate vicinity (within 100') of the dam outlet.

Bull trout - Same as Alternative 2.

Determination of Impact of Alternative 4

WSCT - Although sediment would be reduced under Alternative 4, some habitat near the outlet may still be temporarily impacted. Therefore, Alternative 4 **MAY IMPACT INDIVIDUAL WSCT AND HABITAT, BUT WOULD NOT LIKELY CONTRIBUTE TOWARDS FEDERAL LISTING OR RESULT IN A LOSS OF POPULATION VIABILITY.** Alternative 4 would have no significant effect on the viability of WSCT on a local, regional, state, or range-wide basis because local populations are not expected to decrease, and there would be no effect on populations or habitat outside the area.

Bull trout - Same determination and rationale as Alternative 2.

Recommendations for Mitigations - Follow all INFISH standards and guidelines

6. Cumulative Effects

Over time, the annual release of stored water from Tin Cup Reservoir has probably contributed to elevated sediment levels (25-40%) in the first 500' of stream below the dam. This local build-up of sediment has probably reduced WSCT carrying capacity and reproductive output in this section. The remainder of Tin Cup Creek generally contains low sediment levels (< 10%) and does not exhibit signs of unnatural sedimentation. The operation of the dam does not appear to have a cumulative effect on the water temperature of Tin Cup Creek.

The main cumulative effect of Tin Cup Dam may occur in winter when the outlet pipe is closed for water storage and winter flows are reduced. This effect is most significant in the first 2-3 miles immediately below the dam, and becomes

less important further downstream as other tributaries enter Tin Cup Creek and supplement the low flows. Low winter flows probably cause some losses of WSCT overwintering and stream margin rearing habitat in the first 2-3 miles below Tin Cup Dam. Within the range of bull trout, low winter flows are less of a problem due to the addition of water from several large tributaries. Still, it is possible that some bull trout spawning habitat may be annually lost. Bull trout redds are particularly vulnerable to low winter flows because the eggs must overwinter in the gravel, and water reductions can expose and freeze the eggs. In summary, low winter flows caused by dam operation could potentially reduce the survivorship of young-of-the-year (YOY), juvenile, and adult bull trout and WSCT in some areas of upper Tin Cup Creek by reducing winter pool volume, stream margin rearing habitat, and bull trout spawning habitat.

**SENSITIVE SPECIES BIOLOGICAL EVALUATION
SUMMARY OF CONCLUSION OF EFFECTS****

Project Name: Tin Cup Dam Repair

Species	ALT 1	ALT 2	ALT 3	ALT 4
1. Westslope cutthroat trout	NI	MIIH	MIIH	MIIH
2. Bull trout	NI	NI	NI	NI
3. Shorthead sculpin	NI	NI	NI	NI

Prepared by: /s/ Michael J. Jakober
BNF North Zone Fisheries Biologist

Date: 4/11/97

NI = No Impact

MIIH = May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Loss Of Viability To The Population Or Species

WIFV* = Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population Or Species

BI = Beneficial Impact

*Trigger for a Significant Action As Defined In NEPA

** Note: Rationale For Conclusion Of Effects Is Contained In The NEPA Document.

Form 2 (R-1/4/6-2670-95)

B. Vegetation (including noxious weeds and sensitive plant species)

1. Introduction

The effects of proposed management activities on sensitive plant species are assessed by estimating how activities would affect the population viability of these species throughout their geographic range. There were no sensitive plant species found in areas of proposed activity for the Tin Cup Dam project.

Spotted knapweed (Centaurea maculosa), a state noxious weed, was found on the dam site and effects of proposed activities on the spread of this weed will be analyzed.

2. Consistency With the Forest Plan

The Forest Plan specifies (Forest Plan, Chapter II, page 5) that vascular plants identified as rare, pending study, or proposed as threatened or endangered would be identified and protected.

Noxious weed direction in the Forest Plan (p. II-29) states that "the primary means of preventing, controlling, or containing noxious weeds will be through vegetative management practices and by the use of biological agents such as insects, rusts, molds, and other parasites on host plants. However, herbicides may be utilized to provide short-term protection on specific sites after appropriate environmental analysis."

All alternatives would achieve Forest Plan goals and standards.

3. Alternative 1 - No Action

The No Action Alternative should have no effect on sensitive plant species, since none occur on the dam site. However, should the dam fail due to No Action, any sensitive plants that may exist downstream from the dam may be impacted by floodwaters. It is unknown if these impacts would be adverse or beneficial, since some species respond favorably to disturbances. Affects on native vegetation would be similar to sensitive plant species.

Disturbances associated with dam failure are likely to encourage knapweed spread.

