ELOIKA LAKE IN-DEPTH SURFACE WATER STORAGE AND WETLAND RESTORATION FEASIBILITY

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1.0 INTRODUCTION

Eloika Lake lies at the southern end of the area defined as the West Branch of the Little Spokane River (WBLSR), which includes the river bearing that name along with a series of lakes (**Figure 1-1**). The lake (**Figure 1-2**) covers an area of roughly 691-699 acres, based on elevations of 1,903 to 1,907 ft above mean sea level (ft MSL) (NRCS, 1996), and is 3 miles long and ½ mile wide with a drainage area of 111 square miles. The drainage of Diamond, Sacheen, Trout, Horseshoe, and Fan lakes flows into Eloika Lake via the West Branch of the Little Spokane River which continues as the outflow, eventually merging with the Little Spokane River about 2.5 miles to the south. In addition to the major inlet at the north, there are numerous springs that flow into Eloika Lake (Magnuson et al, 1988).

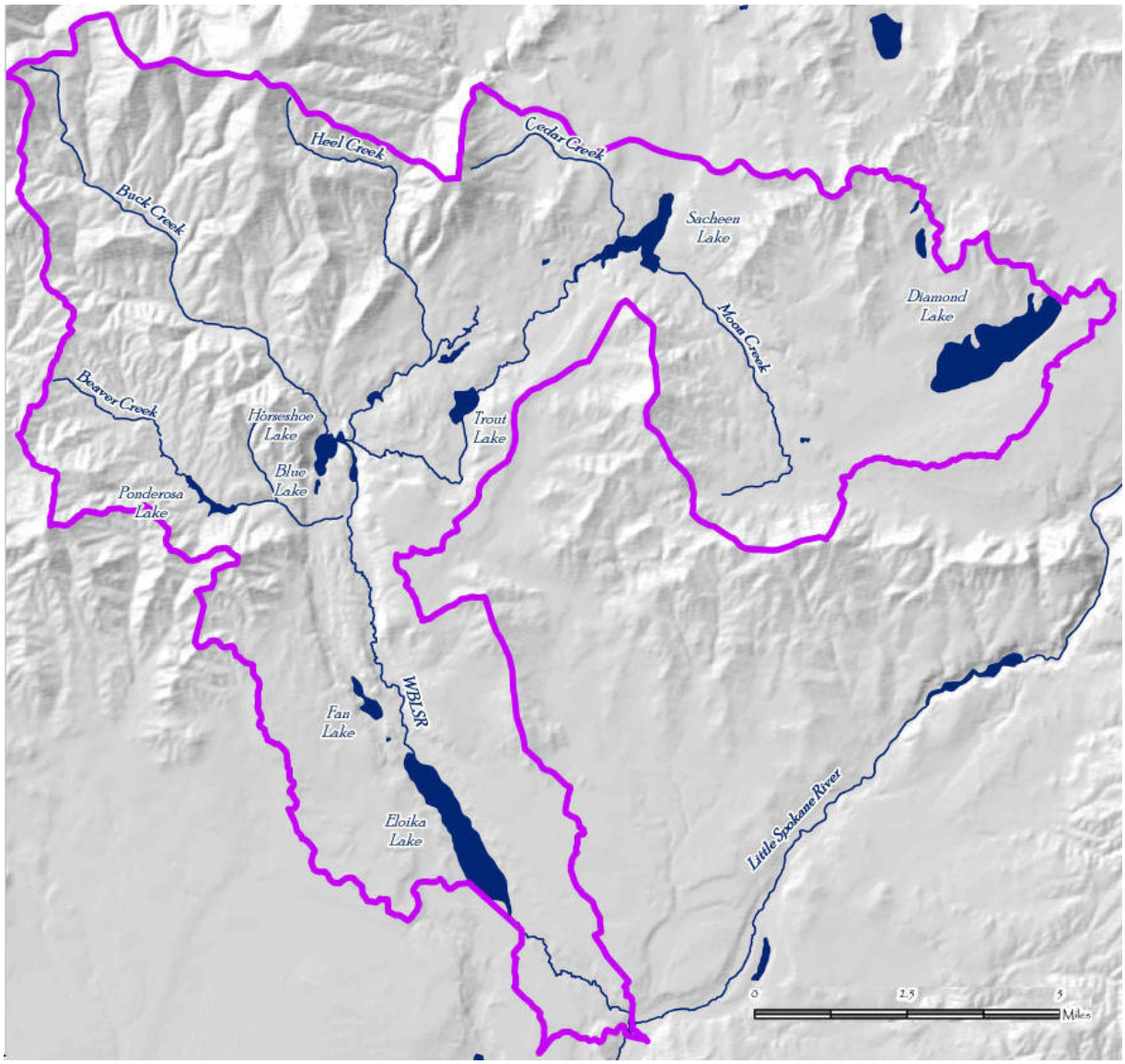

Figure 1-1. WBLSR Area of WRIA 55

An evaluation of potential water storage opportunities within the WBLSR (PBS&J, 2009) concluded that an in-depth evaluation of Eloika Lake was warranted. This in-depth study of Eloika Lake summarizes previous investigations, describes the lake in detail including data collected to date, and evaluates the potential benefits and issues associated with a water-control structure and wetland restoration possibilities. This study is intended to provide a summary of key issues and steps required for these water-storage opportunities to be realized.

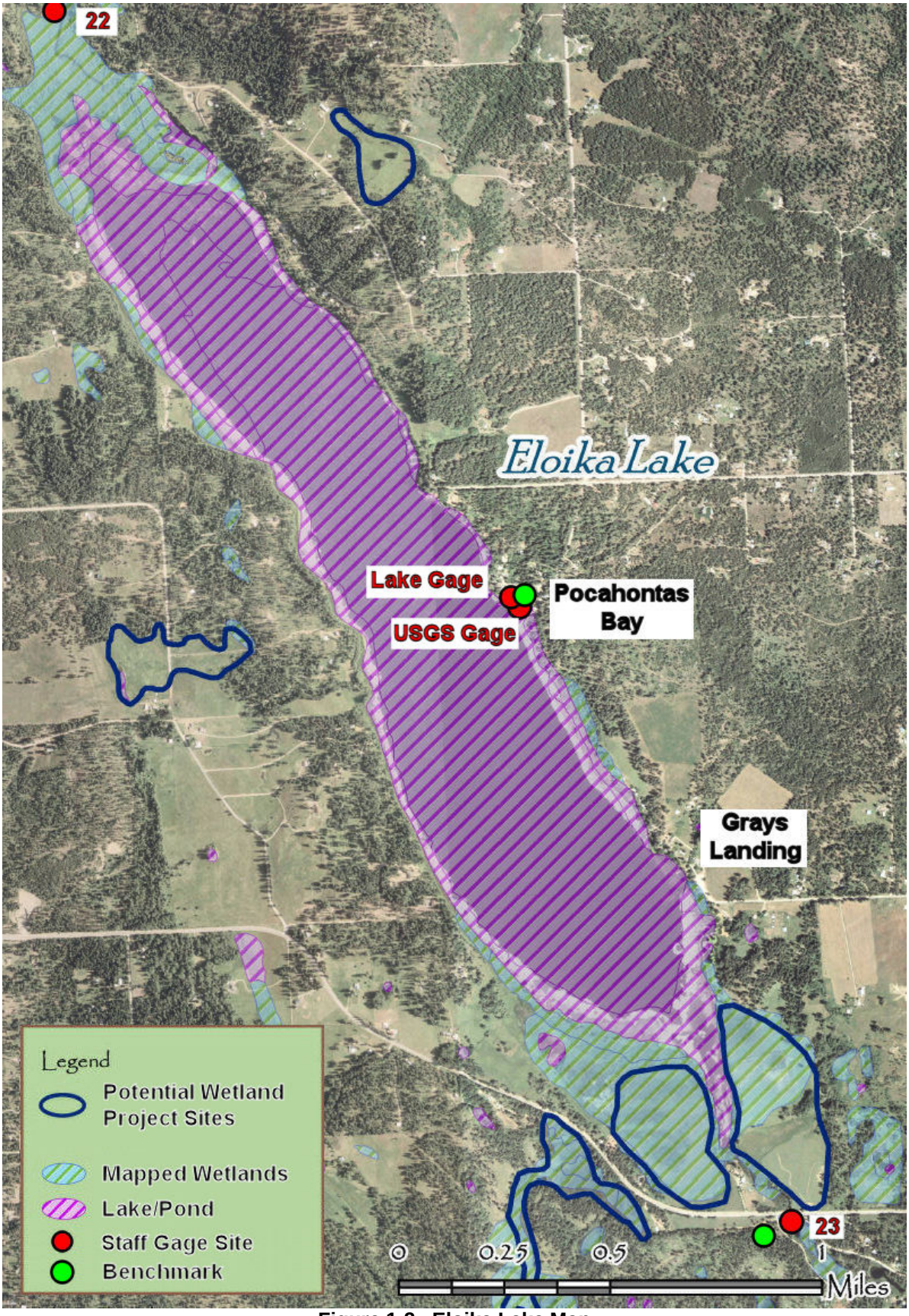

Figure 1-2. Eloika Lake Map

1.1 Data Sources and GIS Coverages

Data and information for this study were obtained from a variety of sources. Historical descriptions and some of the physical information were derived from documents obtained from the Spokane County Conservation District (SCCD), the Eloika Lake Association (ELA), the Spokane County Division of Utilities, and from various internet sources. Other data sources are summarized below in **Table 1-1**. Several GIS data layers in addition to those listed in **Table 1-1** were obtained but are not included in the list for brevity and because some of the layers, such as geology, were not used for this analysis.

Table 1-1. Summary of Data Sources

Data Type	Description	Source
Shoreline Designations	Map Image	Spokane County Public Works Website
High Density Residential Areas	Map Image	Wimpy (2009)
USGS Stage Data	Tabulated Values	Soltero et al (1988)
Recent Lake/Inlet/Outlet Stage Data	Tabulated values	SCCD
Lake Area for Various Elevations	Tabulated Values	NRCS (1996)
Inlet/Outlet Flow Data	Tabulated Values	SCCD
Streams and Lakes	GIS Coverage	Spokane County
Property Parcels	GIS Coverage	Spokane County
Lake Bathymetry	GIS Coverage	Ecology
Wetlands (1"=400' scale)	GIS Coverage	Spokane County
Critical Areas Ordinance layers (Wetlands, Wildlife, and Critical Habitat	GIS Coverage	Spokane County
NAIP Aerial Photography (2006) (18 inch pixels)	GIS Coverage	Spokane County
Topography-5ft Contours (from DEM)	GIS Coverage	Spokane County
Topography-National Elevation Dataset	GIS Coverage	USGS

1.2 Elevation Datum Discussion

None of the references and data sources reviewed for this study indicate whether the vertical datum is the 1929 datum (NGVD29) or the 1988 datum (NAVD88). This is important because the NGVD29 datum is 3.901 ft lower than the NAVD88 datum at Eloika Lake (determined from an interactive online conversion program at http://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl provided by NOAA using latitude 48.0262849 and longitude 117.3782755).

The general locations of known benchmarks are shown on **Figure 1-2**. The design report for the water control structure (NRCS, 1996) indicates that elevations in that document are based on a benchmark established in the SW ¼ of Section 15 T29N R43E near the outlet of Eloika Lake, described as "behind the Ferguson house near the outlet of Eloika Lake". This is presumed to be the same benchmark that is shown on the map from the meander line survey (Sargent, Ramer & Associates, 1970) which indicates an elevation of 1914.61 ft. In addition, some surveys (Buchanan, 1998 for one) use the USGS gage at Pocahontas Bay (**Figure 1-2**) as a reference elevation. The SCCD used a benchmark near the USGS gage (RM5, elevation 1914.64) as a reference datum when surveying the elevation for a new gage they established near the USGS gage.

All of the benchmarks presumably use the NGVD29 datum. Based on the dates of the various data sources, and lacking no indication otherwise it is presumed that all elevations are in NGVD29.

2.0 HISTORY AND PREVIOUS INVESTIGATIONS

2.1 Early History

Detail on early Eloika Lake history was compiled by Magnuson et al (1988) and is summarized in this section. In brief, Eloika Lake was used by Native Americans and then early settlers for fishing. The lake was also known as Lake DeNef and prior to 1926 as Blakes Lake, although maps as early as 1881 label it as Eloika Lake (from Salish, "En-sloy-qua" meaning "a lake with Dolly Varden trout")..

The area around Eloika Lake was homesteaded between 1860 and the early 1900's. The chief industry around many lakes in the area was logging, with homesteaders logging their lands for commercial and private use prior to larger sawmills appearing. Initially, logs were floated from the upper West Branch lakes to Eloika Lake and south of what is now Eloika Lake Road where two main sawmills were located. Many trees sank to the bottom of the lake with a loss of thousands of board feet of lumber each year. The last logs were floated to Eloika Lake in 1926. During this period of logging, lake levels in the area were repeatedly raised and lowered.

2.2 1930's to 1970's

In 1935 the Eloika Lake Improvement Club petitioned the State Hydraulics Commission to establish a minimum lake depth at the outlet, but no action was taken. In 1952 two farmers at the south end of the lake were granted permission to remove a beaver dam, but they also decided to widen and deepen the channel.

In 1954 a lawsuit was filed by landowners around the lake against the farmers to restore the lake level or pay compensation. The court ordered the defendants to replace the material that had been removed (except the beaver dam), this was done but the fill material was not sealed and subsequently washed out.

In 1960 the Eloika Lake Community Club petitioned the State to fix the lake level by means of constructing a dam on the channel leaving the lake at the south end. The level specified was 1,908.28 ft above sea level. The court determined that nothing could be done until the meander line was reestablished. The Eloika Lake Community Association was formed in 1962 and raised funds for a meander line survey. The meander line survey was completed in 1970 (Sargent, Ramer & Associates, 1970) which correlated the existing shoreline with the original "Meander Line" as delineated in 1883 and 1896. The meander line is intended to establish a line in "approximate agreement with the minute sinuosities of mean high-water elevation". The study concluded that the lake could be raised to an elevation of 1,907 without flooding buildings, but that a high water elevation should only be established by proper adjudication.

Peat was excavated from both the north and south ends of the lake during the 1970's (Magnuson et al. 1988). Canals from this operation are still evident at the north end of the lake (Soltero et al, 1988).

Also of significance during this period was the relocation and reconstruction of the county road along the south end of Eloika Lake in 1968. The road was relocated northward to its present position and was raised in elevation, effectively blocking water flow southward except through a pair of culverts, changing the nature of the lake outlet. The location of the earlier road and nature of the previous outlet was not clear from the references reviewed for this study. A photo of the culvert pair outlet taken on April 17, 2009 is shown on **Figure 2-1**, which shows conditions at the culvert during high water conditions at Eloika Lake (1,906.6 ft MSL at outlet, 1,907.7 ft MSL at lake). These culverts were interpreted to act as control structures keeping the lake at a minimum level of 1,902.66 ft MSL, or the illegally dredged depth (Buchanan, 1998). The effect of the culvert elevation upon lake levels is being reviewed by SCCD and Spokane County Utilities, but minimum lake levels from gages (see **Section 3.2.1**) suggest that there may be a different natural control upstream that maintains the lake above 1,904 ft MSL.

Figure 2-1. Downstream Side of Eloika Lake Road Culverts at Outlet

2.3 1986 to 1997

Lake Condition and Restoration Evaluations

With urging from the Eloika Lake Community Association, a restoration project for the lake was sponsored in 1985 by the Spokane County Conservation District (SCCD), Soil Conservation Service (SCS), and the Idaho-Washington Resource Conservation and Development Council. The project was funded in 1986 by the Washington State Department of Ecology (Ecology) with partial funding approved by the Spokane County Commissioners. This led to a series of studies that culminated in a design of a water control structure at the lake outlet. It is important to note that these studies focused on lake restoration in terms of macrophyte (weed) management while the current in-depth study is focused on improving downstream summer flows. These two objectives do not appear to be incompatible.

In 1988 a report was published by scientists from Eastern Washington University (EWU) that evaluated the water quality and restoration feasibility of the lake (Soltero et al, 1988). The year long study was intended to establish baseline water quality and recommend feasible control measures of the lake's macrophyte plants. The study concluded that eutrophication of the lake is due in part to its shallow depth and phosphorus loading from sediments and decaying vegetation, with the sedimentation exacerbated by historic logging activities. Potential restoration options included dredging to remove sediments and nutrient inactivation with a chemical, but that was dismissed as being too costly. The recommended restoration approach was to install a water-level control structure at the outlet. The structure would be used to lower levels during the winter to expose plant roots to freezing and to maintain mean normal high water level during the summer to reduce light penetration in deeper portions of the lake.

A preliminary draft of restoration alternatives was produced in 1992 (Burton and Durgin, 1992) by the SCS. Eight different approaches to dealing with excessive macrophyte growth were evaluated, one of which was drawdown of the lake level. Three different approaches to drawdown were developed and evaluated, all of which focused on low winter levels ranging from 1,899 to 1,903 ft MSL with growing season levels ranging from natural rise and fall to fixed elevations of 1,905 and 1,907 ft MSL. The analysis showed that the most effective approach in terms of weed management would be to maintain the lake at 1,907 ft MSL during the growing season and draw it down to 1,903 ft MSL in the winter.

Also in 1992 a Watershed Management Plan was released (SCCD, 1992) that presented an overview of the watershed, resource problems, and watershed and lake specific management issues. The recommended lake restoration alternative was the water level control structure as recommended in the Burton and Durgin (1992) study summarized above.

Control Structure Design, SEPA Checklist, and JARPA

A preliminary design for the Eloika Lake water control structure was completed in 1994 (SCS, 1994). The final design was released in preliminary form in 1996 (NRCS, 1996) with the final design completed in 1997 (NRCS, 1997). The design report contains detailed plans, along with construction specifications, bid cost estimates, and supporting information and data for the design.

On May 8, 1997 a letter was sent from Ecology to the Eloika Lake Community Association (Covert, 1997). The letter indicated steps that would be needed to address water rights issues associated with the control structure, and pointed out permits/processes that would be needed including water rights, Dam Safety permit, SEPA, and a Shorelands Conditional Use permit issued by Spokane County and Ecology.

