Oregon Parks and Recreation Commission

January 25, 2012

Agenda Item:	11a	Information
Topic:	Alternative Analysis for Aquatic Resources at Bates State Park	
Presented by:	Jim Morgan	

Background:
Since the approval by the OPRD Commission and Grant County of the Master Plan for Bates State Park in September 2009, OPRD staff has conducted additional inventory and monitoring of the property's natural resources in order to develop a Natural Resource Management Plan. A focus thus far has been information gathering, monitoring, and analysis regarding the aquatic resources on the site. Working collaboratively with North Fork John Day Watershed Council, Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, OPRD staff has gathered considerable data and information for analyzing issues related to the water bodies within the park boundary.

Interfluve, Inc., an environmental engineering firm specializing in environmental design and restoration of aquatic ecosystems, completed a draft alternative analysis for aquatic habitat improvements in Bates State Park in September 2011. On September 27, 2011, a stakeholders meeting was held in Prairie City, OR to gather feedback on the draft analysis and to identify data gaps. Based on stakeholder input and additional analysis, a final report was issued in November 2011 (Attachment A). Written comments on this final report were received from stakeholders and recorded (Attachment B).

While there was no clear consensus on the preferred alternative, one or a combination of alternatives would meet the three broad goals stated in the Master Plan and merit further study. Additional water quality, fish passage, and habitat studies are planned to continue through 2012. Further researching of regulatory constraints and water rights are needed to refine a preferred alternative. A more focused and refined analysis to recommend a preferred alternative will be developed by January 2013.

Prior Action by Commission:
- January 17, 2008 the Commission approved acquisition of the Bates site.
- Commission approval of the Master Plan for Bates State Park September 17, 2009.

Action Requested: None

Prepared by: Jim Morgan

Bates State Park

Alternatives Analysis for Aquatic Habitat Improvements at Bates State Park

Prepared for:

Oregon Parks and Recreation Department

Prepared by:

Inter-Fluve, Inc.

November, 2011

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1 EXECUTIVE SUMMARY

Oregon Parks and Recreation Department (OPRD) contracted with Inter-Fluve, Inc. to examine ten design alternatives for protecting and enhancing the aquatic habitats of Bates State Park. These design alternatives will contribute to the completion of the Natural Resources Management Plan for the park as outlined in the Bates State Park Master Plan (2010).

Currently, the park is 131 acres of undeveloped land within Grant County, Oregon, approximately 25 miles north of John Day, Oregon. The site includes a portion of the Middle Fork John Day River (MF John Day) that runs along the north edge of the property, Clear Creek flows north to in the south eastern corner of the property, and .Bridge creek which bisects the property flowing north to its confluence with the MF John Day in the northwest corner of the property. The Site also includes a former mill pond.

The Park is the former location of the town of Bates, which once included a lumber mill and an associated mill pond. In the mid-1970s, the mill and lumber industry declined in this region and the mill and town were dismantled. The dam and the mill pond (Bates Pond) still remain. Bridge Creek flows through Bates Pond before its confluence with the MF John Day River, which it enters approximately 2,300 feet downstream of the dam. Bridge Creek historically provided Chinook salmon, steelhead, and bull trout habitat (OPRD 2009). Due to fish passage issues associated with the dam a fish ladder was constructed in the last decade. Since its completion, fish passage has been documented through the fish ladder; however, passage for all life stages is still limited (OPRD 2009). The pond may also contribute to high temperatures in Lower Bridge Creek and the MF John Day River (TMDL 2010). The elevated water temperature associated with the pond; also have critical impacts to water quality and habitat. High temperatures are unsuitable for native fish and may also be contributing to algal blooms and undesirable plant communities within the pond (OPRD 2009). If the pond is left alone "as-is" and the current trends continue. The impacts to MF John Day, Lower Bridge, and on local fisheries will also continue.

While opportunities for restoration in MF John Day River and Clear Creek are identified, Bridge Creek and Bates Pond are a focus of this alternatives analysis.

The goals and objectives of the design alternatives analysis were derived from the Bates State Park Master Plan, which dictates the development and use of the property. The Master Plan directs that any analysis of aquatic resources management options must be considered within the context of the goals as stated in the Master Plan. When developing the design alternatives, the historical, ecological, and recreational aspects of the site were considered within the context of the Master Plan guidance.

There are three broad goals stated in the Master Plan:.

- Protect and improve habitat for native fish and wildlife along the creeks, river, Bates Pond, and in the meadows and forest.
- Provide for recreation access and use in a manner that is compatible with natural and scenic resource protection and enhancement, and allow for day use, camping, trails and interpretive experiences.
- Provide interpretive experiences about the history of the former town, the mill, Bates Pond, and the efforts to improve the natural and scenic setting at the park.

Analysis of natural resources management options for the site are conducted within the context of larger watershed efforts. The recommended conservation actions that are applicable to the site include:

- Maintain or enhance in-channel watershed function, connection to riparian habitat, flow and hydrology.
- Restore river and floodplain interaction.
- Maintain or restore riparian habitat and ecological function; ensure sufficient habitat complexity for wildlife, including channel length and sinuosity, and decreasing channel gradient.
- Initiate wet meadow restoration efforts.

A list of aquatic habitat management alternatives were provided by OPRD that focus on fish passage, habitat, water quality, historical, and recreational use. The alternative foot print and plan form were set in place in conjunction with park development constraints provided in the Bates State Park Master Plan to reduce impacts and cost. The preferred alternative may include a combination of alternatives. The following are the provided alternatives identified and evaluated in this report.

Alternative A: Modify the existing fish ladder.

This alternative includes modifying the existing fish ladder that was constructed in the past decade in order to improve fish passage. Although the fish ladder allows some fish access to the Bates Pond, flows and passage conditions are not adequate for all targeted species or life-stages.

Alternative B: Construct a bypass channel around pond to top of fish ladder.

This alternative constructs a bypass stream channel around the pond that extends from Upper Bridge Creek to the top of the fish ladder. The objective is to reduce temperature and improve fish migration and rearing conditions in the Bates Pond Reach.

Alternative C: Construct a new stream channel that connects Upper and Lower Bridge Cr.

This alternative would construct a natural channel to connect the Upper Bridge Creek Reach with the Lower Bridge Creek Reach, bypassing the pond and fish ladder. This would create a free-flowing stream channel that would improve fish access to Upper Bridge Creek.

Alternative D: Increase pond depth.

This alternative would increase the depth of the pond in order to provide cooler water temperatures. Sediments that have accumulated in the pond would be excavated in order to increase depth and thus reduce the solar gain in the pond.

Alternative E: Increase shading of pond.

This alternative would increase shading of the pond through the planting of aquatic vegetation and adding habitat structures around the pond perimeter. The objective would be to use vegetation and structures to shade the pond and thereby reduce water temperatures.

Alternative F: Modify pond size and shape.

This alternative increases water depths, decreases the surface area of the pond, creates emergent wetlands, and has a constructed natural channel. The increase in depth provides deep, cool-water refuge for salmonids.

Alternative G: Restoration of riparian vegetation.

This alternative reestablishes native vegetation communities along existing water bodies in their current alignment and configuration.

Alternative H: Lower Bridge Creek floodplain reconnection and habitat enhancement.

This alternative reconnects Lower Bridge Creek with its historical floodplain. Lower Bridge Creek currently has a straightened plan form and is positioned at the valley toe.

Alternative I: Remove the dam and fish ladder and re-construct a smaller pond.

This alternative would remove the fish ladder and a portion of the existing dam. The dam height would be reduced, allowing the pond shape and size to be adjusted.

Alternative J: Remove the dam and fish ladder and create a new stream channel.

This alternative would include the full restoration of the historical configuration of Bridge Creek through the project area. The dam and fish ladder and pond would be decommissioned and removed.

Potential project constraints were identified in order to provide guidance for the development and evaluation of restoration alternatives. These constraints were developed based on site observations, data collection and analysis, and discussions with project stakeholders. A temperature analysis was performed to evaluate the relative merits of alternatives with respect to downstream temperature impacts. The results differ from alternatives and are found in Section 5 of the alternatives report.

2 INTRODUCTION AND PROJECT OVERVIEW

2.1 INTRODUCTION

This document presents alternatives analysis for managing the aquatic resources at Bates State Park in Grant County, Oregon. Bates State Park is a 131-acre park located approximately 25 miles northeast of John Day, Oregon. Aquatic resources in Bates State Park include:

- Middle Fork John Day River (MF John Day) which runs east to west along the parks northern boundary;
- Bridge Creek, a tributary to the MF John Day, which bisects the park as it runs south to north through Bates Pond;
- Bates Pond, a former mill pond formed by damming Bridge Creek;
- Clear Creek, also a tributary of the MF John Day, which a short reach flows though the southeastern portion of the park; and,
- Intermittent streams and vernal wetlands.

A portion of the park was recently developed to provide public access for the site's cultural, historical, recreational, and scenic values.

Interfluve, Inc. was contracted by Oregon Parks and Recreation Department (OPRD) to examine ten provided design alternatives for protecting and enhancing the aquatic habitats of Bates State Park. These design alternatives will contribute to the completion of the Natural Resources Management Plan for the park as outlined in the Bates State Park Master Plan (2010). The design alternatives were developed in order to address multiple stakeholders interests, including habitat restoration, recreational uses, and management of historical and scenic resources. This report describes and evaluates the alternatives and presents results from a recent site assessment.

2.2 BACKGROUND

The Park is the former location of the town of Bates, which once included a lumber mill and an associated mill pond. In the mid-1970s, the mill and lumber industry declined in this region and the mill and town were dismantled. There have been substantial impacts to the site from the result of timber harvesting. These impacts include changes to the Bridge Creek alignment, channel geometry, removal of potential wood habitat, impacts to the floodplain, pollution, and an increase of sediment load due to increase surface runoff (BOR 2008).The dam and the mill pond (Bates Pond) still remain. Bridge Creek flows through Bates Pond before its confluence with the MF John Day River, which it enters approximately 2,300 feet downstream of the dam. While opportunities for restoration in MF John Day River and Clear Creek are identified Bridge Creek and Bates Pond are a focus of this alternatives analysis.

Bridge Creek historically provided Chinook salmon, steelhead, and bull trout habitat (OPRD 2009). Due to fish passage issues associated with the dam, the Oregon Department of Fish and Wildlife and other sponsors constructed a fish ladder that provided access to Bates Pond and upstream reaches of Bates Creek. Since its completion, fish passage has been documented through the fish ladder; however, passage for all life stages is limited due to design issues and water flow limitations (OPRD 2009). Water temperature also inhibits fish production upstream of the fish ladder. Water temperature is considered a critical water quality limiting factor and the Oregon Department of Environmental Quality is drafting Total Maximum Daily Load (TMDL) allocations for stream

temperature (OPRD 2009). The data that is available for this site suggests that thermal loading creates high temperatures in the pond. High temperatures are unsuitable for native fish. Optimal water temperatures for Chinook salmon and steelhead rearing are below 16° C. The pond may also contribute to high temperatures in Lower Bridge Creek and the MF John Day River (ORDEQ 2010). A stream survey and report was produced by the United States Forest Service in 2008. The report showed a temperature data reading ranging from 18° C to20° C in Lower Bridge Creek (USFS 2008). Within the last two years OPRD has installed temperature monitoring sensors to take daily temperature readings in Upper Bridge Creek, Bates Pond, and Lower Bridge Creek. The data observed shows that during the summer months the pond contributes to temperature loading to the Lower Bridge Creek and MF John Day River (OPRD 2011). Thermal loading may also be contributing to algal blooms, aquatic macrophytes, and undesirable plant communities within the pond (OPRD 2009). If the pond is left alone "as-is" and the current trends continue. The impacts to MF John Day, Lower Bridge, and on local fisheries will also continue.

2.3 PROJECT OBJECTIVES AND CONSTRAINTS

2.3.1 Objectives

The goals and objectives of the alternatives analysis were derived from the Bates State Park Master Plan, which dictates the development and use of the property. The Master Plan directs that any analysis of aquatic resources management options must be considered within the context of the goals as stated in the Master Plan. When developing the design alternatives, the historical, ecological, and recreational aspects of the site were considered within the context of the Master Plan guidance.

There are three broad goals stated in the Master Plan:.

- Protect and improve habitat for native fish and wildlife along the creeks, river, Bates Pond, and in the meadows and forest.
- Provide for recreation access and use in a manner that is compatible with natural and scenic resource protection and enhancement, and allow for day use, camping, trails and interpretive experiences.
- Provide interpretive experiences about the history of the former town, the mill, Bates Pond, and the efforts to improve the natural and scenic setting at the park.

Analysis of natural resources management options for the site are conducted within the context of larger watershed efforts. The 2006 Oregon Conservation Strategy targeted key habitats for the MF John Day River that include aquatic, riparian, wetlands, and wet meadow habitats (OPRD 2009). Key aquatic species targeted for conservation at this site include the Columbia spotted frog, the Pacific lamprey, freshwater mussels, steelhead, and Chinook salmon. The recommended conservation actions that are applicable to the site include:

- Maintain or enhance in-channel watershed function, connection to riparian habitat, flow and hydrology.
- Restore river and floodplain interaction.
- Maintain or restore riparian habitat and ecological function; ensure sufficient habitat complexity for wildlife, including channel length and sinuosity, and decreasing channel gradient.
- Initiate wet meadow restoration efforts.

2.3.2 Potential Constraints and Other Considerations

Potential project constraints were identified in order to provide guidance for the development and evaluation of restoration alternatives. These constraints were developed based on site observations, data collection and analysis, and discussions with project stakeholders:

- It is a goal to retain the integrity of the historical mill site, including Bates Pond.
- Site topography may limit the ability to keep the mill pond within its current footprint.
- Reducing water temperature in Bates Pond may not be compatible with maintaining existing recreational and historical values.

2.4 DEVELOPMENT OF ALTERNATIVES

A list of aquatic habitat management alternatives was provided by OPRD that focus on fish passage, habitat, water quality, and historical and recreational use were completed in our analysis. The preferred alternative may include a combination of alternatives. The following are alternatives identified and evaluated in this report.

Alternative A: Modify the existing fish ladder.
Alternative B: Construct a bypass channel around pond to top of fish ladder.
Alternative C: Construct a new stream channel that connects Upper and Lower Bridge Creek.
Alternative D: Increase pond depth.
Alternative E: Increase shading of pond.
Alternative F: Modify pond size and shape.
Alternative G: Restoration of riparian vegetation.
Alternative H: Lower Bridge Creek floodplain reconnection and habitat enhancement.
Alternative I: Remove the dam and fish ladder and re-construct a smaller pond.
Alternative J: Remove the dam and fish ladder and create a new stream channel.

3 SITE CHARACTERIZATION

3.1 SITE HISTORY AND OVERVIEW

3.1.1 Site History

The mill and town of Batesville were originally constructed in 1917 by the Oregon Lumber Company and later re-named Bates. A 20-foot high dam was constructed 400 feet across the Bridge Creek valley to establish a mill pond later named Bates Pond. The town and lumber mill were most active through the 1950s and 1960s. The mill started to decline in the 1970s; it was shut down shortly thereafter (OPRD 2009) and was dismantled throughout the 1980s. The most prominent features remaining are the dam and mill pond. Since its construction, the dam has prevented fish from accessing Upper Bridge Creek until a fish ladder was constructed in last decade. The dam was recapped with new material in the last two decades due to degradation of the original dam construction material.

3.1.2 Site Overview

The Bates State Park site includes portions of the MF John Day River, Clear Creek, Bridge Creek, and the Bates Pond. The MF John Day River runs along the north edge of the property for approx. 1,900 feet and Clear Creek occupies 800 feet in the southeastern corner of the property. Bridge Creek is approximately nine miles long and has base flows of approximately one cubic foot per second (cfs). The sinuosity of Bridge Creek is 1.02 (USFS 2008). There are three distinct reach breaks of Bridge Creek on the Bates Park site. These are (from upstream to downstream) Upper Bridge Creek, Bates Pond, and Lower Bridge Creek. Upper Bridge Creek refers to the reach within parks property above the current confluence with the pond and Lower Bridge Creek refers to the reach below the dam to the confluence with the MF John Day River (see Figure 1).

The Upper Bridge Creek Reach is approximately 500 feet long and has channel widths ranging between 7 to 14 feet. Valley bottom widths range from approximately 150 to 200 feet. This upper reach has been channelized due to cattle grazing and has limited floodplain connection.

The Bates Pond Reach is 1,000 feet long and 460 feet at its widest point. It has a total area of 9.2 acres. In early 2011, OPRD conducted a bathymetry survey in Bates Pond. This survey and LiDAR data were used to develop site topography. This topography was used in developing maps and calculations. The deepest portion of the pond is adjacent to the dam, where it is 12 feet deep. Over time, the pond has slowly filled in due to the constant sediment load delivered from the Bridge Creek watershed. This is due to increased surface runoff due to timber harvesting in the Bridge Creek watershed (BOR 2008). Since the construction of the dam, it is calculated that the pond has receives an average of 330 cubic yards (CY) of sediment load per year. Since 1916, sediment deposition in the pond has slowly decreased the water depth, has increased summer water temperatures, and has increased unwanted aquatic vegetation. These changes not only directly affect physical habitat conditions, but also affect ecological processes that influence the suitability of the site for regional fisheries and wildlife. At this rate of deposition the pond will fill in entirely within 150 years. The pond is flanked by two existing maintenance roads. It will be necessary for the road on the east side of the pond to remain for maintenance and access to Upper Bridge Creek.