4. Alternatives 2, 3, and 4

None of the action alternatives include conducting activities where sensitive plant populations occur. Therefore, there will be no direct, indirect, or cumulative impacts to any individual sensitive plant species, their habitat, or the population viability of any sensitive plant species as a result of the proposed Tin Cup Lake Dam Project.

Since there is a small population of spotted knapweed (Centaurea maculosa) on the dam, ground disturbance associated with proposed activities is likely to spread this noxious weed to newly disturbed areas. Removal of 30% of the shrubs from the downstream slope of the dam by flush cutting will let in more sun, possibly increasing the likelihood of knapweed spreading to this area.

However, this is an east-facing slope, and the shrub species growing here will probably resprout in a couple of years. Knapweed is usually most prolific on steep, south-facing slopes with patches of bare soil (Losensky, 1987).

Alternative 4 would result in the least impacts to vegetation since horses or a Bobcat backhoe will not be required to replace the outlet pipe sleeve. Horse use (Alternative 3) could result in less soil compaction than using a Bobcat backhoe (Alternative 2) although plants could be trampled by horses or pulled out of the ground by hoof action. Bobcat backhoe activity would result in plants being compacted and possibly torn out of the ground when pulling heavy items. Efforts should be made with either alternative to reduce the impacts of horses or Bobcat backhoe on vegetation in the area. Areas of high impact, where vegetation is removed, should be reseeded with the seed mix mentioned in Chapter 2 (Mitigation Measures).

If the mitigation measures outlined in Chapter 2 for cleaning equipment and revegetating disturbed areas are followed, the possibility of spreading spotted knapweed should be reduced.

C Wildlife

This section contains narratives which display the effects of the various alternatives to the habitats and populations of the Forest Plan Management Indicator Species (MIS), Threatened, Endangered and Sensitive (TES) wildlife species, and other wildlife species as listed in Chapter 3. Effects of the alternatives will be described individually for each species. Effects to all the species will also be summarized for each alternative.

Effects of management actions to wildlife species are generally a result of either habitat alteration or direct disturbance from human activities. The significance of any effects to a particular species depends in a large part on the scale of the habitat alteration or disturbance. With a few exceptions, most of the wildlife species evaluated in this report are relatively mobile and have fairly large home ranges. Short-term disturbance is unlikely to affect individuals of mobile species to any extent, because they can simply move away from the source of the disturbance. Similarly, minor changes in habitat are unlikely to affect such individuals since their home ranges are large enough that important habitat components are replicated in various areas within them.

1. Effects to Management Indicator Species from all Action Alternatives

a. Elk

Direct Effects

Work at the dam site, helicopter flights to shuttle equipment to and from the site, and packing equipment up the trail on stock have some potential to disturb elk summering in the upper Tin Cup drainage. The effects of such disturbance would be minor due to the short duration of the helicopter flights and the localized nature of the repair work. As noted in Chapter 3, elk likely avoid the area around Tin Cup Lake due to the relatively high amount of recreational use that the area receives during the summer and fall months. Any elk disturbed by these activities could easily get away from them by moving a

short distance into an adjacent drainage. The duration of project related disturbance is longer in Alternative 3, but this would make little difference in overall effects to elk.

Indirect Effects

Elk habitat effectiveness (EHE) and elk security will remain at existing levels under all alternatives because none of them will result in a change to existing levels of public motorized use. There will be no changes to elk habitat percentages under any alternative.

Cumulative Effects

This project would not contribute to cumulative effects to elk.

b. Pine Marten

Direct Effects

The potential for human disturbance to marten from either the helicopter flights or work at the dam site is very limited. Disturbance in the form of pack strings moving supplies up the trail would be similar to the kinds of disturbance that animals living near the trail currently experience from recreational users. This minimal project disturbance would not be expected to displace or alarm animals living near the trail any more than existing recreational use.

Indirect Effects

None of the alternatives would alter marten habitat in the Tin Cup Creek drainage, so existing habitat quality and distribution would be maintained. The area surrounding the dam site is poor quality habitat for marten.

Cumulative Effects

This project would not contribute to cumulative effects to marten.

c. Pileated Woodpecker

Direct Effects

The area surrounding the dam site is not suitable habitat for Pileated Woodpeckers due to the high elevation, so work at the site has no potential for disturbing this species. The potential for human disturbance to Pileated Woodpeckers from the helicopter flights is very limited. Disturbance in the form of pack strings moving supplies up the trail would be similar to the kinds of disturbance that animals living near the trail currently experience from recreational users. This minimal project disturbance would not be expected to displace or alarm animals living near the trail.

Indirect Effects

None of the alternatives would alter Pileated Woodpecker habitat in the Tin Cup Creek drainage, so existing habitat quality and distribution would be maintained.

Cumulative Effects

This project would not contribute to cumulative effects to Pileated Woodpeckers.