A SEPA checklist (SCCD, 1997a) and Determination of Non-Significance (DNS) (SCCD, 1997b) was completed in July of 1997 and was released for review. The applicant was SCCD with agencies requesting the checklist listed as Ecology, Department of Wildlife, Spokane County, and the U.S. Army Corps of Engineers (Army Corps). Permits listed as being needed included Hydraulic Project Approval (HPA) application, Shorelines, Army Corps 404 permit, and a Dam Safety permit. The SEPA checklist was sent to the following agencies:

- Washington Department of Ecology, Environmental Review Section;
- Washington Department of Wildlife, Regional Office (Spokane);
- U.S. Fish & Wildlife (Spokane);
- Spokane County Air Pollution Control;
- Spokane County Engineering; and
- Spokane County Planning.

At the time the SEPA checklist was developed a JARPA (Joint Aquatic Resource Permits Application) document was produced but then retracted. This document was later revised on October 20, 1997 (Spokane County Utilities, 1997). Agencies noted on the JARPA included local government for shoreline, Washington Department of Fish and Wildlife for the HPA, and Army Corps for a Section 404 permit.

During this period two other documents were produced relevant to this project. In May 1997 a wetlands review was conducted for two parcels along the west side of the lake (Cascade, 1997). Also, a letter was sent from Ray Soltero and Linda Sexton (Soltero and Sexton, 1997) at EWU indicating that drawdown approaches alone could serve to spread invasive weed species and that other methods should also be used to help weed management.

SEPA Review Comments

The following SEPA review responses and comments were reviewed. There may have been more but other responses were not obtained.

Ecology:
An August 12, 1997 letter was submitted from Ecology's SEPA coordinator (Renz, 1997). Specific comments include:

- Because wetland impacts were indicated in the JARPA (which was retracted and later revised) a wetland delineation will be required and wetland mitigation may be necessary;
- A shoreline substantial development and a conditional use permit appears to be required; and
- The lake management plan (higher summer levels) would be a consumptive use and water rights would be needed. No new rights are being issued so a transfer would be necessary.

Ecology's Shoreland and Environmental Assistance Program sent a review of the SEPA document on September 23, 1997 (Beich, 1997). The letter requested additional information in order to make a determination of the extent of impacts. The requested additional information included:

- the extent of direct wetland impact as a result of dam construction;
- a list of proposed monthly lake water elevations and comparison of those to existing levels; and
- detailed water surface and ground elevations for 2 ft above and below ordinary high water mark (OHWM) to assess potential indirect impacts to wetlands.

WA Dept of Wildlife:
The State of Washington Department of Fish and Wildlife submitted a review of the SEPA checklist on August 15, 1997 (Whalen, 1997). Comments provided in this letter include:

- a request for a reservoir management plan referenced in the SEPA document and identification of what entity will be responsible for overseeing flow adjustments;
- recommendation that the fish passage facility deigns be reviewed by WDFW and NRCS engineering staff as part of the HPA process to ensure adequate fish passage;
- contact the Spokane County Building and Planning Department to ensure project compliance with the county's critical areas ordinance. A habitat management plan for the project may be required by Spokane County;
- construction should occur between August and November to minimize impacts to nesting and wintering bald eagles, and an assessment should be prepared to address eagle impacts;
- a wetland mitigation plan will be required as part of the HPA process if wetland habitat will be impacted by the project (the SEPA indicated filling of an abandoned channel west of the structure site);
- it is recommended that pre and post monitoring of fish species be conducted to evaluate project impact on fish resources and help refine a reservoir management plan; and
- the linear extent of streambanks which will be altered or changed was not identified. A revegetation and project erosion control plan will need to be included as part of the HPA

U.S. Fish & Wildlife Service:
On August 11, 1997 the U.S. Department of the Interior Fish and Wildlife Service (USFWS) provided some recommendations and indicated they would be providing subsequent comments to the U.S. Army Corps of Engineers for any dredge or fill work requiring a permit under section 404 of the Clean Water Act. The USFWS recommended the following:

- Work with the U.S. Army Corps of Engineers to determine if a Section 404 permit is needed. If so the USFWS will participate in review of any application;
- Altering the natural cycle from high spring to low summer to higher summer conditions may impact native wetland plants. Note: no other language was provided but it appears they were suggesting this be addressed;
- Lake eutrophication is a natural process, if the rate at Eloika Lake is high USFWS recommends addressing potential causes such as nutrient loading; and
- The effects of reduced spring and increased fall stream flow should be addressed.

The Army Corps sent a letter to Spokane County Utilities Department on December 2, 1997 in reference to an application for a permit for the water control structure (U.S. Army, 1997). The letter requested more information before the application could be processed. Additional information requested included:

- A wetland delineation that must be verified by the Army Corps and Ecology including all wetlands adjacent to Eloika Lake and waterward of the ordinary high water mark (OHWM);
- An evaluation of existing wetland functions and values and potential impact analysis to these functions and values; and
- The vicinity map, plan, and cross-sectional drawings must be provided on 8 ½ by 11 inch sheets.

Spokane County Air Pollution Control: Comments on the SEPA document from this agency may have been provided but no record of review comments were found.

Spokane County Engineering: Comments on the SEPA document from this agency may have been provided but no record of review comments were found.

Spokane County Planning: Comments on the SEPA document from this agency may have been provided but no record of review comments were found.

Other:
An August 10, 1997 letter from one Eloika Lake landowner (Riddle, 1997) expressed some concerns about effects on the surrounding land from the water control structure. The letter indicated that all areas affected by the structure should be studied for "environmental effects", raised concerns about mosquitoes, and asked for more information how keeping the lake at the "usual" low level of 1,903 ft MSL during the winter would be different from current conditions.

2.4 Post 1997

In 1998 a study was completed for the Eloika Lake Community Association fixing the line of ordinary high water (LOHW) at Eloika Lake (Buchanan, 1998). Based on a review of historical records, a statistical analysis of 22 years of lake gaging data (from the USGS gage), and spot surveys at four select sites the LOHW was set at 1,907.8.

The last documents reviewed regarding the water control structure was a letter from Ecology on January 13, 1998 (Howard, 1998). This was a follow up letter discussing water rights, shoreland issues, and wetland issues.

- For water rights it was reiterated that a transfer would be the only way to obtain a water right due to basin closure;
- For shoreline issues, the letter noted that Eloika Lake is in the jurisdiction of the Spokane County Shoreline Master Plan (SMP) and the Shoreline Management Act (SMA), and that the control structure plan would need to be reviewed and permitted under the SMP. Appropriate permits would include a shoreline substantial development permit and a conditional use permit, both issued by Spokane County; and
- For wetland issues the letter from the Army Corps of Engineers to Spokane County is referenced.

At this point in time momentum for construction of the water control structure came to a stop, largely due to funding. Under the contract in place, SCCD's work on the project ended with the release of the SEPA checklist and DNS (from SCCD records). It is unclear specifically what happened and when but various people interviewed for this study indicated that there was a request, apparently from the County Board of Commissioners, that an Eloika Lake Management District be formed to provide a tax base for additional work on the water control structure. The intent was that the money from this tax base would be used to obtain additional grants for work at the lake. The management district was never formed due to opposition from some of the landowners at the lake.

Much later, a Watershed Management Plan for Water Resource Inventory Area (WRIA) 55 and 57 was finalized in 2006 (Spokane County, 2006). That plan describes general overall conditions in the watersheds and specifies management issues. A subsequent Detailed Implementation Plan (DIP) was developed (WRIA 55/57 WIT, 2008) that outlined specific recommended actions to address items in the management plan. Relative to Eloika Lake the DIP specified the following actions which include the impetus for this In-Depth Study:

> *Issue VI.A.02 What types of storage can be employed to slow the release of winter snowmelt and runoff into streams in the Little Spokane River basin to augment baseflow in the watershed?*
>
> *Recommendation VI.A.02.a*
> *Continue site identification and feasibility analysis for use of surface runoff storage in existing lakes as means of augmenting baseflow in the Little Spokane Watershed.*
>
> *IMMEDIATE ACTIONS REQUIRED (2008-2009)*
> 1. *The POCD will conduct site identification and feasibility studies of potential instream water storage projects throughout the WBLSR watershed, both to augment summer flows downstream and to alleviate flooding. (WB.SW2-1):* **Completed (PBSJ, 2008)**
> 2. *The SCCD, with assistance from Spokane County and the Eloika Lake Association, will assess the culvert at the outlet of Eloika Lake and determine if the culvert elevation contributes to lowered lake levels. (WB.SW4-1):* **Currently In Progress**
> 3. *The SCCD, with assistance from Spokane County and the Eloika Lake Association, will conduct a feasibility analysis of the installation of a water control structure at the outlet of Eloika Lake to maintain the lake's elevation and serve, if needed, to augment baseflows in downstream reaches of the Little Spokane River: (WB.SW4-2, WB.WQ1-4):* **Study Presented In This Document**
>
> *NEAR-TERM ACTIONS REQUIRED (2010-2012)*
> 1. *Depending on the results of the water control structure feasibility analysis, the SCCD, Spokane County, and the Eloika Lake Association will identify a lead agency to issue an RFP and negotiate a contract to install the water control structure. (WB.SW4-2, WB.WQ1-4)*
> 2. *The POCD, in collaboration with the SCCD, will conduct a feasibility assessment of removing debris from Eloika and Sacheen lakes to increase water storage. The assessment will include recommendations for future actions. (WB.SW2-4)*
>
> *PERFORMANCE INDICATORS / MILESTONES Progress toward completion of this recommendation will be measured by achieving the following tasks or outcomes:*
> 1. *Site identification and feasibility studies conducted of potential instream water storage projects.* **Completed (PBSJ, 2008)**
> 2. *Determination made on the effects of the culvert at the outlet of Eloika Lake.*
> 3. *Feasibility analysis conducted of the installation of a water control structure at the outlet of Eloika Lake.* **Current Study**
> 4. *Review conducted of sediment sources to Eloika Lake.*
> 5. *Feasibility assessment conducted of debris removal from Eloika and Sacheen lakes.*
> 6. *Assessment made of the effects of upstream dissolved phosphate inputs on water storage in Eloika Lake.*
> 7. *Feasibility analysis conducted of selective dredging in Eloika Lake.*

In 2008 a Watershed Implementation Plan for the West Branch Little Spokane River was finalized (Golder, 2008). This plan identified the same Eloika Lake related issues as those specified in the greater WRIA 55/57 Plan. Actions items noted include determining if the road culverts contribute to lowered

lake levels (WB.SW4-1), preparing and implementing an integrated aquatic plant management plan (WB.WQ1-1), and evaluating the feasibility of a water control structure (WB.SW4-2).

Other related work in progress includes an Integrated Aquatic Vegetation Management Plan that at the time of this study is in draft form (Wimpy, 2009). This Ecology funded plan is being developed collaboratively under contract with SCCD by Inland Water Pest Control & Consulting and the Eloika Lake Association.

The vegetation management plan provides an evaluation of various techniques for controlling excessive plant growth in the lake including water level drawdown. The draft document reports that "The modified elevation levels of the lake necessary for aquatic plant control were estimated to be 4-6 feet and exceed the normal fluctuations of 3 feet". In a summary of potential techniques the document lists a water level control structure under long term options for addressing excessive native plant and algae growth.

Water quality monitoring is also being conducted at Eloika Lake with the results provided in Water Quality Assessment Reports including reports for 1990 (Ecology 1993) and 1994 (Ecology, 1997). These reports were not reviewed extensively for this study.

3.0 LAKE CONDITIONS AND AVAILABLE DATA

This section presents a summary of land use and ownership around the lake, followed by a detailed summary of lake conditions focusing on lake levels and spatial extent. Significant information is also available on water quality and biological conditions but these are not the current focus of this study and have therefore not been included.

3.1 Land Use and Ownership

Proposed shoreline designations around Eloika Lake have been mapped by Spokane County and are shown on **Figure 3-1** from the Revised Shoreline Master Program or RSMP (Spokane County, 2009). The map shows that only the east side of the lake having "Shoreline residential" areas. The remainder of the lake shoreline is designated as "Natural" or "Rural Conservancy". Descriptions of these uses are provided in the RSMP.

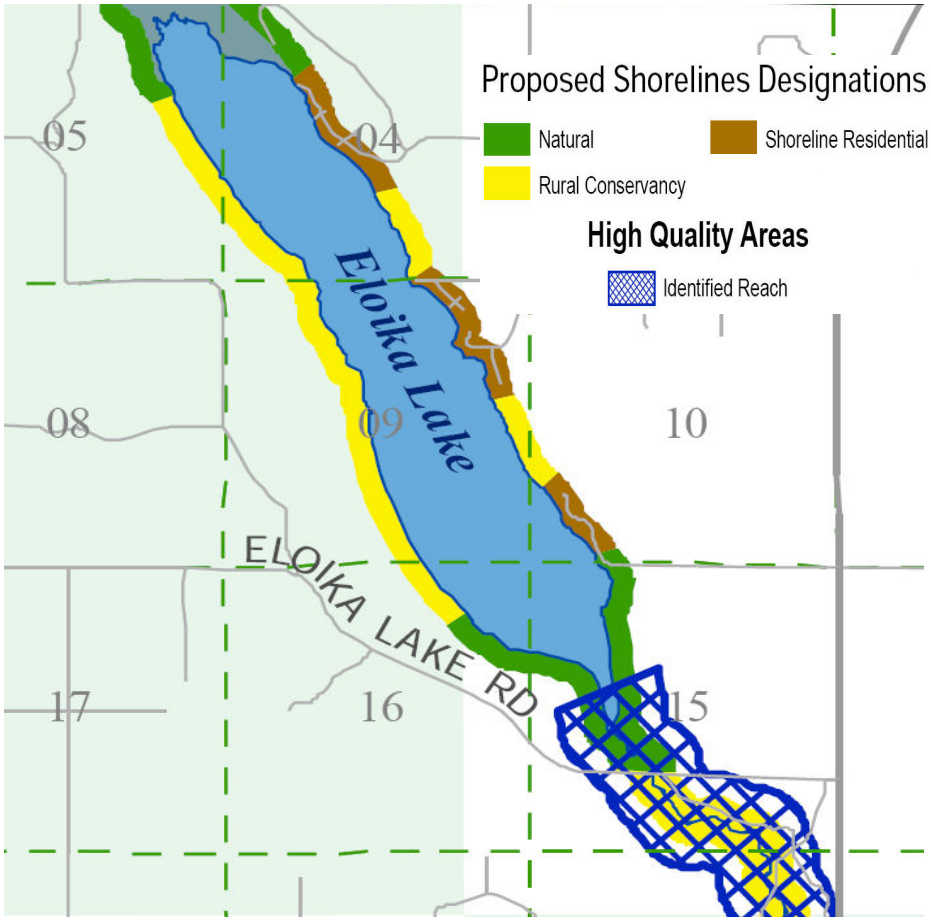

Figure 3-1. Shoreline Designations Around Eloika Lake

Land use in the Eloika Lake drainage basin in 1987 (Soltero et al, 1988) was mostly forest (89%), with lesser amounts agricultural (8%) and residential (1%). This distribution was reassessed in 1992 (SCCD, 1992) and forest was indicated at 85%, hayland and rangeland at 10%, water at 3%, and "other" (presumably residential) at 2%. A more recent study (Wimpy, 2009) lists forest at 85%, agriculture at 10% and residential or summer homes at 5%, but it is not clear if those are updated numbers or from previous work. Land use plans for Spokane County are noted to have Rural 40-acre tracts on the west side of Eloika Lake with residential parcels along the east side.

The 1988 study (Soltero et al, 1988) also estimated shoreline residential development at 30% with 50 nearshore homes on the lake and two resorts (Jerry's Landing and Water's Edge) on the east side. Currently only one resort remains (Jerry's Landing) and there are more new homes according to conversations with ELA members. Public access has been maintained by the Washington Department of Ecology at the south end of the lake since 1967. At the north end of the lake Spokane County has property designated for use as a park. A map of High Density Residential and Public Use Areas (from Wimpy, 2009) is shown on **Figure 3-2**. The map illustrates the greater development along the east side of the lake. Also shown on the map are bathymetry contours at 3-foot intervals.

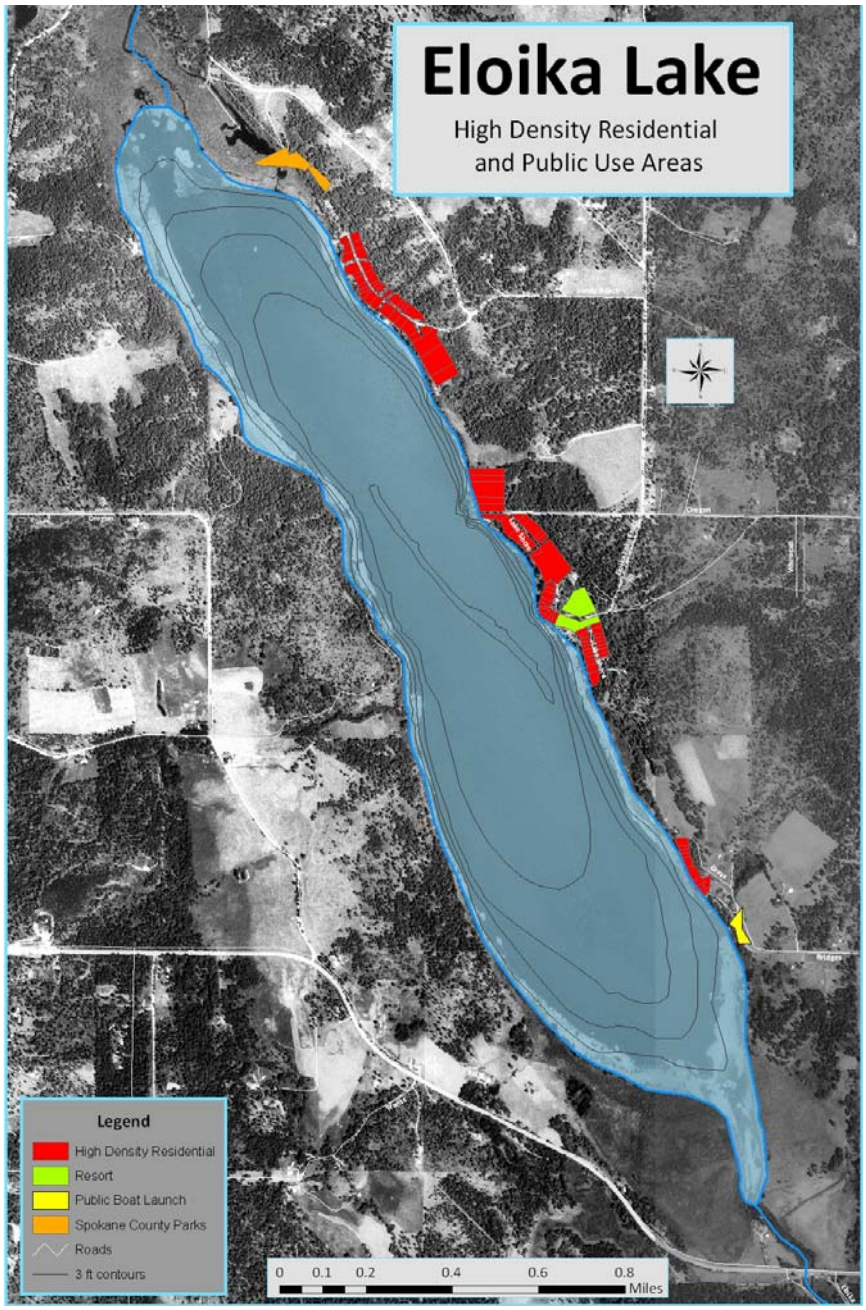

Figure 3-2. Eloika Lake High Density Residential and Public Use Areas (Wimpy, 2009)

The outline of specific property parcels around the lake is shown on **Figure 3-1**. The parcel designations shown on **Figure 3-1** are arbitrary reference numbers for this study and are used instead of owner names for easier reference.