At the outlet of the pond, Bridge Creek flows through the fish ladder before it enters the Lower Bridge Creek Reach. This lower reach is heavily channelized and is positioned against the west valley wall. The creek in this reach has widths ranging from 4 to 8 feet. The creek flows 2,300 feet from the dam to the northwest corner of the park property, where it enters the MF John Day River.

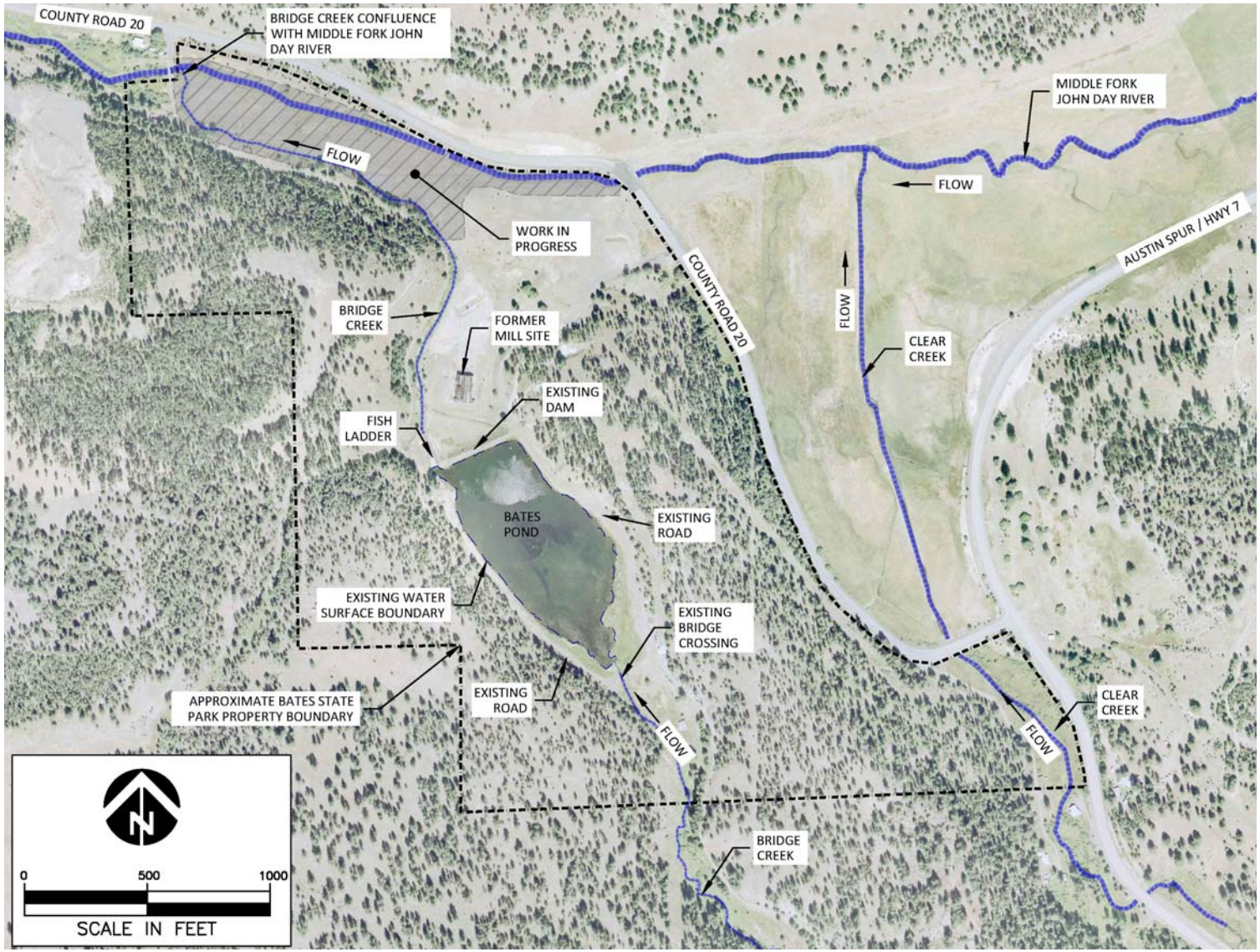

Figure 1. Site overview map.

3.2 FISH AND WILDLIFE

A large number of species utilize the MF John Day River Basin, Clear Creek, and Bridge Creek because of its diverse habitat types (i.e. uplands, wetlands, riparian areas, and open water habitats). The project area provides valuable habitat for a variety of resident and migratory fish and wildlife species. Birds, amphibians, mammals, and fish have all been observed on the site. Although existing habitat is present at site, populations of some of these migratory and resident species are declining. The key species of concern include native freshwater mussels, the Columbia spotted frog, the Pacific lamprey, summer steelhead, and Chinook salmon (OPRD 2009).

Native freshwater mussels. Freshwater mussels (*Mollusca unionoida*) are critical to maintaining an intact salmonid ecosystem. Freshwater mussels are sensitive to ecosystem changes. They have become one of the most endangered faunal groups in North America with nearly 70% of their species either extinct or at high risk. Mussels are common in the MF John Day River and all three genera are present. Mussels have an important relationship with regional fish and are an ecological benefit to the MF John Day because of their ability to filter large amounts of water. They are an important food source for fish, marine mammals, and tribal peoples in the Columbia River Basin (CBMRC 2005).

Columbia spotted frog. The Columbia spotted frog (*Rana luteiventris*) is aquatic and typically lives close to water. Preferred habitat is clear and slow moving or ponded water with little to no shade. They are also found in stream environments. The distribution of the spotted frog is from Alaska to Oregon with isolated ecosystems throughout the west and southwest of the United States. The U.S. Fish and Wildlife Service (USFWS) has petitioned to list the Columbia spotted frog under the Endangered Species Act (ESA) due to falling populations. Some of the causes of the decline in populations can be attributed to livestock grazing, mining, agriculture, spring development, and urbanization. These impacts have changed spotted frog habitat by altering vegetation that affects shelter, water sources, water temperature, and soil temperature. One of the most significant roadblocks for spotted frog recovery is the fragmentation of their native habitat (CBMRC 2005).

Pacific lamprey. The Pacific lamprey eel (*Lampetra trientata*) is an anadromous species native to the MF John Day River. Little is known about the Pacific lamprey. Pacific lamprey were identified as a sensitive species in the early 1990s and there was a push to get them listed under the ESA; however, because of funding limitations, they have not been listed. In the Pacific Northwest, conservation groups continue to push to protect these species. Lamprey provide a great value to the ecosystem by supplying nutrients to fisheries and marine mammals (CBMRC 2005).

Summer steelhead. Summer steelhead (*Oncorhynchus mykiss*) are present in the MF John Day Basin and were historically a strong fishery. Steelhead production in the MF John Day subbasin is still driven by native (non-hatchery) fish, although some hatchery fish have been known to migrate into some tributaries and interbreed with native fish. This impact of interbreeding of non-native and native steelhead is not well understood. John Day summer steelhead are listed as threatened under the ESA (CBMRC 2005).

Chinook salmon. In the MF John Day, native Chinook salmon (*Oncorhynchus tshawytscha*) regularly spawn above Armstrong Creek. They typically arrive in the MF John Day in July to spawn. Adult Chinook Salmon annually spawn in the reach of MF John Day River within the Bates State Park (ODFW Jeff Neil, personal communication, 2011). There are no non-native or hatchery Chinook being introduced into the John Day Basin, although some have been encountered during recent fish

surveys. The salmon populations in the MF John Day have started to increase in recent years but are far from historical numbers. Although population numbers have increased, they are still considered vulnerable to adverse changes in their environment.

4 ALTERNATIVES EVALUATION

The following are descriptions of 10 aquatic habitat management alternatives provided by OPRD for Bates State Park. These alternatives focus on fish passage, habitat, water quality, historical, and recreational use. The alternative foot print and plan form were set in place in conjunction with park development constraints provided in the Bates State Park Master Plan to reduce impacts and cost. If plan form or design is adjusted from what is represented in this report additional costing and analysis will need to be developed. The preferred alternative may include a combination of alternatives. A tabular summary of the alternatives evaluation is presented in Table 1 (Summary of Alternatives).

4.1 ALTERNATIVE A: MODIFY THE EXISTING FISH LADDER

4.1.1 Description

This alternative includes modifying the existing fish ladder that was constructed in the past decade in order to improve fish passage. Although the fish ladder allows some fish access to the Bates Pond, flows and passage conditions are not adequate for all targeted species or life-stages. To achieve passage for all species and life-stages, the existing flashboards would be modified to adjust slope, height, and flow. This would allow resting zones and flow in the ladder to be adjusted. If adequate fish passage cannot be achieved by adjusting the flashboards alone, there may be a need for additional design to extend the fish ladder.

4.1.2 Benefits/Detriments

The greatest benefit of this alternative is cost. It would be relatively inexpensive to retrofit the existing flashboards to accommodate required geometries and slopes for adequate fish passage. In terms of ecological benefit, this alternative only addresses the issue of fish passage. This alternative does not address fish exposure to the existing elevated temperatures in the pond or thermal loading to Lower Bridge Creek and MF John Day River that continues without treatment. Thus, goals for improved fish habitat and elevated water temperature are not addressed. This alternative does however retain the recreational use and historical value of the pond

4.1.3 Constraints/Risks

It is possible that simply retrofitting the existing flashboards will not be adequate to significantly improve fish passage. Additional engineering analysis will be necessary to make this determination. Permitting may also be a risk if proper passage is not possible with existing fish ladder. More constraints may occur during the permitting process.

4.1.4 Level of Effort/Cost

This alternative is relatively inexpensive if adequate fish passage can be achieved by retrofitting the existing flashboards. The construction effort would be minimal since flow from the ladder could be diverted for a short time while the flashboards are reshaped and configured. The cost for this option would be approximately $32,000. If an extension of the ladder is required the cost would be $200,000.

Photo 1. Existing flashboard configuration.

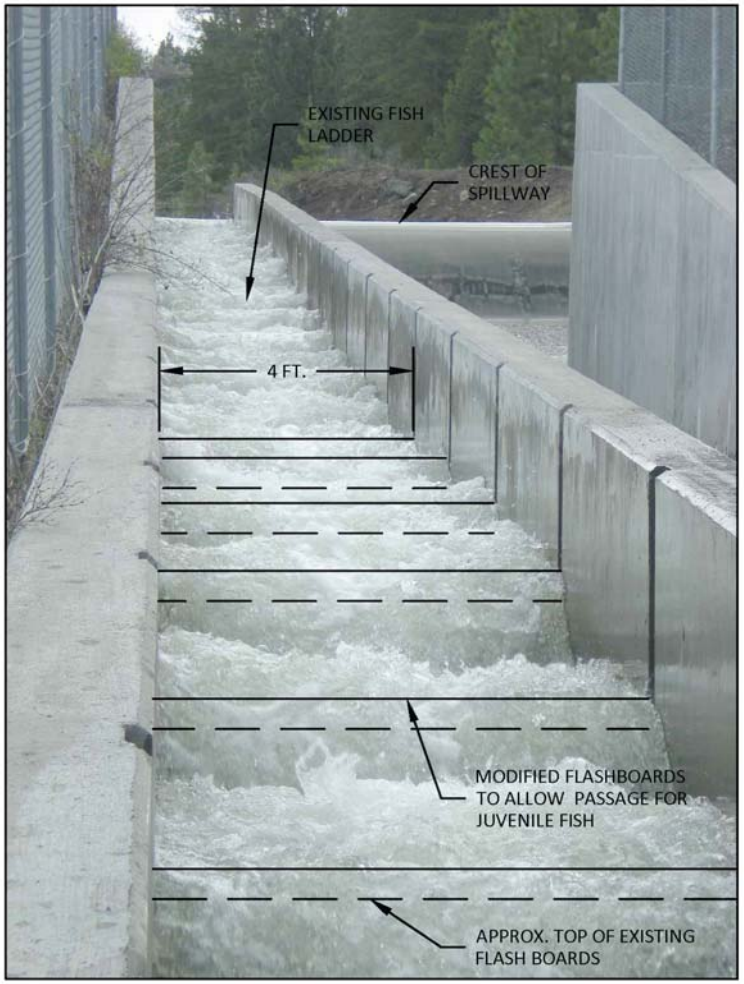

Photo 2. Proposed flashboard configuration

Bates State Park - Preliminary Cost Summary

September, 2011

Alternative A - Modify the Existing Fish Ladder Flash Boards [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$8,000	$8,000
Permitting (10% of Construction Cost)	1	LS	$400	$400
Design (20% of Construction Cost)	1	LS	$800	$800
Construction Oversite	1	Days	$1,100	$1,100
Administrative (5% of Construction Cost)	1	LS	$200	$200
			Total	$10,500

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$200	$200
Diversion and Dewatering	1	LS	$4,200	$4,200
Erosion Control	1	LS	$1,800	$1,800
Fish Resuce	1	Days	$4,000	$4,000
			Total	$10,200

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	0	LF	$140	$0
Riparian Revegetation	0	Acre	$14,000	$0
Upland Revegetation	0	Acre	$8,000	$0
			Total	$0

Materials	Value	Units	Unit Cost	Total Cost
Riprap	0	CY	$63	$0
Logs	0	Pieces	$500	$0
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	0	LF	$2	$0
Splash Boards and Iron	1	LS	$4,000	$4,000
			Total	$4,000
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$4,000

Cost Summary		Total Cost
Project Task		$10,500
General Construction		$10,200
Excavation and Earthwork		$0
Materials		$4,000
Esimated Sediment Maintance Cost over a 5 year Period		$0
	Subtotal	$24,700
Contigency (30%)		$7,410
	Total	$32,110

[1] RSMeans 2011 Construction Cost used to develop unit cost

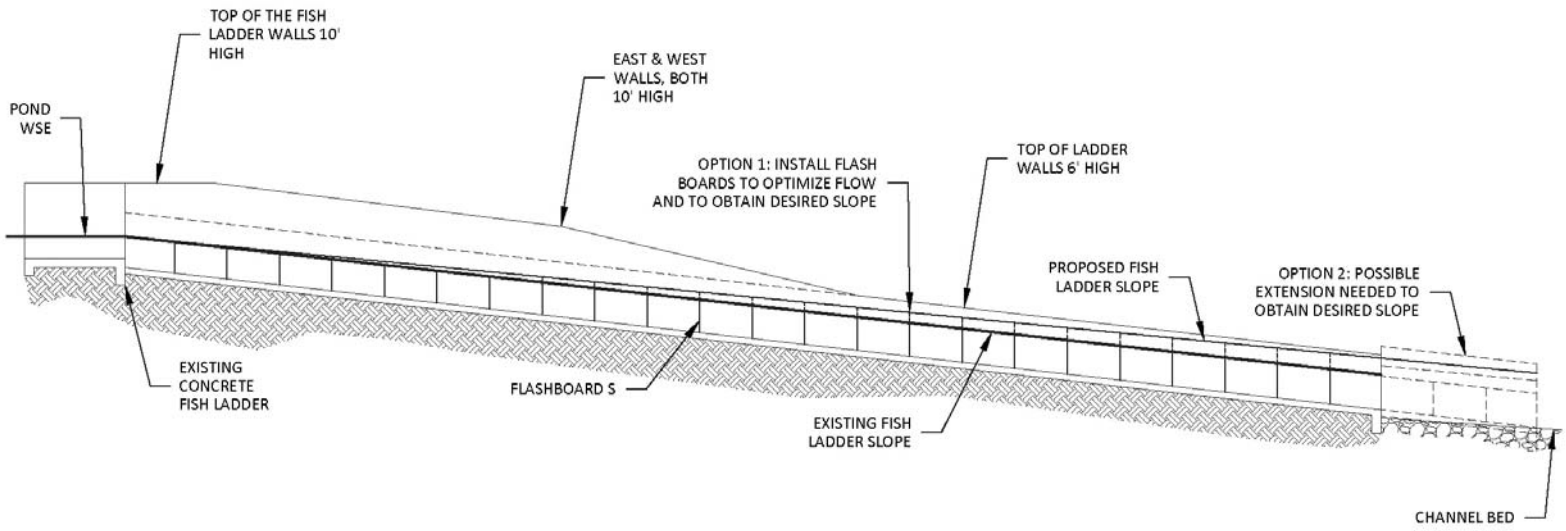

Figure 2. Cross-Section Showing Fish Ladder Slope Adjustment

Bates State Park - Preliminary Cost Summary

September, 2011

Alternative A - Modify the Existing Fish Ladder Concrete Walls [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$8,000	$8,000
Permitting (10% of Construction Cost)	1	LS	$7,600	$7,600
Design (20% of Construction Cost)	1	LS	$15,200	$15,200
Construction Oversite	5	Days	$5,500	$27,500
Administrative (5% of Construction Cost)	1	LS	$3,800	$3,800
			Total	$62,100

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$3,800	$3,800
Diversion and Dewatering	1	LS	$8,100	$8,100
Erosion Control	1	LS	$1,800	$1,800
Fish Resuce	1	Days	$4,000	$4,000
			Total	$17,700

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	0	LF	$140	$0
Riparian Revegetation	0	Acre	$14,000	$0
Upland Revegetation	0	Acre	$8,000	$0
			Total	$0

Materials	Value	Units	Unit Cost	Total Cost
Riprap	0	CY	$63	$0
Logs	0	Pieces	$500	$0
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	150	LF	$480	$72,000
Fencing	0	LF	$2	$0
Splash Boards and Iron	1	LS	$4,000	$4,000
			Total	$76,000
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$76,000

Cost Summary				Total Cost
Project Task				$62,100
General Construction				$17,700
Excavation and Earthwork				$0
Materials				$76,000
Esimated Sediment Maintance Cost over a 5 year Period				$0
			Subtotal	$155,800
Contigency (30%)				$46,740
			Total	$202,540

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.2 ALTERNATIVE B: CONSTRUCT A BYPASS CHANNEL AROUND THE POND

4.2.1 Description

This alternative constructs a bypass stream channel around the pond that extends from Upper Bridge Creek to the top of the fish ladder. The objective is to reduce temperature and improve fish migration and rearing conditions in the Bates Pond Reach. To achieve this, another barrier or dam would have to be constructed along the edge of the existing pond. This barrier could be a sheet pile wall (Option 1) or a constructed earthen dam (Option 2) and would run approximately 1,125 feet. The new active flowing channel would receive less solar heating than the existing pond, which would reduce stream temperatures in Bridge Creek. A fish screen would be needed if the pond is left on line. The majority of the exiting pond would be unaffected and would remain intact.