2. Effects to Other Species--Mountain Goat

Direct Effects

Goats are more likely to be affected by disturbance than by habitat alteration from this project. Goats will not be disturbed by project use of the Tin Cup Creek Trail because they generally stay high above the trail on surrounding steep slopes. They are also not likely to be disturbed by construction activities around the dam and would be expected to simply avoid the immediate area.

There is some potential for adverse impacts to goats from the helicopter flights which would occur under all action alternatives. Goats seem to be much more susceptible to disturbance from aircraft than from people or equipment on the ground (Nielsen, pers. comm., 1995). There is little difference between Alternatives 2 and 3 in terms of the number of helicopter flights or amount of disturbance to mountain goats, although flights would be spread over a longer time period in Alternative 3. Alternative 4 would spread activities out over two summers. Potential for disturbance would thus be somewhat higher, but effects of such disturbance would be minor.

The potential for adverse impacts of helicopter flights to mountain goats will be minimized by designating a flight corridor on the south side of the drainage. Mountain goat use is concentrated on the open, south-facing slopes north and west of Tin Cup Creek. A flight path over the north aspects will keep helicopters farther from goats in the drainage which would reduce the amount of disturbance to these animals.

Indirect Effects

None of the alternatives will have more than a very minor effect on mountain goat habitat. The only potential for habitat impacts might be in the small talus borrow area near the dam.

Cumulative Effects

This project would not contribute to cumulative effects to mountain goats.

3. Effects of all Action Alternatives to Threatened, Endangered and Sensitive Species

Expected effects of the alternatives are summarized for those threatened, endangered, and sensitive species which are known or expected to occur on the Forest, as described in Chapter 3. The timing of project activities limits the potential for any adverse effects because they would occur outside the breeding and nesting periods for all TES species. No effects are expected to several TES species (Bald Eagle, Black-backed Woodpecker, Common Loon, and Western big-eared bat) because suitable nesting/denning habitat for these species does not occur in the analysis area. No effects are expected to the Coeur d'Alene salamander and grizzly bear, because the Tin Cup drainage appears to be outside the occupied range of these species.

The following section constitutes the Biological Assessment/Biological Evaluation which analyzes expected effects of all alternatives to TES species. No differences in potential effects between action alternatives are expected. The BA/BE incorporates habitat and status information for TES species on the Forest which is found in Chapter 3 and/or the Project File.

Direct Effects

Disturbance from helicopter overflights, dam repair activities, or packing supplies up the Tin Cup Trail are the only direct effects to TES species anticipated from this project. These activities are unlikely to cause anything more than minor, temporary disturbance to animals which happen to be along the trail, near the helicopter flight path, or near the dam site. This level of disturbance would not result in adverse effects to individual animals or populations. Potential disturbance extends somewhat longer in Alternative 3 and is spread over two summers in Alternative 4, but neither would create adverse effects to TES species.

Indirect Effects (Effects to Habitat of TES Species)

Habitat changes from this project will be limited to the existing dam structure and the immediate vicinity of the dam. These areas have been altered previously and do not currently provide suitable habitat for any TES species, although some of the far-ranging habitat generalists may occasionally travel through the area. Helicopter flights and packing supplies up the Tin Cup Trail are not expected to result in any habitat alteration. Therefore, none of the alternatives are expected to have any effects to existing or potential habitat for any TES wildlife species, and no indirect effects to these species are anticipated.

Cumulative Effects

This project is not expected to result in cumulative effects to any TES species, because the potential for direct effects is so low, and no indirect effects are likely. No changes to existing or potential habitat nor current or future populations of any TES wildlife species are anticipated.

Table IV-1 summarizes direct, indirect, and cumulative effects to TES species for all alternatives based on the rationale above.

Table IV-1 Effects to Sensitive Wildlife Species (All Alternatives)

Species	Direct Effects	Indirect Effects	Cumulative Effects
Threatened and Endangered Species			
Bald Eagle	None (not present)	None	None
Gray Wolf	None	None	None
Grizzly Bear	None (not present)	None	None
Peregrine Falcon	None	None	None
Sensitive Species			
Black-backed Woodpecker	None	None	None
Boreal Owl	None	None	None
CDA Salamander	None (not present)	None	None
Common Loon	None (not present)	None	None
Fisher	None	None	None
Flammulated Owl	None	None	None
Harlequin Duck	None (leave for coast before project)	Temporary if downstream water fluctuation	None
Lynx	None	None	None
Northern Bog Lemming	None	None	None
W. Big-eared Bat	None	None	None
Wolverine	None	None	None

4. Effects of the Alternatives Summary

a. Alternative 1

This alternative would not alter the habitat or change the existing level of human disturbance to any wildlife species in the area, in the short term. However, if the dam failed because of lack of action, floodwaters could affect downstream wildlife habitat and populations.