Figure 3-3a. Property Parcels Around Eloika Lake

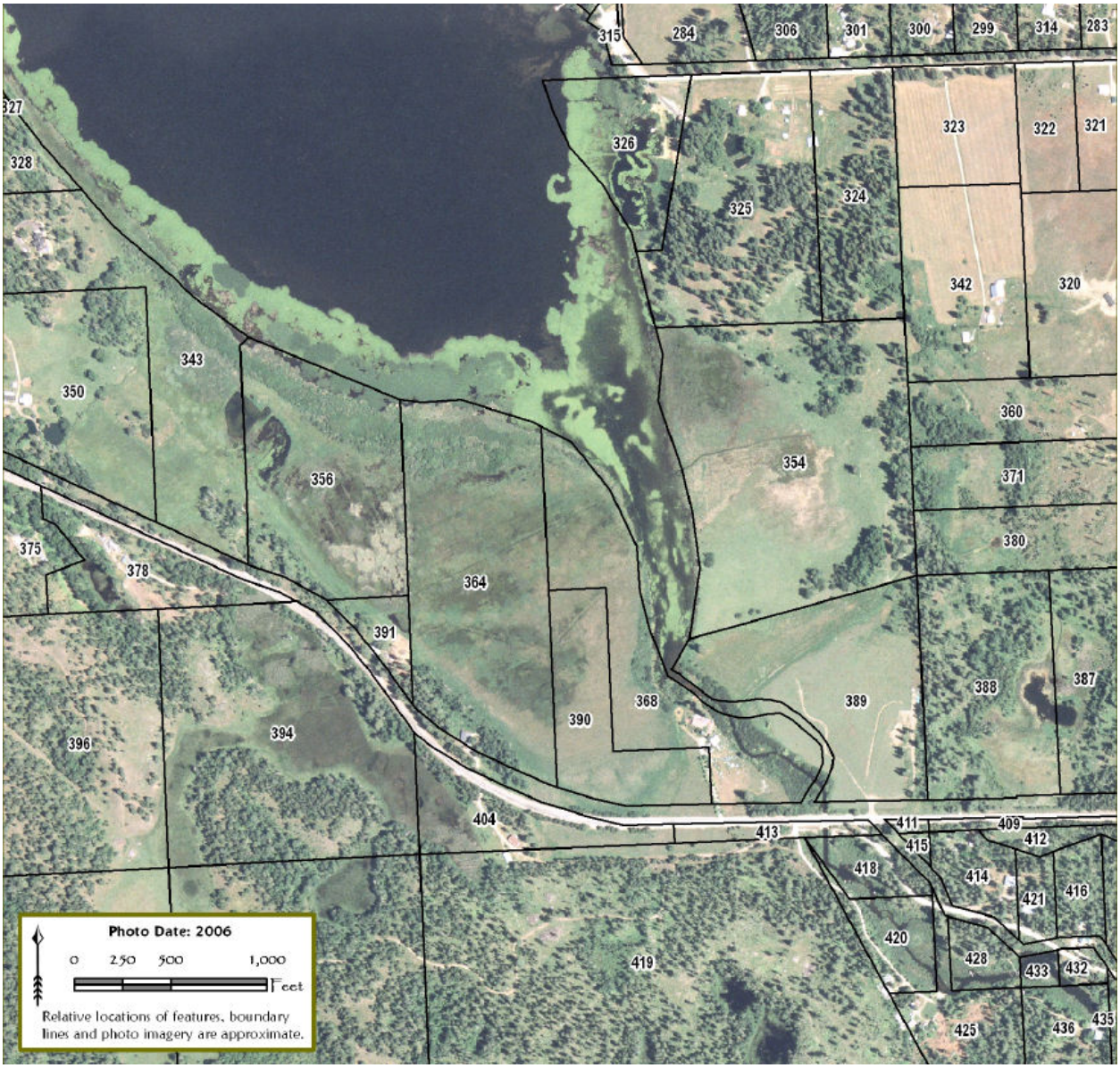

Figure 3-3b. Property Parcels Around Southern Portion of Eloika Lake

3.2 Lake Levels and Inlet/Outlet Flows

3.2.1 Lake Levels

Eloika Lake elevation data prior to 1953 is anecdotal. Washington Department of Fish and Wildlife records show that the maximum lake "level" in 1950 was 17.5 feet and in 1970 the maximum level was 15 ft (Magnuson et al, 1988), though it is unclear if what is meant by "level" is depth. Property owners indicated that there were numerous sandy beaches during the 1950's and 1960's, beaches which no longer exist without considerable weed removal.

The location of four level gaging stations are shown on **Figure 1-2**. The inlet (22) and outlet (23) designations on **Figure 1-2** are SCCD identification numbers. Stations include one at the inlet (actually located on Fan Lake Road to the north of the location shown on the map), one at the outlet, and two at the eastern edge of the lake. The two lake gages include a former USGS station which was not maintained after 1975 and has been subsequently replaced. The three active stations were installed as part of a re-

gional TMDL study and have since been maintained and monitored by SCCD. Plots of the stage data are presented below.

Measured Eloika Lake level data is available from USGS gaging for the period of May 1, 1953 to September 26, 1975. The gage was not maintained after 1975 but elevation data was again collected in 1987 as part of the water quality and restoration feasibility study (Soltero et al, 1988). The 1987 data were considered by the authors to be in error by 1.8 ft and were not included in the feasibility study document. A single reading of 1904.5 was also recorded on 8/13/98 as part of a study by Buchanan (1998).

A plot of the USGS data is shown on **Figure 3-4**. For the period 1953-1975 the maximum lake level exhibited a variation of over 3 ft, with the maximum level for the period being 1,909.58 ft MSL and the average annual maximum being 1,907.79 ft MSL. Minimum levels showed far less variation, all being near 1,904 ft MSL with the average value being 1,904.29 ft MSL. This relatively stable minimum level could indicate the presence of some physical control that prevents the lake from being lowered any further than 1,904 ft MSL.

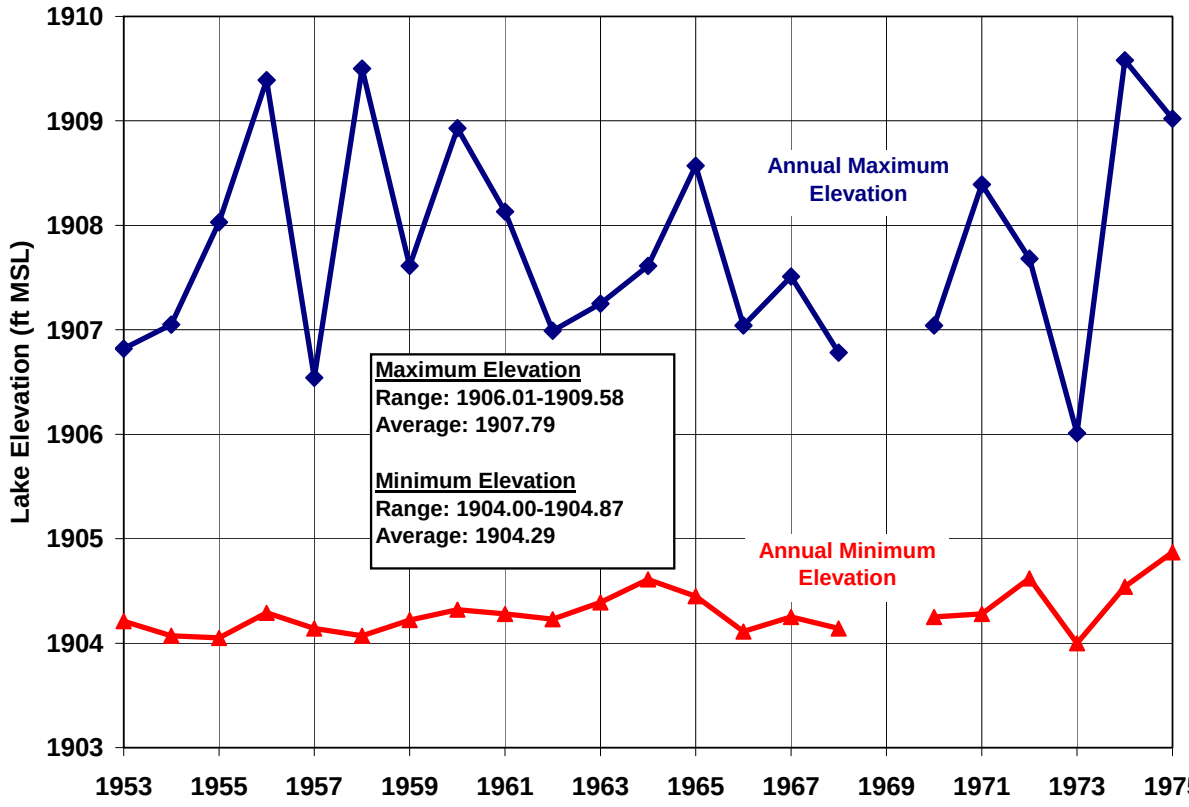

Figure 3-4. Annual Maximum and Minimum Lake Elevations 1953-1975

Lake level monitoring was resumed in 2006 by SCCD, with continuous monitoring at the inlet, outlet, and replacement lake gage near the USGS gage. The monitoring data for these stations were provided by SCCD for this study and run through the present starting in October 2005 for the outlet, October 2006 for the inlet, and April 2007 for the lake. A plot of the stage data from December 2006 to the present is shown on **Figure 3-5**. The gages had been surveyed using temporary benchmarks (TBM's) and readings have been converted for this study to approximate elevations in ft MSL using the following procedure:

- Outlet (23): TBM set at 230. Depth to water from TBM was 5.17 ft and 1.83 ft from water to culvert bottom. Culvert bottom assumed to be 1902.66 ft as indicated in several previous studies.
- Inlet (22): Water elevation assumed to be 1,930 ft MSL at base flow from Topo GIS coverage.
- Lake Gage: TBM set at 98.28 at benchmark RM 5 (reported elevation of 1,914.64).

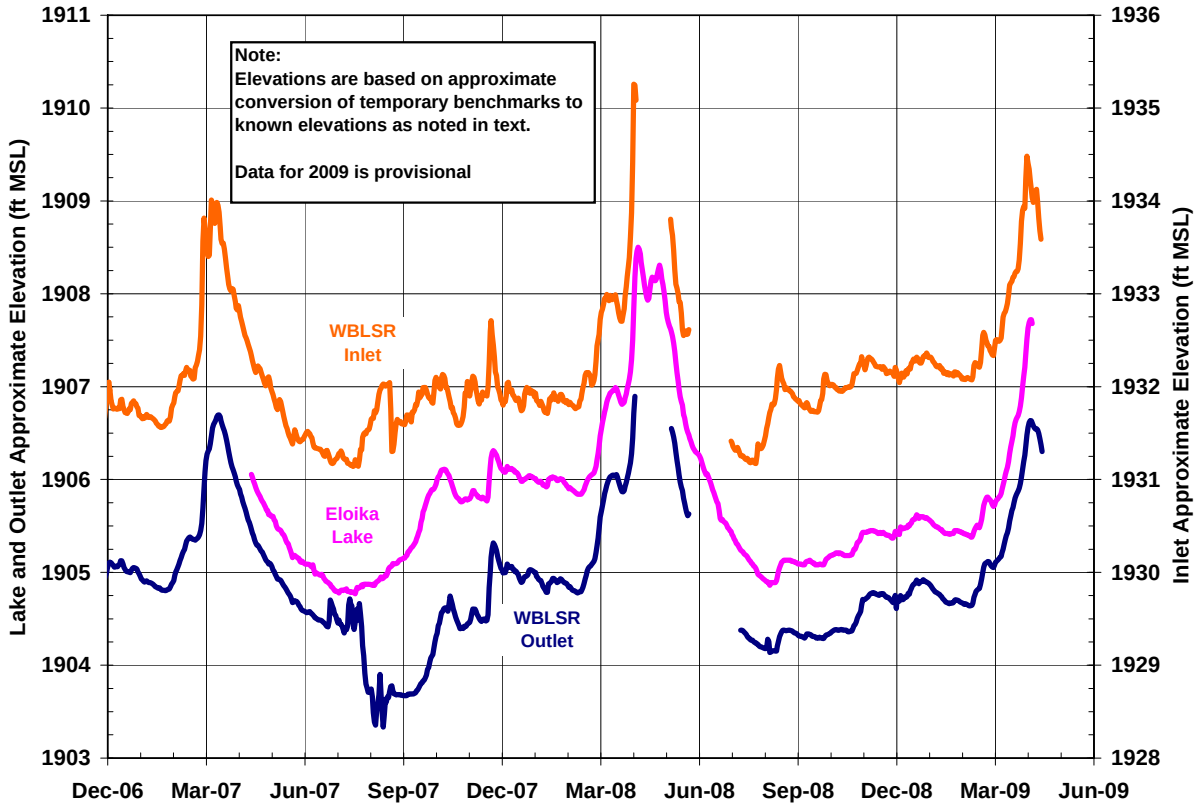

Figure 3-5. Inlet, Outlet and Eloika Lake Elevations 2006-2009

The recent data show that lake peak elevations occur in mid-April and range from 1,907.7 ft MSL (April 18, 2009) to 1,908.5 ft MSL (April 20, 2008) which falls within the range of the earlier USGS data noted above. Minimum lake levels occur in July-August with the minimum level being 1,904.8 ft MSL, similar to the average level of 1,904.29 ft MSL noted above for the earlier USGS data.

The stage data also shows that the lake elevation is higher than the outlet, ranging from about 0.5-1 ft higher. This is potentially significant for evaluating impacts from a water control structure south of Eloika Lake Road. For example, if lake levels are being maintained at 1,907 ft MSL, then the water level at the control structure would also be at 1,907 ft MSL, compared to about 1,906 ft MSL under natural conditions (when the lake is at 1,907 ft MSL). This suggests that flooding may occur in areas around the outlet beyond where natural impacts occur.

Lake depth has reportedly decreased substantially over time. Although lake infilling is a natural process various investigations have indicated this natural process has been accelerated at Eloika Lake. The increased rate of lake infilling is reportedly due to the historical logging practices which left large amounts of wood debris on the lake bottom, and due to other surrounding land practices which have increased the sedimentation rate. This issue is a concern relative to water quality, but does not impact decisions regarding lake storage and downstream flow impacts.

A previous investigation cited the mean lake depth to be 7.4 ft with a maximum depth of 15 ft (Soltero et al, 1988). A map showing lake bathymetry (depth contours) is shown on **Figure 3-6**. The lake depth map was taken from Wimpy (2009) who references Ecology for the data. It is unknown when the data is from or how many specific depth measurements were taken to develop the contours. Also, the reference elevation of the lake is not known, but the Ecology summary table for the lake notes an elevation of 1,905 for the lake. Therefore, 1,905 is the presumed base elevation for the lake depth contours.