4.2.2 Benefits/Detriments

The primary benefits of this alternative are reducing stream temperatures below the pond and seasonally improving habitat in the newly formed Bates Pond Reach while retaining the historical values and recreational uses of the pond. This alternative does not, however, address passage issues at the existing fish ladder or water quality in the Bates Pond. Therefore, this alternative does not fully meet the goals and objectives stated in the Bates State Park Master Plan.

4.2.3 Constraints/Risks

One of the primary constraints is topography. The existing pond is flanked by two high ridges, which does not allow much flexibility for variability in channel plan form. With the sheet pile wall (Option 1), sediment will be deposited behind the sheet pile over time and fill this area. It will take approximately 9 years to fill in completely. The placement and size of the earthen dam and constructed channel (Option 2) would have to be positioned to prevent erosion of the existing slope. Slope and sediment load is a concern with Option 2. The slope of the channel would be less than 0.08%. With the pond seeing an average of 330 CY of sediment deposition annually, the low slope of the constructed channel could cause aggradation. A maintenance plan may have to be developed to maintain flow in the active channel and to prevent avulsion back into the pond. Further investigation would be needed to quantify this risk. Another constraint to this alternative is tying the new barrier into the existing dam. This would involve more analysis of the materials and stability of the existing dam. More constraints may occur during the permitting process.

4.2.4 Level of Effort/Cost

The greatest cost is constructing a new barrier that isolates the pond from the new channel. A sheet pile or earthen barrier would need to be constructed to isolate Bridge Creek from the mill pond. Once the barrier (Option 1 – 1,125 lineal feet of sheet pile, or Option 2 – approximately 4,200 CY of material) is in place, the new channel would be constructed. Sheet pile is used in Option 1 instead of an earthen barrier, but access for large equipment would be needed. This may be a challenge given the limited space for machinery access on the west side of the pond. A barge may be needed to drive the piles properly or the pond may have to be drained completely during construction. The cost for the sheet pile option would be approximately $662,000. The cost for an earthen dam would be approximately $609,000. A fence will need to be installed to protected newly vegetated area during initial growth period. A sediment maintenance plan would be needed and cost approximately $2,400 annually.

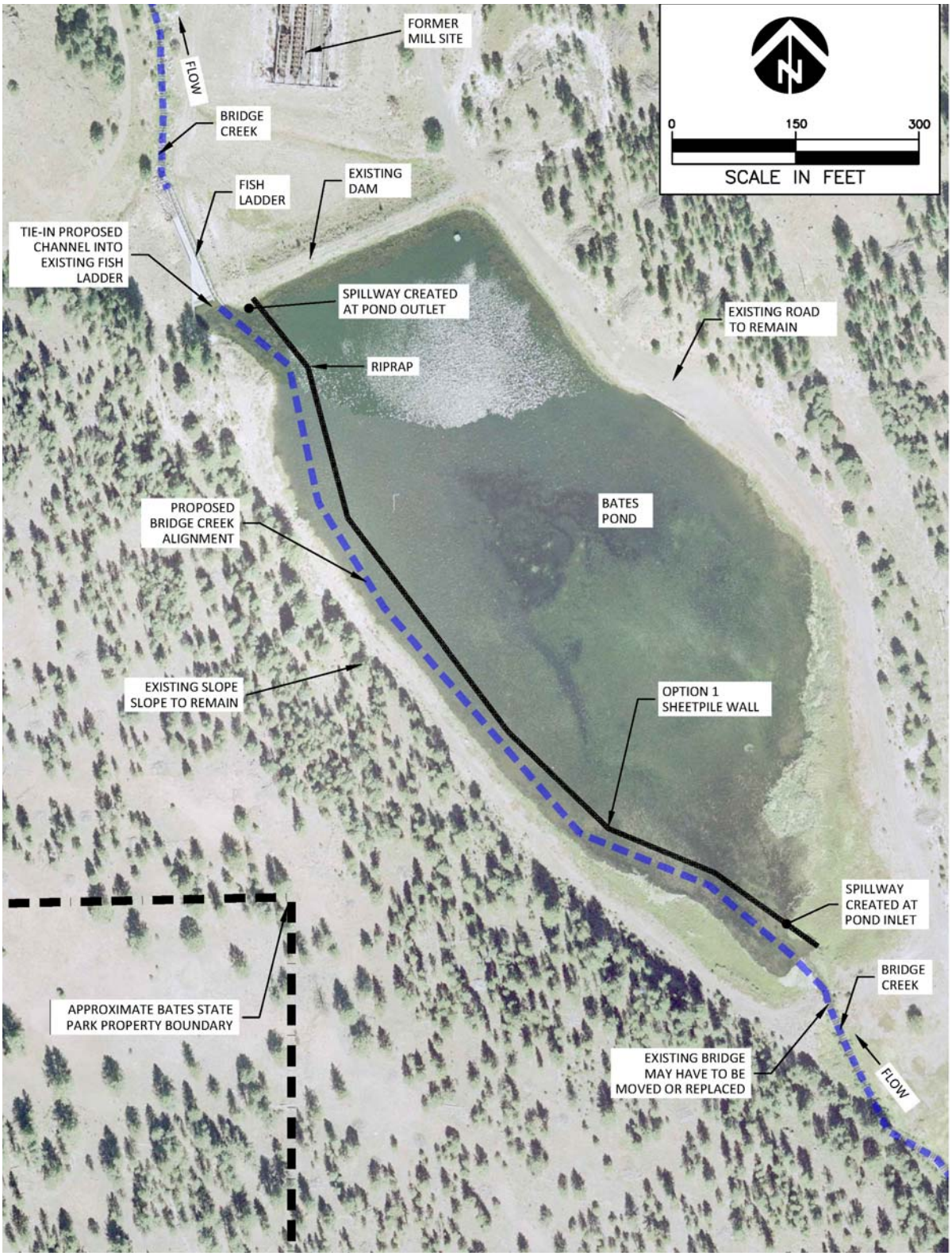

Figure 3. Alternative B Option 1– Sheet Pile.

Bates State Park - Preliminary Cost Summary

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Alternative B - Option 1 Sheet Pile [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$16,200	$16,200
Design (18% of Construction Cost)	1	LS	$58,320	$58,320
Construction Oversite (2% of Construction Cost)	1	LS	$6,480	$6,480
Administrative (5% of Construction Cost)	1	LS	$16,200	$16,200
			Total	$109,200

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$16,200	$16,200
Diversion and Dewatering	1	LS	$51,300	$51,300.00
Erosion Control	1	LS	$2,000	$2,000
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$73,500

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	0	LF	$140	$0
Riparian Revegetation	0	Acre	$14,000	$0
Upland Revegetation	0	Acre	$8,000	$0
			Total	$0

Materials	Value	Units	Unit Cost	Total Cost
Riprap	500	CY	$63	$31,500
Logs	0	Pieces	$500	$0
Sheetpile	22500	SF	$13.00	$292,500
Reinforced Concrete	0	LF	$480	$0
Fencing	0	LF	$2	$0
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$324,000
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$324,000

Cost Summary		Total Cost
Project Task		$109,200
General Construction		$73,500
Excavation and Earthwork		$0
Materials		$324,000
Esimated Annual Sediment Maintance Cost over after a 9 year period (Fills in Completely)		$2,400
	Subtotal	$509,100
Contigency (30%)		$152,730
	Total	$661,830

[1] RSMeans 2011 Construction Cost used to develop unit cost

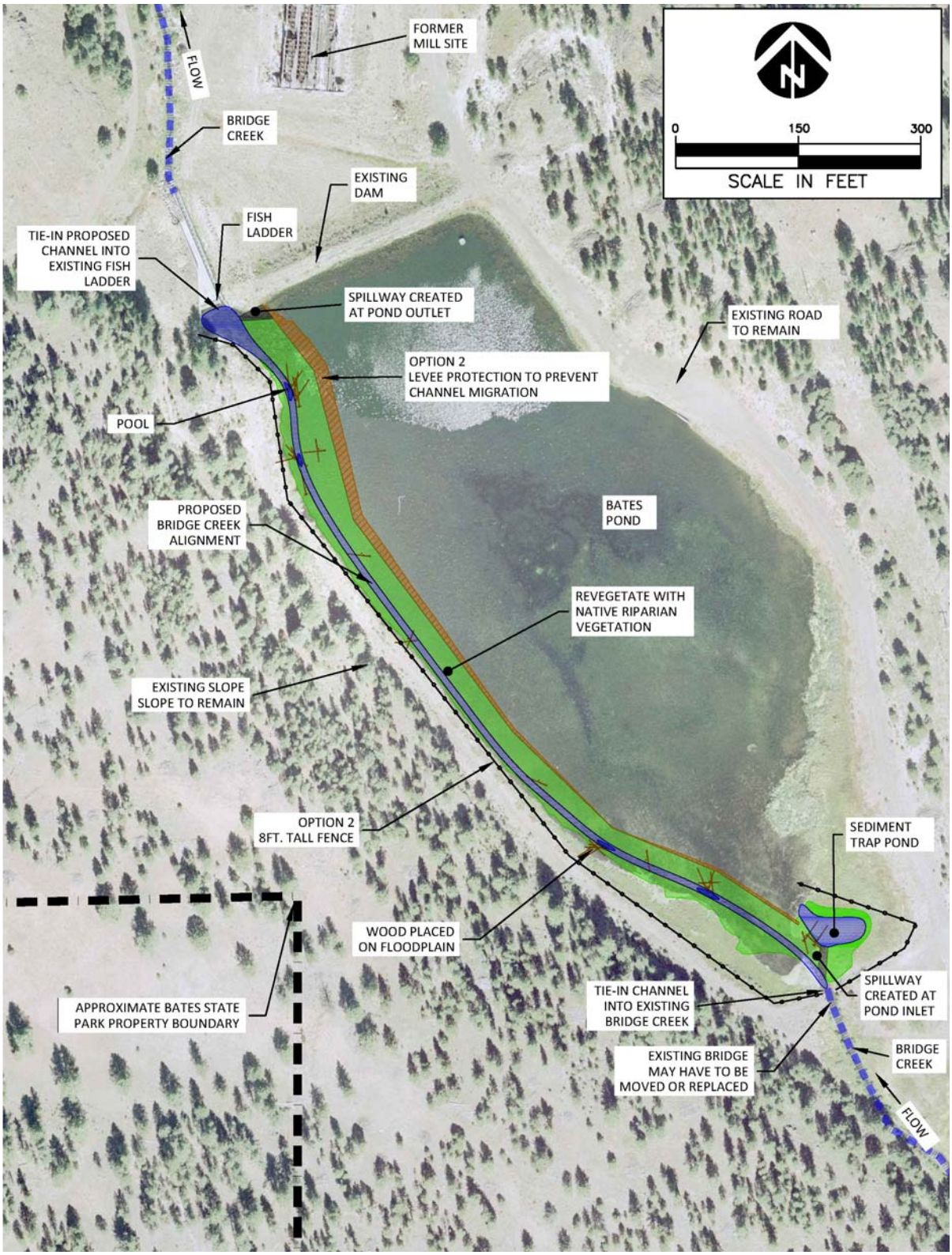

Figure 4. Alternative B Option 2 – Constructed channel bypassing Bates Pond.

Bates State Park - Preliminary Cost Summary

September, 2011

Alternative B - Option 2 Earthend Dam [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$14,335	$14,335
Design (18% of Construction Cost)	1	LS	$51,606	$51,606
Construction Oversite (2% of Construction Cost)	1	LS	$5,734	$5,734
Administrative (5% of Construction Cost)	1	LS	$14,335	$14,335
			Total	$98,010

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$14,400	$14,400
Diversion and Dewatering	1	LS	$51,300	$51,300
Erosion Control	1	LS	$2,000	$2,000
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$71,700

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	4200	CY	$18.00	$75,600
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	1125	LF	$140	$157,500
Riparian Revegetation	1	Acre	$14,000	$7,000
Upland Revegetation	0	Acre	$8,000	$0
			Total	$240,100

Materials	Value	Units	Unit Cost	Total Cost
Riprap	300	CY	$63	$18,900
Logs	50	Pieces	$500	$25,000
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	1500	LF	$2	$2,700
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$46,600
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$286,700

Cost Summary		Total Cost
Project Task		$98,010
General Construction		$71,700
Excavation and Earthwork		$240,100
Materials		$46,600
Esimated Sediment Maintance Cost over a 5 year Period		$12,000
	Subtotal	$468,410
Contigency (30%)		$140,523
	Total	$608,933

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.3 ALTERNATIVE C: CONSTRUCT A NEW STREAM CHANNEL CONNECTING UPPER AND LOWER BRIDGE CREEK

4.3.1 Description

This alternative would construct a natural channel to connect the Upper Bridge Creek Reach with the Lower Bridge Creek Reach, bypassing the pond and fish ladder. This would create a free-flowing stream channel that would improve fish access to Upper Bridge Creek. At the upstream end of the constructed channel, a spillway would be created to allow higher flows to enter the pond. A levee would have to be constructed on the north bank where it interfaces with the pond to ensure that Bridge Creek stays in its new alignment. Once Upper Bridge Creek and Lower Bridge Creek are connected, Bridge Creek would no longer pass through Bates Pond or be influenced by the elevated temperatures that are present in the pond. The fish ladder would become active only at high flows. A fish screen would be needed if the pond is left on line. This would ensure that fish do not have access to the pond at normal flows.

4.3.2 Benefits/Detriments

The primary benefit of this alternative is the creation of a stream channel that would allow fish to move between Upper and Lower Bridge Creek without having to negotiate the fish ladder and pond. The new stream channel would provide better conditions with respect to stream temperature and aquatic habitat compared to the Bates Pond Reach. This alternative also retains the recreational use and historical component of the pond. This alternative meets most of the goals and objectives stated in the Bates State Park Master Plan, but with a cost. The construction effort and scale are large. In order to create a new channel, an estimated 700,000 CY of material would have to be excavated and hauled off site.

4.3.3 Constraints/Risks

The greatest constraint to this alternative are the existing site conditions. The topographic relief limits the ability to connect Upper Bridge Creek and Lower Bridge Creek without moving a large volume (700,000 CY) of material. The material would have to be hauled off to a disposal site and discarded. More constraints may occur during the permitting process.

4.3.4 Level of Effort/Cost

The cost of this alternative is $10,900,000. The high cost is due to the large amount of excavation that would be required to achieve the necessary grade through the western hillside. The earthwork alone is close to $5,600,000.

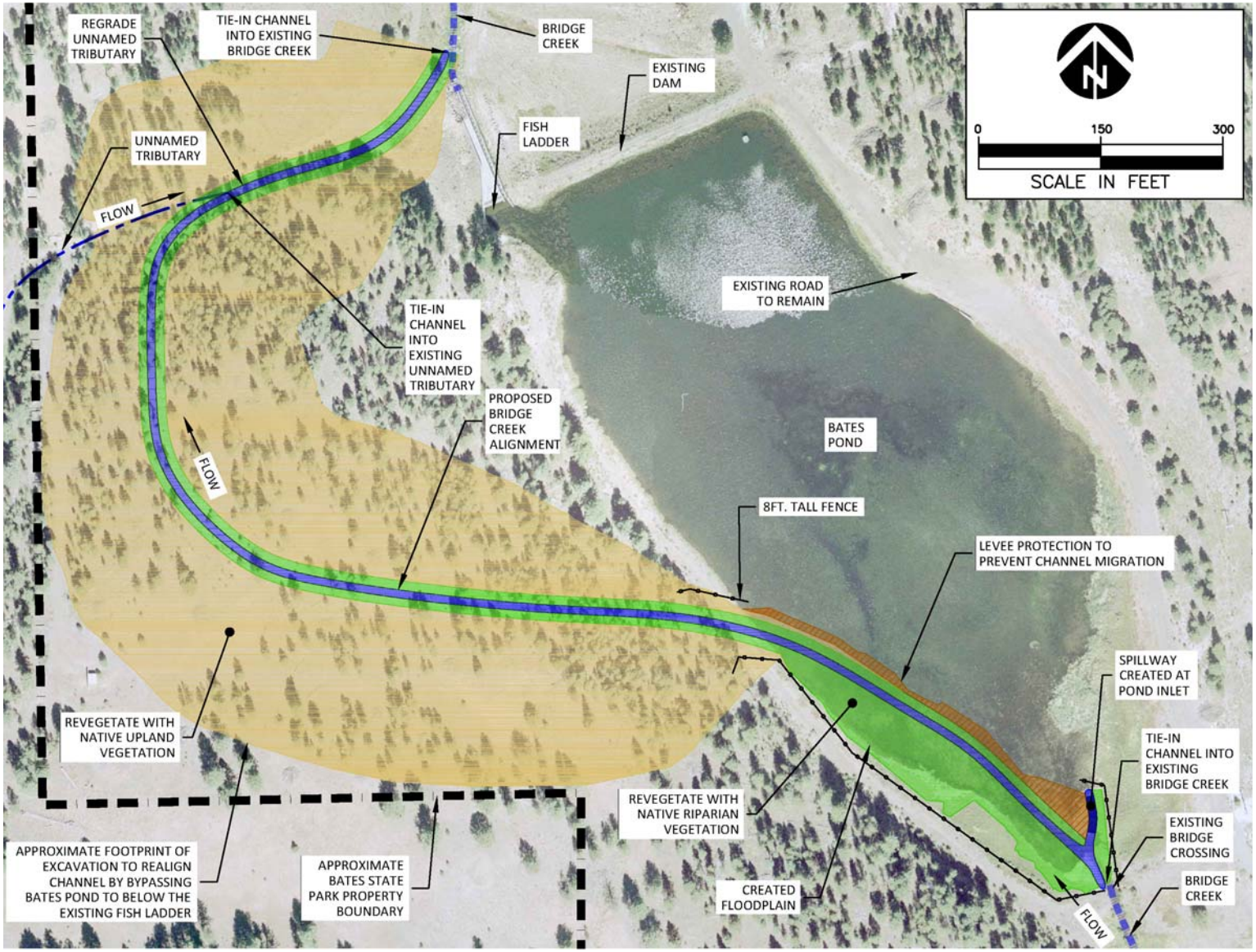

Figure 5. Alternative C – Constructed new channel connecting Upper Bridge Creek to Lower Bridge Creek.