b. Alternative 2

This alternative would not alter existing habitat quality for any wildlife species. It has some potential for minor, temporary impacts to a number of wildlife species due to disturbance associated with helicopter flights, and/or dam repair activities (duration 2 weeks). None of these impacts would be expected to affect populations or distribution of any wildlife species.

c. Alternative 3

This alternative would have wildlife effects similar to Alternative 2. Potential for disturbance from project activities would be slightly greater (3 weeks) because limitations on the use of motorized equipment would increase the duration of those activities near the dam. The reduced noise associated with using hand equipment instead of machinery for some tasks would mitigate the increased duration of disturbance to some extent. Regardless, none of these impacts would be expected to affect populations or distribution of any wildlife species.

d. Alternative 4

This alternative would have wildlife effects similar to Alternative 2, but these effects would be spread over two summers. Total duration of project activities would be somewhat longer since two, move in/move out periods would be required. The potential for disturbance to wildlife species would be slightly greater as a result, but effects of such disturbance would still be minor.

5. Compliance with the Forest Plan

All alternatives would comply with Forest Plan standards pertaining to wildlife. There will be no alteration to wildlife habitat or to existing motorized access. Any disturbance resulting from project activities is expected to be minor and of short duration and will not cause adverse effects to populations of any wildlife species.

**THREATENED, ENDANGERED AND SENSITIVE SPECIES
BIOLOGICAL ASSESSMENT/EVALUATION
SUMMARY OF CONCLUSION OF EFFECTS****

Project Name: Tin Cup Dam Repair

Species	ALT 1	ALT 2	ALT 3	ALT 4
1. Bald Eagle	NE	NE	NE	NE
2. Gray wolf	NE	NE	NE	NE
3. Grizzly bear	NE	NE	NE	NE
4. Peregrine Falcon	NE	NE	NE	NE
5. B-B Woodpecker	NI	NI	NI	NI
6. Boreal Owl	NI	NI	NI	NI
7. CDA salamander	NI	NI	NI	NI
8. Common Loon	NI	NI	NI	NI
9. Fisher	NI	NI	NI	NI
10. Flammulated Owl	NI	NI	NI	NI
11. Harequin Duck	NI	NI	NI	NI
12. Lynx	NI	NI	NI	NI
13. N bog lemming	NI	NI	NI	NI
14. W. big-eared bat	NI	NI	NI	NI
15. Wolverine	NI	NI	NI	NI

Prepared by: /s/ David W. Lockman Date: 04/11/97

DAVID W. LOCKMAN

Wildlife Biologist, Bitterroot North Zone

NE = No Effect

NI = No Impact

MIIH = May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Loss Of Viability To The Population Or Species

WIFV* = Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population Or Species

BI = Beneficial Impact

*Trigger for a Significant Action As Defined In NEPA

** Note: Rationale For Conclusion Of Effects Is Contained In The NEPA Document.

Form 2 (R-1/4/6-2670-95)

IV. HUMAN ENVIRONMENT

A. Wilderness, Trails, Recreation

1. Introduction

This section will discuss and disclose the environmental effects of this project on the wilderness, trails, and recreation resources of the Tin Cup Creek drainage from its headwaters at the Idaho border to the wilderness boundary, approximately 10 miles to the east. Also included are effects outside of wilderness. This includes approximately three miles of the Tin Cup Creek Trail #96 from the wilderness boundary to the trail's origin at the trailhead near the Tin Cup Creek Road #639.

The parameters used to measure the effects were determined using public scoping. Additionally, criteria are also included in the Forest Plan, a minimum tool decision-making process, and the amendment titled The Selway-Bitterroot Wilderness General Forest Plan Management Direction (approved in 1992). That document discloses standards and management direction for wilderness, trails, and recreation. The environmental consequences of the various alternatives will be discussed and evaluated within the context of three settings: 1) the resource setting (natural integrity, apparent naturalness, remoteness, and special features); 2) the social setting, which is related to solitude; and, 3) the management and administrative setting.

In addition, other applicable laws, regulations, and policies are taken into consideration as they regulate or affect activities related to wilderness, recreation, and trails.

2. Consistency With Forest Plan Standards

The Bitterroot National Forest Plan established goals for the Selway-Bitterroot Wilderness (Forest Plan, 1987, and Amendment #7, 1992):

- Preserve the integrity of the Selway-Bitterroot Wilderness resource to meet the purposes described in the Wilderness Act; to protect and preserve natural conditions so that the wilderness generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable, and has outstanding opportunities for solitude or primitive and unconfined recreation.

- Provide for limiting and distributing visitor use of specific portions in accord with periodic estimates of the maximum levels of use that allow natural processes to operate freely and that do not impair the values for which wildernesses were created.