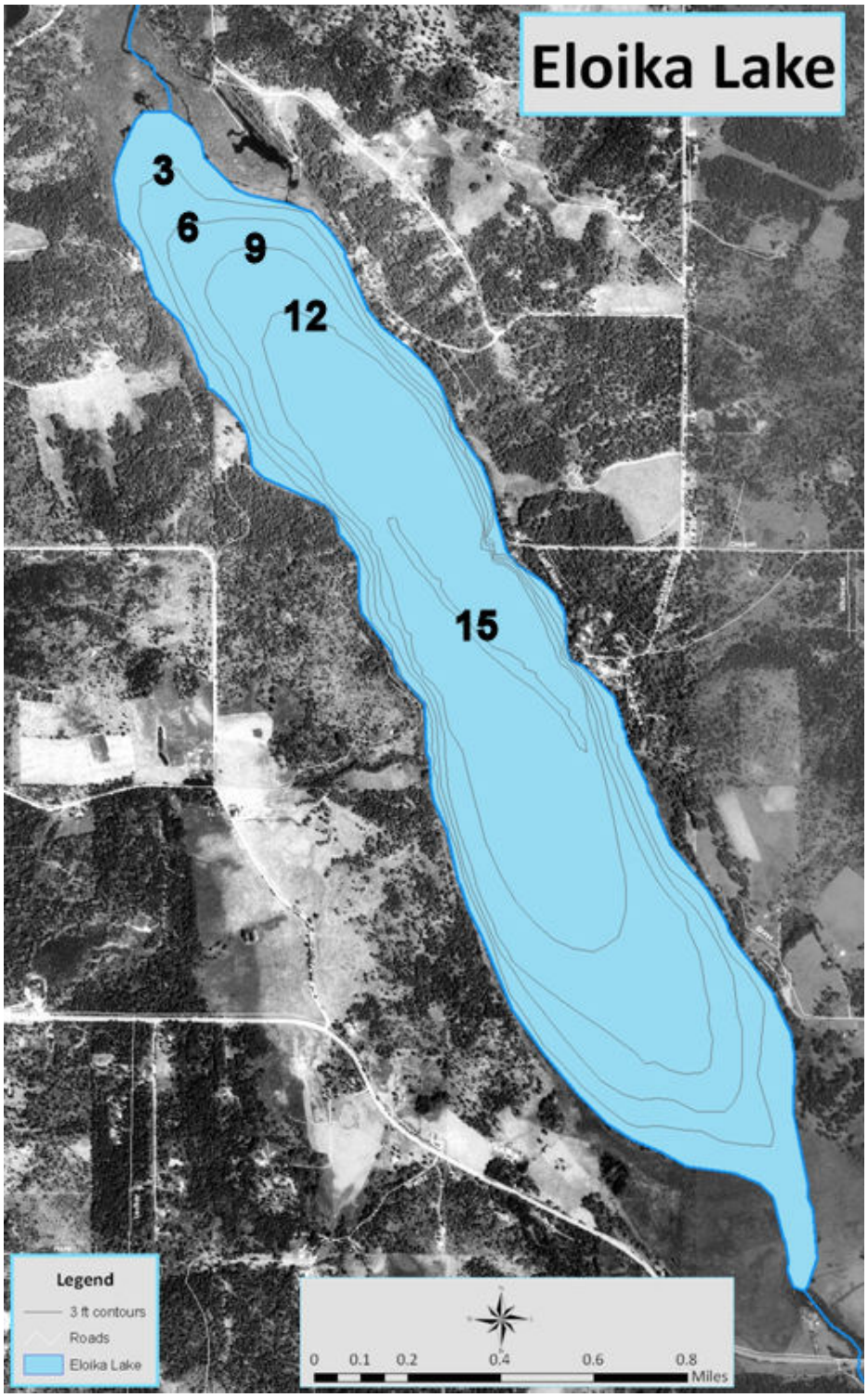

Figure 3-6. Lake Bathymetry (Depth) Contours (Modified from Wimpy, 2009)

3.2.2 Lake Area and Volume

Specified area of the lake varies depending on the source. Studies by Soltero et al (1988) and SCS (1992) list an area of 622 acres for a lake elevation of 1,905 ft. The lake elevation of 1,905 ft matches what is shown on the USGS 1968 Topographic map for the area, so the cited lake area was likely derived from the topographic map contours. Ecology, however (Ecology, 1997), specified the lake area as 662 acres for a lake elevation of 1,905 ft.

A detailed table listing lake volume and area for various elevations was included in the final design report for the water control structure (NRCS, 1996). These data are summarized below in **Table 3-1**. The methodology for developing the areas in the table was not specified, but it is presumed that topographic contours were used. Note that the area listed for the lake elevation of 1,905 ft is larger than other references noted above. Because this table was developed as part of a detailed engineering study it may be assumed that the information is reasonably accurate, although if a more detailed topographic survey is conducted in the future these area calculations should be updated.

Table 3-1. Lake Area and Volume For Various Elevations

Eloika Lake Data (NRCS, 1996)		
Stage (ft)	Volume (AF)	Surface Area (A)
1903	5,204	691.2
1904	5,896	693.2
1905	6,592	695.2
1906	7,289	697.2
1907	7,988	699.2
1908	8,690	701.3
1909	9,393	703.3
1910	10,098	705.3
1911	10,806	707.4
1912	11,515	709.4
1913	12,227	711.5
1914	12,940	713.5
1915	13,656	715.6
1916	14,373	717.6
1917	15,093	719.7
1918	15,815	721.7
1919	16,539	723.8

An alternative approach to evaluating the change in lake area at different elevations would be to compare digital aerial photographs of high and low water conditions. The aerial photograph used as a base map throughout this document was taken in the summer of 2006 and is representative of low water conditions. An extensive search was made to locate a digital aerial photo from springtime high water conditions; however, aerial photography is rarely done in the springtime because weather conditions are unpredictable. Satellite imagery may be available to evaluate spring high level conditions, though a preliminary search failed to reveal any easily available coverages. Satellite coverages, if available, may also be limited in resolution as they commonly cover large areas outside of key locations of interest (such as cities).

3.2.3 Lake Inlet and Outlet Flow

Key inlets, or sources of water, for Eloika Lake are shown on **Figure 3-7**. The inlets consist of the WBLSR at the north, which reportedly accounts for 95% of the recharge to the lake (Soltero et al, 1988), seven perennial creeks and springs, and several other creeks and springs that reportedly flow intermittently. The creek and spring locations are approximate and are based on a map of inlets presented by Wimpy (2009) and conversations with ELA members, and the identification as perennial or intermittent should be considered preliminary. The sole outlet for the lake is the WBLSR at the south end of the lake. The outlet location shifts from the location shown on the map southward as the lake fills and expands during the spring high water period. Aside from the WBLSR inlet and outlet, the only other inlet that has been assigned a name is Spring Creek, Location #3 on **Figure 3-7**.

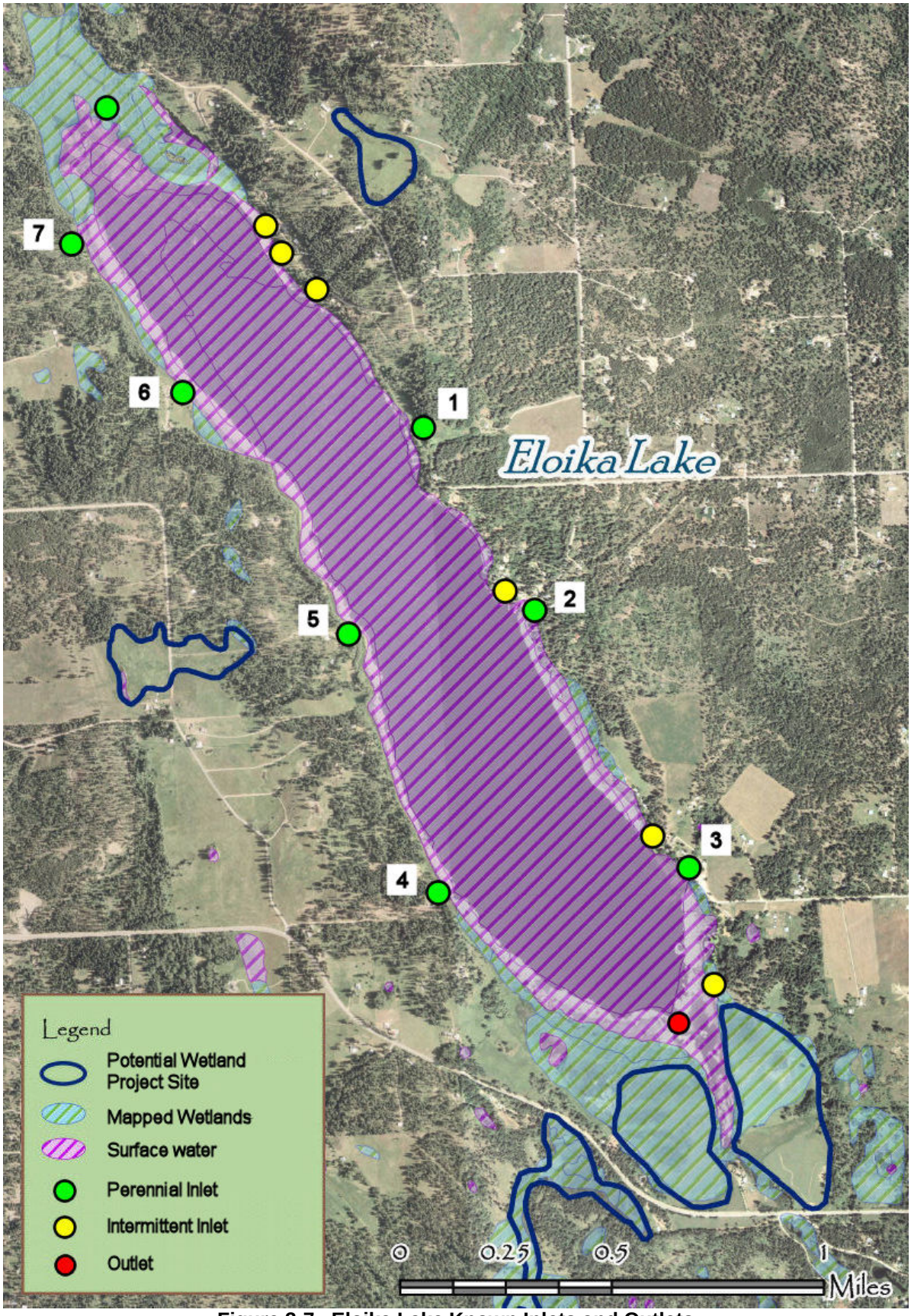

Figure 3-7. Eloika Lake Known Inlets and Outlets

Historic flow data is limited. The first measurements of flow found in the documents reviewed were in 1987 (Soltero et al, 1988). The 1987 measurements were taken at the WBLSR inlet at the north end of the lake, at one of the perennial spring inlets, referred to as "Spring Creek " (Location #3 on **Figure 3-7**), and at the outlet. The data are summarized below in **Table 3-2**. The inlet data from the two monitored sites were combined in the report, but it was noted that 95% of the flow into the lake came from the WBLSR. The combined flow of the two inlets was 28,597 AF (average of 43.1 cfs) for February to December, with the maximum occurring in March at 10,268 AF (167 cfs), and the minimum in October at 324 AF (5.3 cfs). The inflows are underestimates because flow in the other inlets were not measured, but flow at the other inlets have never been measured so the amount of error is unknown.

Table 3-2. 1987 Inflow and Outflow Measurements

Month	Inflow		Outflow		Storage Change (AF)
	(AF)	(cfs)	(AF)	(cfs)	
Feb	2,928	52.7	2,571	46.3	357
Mar	10,268	167.0	6,951	113.0	3,317
Apr	5,523	92.8	6,367	107.0	-843
May	2,352	38.3	2,498	40.6	-146
Jun	1,135	19.1	1,322	22.2	-187
Jul	779	12.7	438	7.1	341
Aug	649	10.6	543	8.8	105
Sep	373	6.3	422	7.1	-49
Oct	324	5.3	373	6.1	-49
Nov	373	6.3	292	4.9	81
Dec	3,893	63.3	4,704	76.5	-811

Additional flow measurements have been recorded since March 2007 by SCCD at the lake inlet and outlet gage locations as part of an ongoing monitoring program for the lake. These data are shown below on **Figure 3-8**. The data show that flows peak in April with maximums ranging from 224 to 301 cfs for the inlet and 202 to 218 cfs for the outlet. Flows reach their minimums in August-September with a single minimum flow value available for the inlet at 1.7 cfs and a range of 5.5 to 10.6 cfs for the outlet.

The data shown on **Figure 3-8** can also be used to estimate the contribution of lake inlets other than the WBLSR. The minimum flow values in September of 2007 (1.7 cfs for the inlet and 5.5 cfs for the outlet) suggest a summer base flow contribution of about 3.8 cfs for the other inlets. The contributions of the other inlets increase throughout the year but are difficult to estimate because of lake level fluctuations. However, a few stable lake level periods indicate contributions of 6.3 cfs in February of 2009 and 11.1 cfs in December of 2008. It is likely the contribution of the other inlets peaks in April (the data from April 2007 suggests this value could be on the order of 26 cfs).

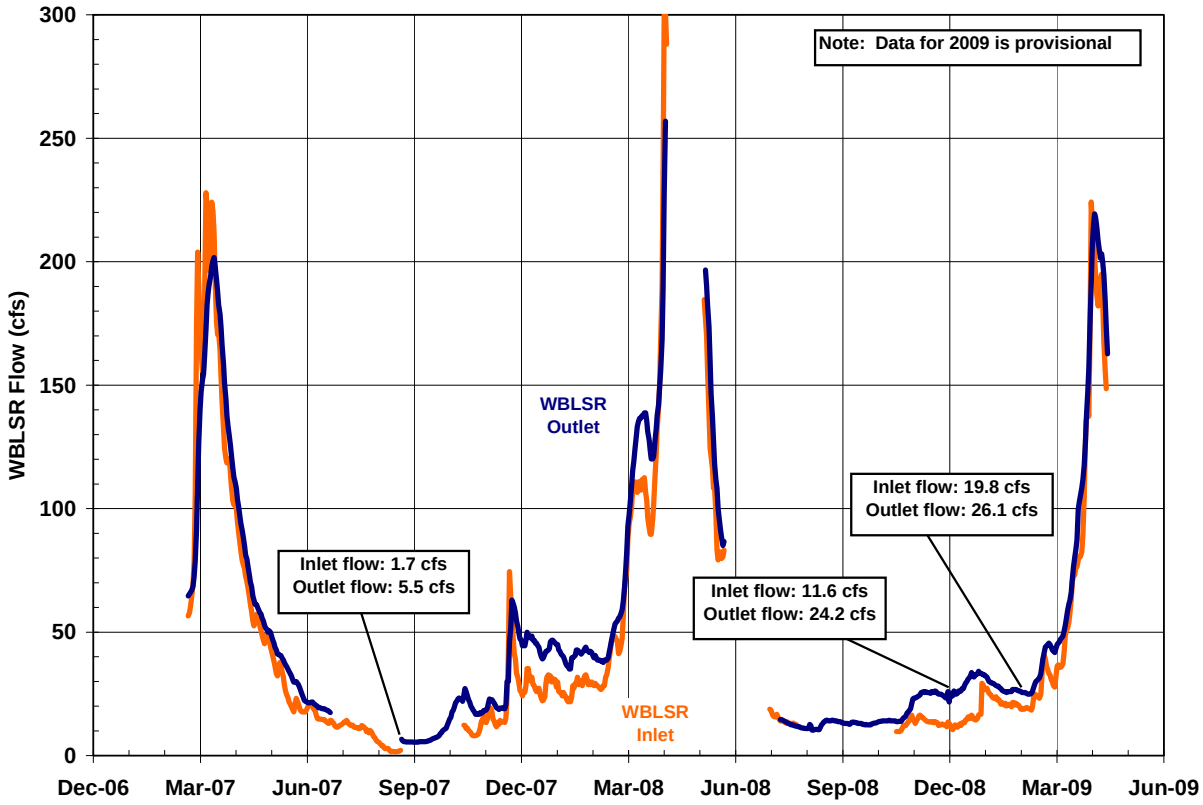

Figure 3-8. Inlet and Outlet Flow Measurements

3.3 Topography

Topographic information for the lake area includes generalized relief maps from Ecology's website, shown on **Figure 3-9**, to DEM elevation contours obtained from Spokane County and shown on **Figure 3-10a** and **Figure 3-10b**. The DEM resolution is accurate to about 5 ft.