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Alternative C - Construct Open Channel by-Passing Pond and Fish Ladder [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$308,507	$308,507
Design (18% of Construction Cost)	1	LS	$1,110,623	$1,110,623
Construction Oversite (2% of Construction Cost)	1	LS	$123,403	$123,403
Administrative (5% of Construction Cost)	1	LS	$308,507	$308,507
			Total	$1,863,039

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$308,600	$308,600
Diversion and Dewatering	1	LS	$27,900	$27,900
Erosion Control	1	LS	$6,600	$6,600
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$347,100

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	11	Acre	$5,900	$64,900
Excavation and Stockpile	3000	CY	$10.00	$30,000
Excavation and Haul	700000	CY	$8.00	$5,600,000
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	3000	CY	$5.00	$15,000
Constructed Habitat Channel	2000	LF	$140	$280,000
Riparian Revegetation	1.4	Acre	$14,000	$19,600
Upland Revegetation	9.7	Acre	$8,000	$77,600
			Total	$6,087,100

Materials	Value	Units	Unit Cost	Total Cost
Riprap	500	CY	$63	$31,500
Logs	100	Pieces	$500	$50,000
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	850	LF	$2	$1,530
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$83,030
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$6,170,130

Cost Summary		Total Cost
Project Task		$1,863,039
General Construction		$347,100
Excavation and Earthwork		$6,087,100
Materials		$83,030
Esimated Sediment Maintance Cost over a 5 year Period		$0
	Subtotal	$8,380,269
Contigency (30%)		$2,514,081
	Total	$10,894,350

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.4 ALTERNATIVE D: INCREASE POND DEPTH

4.4.1 Description

This alternative would increase the depth of the pond in order to provide cooler water temperatures. Sediments that have accumulated in the pond would be excavated in order to increase depth and thus reduce the solar gain in the pond. This alternative would also increase water and sediment storage capacity of the pond.

4.4.2 Benefits/Detriments

Deepening of the pond could provide localized deep and cool-water temperature refuge for salmonid rearing. However earlier vertical temperature profiles taken in Bates Pond indicate weak thermal stratification , Additional investigative work would be necessary to determine if deepening the pond and increasing the pond capacity would provide adequate and significant temperature refuge.. The localized cold zones may not be substantial enough to significantly benefit fish within the pond. Also, by increasing the capacity of Bates Pond, the residence time of water from Bridge Creek will increase. More investigation would be needed to determine specific potential temperature benefits of this alternative. By increasing the volume of the pond this alternative also increases the time that it would take the pond to fill in by adding an additional 27 years. Also the recreational use and historical components of the pond are left intact. Although this alternative satisfies some of the goals and objectives of the Bates State Park Master Plan, it may be only a temporary remedy since sediment will continue to accumulate in the pond over time and future dredging would likely be necessary to maintain conditions. Under thermal stratified conditions in the pond, warmer surficial water entering the fish ladder may continue to pour a thermal barrier and continue thermal loading to lower Bridge Creek and MF John Day River

4.4.3 Constraints/Risks

The major constraint for this alternative is that it requires a maintenance plan to maintain desired depth. The pond receives an estimated 330 CY of sediment load annually, which means periodic dredging would be required to maintain desired depths. More constraints may occur during the permitting process and in unearthing of soils in the pond.

4.4.4 Level of Effort/Cost

The initial cost for this alternative is $238,000. A sediment maintenance plan would be needed maintain the shape and size of the pond and cost approximately $12,000 over a 5 year period. Possible higher cost may occur if excavated materials in the pond are not found to be satisfactory for disposal.

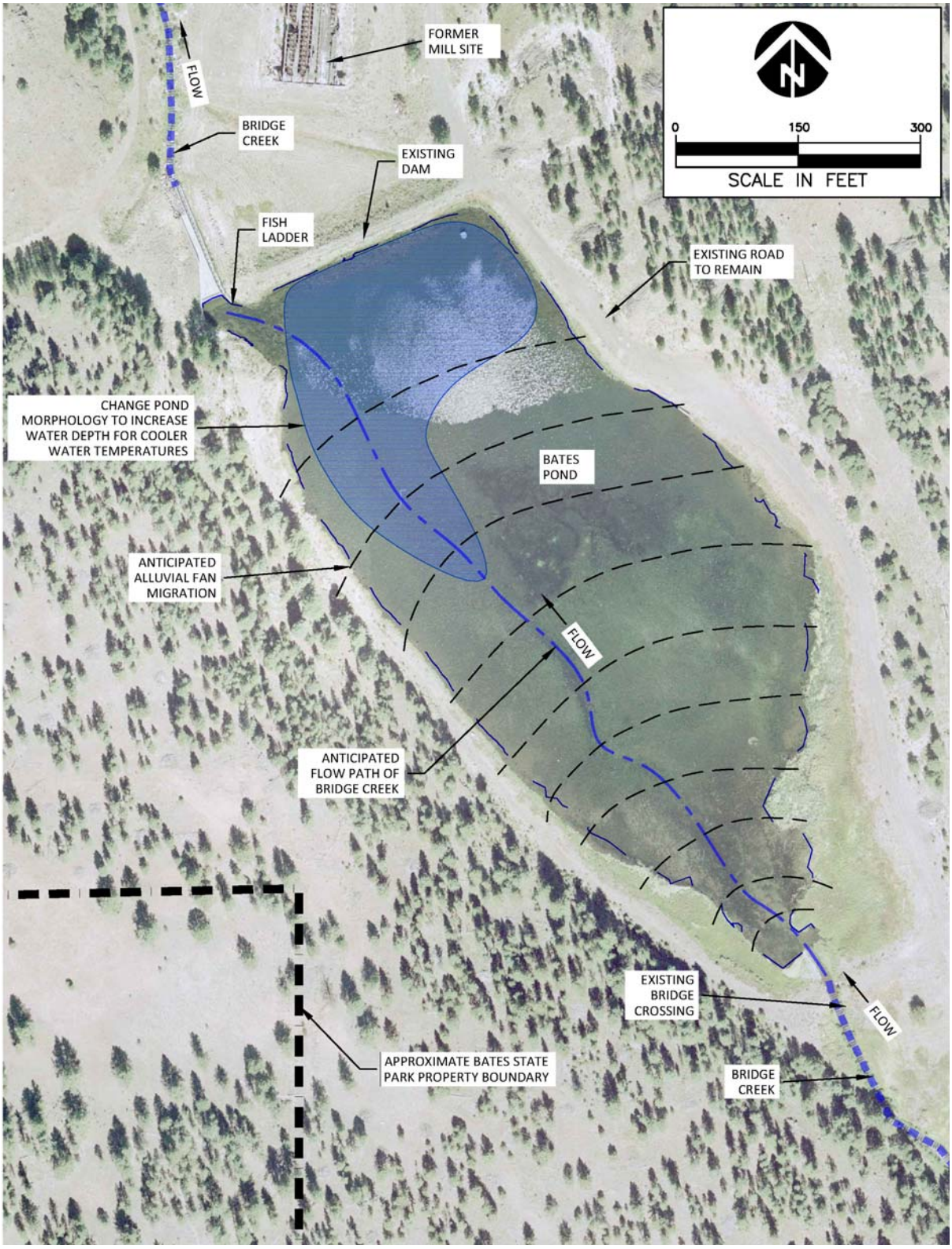

Figure 6. Alternative D – Deepening Bates Pond

Bates State Park - Preliminary Cost Summary

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Alternative D - Increased Water Depth in Pond [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$8,000	$8,000
Permitting (5% of Construction Cost)	1	LS	$3,758	$3,758
Design (18% of Construction Cost)	1	LS	$13,527	$13,527
Construction Oversite (2% of Construction Cost)	1	LS	$1,503	$1,503
Administrative (5% of Construction Cost)	1	LS	$3,758	$3,758
			Total	$30,545

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$3,800	$3,800
Diversion and Dewatering	1	LS	$55,200	$55,200
Erosion Control	1	LS	$2,200	$2,200
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$65,200

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	9000	CY	$8.00	$72,000
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	0	LF	$140	$0
Riparian Revegetation	0.0	Acre	$14,000	$0
Upland Revegetation	0.0	Acre	$8,000	$0
			Total	$72,000

Materials	Value	Units	Unit Cost	Total Cost
Riprap	50	CY	$63	$3,150
Logs	0	Pieces	$500	$0
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	0	LF	$2	$0
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$3,150
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$75,150

Cost Summary		Total Cost
Project Task		$30,545
General Construction		$65,200
Excavation and Earthwork		$72,000
Materials		$3,150
Esimated Sediment Maintance Cost over a 5 year Period		$12,000
	Subtotal	$182,895
Contigency (30%)		$54,869
	Total	$237,764

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.5 ALTERNATIVE E: INCREASE SHADING OF THE POND

4.5.1 Description

This alternative would increase shading of the pond through the planting of aquatic vegetation and adding habitat structures around the pond perimeter. The objective would be to use vegetation and structures to shade the pond and thereby reduce water temperatures.

4.5.2 Benefits/Detriments

The benefits for this alternative include enhanced habitat and retaining the historical and recreation value of the site. The potential to reduce water temperature with shade alone is difficult to achieve. Once the vegetation matures, the shade created on the pond perimeter could be up to 7% of the pond's existing surface area. Without changing the shape or size of the pond, the shade alone may not significantly change the temperature. A comparative temperature analysis was performed for this alternative using available data. Although the data is limited, the analysis suggests that the increase in shade has a minor effect on water temperature. The results are presented in Section 5.1 of this report. More investigation would be needed to determine specific potential temperature benefits. This alternative meets a couple of the goals and objectives of the Bates State Park Master Plan. This alternative would have minimal impacts on the local fisheries.

4.5.3 Constraints/Risks

The greatest constraint with this alternative is the size of the pond. Given the surface area and volume of water, the amount of increased shade provided from vegetation may not be sufficient to provide any temperature benefit for the target species. The narrow access corridor on the western valley wall would make installation difficult. This alternative does not address on-going sediment loading of the pond or the fish passage issues associated with the existing ladder. A maintenance plan will have to be implemented to maintain vegetation and desired pond size. More constraints may occur during the permitting process.

4.5.4 Level of Effort/Cost

The initial cost for this alternative is $98,000. The largest level of effort with this alternative is the long-term maintenance needed for watering, weed/browse control, and the follow-up planting needed to offset plant mortality. The impacts due to installation and construction will be minimal. A fence will need to be installed to protected newly vegetated area during initial growth period and a sediment maintenance plan would be needed maintain the shape and size of the pond and cost approximately $2,400 annually. The maintenance of the pond and vegetation shares a majority of the cost.

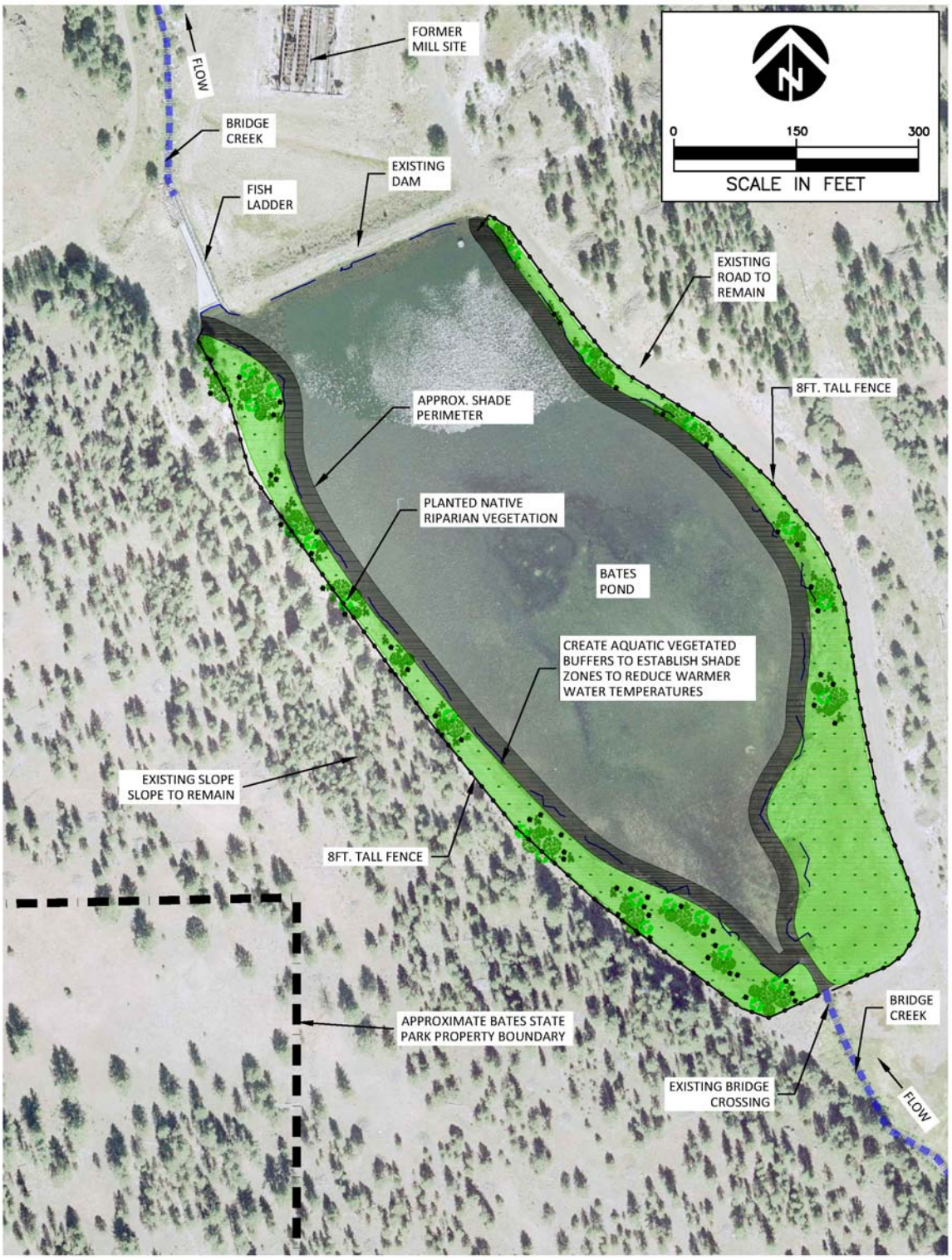

Figure 7. Alternative E – Increased shade around perimeter of Bates Pond.

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Alternative E - Increased Shade on Pond Perimeter [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$8,000	$8,000
Permitting (5% of Construction Cost)	1	LS	$1,896	$1,896
Design (18% of Construction Cost)	1	LS	$6,826	$6,826
Construction Oversite (2% of Construction Cost)	1	LS	$758	$758
Administrative (5% of Construction Cost)	1	LS	$1,896	$1,896
			Total	$19,376

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$1,900	$1,900
Diversion and Dewatering	0	LS	$0	$0
Erosion Control	0	LS	$4,100	$0
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$5,900

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	0	LF	$140	$0
Riparian Revegetation	2.4	Acre	$14,000	$33,600
Upland Revegetation	0.0	Acre	$8,000	$0
			Total	$33,600

Materials	Value	Units	Unit Cost	Total Cost
Riprap	0	CY	$63	$0
Logs	0	Pieces	$500	$0
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	2400	LF	$2	$4,320
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$4,320
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$37,920

Cost Summary				Total Cost
Project Task				$19,376
General Construction				$5,900
Excavation and Earthwork				$33,600
Materials				$4,320
Esimated Sediment Maintance Cost over a 5 year Period				$12,000
			Subtotal	$75,196
Contigency (30%)				$22,559
			Total	$97,755

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.6 ALTERNATIVE F: MODIFY POND SIZE AND SHAPE

4.6.1 Description

This alternative increases water depths, decreases the surface area of the pond, creates emergent wetlands, and has a constructed natural channel. The increase in depth provides deep, cool-water refuge for salmonids. To decrease the surface area and volume of the pond there are two options. Option 1leaves the dam in place and then imported fill is placed and graded to reduce the pond size. With Option 2, the dam is lowered and the pond is regarded to reduce pond size. Both of these options will be graded to create shallow-water emergent wetland habitat. The increase in emergent wetland would enhance habitat diversity for a variety of aquatic and terrestrial species. By reducing the volume of the pond, the residency time for Bridge Creek is also reduced. This also promotes cooler water temperatures. A short segment of natural channel will be constructed connecting the new pond with Upper Bridge Creek. This segment of channel will also have habitat components incorporated into its design and plan form.