- Application of a Prevention of Significant Deterioration (PSD) approach to prevent a net degradation of the wilderness resource, while acknowledging that wilderness and the impacts caused therein, are dynamic.

The Bitterroot National Forest Plan specifies in Amendment # 7 Section II M-2:

- Environmental assessments or environmental statements will be prepared for all reconstruction and heavy maintenance work on reservoirs within the wilderness. These reports will include analysis of nonmotorized vs. motorized means of doing the work. Motorized equipment or other non-conforming activities will be authorized when it can be demonstrated that: 1) it is the only feasible means of accomplishing the necessary maintenance; and, 2) the continued existence of the reservoir is more in the public interest than its breaching. Feasibility for the use of primitive equipment will be based on the technical requirements of the project.

Wilderness-wide indicators and standards are also directed by the Forest Plan Amendment, including Section II, A-1:

- The minimum tool principle is to be applied to the management of all resources within the Selway-Bitterroot Wilderness. This means that the minimum management actions necessary to correct a given problem will be identified. These will be implemented using the methods and equipment which accomplish the objective with the least impact on the physical, biological, and social characteristics of wilderness.

3. Features and Effects Common to All Alternatives

It is unlikely that there would be any cumulative effects or connected actions associated with any of the alternatives to this proposal. There are no additional planned activities in the drainage area, except for trail maintenance and future dam maintenance activities. There is the possibility of future reconstruction work at the dam; but because of the temporal nature of the affects, these are not additive aspects of existing activities nor are there other connected or anticipated activities in this part of the Selway-Bitterroot Wilderness. Future reconstruction work will be addressed with an environmental analysis.

Motorized tools necessary for completion of the project under all alternatives are a grout pump, two water pumps, air compressor, rock drill, and a generator.

Wilderness attributes will be affected to some extent by all of the action alternatives. The presence of the Tin Cup Lake Dam affects the wilderness attributes listed below. This analysis will not address the existing effects of the dam, only the effects of the proposed access and repair work.

All action alternatives include provisions for public safety at the dam site and along the access route.

A stock holding facility would be located at the west end of the lake at a site that has been historically used as a corral.

Trail #96 will be used to transport the personnel, equipment, and supplies that weigh less than 200 pounds. This will require using a pack string. The estimated eight trips will be in excess of normal use on this trail and under moist conditions could cause trail tread disturbance and increased wear and tear on trail structures such as waterbars and culverts. Trails and recreation will be discussed together, because all recreation activities are associated with trail use in the assessment area.

Trail users will see and hear helicopter deliveries overhead. This effect will be concentrated at the beginning and end of the project. There are no other expected adverse effects to recreational use on the trail.

Recreational use of the trail will not be limited during the project, except where it encroaches on the dam. At this point it may be necessary to close the trail for short periods to allow for user safety. Trail use information would be provided, in part, by using a wilderness ranger to monitor progress and to inform users. Public notices posted at the trailhead and radio announcements will be used to inform users of possible effects of the project.

The use of the pack string and draft horses on the trail will be mitigated by requiring the Tin Cup Water Company to rehabilitate the trail to comply with regional standards at the end of the project. The assessment area is within Opportunity Class 4 which provides for a moderate to low opportunity for isolation and solitude. The probability of encountering other users in the area is moderate to high. With these settings in mind, the effect of the encounters with the pack string and the effects of the additional ground disturbance are unlikely to be highly significant to users and will be limited to a relatively short duration; although rehabilitation work on the trail could extend this.

4. Effects to Wilderness Attributes Common to All Action Alternatives

Natural Integrity refers to the extent to which long-term ecological processes are intact and operating and is measured by the presence and magnitude of human induced change to an area. Long-term processes will not likely be affected by any of the alternatives because the various activities associated with the completion of this project are short-term and localized. They are also occurring in previously disturbed areas.

Apparent Naturalness is indicated by how the environment looks to most people using the area. The apparent naturalness of the trail corridor will not be affected by any action alternatives. Repair and maintenance activities at the dam site will have short-term effects on sight and sound. Apparent naturalness would be directly affected by aircraft activities and those ground activities associated with the actual repair of the dam. Effects of aircraft noise and visibility would occur during the transport phase of the project and infrequently during the repair phase. During the transport phase (about two days at the beginning and two days at the end of the project), there will be almost continuous visual and audio disturbance the entire length of the drainage. During the repair phase of the project, transport of supplies with individual weights in excess of 200 pounds would be airlifted to the repair site. These flights would be infrequent and coordinated to assure they are of the minimum duration.

Remoteness is a perceived condition of being secluded, inaccessible, and out of the way. This feature will be impacted by each alternative during the period of work. Sights and sounds of the reconstruction work will be apparent near the dam and reservoir, affecting the feeling of remoteness.