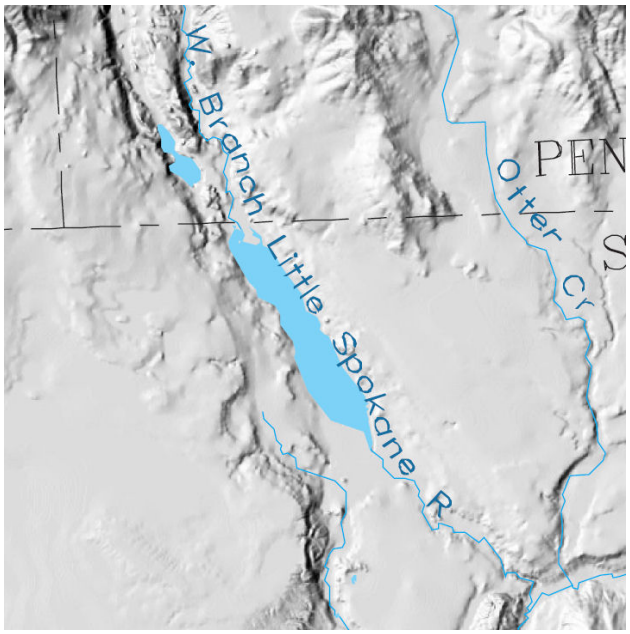

Figure 3-9. Generalized Relief Map of the Eloika Lake Area

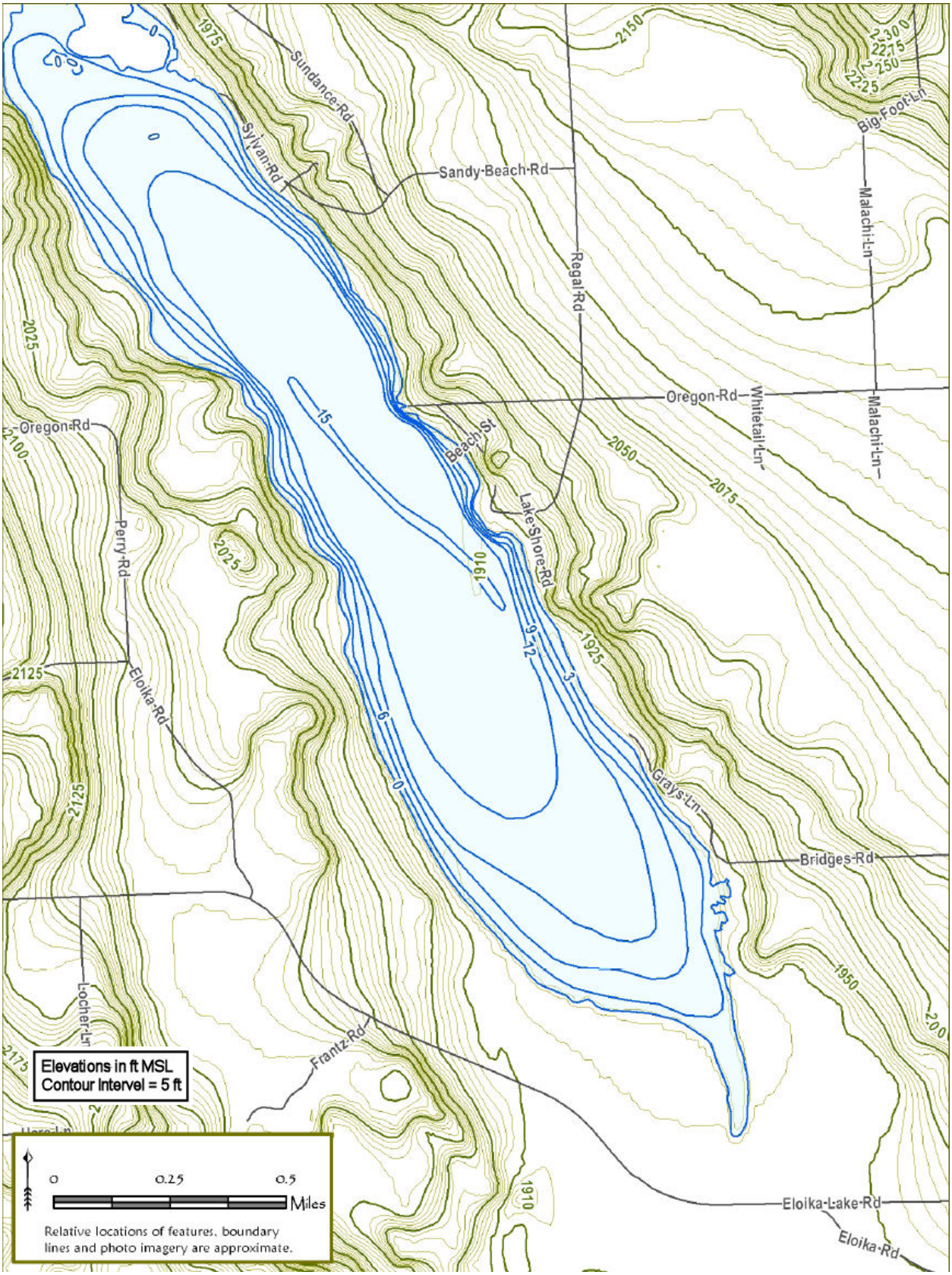

Figure 3-10a. USGS Topographic Contour Map of the Eloika Lake Area

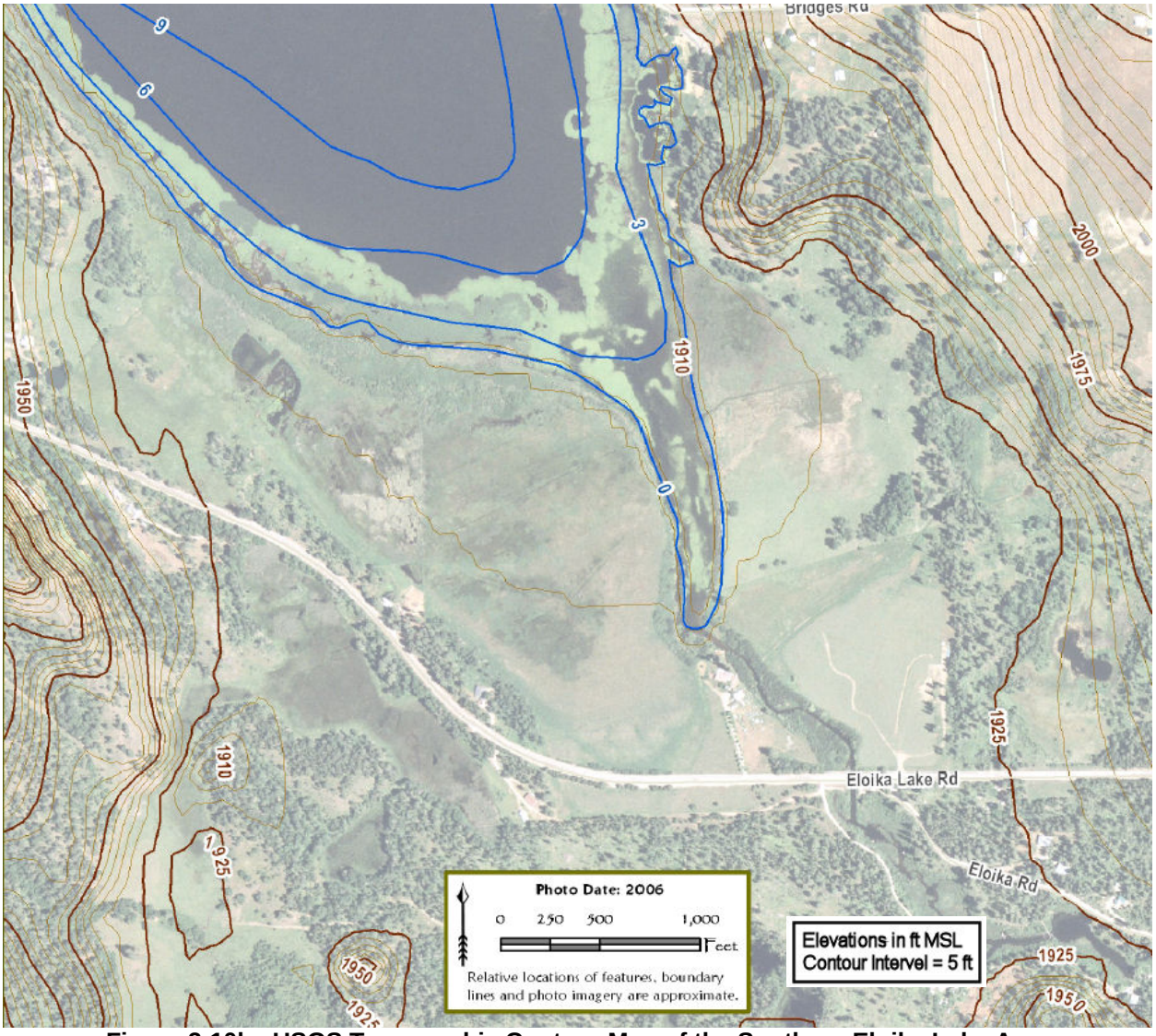

Figure 3-10b. USGS Topographic Contour Map of the Southern Eloika Lake Area

Other available topographic information includes information from the Meander Line Survey (Sargent, Ramer & Associates, 1970), point elevation data the southern Eloika Lake area from a survey completed for the control structure design (NRCS, 1996), and an ongoing high water approximation survey being conducted by the ELA.

The meander line survey information was presented in map (non-digital) form and it was noted that details of the survey were available if needed. Because this study is over 30 years old is not known if the survey data would still be available, and it is not clear how useful that information would be.

Additional survey data is available in the final design report for the control structure. These survey data were presented in table form in the report and if used would need to be manually entered into an electronic file, contoured, and merged with the existing DEM information. However, if additional surveying is conducted as is recommended below, then the area south of Eloika Lake Road could simply be resurveyed at that time and the data from the final design report would not be needed.

The high-water survey underway by the ELA has not been completed at the time of this report. The survey consists of setting stakes on shoreline property to mark various high water levels. The intent of that evaluation is to help identify what would be a desirable lake level for lakeshore owners.

4.0 WETLANDS

Existing and potential wetland areas around Eloika Lake were investigated as part of a previous study (PBS&J, 2009b). That study identified several potential wetland project sites around Eloika Lake (see **Figure 1-2**), and an in-depth study of wetland areas at the southern end of the lake was recommended. The in-depth study of the Eloika Lake wetlands is included in this report because of its intimate relationship to the lake level management strategies being evaluated. **Figure 4-1** illustrates the location of the two potential wetland project sites evaluated in this report – Eloika South and Eloika Southeast. In the previous study these sites were estimated as 39 and 49 acres, respectively, for a total of 88 acres. Upon additional evaluation for this report, Eloika South was expanded to 71 acres and Eloika Southeast was reduced to 28 acres for a total of 99 acres (**Figure 4-1**).

A summary of the methodology used in the previous study is presented below along with additional information and analyses. Limited site reconnaissance was conducted as part of this study, during which the sites were viewed to the extent possible from the adjacent county road. Wetland delineation and groundwater monitoring were not within the scope of the project and were not performed.

4.1 Previous Investigations

Previous investigations have been conducted in the Eloika Lake area that included wetland considerations. Two of the most useful previous investigations are cited below including the Eloika Lake Management Plan (SCCD, 1992) and WRIA 55/57 Potential Wetland Project Sites (PBS&J, 2009b).

4.1.1 Lake Management Plan Wetland Inventory

The wetlands at the southern end of the lake were previously described in the Lake Management Plan (SCCD, 1992) which expanded upon the existing National Wetlands Inventory (NWI) mapping. Results from this inventory are discussed below in Section 4.2.7.

4.1.2 Regional Existing and Potential Wetland Investigation

The original method proposed for the previous regional study (PBS&J, 2009b) was to compile and develop both current and historic wetland distribution maps of WRIAs 55 and 57 and then conduct a comparison for purposes of identifying drained or otherwise converted historic wetlands representing potential wetland restoration project sites. This original approach was modified based on a lack of sufficient detail and quality in the available data.

The available NWI wetland and USDA soil information was of limited utility, so current high-resolution aerial photography was used to locate potential wetland project sites. Aerial photographs of the entire WRIA 55/57 area were evaluated by staff familiar with wetland identification, wetland soil identification, drainage system identification, and stream alteration identification. NWI and soil maps were used as initial indicators of potential current and historic wetlands, but areas were then further evaluated using current aerial photography and limited field verification. That analysis identified three potential wetland project sites at the south end of Eloika Lake and two of these (Eloika South and Eloika Southeast) were chosen for further evaluation as summarized in this report.

4.2 Current Investigation

This investigation of the two Eloika Potential Wetland Project sites uses existing available information to provide an overview regarding site history, land use, topography, hydrogeology, geology, soils, aquifer relationships, habitat, water quality, water rights, restoration options, potential for success and other information. Critical information which is not currently available is identified and the tasks/costs to obtain it are summarized.

4.2.1 Field Visit-April 2009

A field visit was conducted in April 2009 during high water conditions to view the southern lake area, and photographs from that visit are included as **Appendix A**. During that field visit, the area was viewed from the adjacent county road without entering either potential wetland site. At the time of the visit the water level in the WBLSR channel below the lake was high (**Figure A-1** and **Figure A-2**). Significant flooding was evident on the Eloika South potential wetland project site (**Figure A-3**) with water extending as far as Eloika Lake Road in places (**Figure A-4**). The Eloika Southeast potential wetland project site exhibited flooding only on the northern portion (**Figure A-5**).

The potential wetland area previously identified as Eloika Lake-West (outlined to the southwest of Eloika Lake and the county road on **Figure 1-2** was also viewed from the county road (**Figure A-6**). This area was not evaluated in -depth for this current study.

Based on this field visit and re-examination of the aerial photographs, the boundaries of Eloika South and Eloika Southeast were revised as illustrated in **Figure 4-1** and all subsequent figures in this report.

4.2.2 Land Use

Land use at the Eloika South and Southeast sites is dominated by agriculture including hay production and livestock grazing. One residence is present between the two sites. County plat maps list four different owners for the Eloika South site and two for the Eloika Southeast site.

4.2.3 Topography

Current topographic data for the Eloika South and Eloika Southeast potential wetland sites is limited and somewhat confused by datum issues as discussed in **Section 1.2** above. The existing topographic data is not sufficient for wetland design purposes and more detailed survey information would be needed for final wetland evaluation and design. **Figure 4-1** illustrates topography according to the Spokane County five-foot contour data. This figure indicates that both sites are relatively level with 5-10 feet of elevation variation. Observations during the April 2009 field visit revealed that the southern portion of the Eloika Southeast site is significantly higher topographically than the remainder of the site and that wetland development would be difficult. For this reason, the boundary of Eloika Southeast was altered to eliminate this higher area. This higher area was not revealed on the county five-foot contour topography map, reinforcing the need for additional survey information for final evaluation and wetland design.

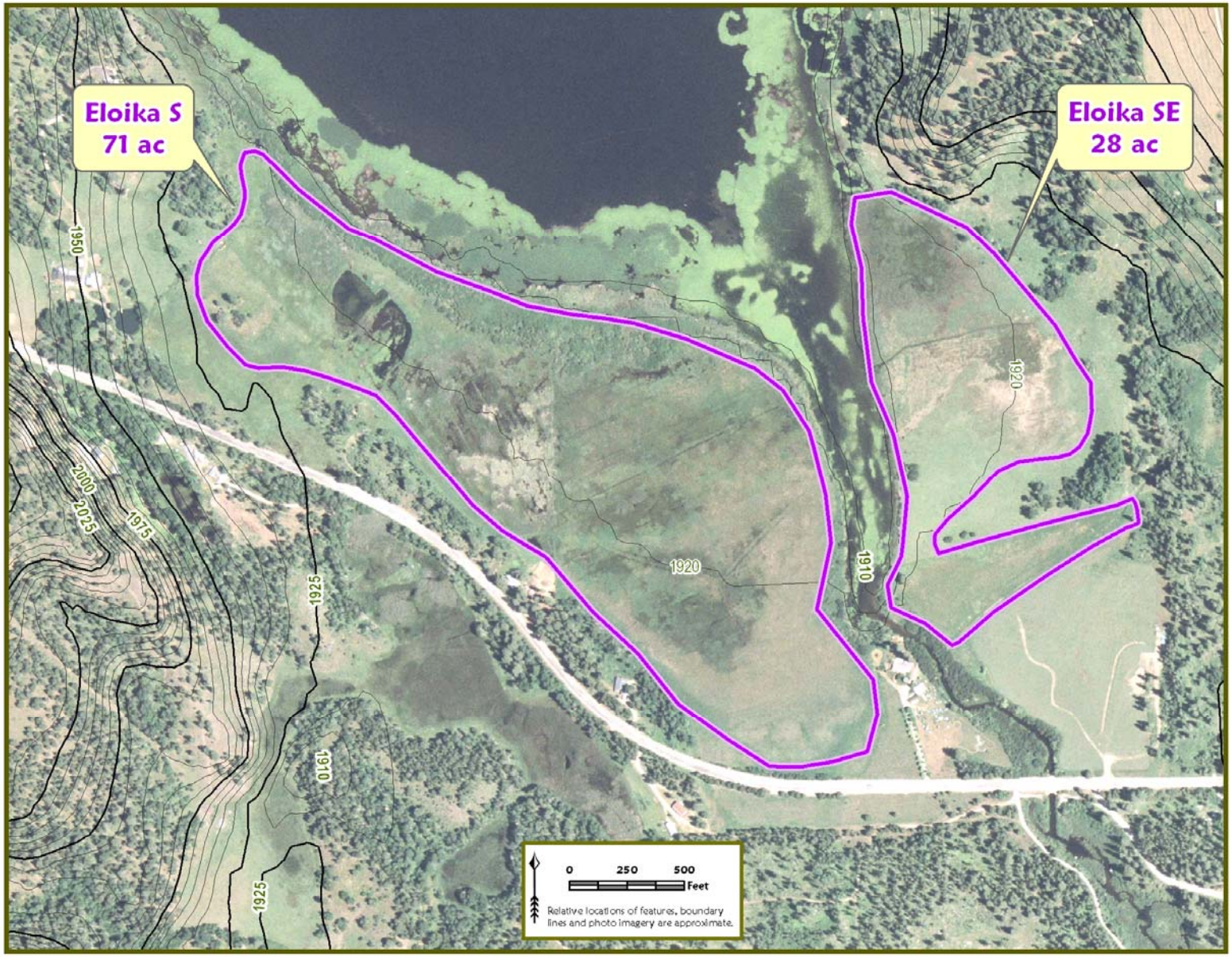

Figure 4-1. Topography Based on Spokane County Five-Foot Contour Map

4.2.4 Soils

Soils at the Eloika South and Eloika Southeast sites are mainly formed in lakebed sediments and organic materials deposited since the last ice age. **Figure 4-2** illustrates the locations of soils across the two sites. **Table 4-1** lists soils present according to the Spokane County Soil Survey (USDA, 1968). **Appendix B** includes brief descriptions of each soil mapping unit. Although some of these soils have a thin surface layer of silt loam or silty clay loam, the majority of each soil profile is dominated by sandy or organic materials. The properties of these soils do not appear to be appropriate for constructing wetland berms to impound water since the soils are either organic or have sandy textures. However, the proposed wetland restoration and enhancement measures described in **Section 4.2.9** do not require berms and are appropriate based on the existing soil properties. Soil characteristics at the site would need to be confirmed during final wetland design.

Table 4-1. Soils at the Eloika South and Eloika Southeast Potential Wetland Project Sites

Map Symbol	Soil Mapping Unit
Cw	Cocollala Silty Clay Loam
EkB	Eloika Silt Loam
ElC	Eloika Very Stony Silt Loam
HmA	Hardesty Silt Loam, moderately shallow
NcA	Narcisse Silt Loam
PeA	Peone Silt Loam
Se	Semiahmoo muck

4.2.5 Hydrogeology

Hydrogeology at these two sites is related to shallow groundwater associated with Eloika Lake. Groundwater levels are likely to fluctuate in direct relation to lake levels. The lake outlet and outlet stream separates the Eloika South and Eloika Southeast sites.

Information on groundwater conditions was not included in any of the previous investigation reports reviewed for this study. It is likely that wells in the area would be completed in deep formations and that information on shallow groundwater conditions does not exist.

Additional site hydrogeology data would be required for final wetland evaluation and design including seasonal variations in groundwater elevations. This is usually accomplished by installation and monitoring of shallow wells through at least one spring high water period.

4.2.6 Water Rights

Water right information was obtained from the Washington Department of Ecology. Water rights at specific sites are difficult to evaluate since listings are only available by Section and not by specific properties. **Appendix C** lists water rights for Section 15, Twp 29N, 43E where the potential project sites are located. It is not clear from the record if these rights are appurtenant to the project sites or to lands outside these sites. None of the names listed on the water rights appear on the current Spokane County plat map for the project site locations. It is likely that there are no water rights associated with the Eloika South and Eloika Southeast sites.