4.6.2 Benefits/Detriments

The benefits of this alternative include retaining historical value, retaining recreational uses, increasing habitat, and potentially reducing water temperature. Recreational uses would be maintained to some degree, but there would be less open water pond area for recreation. The decreased pond volume would result in less residence time for flow through Bates Pond, which would likely have temperature and water quality benefits. A comparative temperature analysis was performed for this alternative using available data. Although the data was limited, the analysis suggests that a decrease in pond volume and surface area would affect water temperature. The results are presented in Section 5.1 of this report. More investigation would be needed to determine specific potential temperature benefits. This alternative also includes the creation of emergent wetlands and a constructed natural channel with habitat components. The habitat components would be beneficial to terrestrial and aquatic species. This alternative meets most of the goals and objectives stated in the Bates State Park Master Plan. This alternative, however, would be a temporary remedy. Sediment would continue to accumulate in the pond over time and future dredging would likely be necessary to maintain conditions.

4.6.3 Constraints/Risks

This alternative would not address on-going sediment loading of the pond or the fish passage issues associated with the existing ladder. The pond receives an estimated 330 CY of sediment load annually. A maintenance plan would have to be implemented to maintain the designed pond area and volume. More investigation would be needed to determine temperature benefits of this alternative. More constraints may occur during the permitting process and in unearthing of soils in the pond.

4.6.4 Level of Effort/Cost

The initial cost for Option 1 is $1,494,000. Most of the cost and level of effort in this option is acquiring and placing the necessary imported fill material. The imported fill material will be used to create the emergent wetlands within the footprint of the pond. The large amount of imported fill represents a majority of the cost. The cost for Option 2 is $697,000. Most of the cost in this option is in the channel and habitat creation. A sediment maintenance plan would be needed maintain the shape and size of the pond and cost approximately $2,400 annually.

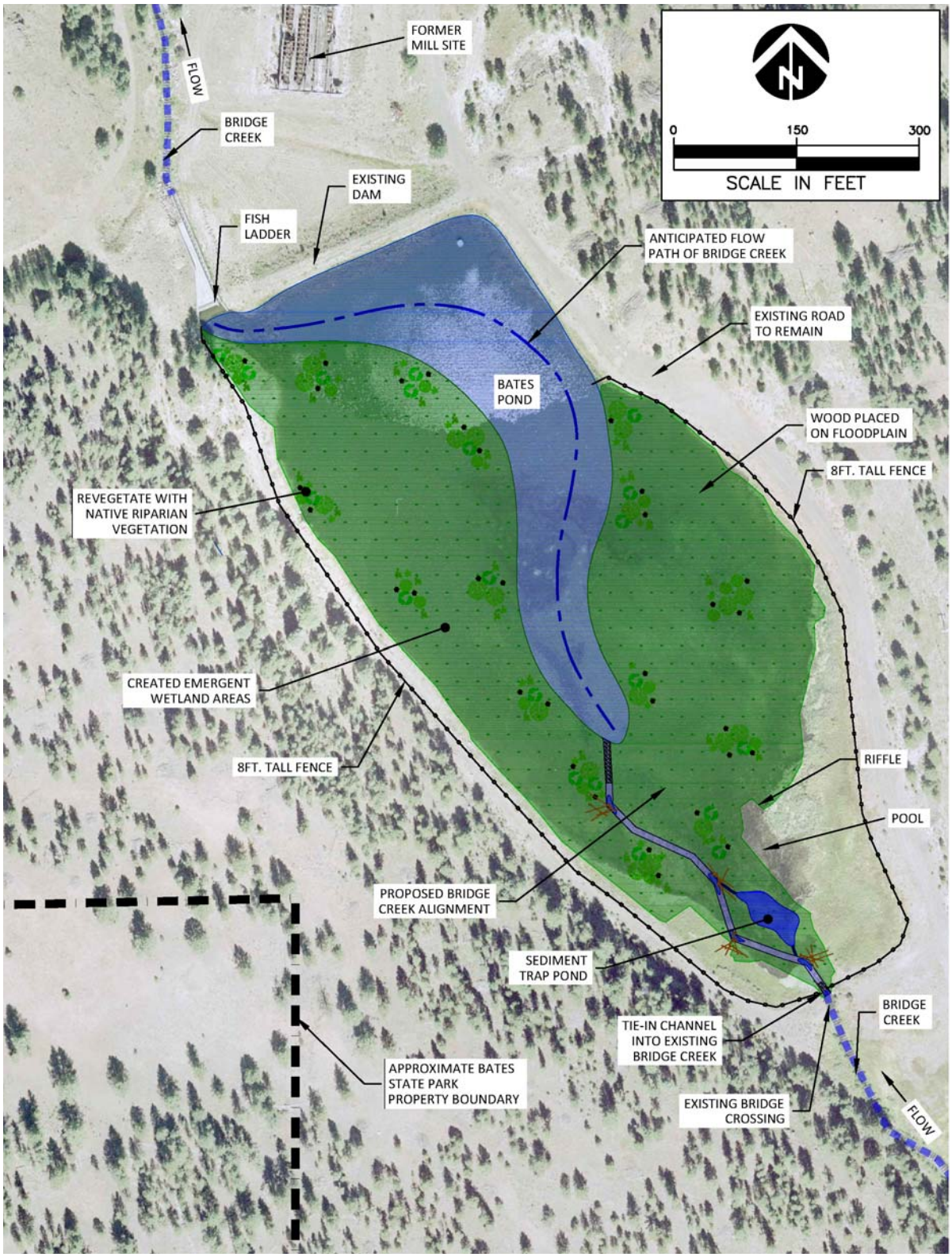

Figure 8. Alternative F Option 1– Modifying the size and shape of Bates Pond and creating margin wetland communities with a new channel segment.

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Alternative F - Reduce Pond Volume Option 1 [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$39,303	$39,303
Design (18% of Construction Cost)	1	LS	$141,491	$141,491
Construction Oversite (2% of Construction Cost)	1	LS	$15,721	$15,721
Administrative (5% of Construction Cost)	1	LS	$39,303	$39,303
			Total	$247,818

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$39,400	$39,400
Diversion and Dewatering	1	LS	$56,800	$56,800
Erosion Control	1	LS	$2,700	$2,700
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$102,900

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	33000	CY	$18.00	$594,000
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	475	LF	$140	$66,500
Riparian Revegetation	6.0	Acre	$14,000	$84,000
Upland Revegetation	0.0	Acre	$8,000	$0
			Total	$744,500

Materials	Value	Units	Unit Cost	Total Cost
Riprap	200	CY	$63	$12,600
Logs	50	Pieces	$500	$25,000
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	2200	LF	$2	$3,960
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$41,560
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$786,060

Cost Summary		Total Cost
Project Task		$247,818
General Construction		$102,900
Excavation and Earthwork		$744,500
Materials		$41,560
Esimated Sediment Maintance Cost over a 5 year Period		$12,000
	Subtotal	$1,148,778
Contigency (30%)		$344,633
	Total	$1,493,411

[1] RSMeans 2011 Construction Cost used to develop unit cost

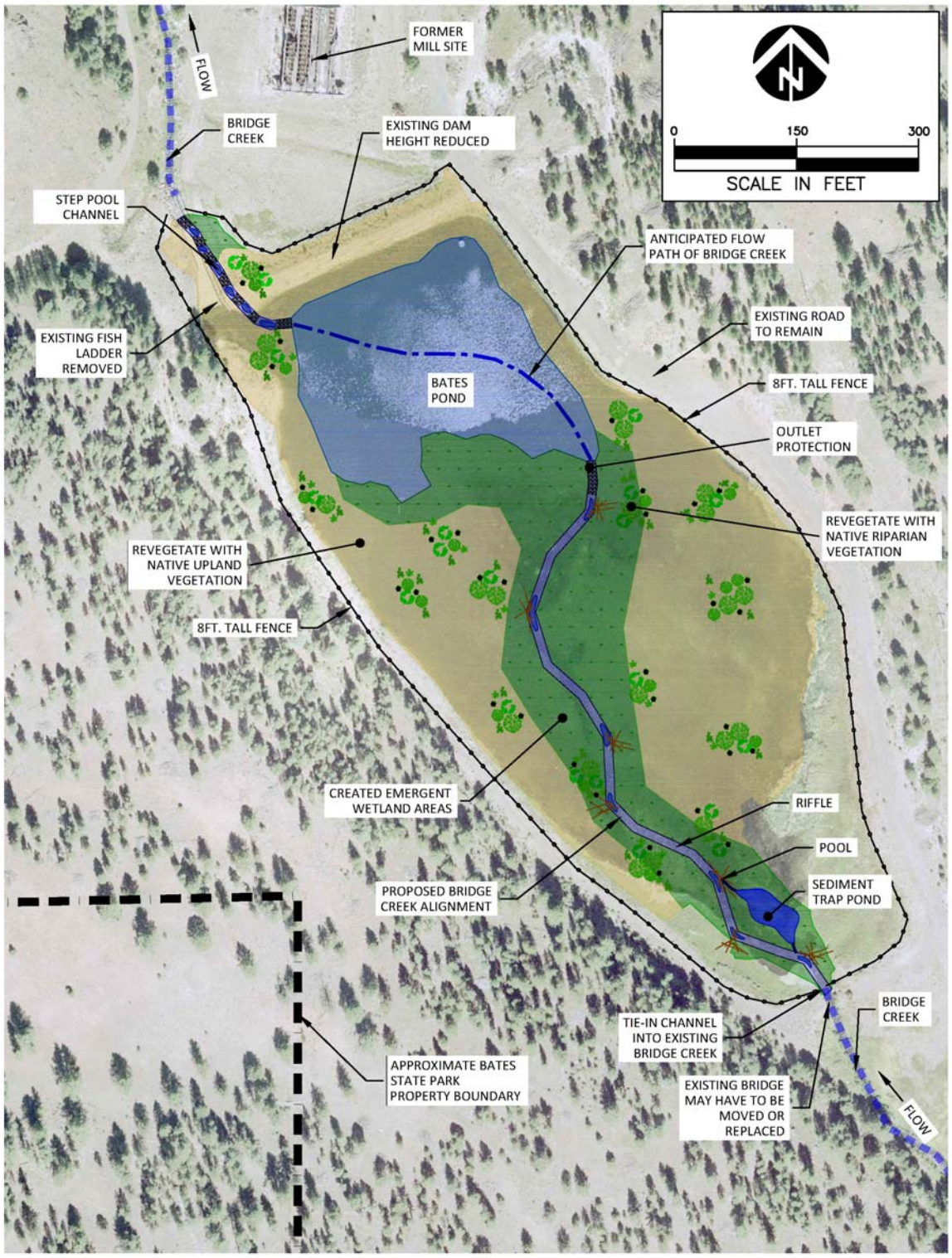

Figure 9. Alternative F Option 2– Modifying the size and shape of Bates Pond and creating margin wetland communities with a new channel segment.

Bates State Park - Preliminary Cost Summary

September, 2011

Alternative F - Reduce Pond Volume Option 2 [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$16,610	$16,610
Design (18% of Construction Cost)	1	LS	$59,796	$59,796
Construction Oversite (2% of Construction Cost)	1	LS	$6,644	$6,644
Administrative (5% of Construction Cost)	1	LS	$16,610	$16,610
			Total	$111,660

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$16,700	$16,700
Diversion and Dewatering	1	LS	$56,800	$56,800
Erosion Control	1	LS	$2,700	$2,700
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$80,200

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	13000	CY	$5.00	$65,000
Constructed Habitat Channel	850	LF	$140	$119,000
Riparian Revegetation	2.2	Acre	$14,000	$30,800
Upland Revegetation	4.6	Acre	$8,000	$36,800
			Total	$251,600

Materials	Value	Units	Unit Cost	Total Cost
Riprap	400	CY	$63	$25,200
Logs	100	Pieces	$500	$50,000
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	3000	LF	$2	$5,400
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$80,600
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$332,200

Cost Summary		Total Cost
Project Task		$111,660
General Construction		$80,200
Excavation and Earthwork		$251,600
Materials		$80,600
Esimated Sediment Maintance Cost over a 5 year Period		$12,000
	Subtotal	$536,060
Contigency (30%)		$160,818
	Total	$696,878

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.7 ALTERNATIVE G: RESTORATION OF RIPARIAN VEGETATION

4.7.1 Description

This alternative reestablishes native vegetation communities along existing water bodies in their current alignment and configuration. This would include Upper Bridge Creek, Clear Creek, Bates Pond, and Lower Bridge Creek to the confluence with the MF John Day.

4.7.2 Benefits/Detriments

Restoring native riparian vegetation communities would increase stream shading, bank stability, future woody debris recruitment, and would enhance complex margin habitat. The greatest potential benefit would be stream shading to reduce water temperatures. A comparative temperature analysis was performed for this alternative using available data. Although the data is limited, the analysis suggests that an increase in shade would have a minor effect on reducing water temperature. The results are presented in Section 5.1 of this report. More investigation would be needed to identify the specific effect on stream temperatures. The water temperature in the pond would change little since the size and shape of Bates Pond would not be reduced. This alternative would also retain the recreational and historical values of the pond. This alternative would meet a couple of the goals and objectives stated in the Bates State Park Master Plan

4.7.3 Constraints/Risks

The greatest constraint with this alternative is the size of the pond. Given the surface area and volume of water, the amount of increased shade provided from vegetation may not be sufficient to provide any temperature benefit for the target species. This alternative does not address on-going sediment loading of the pond or the fish passage issues associated with the existing ladder. A maintenance plan will have to be implemented to maintain vegetation and desired pond size. More constraints may occur during the permitting process and in unearthing of soils in the pond.

4.7.4 Level of Effort/Cost

The initial cost for this alternative is $403,000. The largest level of effort with this alternative is the long-term maintenance needed for watering, weed/browse control, and follow-up planting needed to offset plant mortality. A fence will need to be installed to protected newly vegetated area during initial growth period and a sediment maintenance plan would be needed maintain the shape and size of the pond and cost approximately $2,400 annually. The impacts due to installation and construction will be minimal. The maintenance of the pond and vegetation shares a majority of the cost.

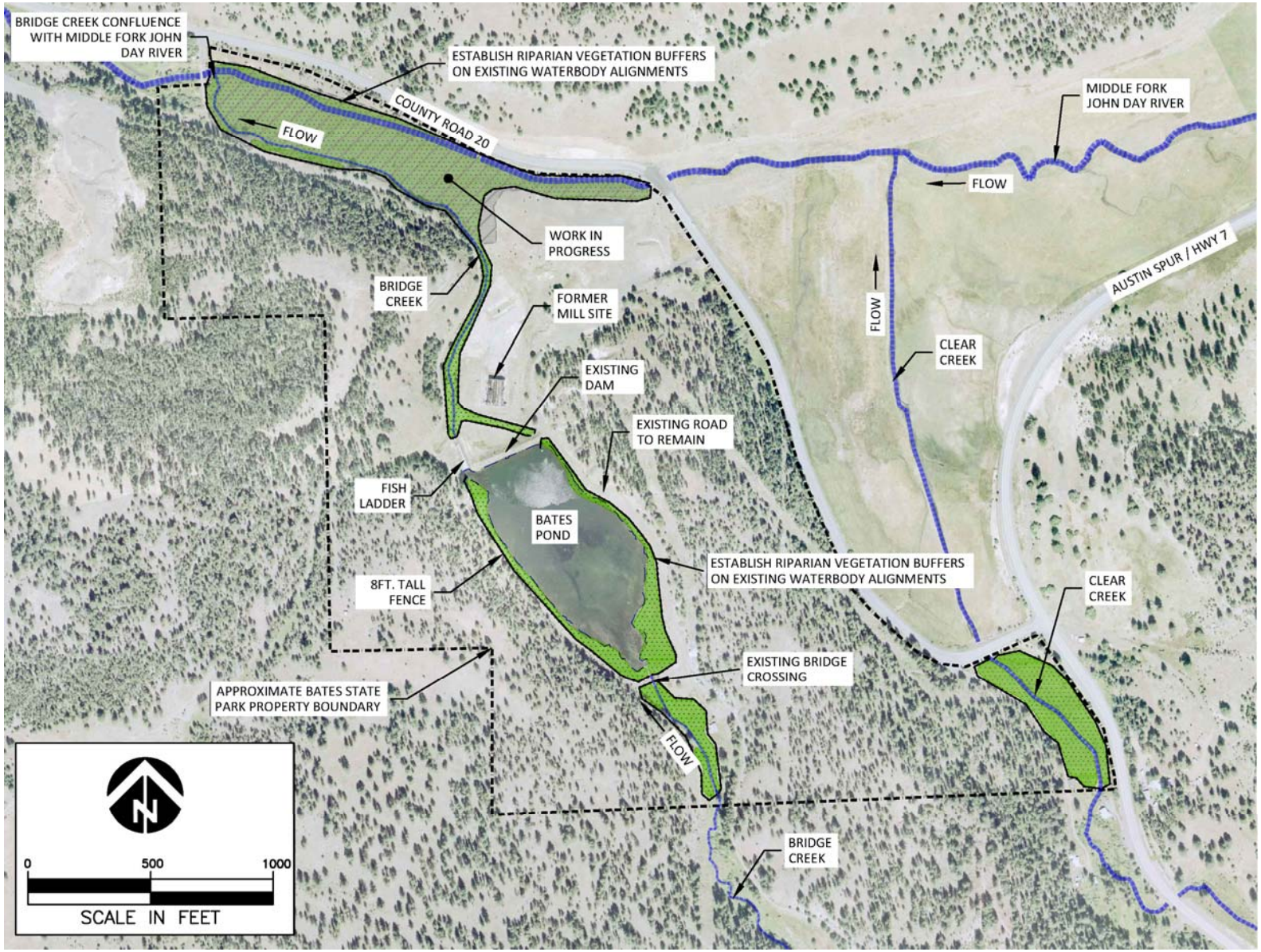

Figure 10. Alternative G – Restoring riparian vegetation communities along existing waterways.