Solitude is a personal, subjective value defined as an isolation from the sights, sounds, and presence of others and the developments of man. The presence of workers and equipment, and the resulting noise will affect the feeling of solitude of the area during the implementation of the alternatives as well as for a short time after due to the physical disturbance of vegetation and soil.

Special Features are those unique geological, biological, ecological, cultural, or scenic features that may be located in wilderness. No unique features have been identified that will be affected by any of the alternatives.

5. Alternatives Considered in Detail

a. No Action

1) Wilderness Values

This alternative would have no effect on wilderness in the short term. However, in the long term, if the dam is not maintained or repaired there is the possibility of breach and subsequent destruction of vegetation, catastrophic soil movement, and drainage scouring which would be an irreversible indicator of man's presence.

2) Recreation/Trails

Similar to the effects to wilderness, the possible overtopping of the dam and the destruction accompanying that breach could affect recreation access in the drainage for an extended period of time. The access provided by the trail would not be available for recreationists.

b. Proposed Action

1) Wilderness Values

Direct/Indirect Effects - This alternative would affect apparent naturalness, remoteness, and solitude. Apparent naturalness would be directly affected by aircraft activities, ground transport of supplies and personnel, and repair activities at the dam site. Total duration of the project including ingress and egress would be approximately 14 days.

The largest negative effect of the greatest duration would result from the noise and sights of the activities directly associated with repair of the dam. Remoteness and solitude features would be affected similarly to apparent naturalness under this alternative. These attributes would be affected primarily during the actual work periods. The direct impacts to wilderness attributes with this alternative would be of the shortest duration compared to the other two action alternatives.

2) Recreation/Trails

Direct/Indirect Effects Trail #96 will be used by pack stock to supply the camp and for light load delivery. This use should be infrequent (an estimated six round trips) and would be similar to what recreationists would normally encounter along the trail. Trail users will see

and hear helicopter deliveries overhead. This effect will be concentrated at the beginning and end of the project. There are no other expected adverse effects to recreational use on the trail.

Recreational use of the trail will not be limited during actual repair work on the dam. Trail use information would be provided, in part, by using a wilderness ranger to monitor progress and to inform users. Public notices posted at the trailhead and public service announcements would also be used.

c. Proposed Action Using Horses

1) Wilderness Values

Direct/Indirect Effects - This alternative would use draft horses to accomplish the tasks that the Bobcat backhoe would do with the other action alternatives, and it would use crosscut saws instead of chain saws. Like the proposed action, this alternative would affect three of the six features of the wilderness resource. The effects to remoteness, solitude, and apparent naturalness will be reduced with the use of the horses and the crosscut saws, because of the lack of motorized equipment noise.

Using draft horses to pull the pipe liner and debris to the designated burn sites will create some soil and vegetation disturbance. This will occur mainly on previously disturbed sites, but it may be a greater visual impact than the use of the Bobcat backhoe in the other alternatives.

There is a possibility that draft horses will not be able to pull the plastic pipe sleeve through the existing masonry and culvert outlet because of irregularities in the outlet and limited working space for the horses. If this happens, the Bobcat backhoe will need to be substituted for the draft horses, and the effects of this alternative will then be the same as for Alternative 2, Proposed Action, except for the noise reduction from the use of cross cut saws instead of chain saws.

The use of draft horses would eliminate the need to fly the backhoe in and out, eliminating the effects of two helicopter round trips, but the helicopter would still be used to fly in equipment that is too heavy for packstock.

The longer duration of this alternative may create some additional disturbance to wilderness resources at the dam site and along the trail, but not to a significant degree.

2) Recreation/Trails

Direct/Indirect Effects - This alternative would have the same effects to recreation and trails as Alternative 2, except in addition to the pack string, two draft horses would be led up the trail and back out. A pack string would be used to transport personnel, lightweight equipment, and supplies for an estimated eight round trips during the 20-day period of the project.

d. Postpone New Pipe Installation Until 1998

1) Wilderness Values

Direct/Indirect Effects - This alternative is a two-phase alternative. Phase one would occur in 1997 and would include: core drilling to determine the existing dam structure; patching the outlet structure to allow it to function safely for a year without inserting the liner; and, piling and burning shoreline debris. This alternative would allow the plastic pipe liner installation to be deferred to 1998, when there may be other repair work needed that would require heavy equipment.

This alternative would also effect three of the six features of the wilderness resource. Apparent naturalness would be directly affected by aircraft activities, ground transport of supplies and personnel, and repair activities at the dam site. Total duration of the project including ingress and egress would be approximately 5 days in 1997 and 11 days in 1998. Remoteness and solitude would be impacted less in 1997 than the other alternatives, due to the shorter duration of the activity and the lack of the Bobcat backhoe and the corresponding impacts to the sights and sounds in the immediate area. In 1998, the effects to wilderness resources would continue for an estimated 11 days, and would be similar to Alternative 2 during 1997.