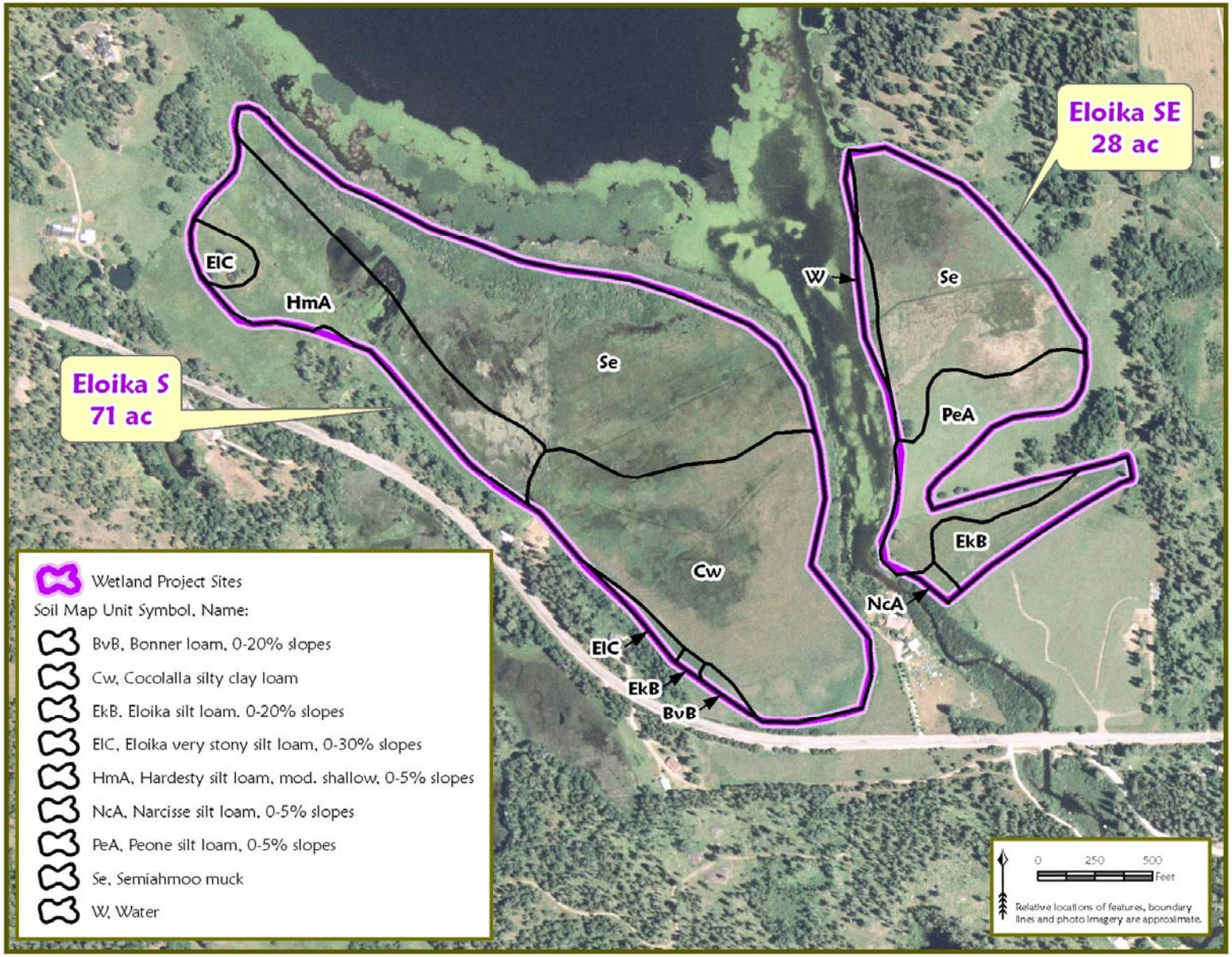

Figure 4-2. Soils Based on the Spokane County Soil Survey

There are several water right filings on the West Branch of the Little Spokane River below the project site in Section 15. It appears from the 2006 aerial photo that at least some of these water rights may currently be in use in the northeast portion of the section. There are a great many water rights filings downstream of these potential project sites along the west branch and main branch of the Little Spokane River. It is likely that the proposed project could affect downstream water users and may create the potential for water right conflicts and for objections from other water users.

A more detailed water rights evaluation would be needed in the future to evaluate the potential to affect downstream water rights. It may be that a water right is not needed for this project but based on past comments on preserving lake levels later in the season, it is likely that that a water right is needed. If a water right is needed for wetland projects at Eloika South and Eloika Southeast, it would be necessary to purchase a right elsewhere and move it to these project sites since the basin is closed.

4.2.7 Existing Wetlands and Vegetation

Wetlands at the southern end of Eloika Lake were previously described in the Lake Management Plan (SCCD, 1992) based upon the existing NWI mapping. **Figure 4-3** illustrates the distribution of wetland types identified at the Eloika South and Eloika Southeast sites.

The SCCD document describes these wetlands as follows:

The outlet of the lake is a sedge dominated floodplain with a narrow band of Drummond's willow on the waters edge at low watermark. Dominant species include slender sedge (Carex lasiocarpa), beaked sedge (Carex rostrata), Hood's sedge (Carex hoodii), small-fruited rush (Scirpus microcarpus), and reed canarygrass. Ten other sedge and rush species were also found in this area.

This area has been used on and off for years as pasture and hayland. Haying and grazing are limited to about 6 to 10 weeks a year due to flooding. Water covers the whole area in the spring but recedes to the row of willows at the edge of the lake by the end of July. Drainage and cultivation of the area was attempted sometime in the past as evidenced by the presence of drainage ditches. Drainage was unsuccessful however and the area has reverted back to sedges and reed canarygrass. The sedges and reed canarygrass have oriented themselves according to water depth which is influenced by minor topographic differences. Reed canarygrass has encroached into one third of the wetland area but is prevented from dominating the rest of the area due to high water during the growing season.

The management plan also summarized an analysis of wetlands functions and values, conducted using the US Army Corps of Engineers WET 2.0 Program as an index of social significance and the DOE draft of the Washington State Wetlands Rating System to rate the resource value. The report concluded the following:

The wetlands associated with Eloika Lake were rated high in social significance for nutrient removal/transformation, wildlife diversity/abundance, and uniqueness/heritage. Recreation was rated low and all other factors were rated moderate in social significance (the document listed what those other factors were). *Effectiveness was rated low for ground water recharge and discharge, sediment/toxicant retention, and nutrient removal/transformation. All other factors were rated as moderate in effectiveness.*

All of the wetlands were classified as category II wetlands by the Draft Washington State Wetlands Rating System. The most significant factor which seemed to determine this rating for all wetland areas was the significant wildlife habitat value.

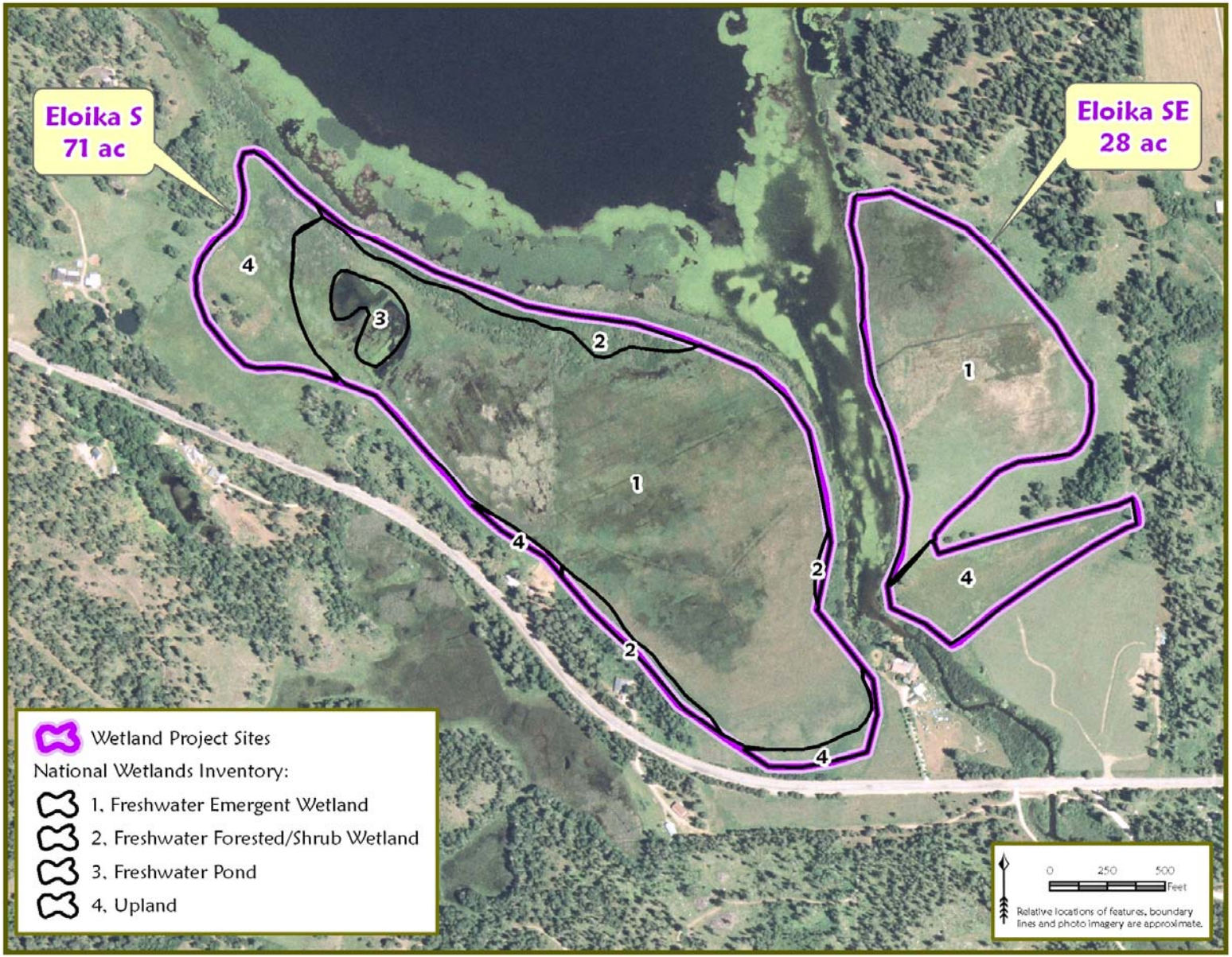

Figure 4-3. Wetlands Based on the National Wetland Inventory

It appears that the SCCD wetland evaluation provided additional onsite information to augment the original NWI Wetland Mapping, but that a formal wetland delineation was not completed. A formal delineation would require completion of US Army Corps of Engineer wetland forms documenting vegetation, hydrology and soils. Since wetland hydrology is critical to this evaluation, monitoring wells would be needed to confirm wetland hydrology. Portions of the area designated as wetland on the NWI/SCCD map do not appear to be wetland on current aerial photographs of the site. This includes the southeast portion of the Eloika South site and the central portion of the Eloika Southeast site. Conversely, portions of the area that appear to be wetland on current aerial photos do not appear as wetland on the NWI map, including the northwest corner of the Eloika South site. The southern portion of the Eloika Southeast site also appears as potential wetland on current aerial photos but is not listed as wetland on the NWI map. These sites are often difficult to evaluate by aerial photograph interpretation or even on the ground. A formal wetland delineation including groundwater monitoring would be needed for final wetland evaluation and design. The Spokane County Critical Areas Ordinance identifies the same areas of wetland as the NWI maps.

4.2.8 Wildlife Habitat

A wide variety of wildlife species have been documented at Eloika Lake (SCCD, 1992). Although this data is not specific to the Eloika South and Eloika Southeast sites, it is probably applicable. Major species likely to use these sites include whitetail deer, mule deer, coyote, black bear, moose, ruffed grouse, ring-neck pheasant, morning dove, California quail, various songbirds, and small mammals. Species specifically related to wetlands include beaver, muskrat, bullfrog, painted turtle, common garter snake and various salamanders. The SCCD study also documented 61 bird species at Eloika Lake, many of which were associated with wetland and riparian habitats or shorelines (**Table 4-2**). Four raptor species were identified including bald eagle. No federally listed animal species are documented in the Eloika Lake area.

The Spokane County critical areas maps list the Eloika South and Eloika Southeast sites as Fish and Wildlife Habitat Conservation Areas for whitetail deer, waterfowl, tundra swan and riparian habitat.

Table 4-2. Bird Species at Eloika Lake

Waterbirds	ruddy duck	**Wetland and Riparian Birds**
redneck grebe	pintail	barn swallows
mallard	wigeon	great blue heron
wood duck	canvasback	mourning dove
coot	scaup	song sparrow
Canada goose		wood pewee
golden eye	**Shorebirds and Gulls**	rough-winged swallow
bufflehead	ring-billed gull	catbird
common merganser	herring gull	yellow warbler
ring-neck duck	spotted sandpiper	cedar waxwing
pied-billed grebe	killdeer	eastern kingbird
blue-winged teal	common snipe	kingfisher
green-winged teal	red-necked phalarope	black tern
cinnamon teal	least sandpiper	arctic tern
common loon	wood sandpiper	yellow-headed blackbird
shoveler	lesser yellowlegs	northern flicker
tundra swan		red-winged blackbird
eared grebe	**Raptors**	pileated woodpecker
western grebe	golden eagle	raven
redhead	bald eagle	horned lark
domestic duck	osprey	violet-green swallow
hooded merganser	red-tail hawk	robin

From SCCD (1992)

4.2.9 Example Wetland Design Options and Success Potential

Wetland projects may be designed in a variety of ways to achieve various goals. This section describes four example designs which may be altered or refined as more information is obtained. Other potential designs may also be identified with further discussion and new data. All designs presented here could be implemented either with or without the lake level control structure discussed elsewhere in this report. Each design has a high potential for success using existing information due to the presence of a dependable water source (Eloika Lake and its associated groundwater system).

It is important to note that two of the most important site characteristics for wetland design are detailed topography and seasonal groundwater depths. These data are not currently available for the Eloika Lake potential wetland project sites; consequently, we have had to make assumptions from available data. The resulting evaluation provides a general framework for how a wetland project in these areas might look, the potential for success, the potential for increased water storage and other related concerns. However, it should be viewed as an example of what may be done and not as a final proposal until additional evaluation is completed.

Future information that could affect final design includes:

- Improved topographic survey
- Onsite groundwater evaluation
- Onsite soil evaluation
- Additional water rights analysis
- Landowner goals
- Funding organization goals
- Lake level adjustments
- Other information

The combined acreage of the Eloika South and Eloika Southeast sites is 99 acres. We have assumed that approximately half of this acreage is currently wetland (45 acres) and work on this portion would be considered *wetland enhancement*. We have assumed that approximately half of these sites (45 acres) is former wetland that has been affected by lowering the lake level and/or by drainage ditches. This portion would be considered *wetland restoration*. We have assumed the remaining 9 acres is upland and this portion would be considered *wetland creation*.

The most common and least expensive method for wetland creation and restoration is to construct berms to raise water levels to or above the current ground surface. This method is not applicable due to the small elevation change across the Eloika sites, their location in relation to the lake and outlet stream, incompatibility of site soil materials with berm construction, and because of concerns for affecting the county road.

Design and Construction Elements Common to All Wetland Designs

Some elements needed to complete the design and construction of potential wetland projects at Eloika South and Eloika Southeast are common to all designs. These common elements include:

1. Wetland delineation and functional evaluation
2. Site survey at a 1 foot contour interval and survey of wells and wetland boundaries
3. Shallow well installation and monitoring through one high water season
4. Soil investigation to confirm soil characteristics
5. Permitting as described in Section 4.2.11
6. Decision on target lake level for the surface water project

Costs for completing these tasks are summarized in **Section 4.2.10**. Four example design scenarios are summarized below. Each design would increase diversity and improve functions and values. Each design would reduce reed canarygrass coverage. These designs would increase water storage by 0 to 100 acre-feet.

Example Wetland Project Design #1

This is the lowest cost and best-case design option. It is based on selecting a target high water elevation that maintains a spring flooding level across this site for a longer duration as proposed in the surface water project. Under this scenario the reed canarygrass which dominate the 45 acres of *Wetland Restoration* (**Figure 4-4**) would be inundated for a much longer period and would meet wetland criteria. The prolonged inundation would result decreased reed canarygrass coverage and an increase in sedge and rush coverage. Reed canarygrass is favored on sites with short duration inundation and tends to decrease with longer inundation. This design scenario assumes that there is sufficient sedge and rush to expand and dominate the site. The SCCD report indicates that sedges are present within the reed canarygrass areas but does not indicate relative coverage.

Example Wetland Project Design #2

This example project design is similar to #1 but assumes that there is not sufficient desirable wetland plants (sedges, rushes and others) to re-colonize the site as reed canarygrass declines. This example project design assumes that the 45 acres of *Wetland Restoration* (**Figure 4-4**) do currently meet wetland criteria. A formal wetland delineation is needed to confirm the wetland status of this area. This example also assumes that the high water conditions viewed during our April 2009 field visit represent the approximate lake level that would be prolonged if the surface water storage project were implemented. Concern was expressed in past reviews of the potential surface water project that it might adversely affect wetlands at the south end of the lake. The effects of this potential project cannot be accurately evaluated until a stabilized lake level is determined and a precise survey is completed.

This Design would implement Option 1 in **Table 4-4**. Our initial evaluation is that stabilizing the lake level for an extended period may actually improve wetland conditions, functions and values for at least a portion of the south-shore wetlands. This would result from conversion of the areas labeled *Wetland Restoration* on **Figure 4-4** from a dominance of reed canarygrass to a more diverse vegetation dominated by wetland grasses, sedges, rushes and shrubs. Reed canarygrass has a competitive advantage on wetland sites that are only briefly inundated but can be eliminated by prolonged flooding. The longer period of flooding that would result from the Eloika surface water project would give more valuable and diverse wetland vegetation a competitive advantage. The SCCD report suggested that these areas of reed canarygrass also include sedges. If the sedges are a significant component of the current vegetation and if they are well-distributed across the area, planting additional wetland plants may be unnecessary. Costs for vegetation are listed in Option 1 on **Table 4-4** but may not be needed except as optional enhancements. If desired wetland vegetation does not develop just by the increased flooding period, wetland plantings would be implemented. These plantings could include either woody wetland vegetation (shrubs) or non-woody vegetation or a combination.