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Alternative G - Revegetate Riparian Areas on All Water Boundaries [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$8,000	$8,000
Permitting (5% of Construction Cost)	1	LS	$10,591	$10,591
Design (18% of Construction Cost)	1	LS	$38,128	$38,128
Construction Oversite (2% of Construction Cost)	1	LS	$4,236	$4,236
Administrative (5% of Construction Cost)	1	LS	$10,591	$10,591
			Total	$71,546

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$10,600	$10,600
Diversion and Dewatering (5% of Construction Cost)	0	LS	$0	$0
Erosion Control	1	LS	$11,500	$11,500
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$26,100

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0	Acre	$5,900	$0
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	0	CY	$5.00	$0
Constructed Habitat Channel	0	LF	$140	$0
Riparian Revegetation	13.6	Acre	$14,000	$190,400
Upland Revegetation	0.0	Acre	$8,000	$0
			Total	$190,400

Materials	Value	Units	Unit Cost	Total Cost
Riprap	0	CY	$63	$0
Logs	0	Pieces	$500	$0
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	11900	LF	$2	$21,420
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$21,420
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$211,820

Cost Summary		Total Cost
Project Task		$71,546
General Construction		$26,100
Excavation and Earthwork		$190,400
Materials		$21,420
Esimated Sediment Maintance Cost over a 5 year Period		$0
	Subtotal	$309,466
Contigency (30%)		$92,840
	Total	$402,306

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.8 ALTERNATIVE H: LOWER BRIDGE CREEK FLOODPLAIN RECONNECTION AND HABITAT ENHANCEMENT

4.8.1 Description

This alternative reconnects Lower Bridge Creek with its historical floodplain. Lower Bridge Creek currently has a straightened plan form and is positioned at the valley toe. This ditched portion of the creek is incised and floodplain connectivity (i.e. frequency of inundation) has been reduced. This alternative would lower the floodplain surface to selected elevations in order to restore historical inundation rates and patterns. Target flows for initiation of floodplain inundation would be determined through hydraulic and geomorphic analysis. The floodplain surface would be planted with native vegetation creating habitat for terrestrial and aquatic species. The existing ditched and straightened channel would be re-meandered through the new lowered floodplain. The channel would have meandering plan form and pool-riffle morphology, which is consistent with Upper Bridge Creek's plan form. Connected off-channel habitats would be created to enhance habitat diversity for a variety of species and life stages. Large wood would be placed in the main channel and off-channel areas to create scour pools and to increase cover and complexity. Large wood would be placed in the floodplain to create hydraulic roughness that has been lost due to past land clearing; this would reduce flow velocities in the floodplain during floods and would help mediate avulsion risk. Floodplain wood would also enhance habitat for terrestrial species. This alternative also includes restoration of the native riparian and floodplain vegetation community.

4.8.2 Benefits/Detriments

The major benefit of this alternative is the reconnection of the floodplain to Lower Bridge Creek. These improvements would reduce incision-related scour and erosion in the stream channel and would improve in stream habitat. Restoration of a meandering pool-riffle channel would increase pool habitat for salmonid rearing, pool tail-outs for spawning, and riffles for macro-invertebrate production. Creation of connected off-channel areas would enhance salmonid rearing habitat availability and diversity. Large wood placements would enhance hiding cover and complexity. Floodplain reconnection would enhance ecological and riparian processes. Benefits for salmonids include reduced stream energy, increased availability of low velocity flood refuge habitat, and increased inputs of food resources derived from the floodplain. These habitat components are beneficial to terrestrial and aquatic species. Floodplain wood placements would increase the availability of flood refuge for fish and would reduce avulsion potential. Restoration of the native riparian and floodplain vegetation community would benefit both terrestrial and aquatic species in numerous ways. This alternative also benefits from retaining the historical values and recreational uses of the pond as well as the recreational use of the Lower Bridge Creek Reach. This alternative meets most of the goals and objectives stated in the Bates State Park Master Plan. However, this alternative only addresses the Lower Bridge Creek Reach and does not address the thermal loading in the pond or fish passage at the ladder.

4.8.3 Constraints/Risks

Constraints include the future campground on the east side of Bridge Creek and the valley wall on the west. The available width for implementing floodplain reconnection is roughly a third of the historical width. This alternative does not address on-going sediment load. A maintenance plan will have to be implemented to maintain riparian vegetation and to manage the annual sediment load.

More constraints may occur during the permitting process and in unearthing of soils in the lower floodplain.

4.8.4 Level of Effort/Cost

The initial cost for this alternative is $577,000. The largest level of effort and cost is associated with the excavating, loading, and hauling of material off site and the materials to create the channel and habitat components. This alternative would also need a long-term maintenance plan for the pond and planted riparian vegetation.

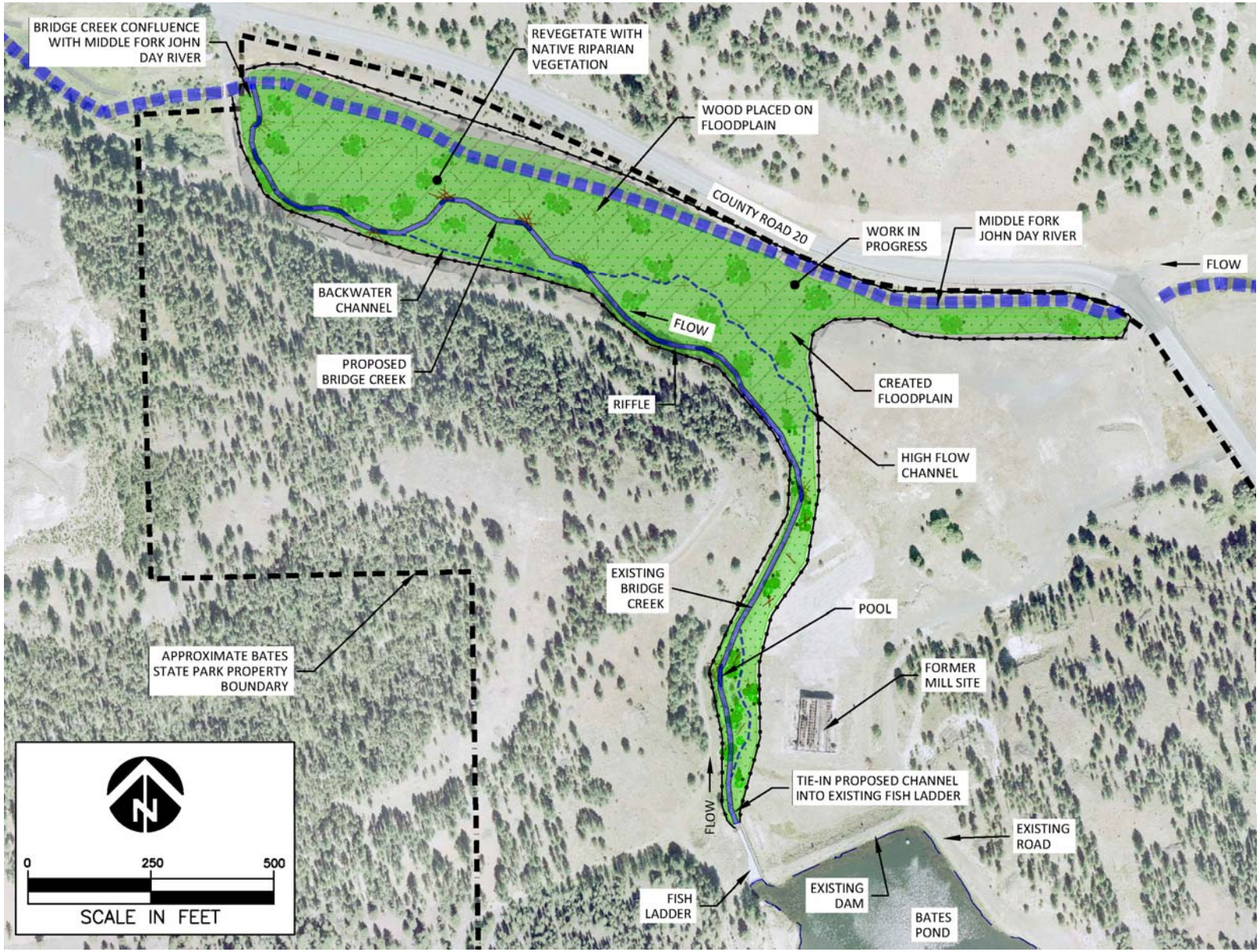

Figure 11. Alternative H – Lower Bridge Creek floodplain reconnection and habitat enhancement.

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September, 2011

Alternative H - Increase Channel Complexity of Lower Bridge Creek and MF John Day [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$15,019	$15,019
Design (18% of Construction Cost)	1	LS	$54,070	$54,070
Construction Oversite (2% of Construction Cost)	1	LS	$6,008	$6,008
Administrative (5% of Construction Cost)	1	LS	$15,019	$15,019
			Total	$102,116

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$15,100	$15,100
Diversion and Dewatering	1	LS	$9,200	$9,200
Erosion Control	1	LS	$13,200	$13,200
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$41,500

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0.93	Acre	$5,900	$5,487
Excavation and Stockpile	250	CY	$10.00	$2,500
Excavation and Haul	0	CY	$8.00	$0
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	600	CY	$5.00	$3,000
Constructed Habitat Channel	500	LF	$140	$70,000
Riparian Revegetation	8.2	Acre	$14,000	$114,800
Upland Revegetation	0.0	Acre	$8,000	$0
			Total	$195,787

Materials	Value	Units	Unit Cost	Total Cost
Riprap	100	CY	$63	$6,300
Logs	175	Pieces	$500	$87,500
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	6000	LF	$2	$10,800
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$104,600
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$300,387

Cost Summary		Total Cost
Project Task		$102,116
General Construction		$41,500
Excavation and Earthwork		$195,787
Materials		$104,600
Esimated Sediment Maintance Cost over a 5 year Period		$0
	Subtotal	$444,003
Contigency (30%)		$133,201
	Total	$577,204

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.9 ALTERNATIVE I: REMOVE FISH LADDER AND ADJUST THE DAM HEIGHT TO CREATE A SMALLER POND AND A NATURAL CHANNEL

4.9.1 Description

This alternative would remove the fish ladder and a portion of the existing dam. The dam height would be reduced, allowing the pond shape and size to be adjusted. Retaining a portion of the dam would allow for some of the historical value and recreational uses to be retained at the site. The existing fish ladder would be removed since a new channel would connect Upper Bridge Creek and Lower Bridge Creek. The new Bridge Creek channel would be constructed with a slope and shape that ensures adequate fish passage and sediment mobility. The new channel would start from Upper Bridge Creek near the bridge crossing and extend down to the confluence with the MF John Day. The new Bridge Creek would have a meandering, pool-riffle plan form. The existing pond would be reshaped to maximize recreational uses, while reducing its overall size. The newly shaped pond would be positioned against the modified dam. The new pond would be fed by a series of emergent wetlands and would provide water storage during seasonal high flow events. Floodplain areas would be re-graded to restore historical floodplain topography and connectivity. Off-channel wetland habitats accessible for fish rearing would be created along Bridge Creek. Large wood would be placed in the new channel to increase in stream cover and complexity for salmonids. A fish screen would be needed if the pond is left on line. This would ensure that fish do not have access to the pond at normal flows. This alternative would also include restoration of the native riparian and floodplain vegetation community.

4.9.2 Benefits/Detriments

This alternative would share the same benefits as Alternative H but would also include additional enhancement benefits. This alternative would remove the fish ladder that limits juvenile fish passage to Upper Bridge Creek. Reshaping of the dam and pond would reduce stream temperature. The new channel connecting Upper and Lower Bridge Creek would be enhanced with instream habitat for spawning and rearing of native fish. This alternative would also enhance aquatic, riparian, and wetland habitat created by vegetation enhancements and floodplain reconnection. This alternative would retain the historical and recreational values of the pond as well as recreational use in the Lower Bridge Creek Reach. This alternative would meet the goals and objectives of the Bates State Park Master Plan.

4.9.3 Constraints/Risks

As with Alternative H, existing development and roads limit full floodplain restoration. Another constraint is modifying the existing dam. This would involve more analysis of the materials and stability of the dam. More constraints may occur during the permitting process and in unearthing of soils in the pond.

4.9.4 Level of Effort/Cost

The initial cost for this alternative is $1,647,000. The largest level of effort and cost is associated with the excavating, loading, and reshaping of material on site and the materials to create the channel and habitat components. This alternative would also need a long-term maintenance plan for the pond and planted riparian vegetation

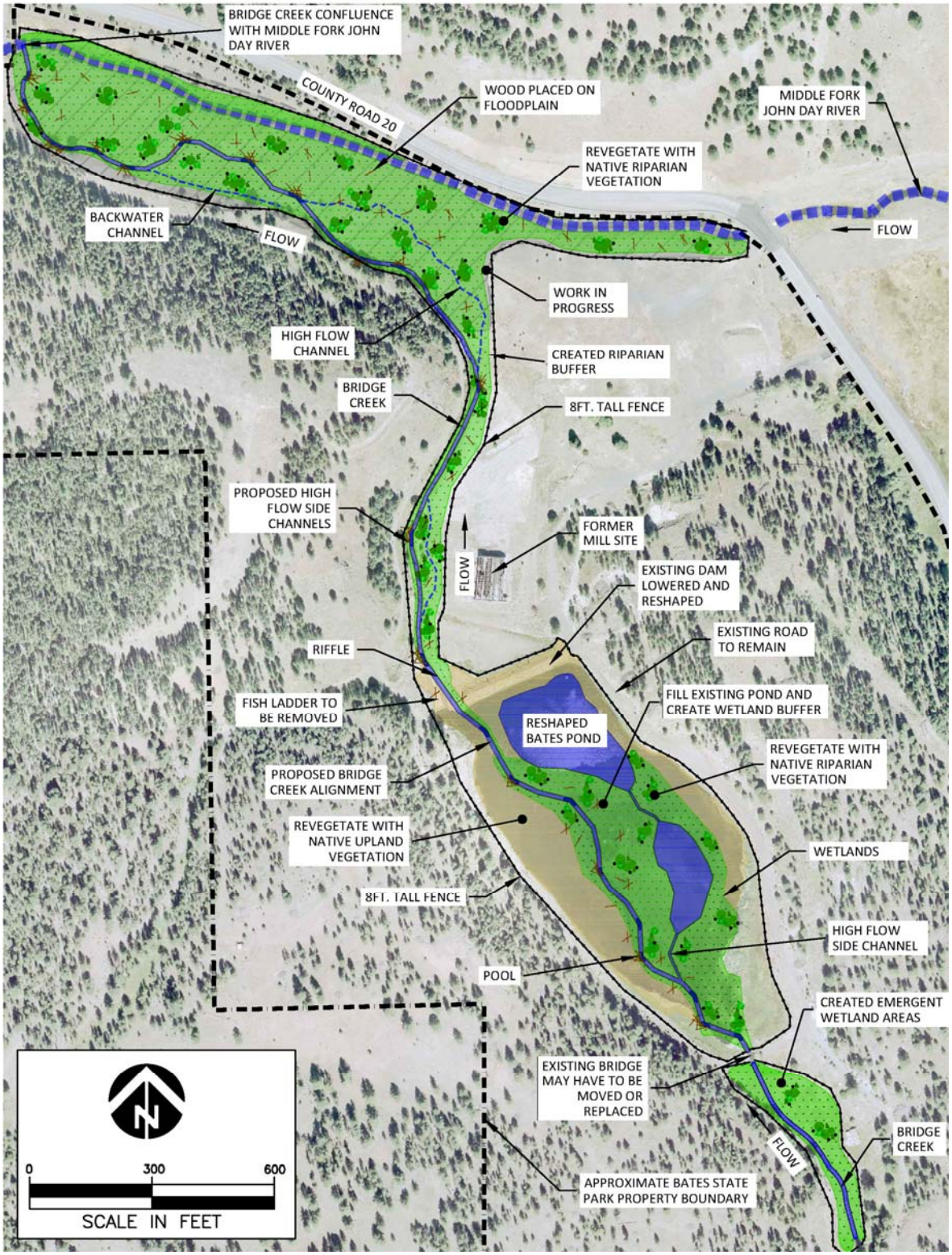

Figure 12. Alternative I – Reduce the height of the existing dam and create a smaller pond with an adjacent free flowing Bridge Creek and wetland complex.