2) Recreation/Trails

Direct/Indirect Effects - The effects to recreation and to users of Trail #96 will be similar to those expected with Alternative 2, since the trail will also be used to access the reservoir under this alternative. Pack strings would supply the project during 1997 and 1998. Like the other alternatives, recreational use of the trail will not be impacted significantly during the project except at the dam site, which will be closed at times during the repair activities.

B. Cultural Resources

Section 106 of the National Historic Preservation Act requires that federal agencies must consider the effects of the agency's undertakings on properties included in or eligible for the National Register of Historic Places. According to 36 CFR Part 800: Protection of Historic Properties, "An undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register of Historic Places. For the purpose of determining effect, alteration to features of the property's location, setting, or use may be relevant depending on a property's significant characteristics and should be considered." (36 CFR 800.9 (a)) Analysis for the proposed Tin Cup Lake Dam Repair was designed to comply with this direction.

As mandated by Section 106 of the National Historic Preservation Act (amended), a cultural resource inventory has been or will be conducted for the final Selected Alternative, under the supervision of a professional cultural resource specialist. Consultation with the Montana State Historic Preservation Officer (SHPO) is underway concerning the proposed Tin Cup Lake Dam Reconstruction project. Consultation with interested Native American tribes was initiated per the National Historic Preservation Act, the American Indian Religious Freedom

Act, and the National Environmental Policy Act. Consultation with the Confederated Salish and Kootenai Tribes is currently underway. At least one site of tribal concern has been identified within the Area of Potential Effect. Tribal consultation will be completed prior to project implementation.

Inventory of the project area has been consistent with the Bitterroot National Forest Plan (II-18-II-19).

Effects

There are three categories of potential effects to cultural resources--direct, indirect, and cumulative. **Direct effects** include the excavation of mud from the original lakeshore area for access to the pipe inlet, ground disturbance due to equipment operation in the area adjacent to the dam and Tin Cup Trail, and ground disturbance associated with the construction camp. These activities can impact both historic and prehistoric sites. **Indirect effects** are those such as noise produced by equipment or the visual effect of dam reconstruction on significant cultural resources. **Cumulative effects** alter the character of an area incrementally, accumulating over a period of time. Cumulative effects, both direct and indirect, have been considered in evaluating the project's potential effects on cultural sites.

Three sites were recorded within the area of potential effect of this project during the 1992 inventory for the proposed Tin Cup Lake Dam project and the 1994 inventory of Tin Cup Trail #96. These sites were the dam itself (24RA542), which was determined ineligible for the National Register; the portions of Tin Cup Trail #96 (24RA492) adjacent to the dam, work area, and camp; and a prehistoric site (24RA428) along the original lakeshore. A possible site, that of an historic construction or hunting camp, was noted but not recorded.

1. Effects by Alternative

a. Alternative 1 - No Action

Although this alternative would appear to have no direct effects on the cultural sites identified above, a dam failure potentially could have seriously adverse direct effects to the prehistoric site (24RA428) due to wave action during a catastrophic release. Likewise, such a release could have serious effects on other cultural sites downstream.

b. Alternative 2 - Proposed Action

Provided that no excavation will occur along the original lakeshore other than in the immediate (and previously disturbed) vicinity of the pipe inlet, this alternative will have no direct effect on sites identified above. The Bobcat backhoe will not operate on or excavate the original, previously submerged shore line, outside the immediate area of the pipe inlet to prevent ground disturbance and damage to the prehistoric site (24RA428). No indirect or cumulative effects are expected to result from this alternative.

c. Alternative 3 - Proposed Action with Use of Horses Instead of Bobcat Backhoe

Potential direct effects associated with this alternative would involve ground disturbance in stock holding areas. The horses will be confined to areas away from the above identified sites and other known cultural sites in the vicinity of Tin Cup Lake. This alternative will have no direct effects on cultural resources. No indirect or cumulative effects are expected to result from this alternative.

d. Alternative 4 - Postpone new pipe installation until 1998, performing only core drilling, pipe patching, and debris removal in 1997

Core drilling, pipe patching, and debris removal are not expected to involve any direct, indirect, or cumulative effects on the above identified cultural sites.

Following the selection of an alternative, project plans will be reviewed by the Forest Heritage Specialist, and an additional cultural resource inventory will be conducted if necessary. Additional inventories would most likely include on-the-ground survey and/or shovel testing. Evaluation of sites and assessment of project effects on significant sites will be conducted in consultation with the State Historic Preservation Officer (SHPO) prior to project implementation as required by Section 106 of the National Historic Preservation Act. Physical avoidance of sites is standard procedure on the Bitterroot National Forest except where imprudent or impractical. In cases where avoidance is not feasible, mitigation measures will be designed in consultation with the SHPO and the Advisory Council for Historic Preservation to minimize adverse effects. If previously unknown cultural resources are encountered during implementation of the project, activities will be halted and the Forest Historian will be notified immediately.