If this example is implemented and is effective as described here, it would increase wetland values and functions on approximately 45 acres. The amount of increase would be determined by the final vegetation. If other wetlands are negatively affected by the surface storage project, increasing wetland values may be a requirement by permitting agencies. Although net storage would not increase dramatically, the period of water storage would be increased if a lake level control structure is installed as discussed elsewhere in this report. This project would contribute slightly to late-season flow conditions in the river downstream. Costs to complete tasks common to all designs and costs for each option of these designs are listed in **Section 4.2.10** below.

Example Wetland Project Design #3

This example design assumes that the 45 acres of *Wetland Restoration* (**Figure 4-4**) do not currently meet wetland criteria due to past lowering of the lake level. We assume that lowering the topography by two feet will result in re-establishment of wetland hydrology and wetland status. The goal of Design #3 is therefore to restore the former wetlands to wetland condition and improve the function and values of existing wetlands.

This design would implement Options 1- 4 (**Table 4-4**) which includes excavation of the 45 acre area by two feet (Option 2), then seeding wetland grass and sedge species across the entire area (Option1). Wetland shrubs would be planted across 10% of the area on a 4 x 4 foot spacing to provide diversity. Wetland shrubs would be planted as 10 cubic inch containerized plants.

Option 3 would increase diversity across the area of potential wetland enhancement (**Figure 4-4**). These sites are assumed to currently meet wetland criteria but have little diversity. Under Option 3, two feet would be excavated across 25% of the area (11 acres) and wetland grasses and sedges would be seeded. A portion of the excavated material would be used to adjust topography across 3 acres to establish wetland shrub vegetation. Wetland shrubs would be planted as 10 cubic inch containerized plants.

This design could also implement Option 4 which would convert the estimated 9 acres of upland to wetland (**Figure 4-4)**. This conversion would be achieved by excavating approximately 3 feet of material from the surface to lower the topography. The 9 acre area would then be seeded with wetland grass and sedge species. Wetland shrubs would be planted across 25% of the area on a 4 x 4 foot spacing.

If all options in this design were implemented, the area of wetland would be increased by 54 acres. The amount of water storage would increase only slightly – on the 11 acres excavated to two feet. Conversion from saturated soil to water increases the volume of water stored by approximately 40 percent. This would result in a net storage increase of approximately 8.8 acre feet. Although net storage would not increase dramatically, the period of water storage would be increased if a lake level control structure is installed as discussed elsewhere in this report. This project would contribute slightly to late-season flow conditions in the river downstream. Costs to complete tasks common to all designs and costs for each option of this design are listed in **Section 4.2.10** below.

Example Wetland Project Design #4

The goal of Design #4 is to provide an example wetland design that is feasible on this site and would increase water storage significantly (**Figure 4-5**). Under this option, 50% of the Eloika South and Eloika Southeast potential wetland project sites would be excavated as shallow water areas 5 feet deep. Conversion from saturated soil to water increases the volume of water stored by approximately 40 percent.

These areas would be planted to hardstem bulrush and/or similar species. The depth of 5 feet was chosen to reduce the potential for cattail invasion, to give bulrush a competitive advantage and to not exceed the regulatory definition of deepwater habitat (6.6 feet).

Under this option, the area of wetland would be increased by approximately 25 acres. The amount of water storage would increase by approximately 100 acre-feet by converting saturated soils to shallow water. The period of water storage would be increased if a control structure is installed as discussed elsewhere in this report. This project would contribute to late-season flow conditions in the river downstream. Costs to complete this option in addition to those common to all designs are listed as Option 4 in **Table 4-4** in **Section 4.2.10** below.

4.2.10 Costs and Timelines

Costs

Table 4-4 lists potential costs for completing options for the three designs discussed in **Section 4.2.9** above. All cost estimates were made using unit values from similar projects in Montana. Costs may be slightly different in Washington, but the results are considered useful for the purpose of making an initial evaluation. Costs can be further refined upon completion of the additional studies summarized in **Section 4.2.9** and required for all options.

Note that this cost estimate does not include purchase of the property or an easement for a wetland project. This estimate also does not include fencing of the site since livestock grazing is not apparent on adjacent lands. This estimate also does not include temporary erosion control measures during construction such as silt fence. Cost estimates for these measures would become clear during the permit phase.

The estimate for permits for this project is difficult to make without agency consultation. Costs may be shared if permitting were coordinated with the surface storage project. Estimates for design are dependent on the final design selected. We have combined these two estimates since both are dependent on factors not now know.

In general, costs for a potential project at these sites are very high, mainly due to the need to construct by excavating to the water table instead of raising water levels with berms. We have used a unit cost of $6 per cubic yard for excavation, which is based on excavation in wet areas in Montana. Our unit cost for areas that are not wet is typically $4 per cubic yard. These excavation costs assume a short haul distance to a disposal/use site. Increasing water storage at this site is especially costly due to excavation costs. Costs for excavation might be offset somewhat by selling the excavated material as topsoil if a soil investigation determines it is suitable. These costs seem high compared with the potential benefits and water storage.

It is important to note that in the real world of wetland project funding, these efforts are often accomplished by the combined efforts of multiple entities and organizations. For instance, the $32,000 identified as further information needs could be reduced if a conservation organization or government agency with survey capabilities would contribute the survey portion ($5,000). The well installation and groundwater monitoring cost ($15,000) could be reduced if one of the interested parties such as the lake association can help with monitoring. A large part of any wetland project cost estimate is for revegetation efforts. Alternatives often include spending a portion of the initial proposed costs to ensure wetland goals and vegetation diversity but supplementing a portion of the effort with volunteer willow cutting and planting. This report has attempted to make accurate cost estimates as if the entire project were to be contracted to one firm. In reality, most wetland projects find ways to cut costs and balance wetland design goals with available resources.

Timelines

The timeline for potential wetland projects at these sites would be dependent on interest, available funding, permitting and other factors. The additional site information including shallow groundwater monitoring, wetland delineation, soil evaluation and topographic survey is generally conducted within a 6-12 month period. Initial design would then require 3-6 months. Permitting and environmental review timelines are difficult to predict due to the uncertainty of agency and public requirements and comment but would likely require 6-12 months.

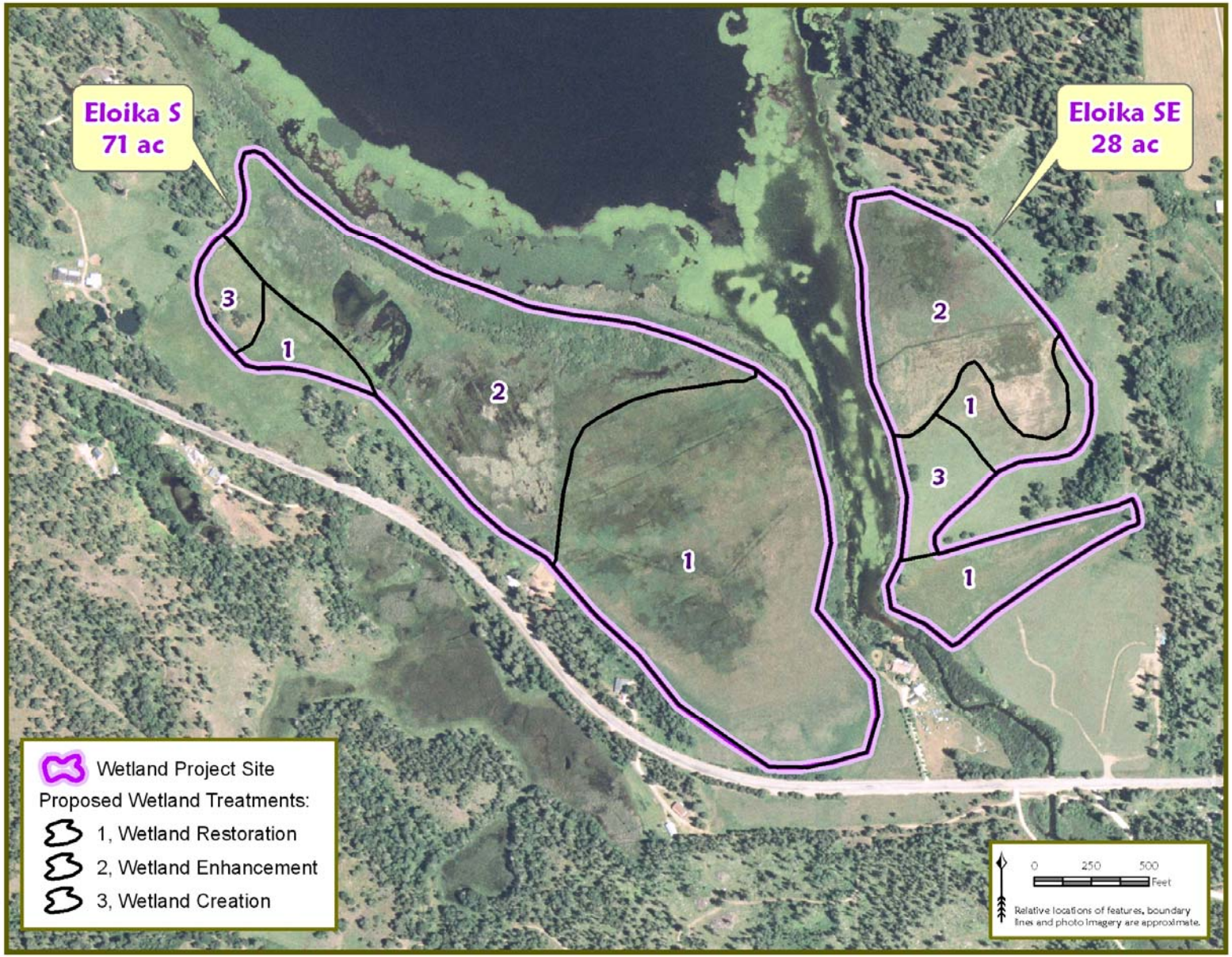

Figure 4-4. Wetland Restoration and Enhancement Areas

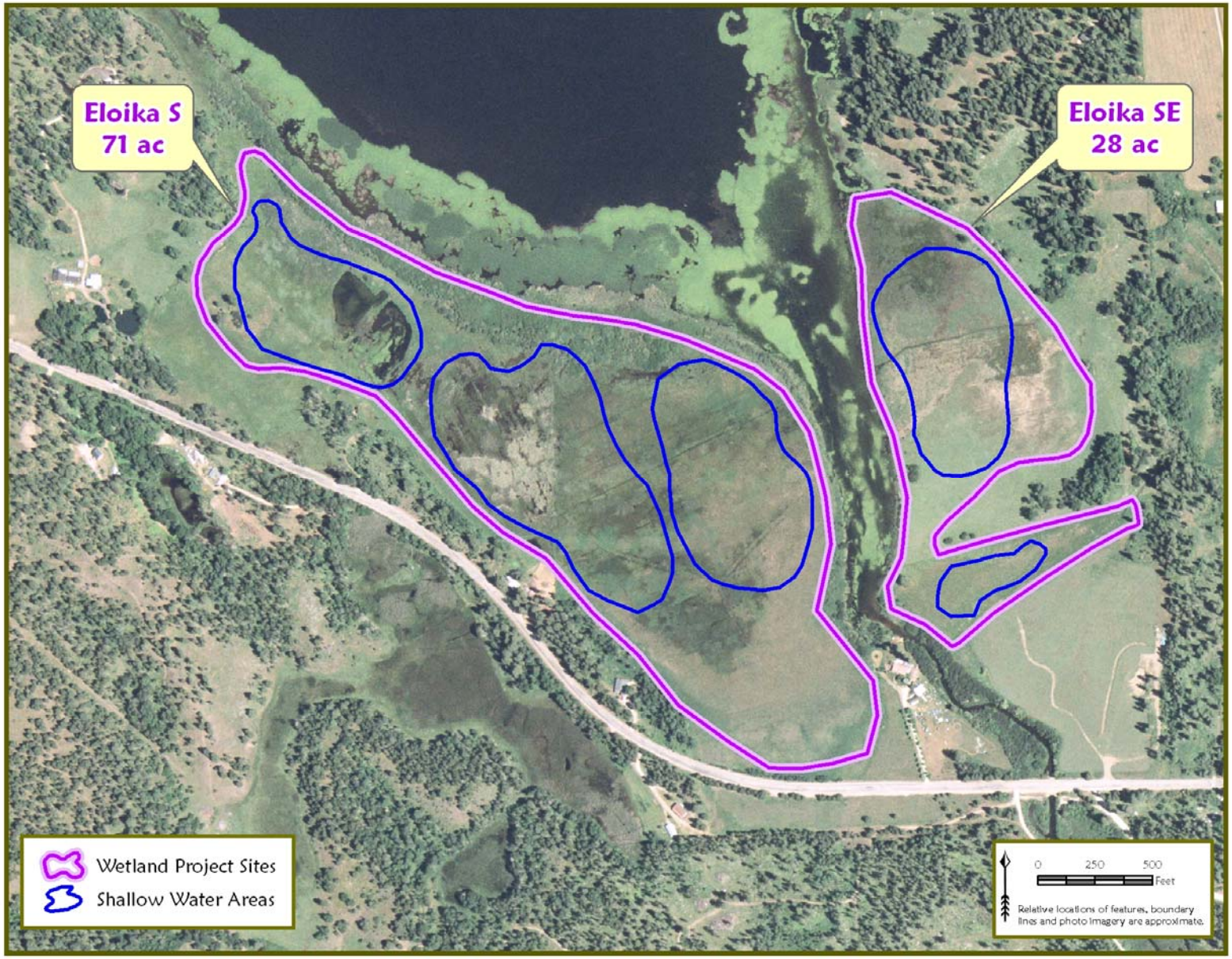

Figure 4-5. Potential Shallow Water Wetland Areas

Table 4-3. Cost Estimates for Eloika Wetland Project

Item No.	Description	Quantities	Unit	Cost Estimate (Dollars)	
				Unit Prices	Total
	Additional Onsite Information				
1	Wetland delineation / functional assessment	1			$10,000
2	Site survey at 1 foot contours	1			$5,000
3	Well installation and monitoring	1			$15,000
4	Soil investigation	1			$2,500
				TOTAL-ADDITIONAL INFO	**$32,500**
5	**Permits and Final Design**	1			**$100,000**
6	**Option 1 (Design 2 &3)**				
	Seed 45 acres with wetland grasses and grass-like species	45	AC	$400	$18,000
	Plant 10% of 45 acres (4.5 ac.) with 4 x 4 spacing of wetland shrubs	15,000	PLANTS	$3	$45,000
				TOTAL-OPTION 1 TASKS	**$63,000**
7	**Option – 2 (Design 3)**	1			
	Excavate 2 feet over 45 Acres	174,240	YD^3	$6	$1,045,440
				TOTAL-OPTION 2 TASKS	**$1,045,440**
8	**Option – 3 (Design 3)**				
	Excavate 2 feet over 11 Acres	35,000	YD^3	$6	$210,000
	Seed 11 acres with wetland grasses and grass-like species	11	AC	$400	$4,400
	Plant 3 acres with a 4 x 4 spacing of wetland shrubs	8200	PLANTS	$3	$24,600
				TOTAL-OPTION 3 TASKS	**$239,000**
9	**Option - 4 (Design 3)**				
	Excavate 9 Acres of upland to a depth of 3 feet	43,560	YD^3	$6	$261,360
	Seed 9 acres with wetland grasses and grass-like species	9	AC	$400	$3,600
	Plant 25% of 9 acres (2.25 ac.) with 4 x 4 spacing of wetland shrubs	6000	PLANTS	$3	$18,000
				TOTAL-OPTION 4 TASKS	**$282,960**
10	**Option - 5 (Design 4)**				
	Excavate 50 Acres of the entire area to a depth of 5 feet	403,333	YD^3	$6	$2,419,999
	Plant 4 x 4 spacing of bullrush	136,000	PLANTS	$3	$408,000
				TOTAL-OPTION 5 TASKS	**$2,827,998**

4.2.11 Permits

Permits, approvals and review processes that may be required for completing a wetland project at these Eloika Lake sites are listed in **Table 4-4**. A description of each permit is presented in **Appendix D** along with timelines and permits fees. Some of these may not be required at Eloika Lake and would be determined during review and discussion with the permitting agencies.

Table 4-4. Potential Permit Requirements for Eloika Wetland Projects

JARPA (Joint Aquatic Resource Permits Application – includes several permits listed below)
Discharge of Dredge or Fill Material Into Waters of the United States (Section 404 Permit)
Hydraulic Project Approval (HPA)
Noxious Aquatic and Emergent Weed Transport Permit
Archaeological Excavation Permit
Section 106 Review
401 Water Quality Certification
Washington State Environmental Policy Act (SEPA)
Floodplain Development Permit
NPDES Construction Stormwater General Permit
NPDES General Permit Coverage
Water Right, New (Permit to Withdraw or Divert Surface or Ground Water)
NPDES Aquatic Pesticides General Permit

4.2.12 Summary

Wetland project design and cost estimating at these sites is difficult at this time due to the lack of precise topographic and groundwater data. Design estimates based on our current information suggest very high costs, especially for wetland restoration, creation and for increasing water storage. One option for proceeding is to conduct the additional onsite investigation needed for a more accurate evaluation and design. Another option is to complete the lake level stabilization project described elsewhere in the report and evaluate the effect it has on the Eloika South and Eloika Southeast potential wetland project sites. This may make wetland project options more clear, especially the status of areas we consider to have restoration potential. It may then be possible to complete relatively low cost enhancements of the existing wetland areas with more stable lake levels. If the surface water project described in this report affects wetlands, some form of wetland mitigation may be required.

5.0 KEY ISSUES AND NEXT STEPS

Constructing a water control structure for Eloika Lake appears to be a viable option for creating downstream flow benefits and facilitating weed management in the lake. However, this current evaluation has identified a number of key issues that would need to be addressed if the project is to move forward.