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Alternative I - Remove Dam and Fish Ladder and Create Channel with Pond Off-Line [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$42,880	$42,880
Design (18% of Construction Cost)	1	LS	$154,367	$154,367
Construction Oversite (2% of Construction Cost)	1	LS	$17,152	$17,152
Administrative (5% of Construction Cost)	1	LS	$42,880	$42,880
			Total	$269,279

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$42,900	$42,900
Diversion and Dewatering	1	LS	$69,900	$69,900.00
Erosion Control	1	LS	$23,000	$23,000
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$139,800

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0.93	Acre	$5,900	$5,487
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	22000	CY	$8.00	$176,000
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	7000	CY	$5.00	$35,000
Constructed Habitat Channel	2000	LF	$140	$280,000
Riparian Revegetation	12.6	Acre	$14,000	$176,400
Upland Revegetation	3.2	Acre	$8,000	$25,600
			Total	$698,487

Materials	Value	Units	Unit Cost	Total Cost
Riprap	250	CY	$63	$15,750
Logs	250	Pieces	$500	$125,000
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	10200	LF	$2	$18,360
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$159,110
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$857,597

Cost Summary		Total Cost
Project Task		$269,279
General Construction		$139,800
Excavation and Earthwork		$698,487
Materials		$159,110
Esimated Sediment Maintance Cost over a 5 year Period		$0
	Subtotal	$1,266,676
Contigency (30%)		$380,003
	Total	$1,646,679

[1] RSMeans 2011 Construction Cost used to develop unit cost

4.10 ALTERNATIVE J: REMOVE THE DAM AND FISH LADDER AND CREATE A NEW STREAM CHANNEL

4.10.1 Description

This alternative would include the full restoration of the historical configuration of Bridge Creek through the project area. The dam and fish ladder and pond would be decommissioned and removed. This alternative is similar to Alternative I, except that no portion of the existing dam or pond would be retained. The new Bridge Creek channel would be constructed with a slope and shape that ensures adequate fish passage and sediment mobility. The new channel would start from Upper Bridge Creek near the bridge crossing and extend down to the confluence with the MF John Day. The new Bridge Creek would have a meandering, pool-riffle plan form. Floodplain areas would be re-graded to restore historical floodplain topography and connectivity. Off-channel wetland habitats accessible for fish rearing would be created along the Lower Bridge Creek Reach as well as within the existing reservoir area. Large wood would be placed in the new channel to increase instream cover and complexity for salmonids. This alternative would also include restoration of the native riparian and floodplain vegetation community.

4.10.2 Benefits/Detriments

This alternative carries the same benefits as Alternative I, but would have some additional biological benefits. Within the reservoir area, the historical channel, floodplain, and wetlands would be restored to maximize habitat benefits to aquatic, terrestrial, and avian species. Restoration of physical processes would restore natural rates of channel migration, floodplain inundation, and long-term habitat creation and maintenance. The impact of the existing pond on stream temperatures and fish passage would be completely eliminated. This alternative would retain some recreational uses but would not retain the historical and recreational values of Bates Pond. This alternative meets some of the goals and objectives of the Bates State Park Master Plan.

4.10.3 Constraints/Risks

Changes to existing historical and recreational values are potential constraints. In Lower Bridge Creek, constraints are the same as Alternative H. More constraints may occur during the permitting process and in unearthing of soils in the pond.

4.10.4 Level of Effort/Cost

The initial cost for this alternative is $2,250,000. The largest level of effort and cost is associated with the excavating, loading, and reshaping of material on site and the materials to create the channel and habitat components. This alternative would also need a long-term maintenance plan planted riparian vegetation

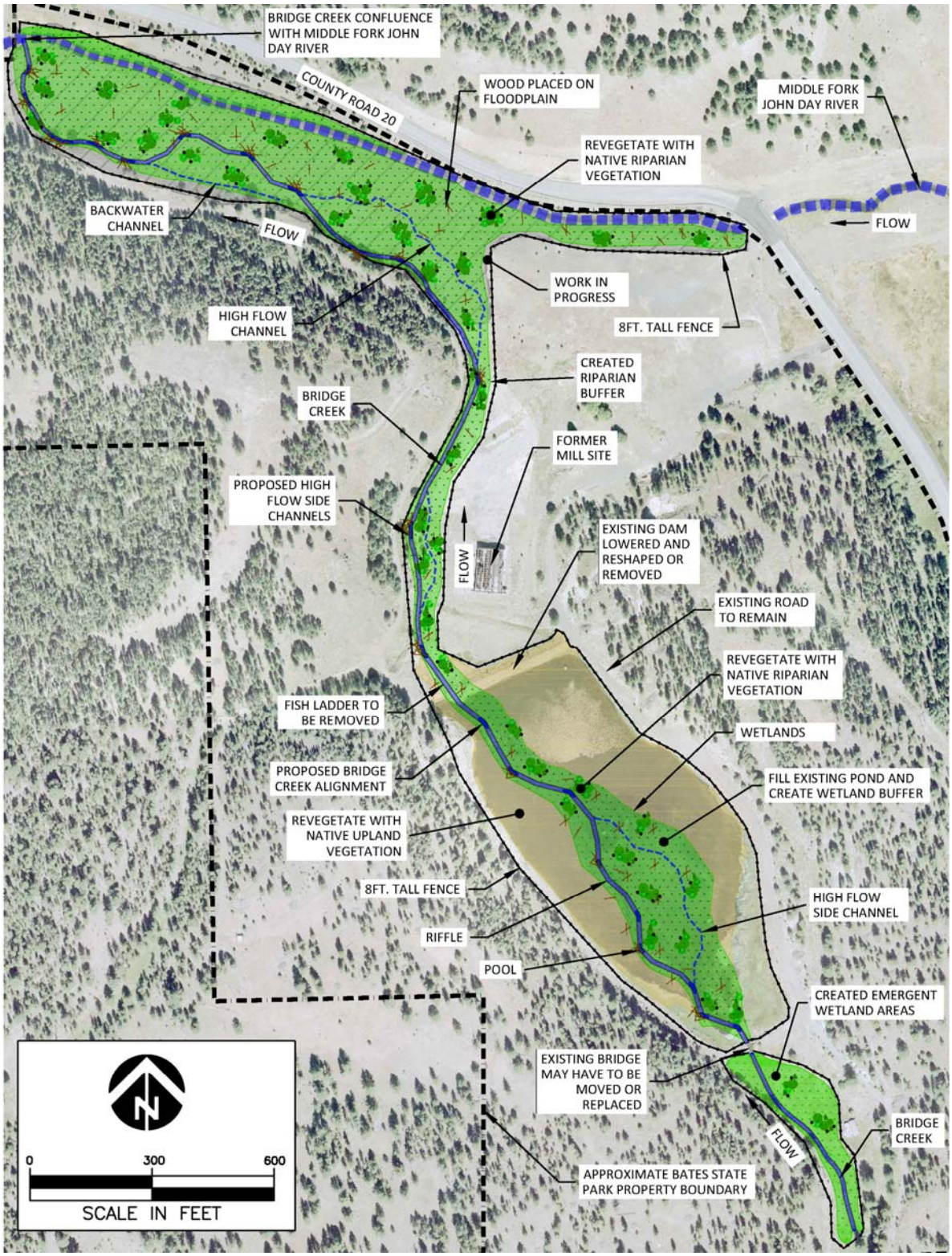

Figure 13. Alternative J – Remove the existing dam and pond and create a free flowing Bridge Creek with adjacent wetland complexes.

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Alternative J - Remove Dam and Pond to Create a Historical Channel Plan Form [1]

Project Task	Value	Units	Unit Cost	Total Cost
Surveying	1	LS	$12,000	$12,000
Permitting (5% of Construction Cost)	1	LS	$60,057	$60,057
Design (18% of Construction Cost)	1	LS	$216,206	$216,206
Construction Oversite (2% of Construction Cost)	1	LS	$24,023	$24,023
Administrative (5% of Construction Cost)	1	LS	$60,057	$60,057
			Total	$372,344

General Construction	Value	Units	Unit Cost	Total Cost
Mobilization and Demobilization (5% of Construction Cost)	1	LS	$60,100	$60,100
Diversion and Dewatering	1	LS	$69,900	$69,900
Erosion Control	1	LS	$23,000	$23,000
Fish Resuce (0.5% of Construction Cost)	1	LS	$4,000	$4,000
			Total	$157,000

Excavation and Earthwork	Value	Units	Unit Cost	Total Cost
Clear and Grub	0.93	Acre	$5,900	$5,487
Excavation and Stockpile	0	CY	$10.00	$0
Excavation and Haul	12000	CY	$8.00	$96,000
Imported Fill	0	CY	$18.00	$0
Placed/Compacted Fill	22000	CY	$5.00	$110,000
Constructed Habitat Channel	4200	LF	$140	$588,000
Riparian Revegetation	12.4	Acre	$14,000	$173,600
Upland Revegetation	5.1	Acre	$8,000	$40,800
			Total	$1,013,887

Materials	Value	Units	Unit Cost	Total Cost
Riprap	300	CY	$63	$18,900
Logs	300	Pieces	$500	$150,000
Sheetpile	0	SF	$13.00	$0
Reinforced Concrete	0	LF	$480	$0
Fencing	10200	LF	$2	$18,360
Splash Boards and Iron	0	LS	$4,000	$0
			Total	$187,260
Sub Total Construction Cost (Excavation, Earthwork, and Materials)				$1,201,147

Cost Summary		Total Cost
Project Task		$372,344
General Construction		$157,000
Excavation and Earthwork		$1,013,887
Materials		$187,260
Esimated Sediment Maintance Cost over a 5 year Period		$0
	Subtotal	$1,730,491
Contigency (30%)		$519,147
	Total	$2,249,638

[1] RSMeans 2011 Construction Cost used to develop unit cost

5 ADDITIONAL ANALYSIS

5.1 COMPARATIVE TEMPERATURE ANALYSIS

A temperature analysis was performed to evaluate the relative merits of alternatives with respect to downstream temperature impacts. The analysis utilized methods presented in "Principles of Surface Water Quality Modeling and Control" (Thomann et. al. 1987), which were developed for electrical power plant cooling ponds. The analysis considers the following heat transfer variables: short-wave solar radiation, long-wave atmospheric radiation, long-wave back radiation, evaporative cooling, and conductive heat transfer. Short-wave solar radiation was calculated using equations developed by Thackston (1974) that provide empirical relationships for solar radiation based on day of the year and latitude. The analysis assumes clear sky conditions for the evaluation period of July and August. Flow during July and August is assumed to be 1 cfs for this analysis. Reflected short-wave solar radiation is assumed as a typical value of 6 percent. Long-wave atmospheric radiation assumes 6 percent reflected long-wave atmospheric radiation. The long-wave atmospheric radiation calculation is based on air temperature. Average monthly air temperature values were obtained from Austin, OR, which is near the site. Unfortunately, average daily temperatures are not published for the Austin, OR site. Back radiation accounts for heat losses from ponds that occur primarily during nighttime hours. Back radiation depends upon emissivity and water temperature at the surface. A value of 0.97 was used for emissivity, as typical for water bodies. Surface water temperature was assumed to be 13 degrees Celsius on July 1. Conductive heat transfer is based on surface water temperature (assumed 13° C on July 1), air temperature (average monthly from Austin, OR), and average wind speed. The closest average wind speed values are available from a recording station at Pendleton, OR, which publishes average monthly wind values. The rate of heat loss by evaporation depends upon wind speed measured 7 meters above the water, air vapor pressure, and saturation pressure. Average monthly wind speeds published for Pendleton, OR were assumed to be applicable since no better data appears to be available. Air vapor and saturation pressure are a function of relative humidity. The closest relative humidity values available were recorded in Pendleton, OR, with only average monthly values published.

A simplified heat balance equation is presented in Thomann (1987) that was originally developed by Edinger (1974). For this analysis, a completely mixed lake is assumed and temperature in the lake is at a temporal steady state, with little change in temperature during the time step. Since a temporal steady state is assumed, average monthly climatological data is applied on a daily basis in order to calculate temperature within a time step that may reasonably be assumed as a temporal steady state. As such, the only heat flux component that changes on a daily basis is short-wave solar radiation; all other variables are constant throughout the month. The months of July and August were selected since they are the hottest months of the year; climatological conditions do not change dramatically from the beginning to the end of those months. This is a simplified methodology, but it allows for the calculation of a temperature increase during July and August for the existing lake and a comparison of the various alternatives' effect on downstream temperatures. The extent of the temperature increase would be more accurate if climatological data were available on an average daily basis. Additional manipulations to calculations were required to represent some alternatives. For instance, shade is not considered in the Edinger (1974) analysis, but increased shading was represented in this analysis by reducing short-wave solar radiation by the percent shade added for Alternative E. Also, the Edinger (1974) calculations do not consider pond volume directly, but they

do consider flow through the pond due to mathematical simplifications. Thus, reduced residence time of water associated with volume reduction for Alternative F is represented by increasing flow instead of reducing volume (having the same effect to reduce residence time). This analysis does not provide absolute values for temperature increases; it only provides a comparison of existing conditions to alternatives based on the above assumptions. The analysis found that heat is added to the pond until sometime in August, depending upon the alternative, and then heat begins to be lost from the pond. The table below displays modeled temperature values for July 1, August 31, and maximum temperature that occurs in August for existing conditions and alternatives that include reductions in pond surface area, volume decreases, or increased shading.

	Existing Conditions	Alternative B	Alternative D	Alternative E	Alternative F	Alternative G
July 1	13.00	13.00	13.00	13.00	13.00	13.00
Max Temp ° C	19.66	13.24	19.88	18.27	16.06	18.27
August 31	13.83	13.24	13.61	12.88	15.41	12.88

6 SUMMARY OF ALTERNATIVES

Table 1 list find key points for each alternative, which have been summarized so they can be compared side by side. The alternatives where looked at with the goals and objects that are stated in the Bates State Park Master Plan Bates in mind. The "goals met" column gives a sum of objectives achieved for each alternative. A point is credited for historic, recreational, and ecological retention or enhancement. A +/- point was awarded for only addressing a portion of a specific goal as stated in the Bates State Park Master Plan. The "goals summarized" column gives a brief explanation of how the alternative specifically impacts the goals and objects stated in the Bates State Park Master Plan. The table finishes with general notes and cost that are specific to each alternative.

Table 1. Summary of Alternatives

Alternative	Goals Met	Goals Summarized	Notes	Cost
A: Modify the Existing Fish Ladder.	▪ 2	▪ Retains Recreational and Historical use in pond.	▪ Ecological benefits are unknown due to elevated temperatures in the Bates Pond	▪ Flash Board Modification: $32,000 ▪ Concrete Retrofit: $202,500
B: Construct a Bypass Channel Around the Pond.	▪ 2	▪ Retains Recreational and Historical use in pond. ▪	▪ Does not address fish passage issues with ladder. ▪ Sediment load will have to be addressed	▪ $Option 1- Sheet Pile: $662,000 ▪ Option 2 – Earthened Dam: $609,000
C: Construct a New Stream Channel Connecting Upper and Lower Bridge Creek.	▪ 3	▪ Retains Recreational and Historical use in pond. ▪ This also a ecological enhancement to the fisheries.	▪ Large Construction Effort ▪ Expensive	▪ $10,000,000
D: Increase Pond Depth.	▪ 2	▪ Retains Recreational and Historical use in pond	▪ More analysis would need to be done to understand potential temperature benefits.	▪ $238,000initial, ▪ 2,400 annual
E: Increase Shading of the Pond.	▪ 2	▪ Retains Recreational and Historical use in pond.	▪ More analysis would need to be done to understand the temperature benefits.	▪ $98,000

Alternative	Goals Met	Goals Summarized	Notes	Cost
F: Modify Pond Size and Shape.	▪ 2 +/-	▪ Retains Recreational and Historical use in pond. ▪ Reduces elevated temperatures in pond	▪ Does not address fish passage issues with ladder. ▪ Sediment load Will have to be addressed	▪ Option 1: $1,494,000 ▪ Option 2: $697,000 ▪ Same annual maintenance cost.
G: Restoration of Riparian Vegetation.	▪ 2	▪ Retains Recreational and Historical use in pond.	▪ More analysis would need to be done to understand the temperature benefits.	▪ $402,000
H: Lower Bridge Creek Floodplain Reconnection and Habitat Enhancement.	▪ 2+/-	▪ Retains Recreational and Historical use in pond. ▪ Ecological Benefit in Lower Bridge Creek.	▪ Does not address fish passage issues with ladder. ▪ Sediment load will have to be addressed	▪ $577,000
I: Remove Fish Ladder and Adjust the Dam height to Create a Smaller Pond and a Natural Channel.	▪ 3	▪ Retains Recreational and Historical use in pond. ▪ This also a ecological enhancement to the fisheries.	▪ This removes the fish ladder, reduces the pond size, and takes the pond off line.	▪ $1,647,000
J: Remove the Dam and Fish Ladder and Create a New Stream Channel.	▪ 2+/-	▪ This has recreation and ecological value from upper Bridge Creek to MF John Day River.	▪ Does not retain historical value of the site.	▪ $2,250,000

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October 20, 2011

James Morgan
Natural Resources Manager
Oregon Parks and Recreation Department
725 Summer Street, Suite C
Salem OR 97301-1271

Dear Jim:

The following are my comments on some portions of the report entitled "Alternatives Analysis for Aquatic Habitat Improvements at Bates State Park." A significant focus of the report is on fish in Bridge Creek, primarily Chinook. Consequently I will largely focus my comments on the role of Chinook in Bridge Creek.

Federal Listing of Chinook

Chinook are not listed as either 'threatened' or 'endangered' in the John Day River by the federal Endangered Species Act (ESA) 16 U.S.C. §1531 et. seq. (1973). In fact, the number of Chinook is increasing in the John Day River basin. In the Middle Fork of the John Day River the number of Chinook is holding steady or is increasing, but data on the Middle Fork is sketchy. Basin-wide in the John Day River Chinook spawner escapement rose 70% from *2197* in 2006 to *3744* in 2010.

Spawning Chinook are found in the Middle Fork from Armstrong Creek near Galena to Summit Creek east of Phipps Meadow, a distance of 31 miles. Chinook are found in the Middle Fork itself, its tributaries, in irrigation ditches, etc.