C. Economics, Engineering, and Safety

Estimated Costs by Alternative:

Alternative 1	\$0 (does not include dam removal costs)
Alternative 2	\$100,000
Alternative 3	\$115,000
Alternative 4	\$ 25,000-(1997) \$80,000-(1998)*

* Does not include costs of other possible 1998 repair work besides the installation of the pipe liner and rip rap testing.

1. Alternative 1

The No Action Alternative would not meet engineering and dam safety requirements. The dam currently needs to be repaired, and the outlet pipe replacement and debris removal are the minimal work needed. Further evaluation will determine repair needs. If the outlet pipe replacement and debris removal is not completed, the dam would be in violation of federal and

state laws. The dam would need to be breached during low water, in a way that would prevent a large erosive event, and eventually levelled, stabilized, and revegetated. This cost would probably exceed the 1997 costs for repair and maintenance of the structure.

2. Alternative 2

The actions as proposed by the Tin Cup Water Company, if completed and accepted by Forest Service engineers, will meet federal dam safety requirements. The estimated cost of this alternative is provided by the Water Company.

3. Alternative 3

The completion of the project with the use of horses and crosscut saws, if approved by Forest Service engineers, will meet federal dam safety requirements. There is a risk that draft horses will not be able to pull the plastic pipe sleeve through the existing masonry and culvert outlet. The bends, alignment, and joints within the existing outlet may cause obstructions and may require the use of machinery. Also, there is limited space for the draft horses to pull in the area below the dam. The Bobcat backhoe with a winch may need to be substituted for the draft horses.

The use of draft horses would eliminate the need to fly the backhoe in and out, which is a hazardous operation. The use of draft horses would also reduce the amount of fuel that would need to be flown in and stored at the site, from 200 gallons to approximately 50 gallons. Fuel transport and storage can provide risks from spills.

The estimated cost of this alternative was developed using experienced costs for a draft horse team at a wilderness lake. The estimated cost does not include the cost of mobilizing, operating, and helicopter transport of the backhoe if the horses are not able to pull the pipe through.

The backhoe would also not be available with this alternative for assisting with the drilling and soil sampling of the dam core. Alternative methods using portable equipment are available, but they would take more time.

4. Alternative 4

This alternative would meet engineering and safety standards, providing that the patching of the outlet pipe can be completed successfully. There is a risk that the strong water current through the pipe could erode the concrete patches, or that some loose rock or holes that need to be patched are missed. This could create erosive action and damage within the outlet pipe, putting the integrity of the dam at risk.

If other repair work is needed in 1998, this alternative would add to the length of operations. There is a short operating season at the lake, and the lake needs to be drained for maintenance or repair work. This alternative would also lengthen the time needed to drain the lake, because only low volumes and velocities of water should pass over the patched outlet pipe to protect it from erosive action. This could create a constraint on completing all the work in 1998.



APPENDIX A

Literature Cited

APPENDIX A**LITERATURE CITED**

Allen, A.W. 1984. Habitat suitability index models: marten. USDI, U.S. Fish and Wildl. Serv. FWS/OBS-82/10.11 Revised. 13 pp.

Losensky, B.J. 1987. An Evaluation of Noxious Weeds on the Lolo, Bitterroot and Flathead Forests with Recommendations for Implementing a Weed Control Program. USDA Forest Service, Lolo National Forest, Missoula, Montana. 64 p.

Reel, S., L. Schassberger and W. Rudiger. 1989. Caring for our natural community: Region 1 threatened, endangered and sensitive species program. USDA Forest Service, Northern Region. Missoula, Montana. 309 pages.

US Fish and Wildlife Service. 1994. The reintroduction of gray wolves to Yellowstone National Park and Central Idaho: Final Environmental Impact Statement. Helena, Montana.

Warren, N. (ed.) 1990. Old-growth habitats and associated wildlife species in the northern Rocky Mountains. USDA Forest Service, Northern Region, Missoula, Montana.

OTHER REFERENCES CITED

Foresman, K. Professor of Biological Sciences, University of Montana, Missoula, Montana. Personal communication, March, 1997.

Nielsen, L. Wildlife biologist, Montana Department of Fish, Wildlife and Parks, Hamilton, Montana. Personal communication, July 1995.

US Fish and Wildlife Service. 1996. Letter dated 4/01/96. List of Threatened and Endangered fish and wildlife species known or expected to occur on the Bitterroot National Forest.