Water Flow in Bridge Creek

There are no official stream gauge sites on Bridge Creek. However, on July 29, 2008, the U.S. Forest Service conducted a one-spot-in-time water discharge survey on Bridge Creek. The survey found a water discharge of 0.98 cubic feet per second cfs. Private surveys by the North Fork John Day Watershed Council showed a higher number in 2011, a record-breaking high water year.

Some people have opined that it takes 2.0 cfs of water flow to support an adult spawning Chinook but that water flow depends on a number of factors. In September, when Chinook spawn in the Middle Fork drainage, it is likely the discharge rate in Bridge Creek is lower than 2.0 cfs and perhaps lower than 0.98 cfs.

In the spring during high water steelhead easily move from the Middle Fork, up Bridge Creek, up the Bates State Park fish ladder, through Bates Pond and to upper Bridge Creek. In 2011 five (5) steelhead redds were counted in Bridge Creek by the Oregon Department of Fish and Wildlife (ODFW). In some prior years more redds were found.

The large snowpack and the peak flood in 2011 was the largest on record. In September 2011, when Chinook spawn in the Middle Fork drainage, four (4) adult Chinook were counted in Bridge Creek. Notwithstanding ample water no redds from those four Chinook were found. In the recent five-year period the ODFW counted an average of seven (7) adult and juvenile Chinook in Bridge Creek. In 2010, the last formal survey, two (2) Chinook carcasses were found in Bridge Creek.

Based on available data Bridge Creek has minimal water flow in late summer. No engineering project on Bridge Creek will overcome the fundamental fact that there is insufficient water in Bridge Creek to support a substantial number of spawning Chinook.

While Bridge Creek may not support good spawning habitat for Chinook because of flow restrictions, it may support rearing habitat for young Chinook who are hatched and grow in the Middle Fork and then seek thermal refuge up lower Bridge Creek, up the fish ladder, through Bates Pond and on up to upper Bridge Creek in the hot summer months.

Water Temperature in Bridge Creek

Water flowing out of Bates Pond into Bridge Creek in late summer can be +/- 6° centigrade higher than the water flowing into the pond from upper Bridge Creek. However, there is no documented proof that the water flowing out of Bates Pond into lower Bridge Creek, and on into the Middle Fork, harms Chinook.

Some believe that the optimal temperature of Chinook to spawn is 16° centigrade or lower (61° Fahrenheit). Surveys have shown water in Bates Pond in summer can be up to +/-20° centigrade (68° Fahrenheit). Chinook can and do spawn in +/-20° centigrade water. However, it is thought that warmer water is less conductive to egg survival.

Chinook <u>may</u> spawn in Bridge Creek from time to time no matter what the water flow and temperature is. However, the outflow from Bates Pond, into lower Bridge Creek, into the Middle Fork of the John Day River has not been shown to harm migrating Chinook. Large numbers of Chinook successfully spawn in the Middle Fork in the approximate 25 miles <u>below</u> Bridge Creek.

The only official water gauge on the Middle Fork is at Ritter. It showed 60 cfs flow on October 15, 2011. Pulling a number out of the air, if the cfs flow in the Middle Fork at Bates was one fifth of Ritter, that is 12 cfs, then the 0.98 cfs discharge from Bridge Creek into the Middle Fork would only be about 8%. (The percentage might be lower.) Thus a +/- 6° centigrade flow of water from Bridge Creek would not have an appreciable impact on the water temperature in the Middle Fork and would not negatively impact Chinook.

These numbers are very rough estimates. They should not be considered conclusive. Nonetheless the estimates point to the conclusion that somewhat higher temperature in water from Bates Pond into Bridge Creek and onto the Middle Fork has a minimal impact on the temperature of the Middle Fork and has not been shown to have a negative impact on spawning Chinook on the Middle Fork.

Summary

Bridge Creek is not a significant fish-bearing stream. Expensive engineering projects, up to $10,000,000, in Bridge Creek and Bates Pond will have minimal impact on Chinook migration, spawning and survival. Worse, such engineering projects will damage Bates Pond, which is the central asset of Bates State Park.

Nonetheless, useful cost-effective improvements can be made in Bridge Creek, the fish ladder and Bates Pond. Those improvements might include:

(1) dredge and deepen the pond to its original depth,
(2) create a silt trap at the head of the pond,
(3) remove accumulated silt and aquatic plants from the pond,
(4) increase shading of the pond with trees along the periphery of the pond,
(5) restore the riparian vegetation along Bridge Creek and
(6) modify the fish ladder to allow easier transit of fish.

These actions could address many of the concerns of fish-oriented environmental groups.

Sincerely,

M. Gregg Smith
Advisory Committee Chairman
The Friends of Bates State Park

cc: Jackie Rapp, President, Friends of Bates State Park
Dennis Bradley, Manager, Bates State Park
Jeff Neal, District Fish Biologist, Oregon Department of Fish and Wildlife

Native Fish Society
221 Molalla Ave., Suite 100
Oregon City, OR 97045
503.496.0807
admin@nativefishsociety.org

The Native Fish Society is a forward-thinking organization guided by the best available science to advocate for historically abundant wild, native fish and promote the stewardship of habitats that sustain them.

Oregon Parks and Recreation Commission
725 Summer St. NE, Suite C
Salem, OR 97301

October 4, 2011

Subject: Bates Pond Alternatives Analysis

Dear Commissioners:

The Native Fish Society (NFS) is a regional native fish conservation organization with over 500 members throughout the Pacific Northwest. We appreciate this opportunity to comment on the draft *Alternatives Analysis for Aquatic Habitat Improvements at Bates State Park.*

First of all, we would like to thank the Oregon Parks and Recreation Department (OPRD) for undertaking this analysis of the alternatives for resolving fish passage and water quality problems at Bates Pond on Bridge Creek within Bates State Park. This analysis is similar to what the Native Fish Society had contemplated accomplishing with a grant request to the Oregon Watershed Enhancement Board that we submitted two years ago. This information should form the basis for an informed decision about the future of Bates Pond.

As I am sure you are all aware of by now, Bates Pond and dam create problems with the upstream and downstream passage of native fish, including federally listed species such as summer steelhead and bull trout. Other sensitive species like Chinook salmon and lamprey are also adversely impacted by the Bates Pond. The pond also exacerbates the water quality problems in Bridge Creek and causes further violations of state water quality standards. The Oregon Parks and Recreation Commission needs to choose an alternative that not only resolves the fish passage problems, but also eliminates the water quality problems caused by the impoundment of Bridge Creek at Bates Pond.

The Commission has an obligation to assure that the State of Oregon does all that it can to assist in the recovery of federally listed fish in Middle Fork of the John Day River. The federal recovery plan for Mid-Columbia steelhead expects nothing less of the state. The federal Environmental Protection Agency has also recently approved a Total Maximum Daily Load allocation for the Middle Fork that requires OPRD to address and resolve the water quality problems at Bates Pond. Unfortunately, these Endangered Species and Clean Water Act issues weren't fully considered by the Commission at the time that OPRD purchased the Bates Park property, but they must be addressed now.

In reviewing the available alternatives in the plan, the Native Fish Society concludes that there are two alternatives that could resolve both the fish passage and water quality problems at Bates Pond. The alternatives that NFS can support are Alternatives I and J. Of these two, we would prefer Alternative J, the complete removal of Bates Pond and dam and the return of Bridge Creek to a free-flowing stream on the Bates Park property.

Sincerely,

Bill Bakke, Executive Director

THE CONFEDERATED TRIBES OF WARM SPRINGS RESERVATION OF OREGON

BRANCH OF NATURAL RESORUCES
4223 HOLLIDAY STREET
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WARM SPRINGS, OREGON 97761
(541) 553-2001
(541) 553-1994 FAX

October 7, 2011

Oregon Parks and Recreation Commission
725 Summer St. NE, Suite C
Salem, OR 97301

Subject: Bates Pond Alternatives Analysis

Dear Commissioners:

Bates Pond and its dam create problems with the upstream and downstream passage of fish, including federally threatened species such as Mid- Columbia summer steelhead and bull trout. Federal and State sensitive species like Chinook salmon and Pacific lamprey are also adversely impacted by Bates Pond and the associated ladder facility. The pond also exacerbates the water quality problems in Bridge Creek and causes continued violations of State water quality standards. The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) have reviewed the draft *Alternatives Analysis for Aquatic Habitat Improvements at Bates State Park.* The Oregon Parks and Recreation Commission needs to choose an alternative that not only resolves the fish passage problems, but also eliminates the water quality concerns and restores sediment transport created by the impoundment of Bridge Creek at Bates Pond. Most importantly, the final alternative should maximize the habitat available for Endangered Species Act listed and sensitive species within the footprint of the State Park.

The Commission has an obligation to assure that the State of Oregon does all that it can to assist in the recovery of federally listed fish in Middle Fork of the John Day River. The Oregon Department of Environmental Quality has recently approved the Total Maximum Daily Load allocation for the Middle Fork John Day River that requires OPRD to address and resolve the water quality problems at Bates Pond. Unfortunately, these Endangered Species Act and Clean Water Act issues weren't fully considered by the Commission at the time that OPRD purchased the Bates Park property, but they must be addressed now.

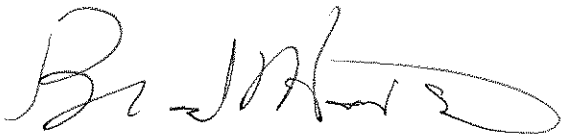
In reviewing the available alternatives in the plan, CTWSRO concluded alternatives I and J are two that could resolve both the fish passage and water quality problems at Bates Pond. Of these two, CTWSRO would prefer Alternative J, the complete breaching of the dam and the return of Bridge Creek to a free-flowing stream on the Bates Park property. We would also appreciate seeing further development of options associated with Alternative H, involving the restoration of the Bridge Creek channel and habitat below Bates Pond.

The entire John Day River Basin lies within the exterior boundaries of the Ceded Lands of the Confederated Tribes of the Warm Springs Reservation of Oregon. The Treaty with the Tribes of Middle Oregon in 1855 reserved the Tribe's right to harvest fish, wildlife, and cultural plants on open and unclaimed lands within these Ceded Lands and at usual and accustomed stations. The wild fish populations in the John Day River are a significant aspect of these rights.

Over the past 15 years CTWSRO has invested in fish passage, habitat improvements, and irrigation upgrades across the John Day Basin. Bates State Park is one of the last places on the Middle Fork John Day River where major gains can be made towards the recovery of these important fish stocks. The Tribe is also an adjacent downstream land owner engaged in fisheries restoration. The water quality and geomorphic problems created by Bates Pond are affecting the overall success of our restoration efforts.

Our Fisheries Department is more than willing to provide technical and financial assistance for one of these Alternatives. We will in the future as we have in the past continue to partner with OPRD on projects that protect tribal resources within the boundaries of our exclusive Ceded Lands. We would like to thank the Oregon Parks and Recreation Department (OPRD) for your efforts to resolve fish passage and water quality problems posed by Bates Pond on Bridge Creek within Bates State Park. These alternatives are a great start to make an informed decision about the future of Bates Pond.

Thank you,



Brad Houslet
Fisheries Department Manager
Branch of Natural Resources

WATERWATCH

PROTECTING NATURAL FLOWS IN OREGON RIVERS

December 1, 2011

Oregon Parks and Recreation Commission
725 Summer Street NE, Suite C
Salem, OR 97301

Re: Bates Pond Alternatives Analysis

Dear Commissioners,

Thank you for the opportunity to comment on the *Alternatives Analysis for Aquatic Habitat Improvements at Bates State Park.* WaterWatch is a nonprofit river conservation group that is dedicated to protecting and restoring stream flows in Oregon's Rivers for fish, wildlife and the people who depend on healthy rivers.

The fish passage and water quality issues associated with Bates Pond have long created problems for fish in the Bridge Creek and John Day systems, including summer steelhead which are protected by the federal Endangered Species Act. While a fish ladder has been installed at the dam, there are still ongoing passage issues that are blocking full passage. Moreover, it is our understanding that the very existence of the pond is also contributing to high temperatures in Lower Bridge Creek and the MF John Day River.

We commend the Oregon Parks and Recreation Department for examining alternatives to protect and enhance the aquatic habitats of Bates State Park. In assessing the alternatives, it is WaterWatch's position that Alternative J would be the best course forward to restore fish habitat. Alternative J calls for the removal of the dam and fish ladder and the creation of a new stream channel. This would not only fully resolve fish passage issues but would also rid the stream of the warm water input attributed to the pond. WaterWatch urges the Commission to adopt Alternative J.

Thank you for your thoughtful consideration of this issue.

Sincerely,

K. Priestley

Kimberley Priestley
Senior Policy Analyst

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October 20, 2011

James Morgan
Natural Resources Manager
Oregon Parks and Recreation Department
725 Summer Street, Suite C
Salem OR 97301-1271

Dear Jim:

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These numbers are very rough estimates. They should not be considered conclusive. Nonetheless the estimates point to the conclusion that somewhat higher temperature in water from Bates Pond into Bridge Creek and onto the Middle Fork has a minimal impact on the temperature of the Middle Fork and has not been shown to have a negative impact on spawning Chinook on the Middle Fork.

Summary

Bridge Creek is not a significant fish-bearing stream. Expensive engineering projects, up to $10,000,000, in Bridge Creek and Bates Pond will have minimal impact on Chinook migration, spawning and survival. Worse, such engineering projects will damage Bates Pond, which is the central asset of Bates State Park.

Nonetheless, useful cost-effective improvements can be made in Bridge Creek, the fish ladder and Bates Pond. Those improvements might include:

(1) dredge and deepen the pond to its original depth,
(2) create a silt trap at the head of the pond,
(3) remove accumulated silt and aquatic plants from the pond,
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(5) restore the riparian vegetation along Bridge Creek and
(6) modify the fish ladder to allow easier transit of fish.

These actions could address many of the concerns of fish-oriented environmental groups.

Sincerely,

M. Gregg Smith

M. Gregg Smith
Advisory Committee Chairman
The Friends of Bates State Park

cc: Jackie Rapp, President, Friends of Bates State Park
Dennis Bradley, Manager, Bates State Park
Jeff Neal, District Fish Biologist, Oregon Department of Fish and Wildlife

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Friday, December 16, 2011

Greg Ciannella
Oregon Parks and Recreation Department
1645 NE Forbes Rd., Suite 112
Bend, OR 97701-4990

Subject: Bates Pond Alternatives Analysis

Dear Greg:

As a member of the technical review team I would like to submit the following comments on the draft *Alternatives Analysis for Aquatic Habitat Improvements at Bates State Park.*

ODFW's primary mission is to protect and restore native fish species and their habitats but we also strive to provide recreational fishing opportunities. This area of the state has very few lakes and addressing impact issues on adjacent streams to maintain existing lakes is important to local communities. I hope the chosen alternative can accomplish both.

My specific concerns, in priority order, include:

- warm, oxygen poor surface water from the pond creating a thermal barrier to migrating fish during the summer months at the fish ladder.
- existing vegetative creating a fish passage barrier within the pond.
- lack of riparian habitat and floodplain connection along all stream courses within the park (Middle Fork John Day, Bridge Creek and Clear Creek).
- the pond must be separated from the stream channel before ODFW will stock any fish.

During the technical committee meeting in September to discuss the Bates Pond Alternatives Analysis, the presentation of alternatives B2, D, F2, G, H, I and J partially addressed our concerns listed above. Combining components of several alternatives (such as B2 and I) may provide the ideal results to re-establish a new stream channel that remains cool enough to pass all aquatic life stages of fish, will transport expected sediment loads and is screened to fish passage from the pond. I feel this still allows the recreational and site history values of the pond to be maintained.

After an alternative is chosen by State Parks I look forward to taking a closer look at the technical design details for Bridge Creek channel geomorphology and assisting with any fish screening and passage requirements for the pond. I appreciate the effort State Parks has invested in restoration of this site.

Sincerely,

Jeff Neal

John Day District Fish Biologist
jeff.neal@state.or.us

10/4/2011 – Email from USBR

Greg,

I read through this pretty quickly. It presents a lot of interesting alternatives and is pretty well done. It does lack a description of current fish use of the pond, available habitat above the pond and how the existing ladder impacts the use of available habitat above the pond. Is there an expectation that removing or improving the ladder would increase steelhead use by a certain amount? Would chinook spawning take place above pond and/or chinook juvenile use increase?

There are a couple of other specific questions that this report doesn't address in the analysis of alternatives.

The first is water rights. Does the pond have storage rights or maintenance rights that can be applied to each of the alternatives or not. If a smaller pond is kept, but offline from Bridge Creek, can existing water rights be used to fill and maintain the pond? If a different or new water right is needed is that possible?

The second is a recreational fishery in the pond. When they talk about historical uses of the pond does that include a recreational fishery in the pond, it is not clear what the target for use of the pond in the different alternatives are relative to historical uses. If the desired historical uses include a put-n-take fishery in the pond, is that even a possibility under today's fisheries management? Are the alternatives that have a pond offline from Bridge Creek more likely to be acceptable for ODFW to stock? What are the criteria that would allow stocking? A clear understanding of whether there is a potential recreational fishery may influence the acceptance of a particular alternative by those folks who have an expectation that the pond would be a recreational fishery.

From an engineering stand point Alternative I seems to offer the most potential to meet all goals. Depending on how and when the water is diverted to the offline pond a lot of the sediment into the pond could be avoided. Depending on the criteria ODFW would use to determine where a put-n-take fishery could occur, the diversion from the channel could be engineered so that fish can't get out of the pond, and fish in the creek would be screened from entering the pond.

Thanks for letting me take a look at this and hope this feedback is helpful. It will be interesting to see what the decision is!

Mark Croghan
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