This section presents an overview of key issues associated with installing a water level control structure at Eloika Lake and potentially restoring wetlands south of the lake. The key issues identified are presented below along with a summary of anticipated analyses and action items that will need to be considered. These issues are also summarized in **Table 5-3** at the end of this section.

5.1 Lake Level Management Strategies and Implications

The first set of issues regarding the control of Eloika Lake levels and wetland impacts includes deciding upon an appropriate maximum lake level and control schedule that addresses both downstream flow benefits and lake weed management concerns. Part of this decision process will include an estimate of the timing and extent of downstream flow benefits resulting from implementation of different management strategies.

5.1.1 Desired Maximum Lake Level and Level Control Schedule

In order to be able to assess lake level control impacts to land around the lake and to quantify downstream flow benefits, the managed lake maximum and minimum levels need to be specified. In addition, the schedule for maintaining lake levels will also need to be specified as that will not only determine downstream flow benefits, but will also indicate the duration that areas around the lake will be impacted by higher (or lower) water levels than "naturally" occur. This will by necessity be an iterative approach requiring the following:

- Identification of land impacts around the lake including flooding extent and duration, and shoreline erosion control requirements;
- Discussion with and consensus of landowners regarding acceptable lake level impacts on their property; and
- An evaluation of downstream flow benefits and lake weed management aspects.

A viable approach would be to identify a number of potential lake level management strategies, specify the associated potential impacts, and then decide on the most feasible option through coordination with landowners and watershed management groups.

Action Items: This decision process will be most efficient if it is overseen by a select group of stakeholders, which could be the ELA, a combination of the ELA and the WBLSR Committee or the WRIA 55/57 WIT, or a Lake Management or Water and Sewer District. Once the controlling organization is in place then the first step would be to develop various management scenarios, followed by evaluating the impacts and specifying the most feasible approach.

5.1.2 Storage Volume and Potential Downstream Flow Benefits

The desired maximum and minimum lake levels that will achieve the goals of downstream flow increases and weed management, and that will satisfy local landowners, are yet to be decided. To illustrate some preliminary examples, the difference in area and volume for elevation ranges can be calculated using **Table 3-1** as follows:

1. 1,903-1,907 (NRCS control structure range): 8 acre surface increase, 2,784 AF volume increase

2. 1,904-1,907 (stage minimum, design maximum): 10 acre surface increase, 2,092 AF volume increase
3. 1,904-1,909 (stage range): 10 acre surface increase, 3,497 AF volume increase

To equate these volumes in terms of outlet flow, **Table 5-1** lists the duration of downstream flow increases for various rates for the three options noted above.

Table 5-1. Downstream Flow Increase Duration For Various Rates

Option Number	Elevation Range	Volume		Duration (days) at:		
		(AF)	(ft^3)	5 cfs	10 cfs	15 cfs
1	1903-1907:	2,784	121,271,040	281	140	94
2	1904-1907:	2,092	91,127,520	211	105	70
3	1904-1909:	3,497	152,329,320	353	176	118

Option 1 is the control structure design range. However the lake minimum appears to be controlled by a natural feature and does not allow the lake to drop below 1,904 ft MSL, so excavation would be necessary to obtain this range. This range may be desirable to maximize winter drawdown for weed control.

Option 2 is the easiest to accomplish as it fits within the current control structure design and natural lake minimum level. This option would provide roughly 10 cfs of additional downstream flow for the period of May through August, but would not provide any additional winter drawdown capabilities.

Option 3 assumes a maximum lake level equal to the maximum natural level from the available data. This would require a redesign of the control structure, and the high level would need to be studied for impacts on the lake and surrounding properties.

As an example of a management schedule, an illustration of current and potential monthly lake levels under Option 1 and Option 2 is shown on **Figure 5-1**. The potential lake levels on the plot assume a release of 10 cfs. The natural lake levels shown are monthly minimum and maximum levels from the data for 2006 through April 2009. Note that on the graph during springtime water levels exceed the simulated managed maximum lake level of 1,907 ft MSL by 1.5 ft because the lake naturally rises to that point and it is assumed in this case the outlet capacity won't be altered to allow for greater maximum flow from the lake than naturally occurs.

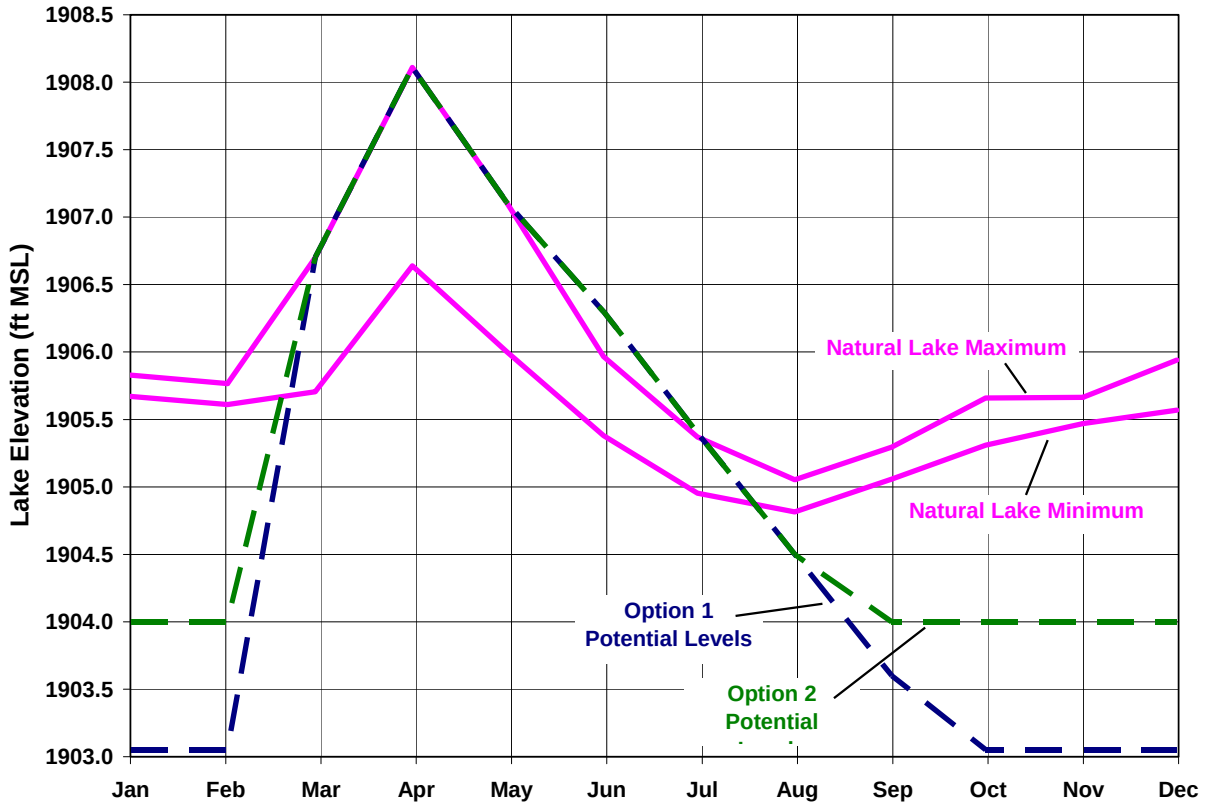

Figure 5-1. Current and Potential Managed Monthly Lake Levels

Action Items: This preliminary analysis will need to be redeveloped for selected management scenarios when they are developed as discussed in **Section 5.1.1**. In addition, it is recommended that current monitoring and data collection at the inlet, lake, and outlet gages be continued and used in the planning as well as operation and maintenance (O&M) actions.

5.2 Outlet Control Structure Design

This section presents a summary of issues related to the actual control structure design. Discussed is a brief summary of a review of the existing design along with a discussion of issues related to the location and applicability of the existing design.

5.2.1 Existing Design Condition

The final design of the control structure was completed in 1997 (NRCS, 1997). The control structure is designed to hold the lake elevation at 1,907 ft MSL from April to October. Water from the lake is designed to be released in late fall to lower the lake to winter levels. The winter lake level was determined to be 1,903 ft MSL, which appears contrary to available stage data. The permanent elevation (on the installed concrete weir) is 1,902 ft MSL, which is even with the existing channel near the design location of the control structure.

The control structure design includes the following details. The control structure would be located approximately 60 feet downstream of where Eloika Lake Road crosses the West Branch Little Spokane River. The largest opening in the proposed control structure is 40 feet wide by 10 feet deep with 10 4-foot wide bays constructed of steel. A smaller opening in control structure, designed for fish passage, is 5 feet wide by 10 feet deep with one bay. Flashboards can be installed in bays to control water level. A mechanical hoist mechanism can help install flashboards in 8 of the 10 bays of the main opening.

The final design package contains a survey data file including benchmarks located near the proposed control structure site. The design package includes construction plans, specifications and a cost estimate based on 1996 dollars. There may be some work needed to update the design to be construction ready, but it should be minimal if the location is not changed. The cost estimate would need to be updated to current prices. Additionally, an O&M plan would need to be created to insure that the lake level and flow through the structure are controlled properly. Although the control structure was designed to handle several different flood flow scenarios, it is important that the O&M plan adequately instruct the operation of the structure during these scenarios.

Discussions with the NRCS have indicated that the engineering staff would be willing to review the existing plans and documents and make changes to update them to current standards. Additionally, the NRCS seems to be willing to conduct the contracting and oversee the installation of the control structure. There is some potential that the NRCS could obtain funding for these tasks as well as funding to pay for control structure installation.

5.2.2 Existing Design Location and Applicability

The applicability of the existing design cannot be determined until a preferred lake level management strategy is specified. If the managed lake levels fall within the operational range of the existing design (1,903-1,907 ft MSL), then the existing design will be applicable.

If the existing design is determined to be applicable, then a more detailed assessment of the design will be necessary to identify any required updates. Design updates and a revised cost estimate will be necessary as noted in **Section 5.2.1**. In addition, it is likely that the design drawings are not available electronically and would have to be redrawn in a CADD type system.

If the specified managed lake levels fall outside of the operational range of the existing control structure design, then the structure would need to be redesigned. The level of effort involved in a redesign cannot be determined and depends upon how much of a change is needed, and if the proposed location is to be retained.

The location of the existing design, south of Eloika Lake Road, was chosen for two reasons. First, the landowner in that location was agreeable to placing the structure on his property. Second, the geologic investigation for the design indicated that there was "less fill material" south of the road than to the north (Durgin, 2009).

Assuming the landowner situation has not changed, it appears the chosen location for the control structure is an appropriate choice, with one caveat. The culvert beneath the road should be evaluated and surveyed to confirm that when levels at the control structure are maintained at 1,907 ft MSL (or whatever maximum managed lake level is specified), there is adequate headroom below the culvert top. It does not appear the analysis for the control structure took into account the drop in elevation between the lake and the culvert area, which suggests that water levels in that location could be slightly higher under managed conditions than occur naturally (see **Figure 3-5**).

Action Items: The following action items regarding the control structure design and location have been identified:

1. Determine if the operational range of the existing control-structure design meshes with the specified managed lake levels. If not, then redesign the structure;
2. If the existing design is to be used, evaluate the design and determine what updates are necessary. At a minimum the design will likely need to be redrawn and the cost estimate updated; and
3. Verify that the existing culvert beneath Eloika Lake Road is capable of handling the specified maximum lake level.

5.3 Lake Control Impacts

Previous investigations for the water control structure did not provide a sufficient level of detail regarding flooding impacts that would result from management of lake levels. The extent and duration of flooding will need to be accurately defined so landowners understand how their property may be impacted and to secure their support of the project. Quantification of the nature and extent of impacts will also be needed during the permitting process based on documented comments received during the previous SEPA review.

In addition, there may be some water quality issues related to the storage and release of water that will need to be considered. These water quality issues have not been evaluated in detail for this study but are noted below as potential issues.

5.3.1 Flooding Impacts

The evaluation of available data presented in this document illustrates that there is insufficient information to adequately delineate flooding impacts from controlled management of lake levels. Available topographic information does not contain the degree of resolution needed to identify impacts over the potential range of lake levels. In fact, there is not enough information to delineate the areas impacted under natural fluctuations, which would also be needed to specify changes in conditions resulting from any proposed control structure operation.

In addition to assessing the extent of flooding, which may not be different from natural conditions, there needs to be an evaluation of the duration. Under controlled conditions, the extent of flooding may not be different from what occurs naturally at certain times of the year, but the duration of that flooding will increase. This will clearly affect the way impacted land can be used, and could also impact how adjacent wetlands function.

The best way to adequately assess existing and managed lake level impacts will be to improve the accuracy of topographic information. The greatest impacts from lake level fluctuations occur to the south of the lake and a detailed survey in that area would be warranted. Additional survey work around the rest of the lake is also warranted, perhaps in concert with the ongoing staking evaluation being conducted by the ELA.

Action Items: A detailed survey of the southern Eloika Lake area should be conducted and used to update the existing GIS topographic coverage. The level of accuracy needed will need to be determined and an appropriate methodology developed. Additional survey work around the rest of the lake should be planned and coordinated with ongoing ELA efforts.

5.3.2 Southern Landowner Impacts and Resolution

Landowners south of the lake will be the most heavily impacted from a managed lake level control strategy. While flooding may not occur in areas that are not flooded under natural conditions, the duration of existing flooding would increase.

Once the nature and extent of these impacts to areas south of the lake can be defined, the potentially impacted landowners should be brought into the decision making process. Methods to compensate for the loss of land use will need to be explored with the landowners. Potential compensation methods have not been explored in any detail for this study but could include conservation or flood easements, wetland banking, tax breaks, or outright property purchase.

Action Items: Following the development of a management strategy and assessment of potential impacts, a dialog should be developed with the landowners to the south to explore options for making the project acceptable.

5.3.3 Other Landowner Impacts and Resolution

Landowners along the lake shore in areas other than south of the lake will also be impacted by lake level control, although to a lesser degree. Additional surveying in conjunction with ongoing ELA efforts will help to identify the nature and extent of those impacts.

In addition to the seasonal loss of land use, lake shore landowners will likely need to implement shoreline erosion controls. The nature of the erosion controls have not been investigated for this study but will need to be assessed. After the nature and extent of managed lake level impacts has been identified all impacted landowners will need to be involved in the decision making process to address concerns and identify any potential problems with acceptance of the project.

Action Items: Following the development of a management strategy and assessment of potential impacts, a dialog should be developed with all potentially impacted lake shore landowners to explore options for making the project acceptable.

5.3.4 Downstream Water Quality Issues

There is potential that some downstream water quality issues may need to be addressed. These were not evaluated in depth for this study but were identified during the course of the data evaluation. The two key water quality issues that warrant further study are phosphorous loading and temperature effects.

Phosphorous levels have been identified as a problem with respect to vegetative management in the lake. Late season release of water from the lake could have the result of releasing additional phosphorous downstream. An assessment of potential phosphorous loading downstream from managed releases of water from the lake should be assessed to determine if that would be a regulatory issue.

The potential temperature impacts downstream from late season release of water should also be assessed to verify that it will not create any substantive issues. The shallow nature of additional storage in the lake could result in warm water release that may not be acceptable downstream.

Action Items: Evaluate potential phosphorous loading and downstream temperature impacts from water release under the selected lake level management strategy.

5.4 Wetland Restoration

Various wetland restoration alternatives were presented in Section 4. These alternatives included as much detail as was possible with the currently available data, but there remains some uncertainty regarding the feasibility and costs that would be entailed with implementing the alternatives. Some of the uncertainty will be addressed as a site survey and wetland delineation are completed, as are indicated elsewhere in this section. Once these actions are complete, the feasibility and costs for the various wetland restoration scenarios can be revisited.

Action Items: Reevaluate feasibility of the restoration scenarios upon completion of a site survey and wetland delineation.

5.5 Required Permits and Processes

Once a lake level management strategy has been selected, a control structure design developed, and potential impacts determined, the project can move into the permitting process. The first step in this process will be to issue a SEPA checklist and JARPA application, which was completed in 1997 for the existing proposed control structure design. The SEPA checklist and JARPA process will initiate a review of the project from agencies that will need to issue required permits for the project.

Issues that are expected receive particular focus by various agencies are summarized below. These issues are based on documented comments from the earlier SEPA review.

5.3.1 Federal

Federal review will be conducted by the Army Corps of Engineers, with support from the USFWS. The Army Corps will review the project for issuance of a Section 404 permit under the Clean Water Act (and initiated via JARPA). The USFWS will supply comments to the Army Corps pursuant to the Fish and Wildlife Coordination Act, section 7 of the Endangered Species Act, the National Environmental Policy Act, and the Migratory Bird Treaty Act.

Army Corps

Previous comments from the Army Corps consisted of the following:

- A wetland delineation should be provided that must be verified by the Army Corps and Ecology including all wetlands adjacent to Eloika Lake and waterward of the ordinary high water mark (OHWM);
- An evaluation of existing wetland functions and values and potential impacts to these functions and values should be evaluated; and
- The vicinity map, plan, and cross-sectional drawings must be provided on 8 ½ by 11 inch sheets.

A wetland delineation and functional assessment has been identified as necessary under **Section 5.4** above. The wetland delineation recommended may need to be extended to include the wetlands on the north end of the lake. The map and drawings requirement will be simple to address when and if needed.

USFWS

USFWS concerns during the previous review include:

- Altering the natural cycle from high spring to low summer to higher summer conditions may impact native wetland plants. Note: no other language was provided but it appears they were suggesting this be addressed;
- Lake eutrophication is a natural process; if the rate at Eloika Lake is high then USFWS recommends addressing potential causes such as nutrient loading; and
- The effects of reduced spring and increased fall stream flow should be addressed.

The first item will be addressed as part of the wetland delineation and functional assessment anticipated to be required for the Army Corps. The second item can be addressed through a separate lake management process and does not appear a necessary assessment for this project. The last item, downstream flow impacts, will be addressed during the evaluation of downstream flow benefits discussed in **Section 5.1.2** above.

Action Items: It appears that potential concerns from the USFWS will be addressed by action items already specified.

5.3.2 State

Primary Washington State permitting issues expressed in the past originated from Ecology and WDFW. These are discussed below.

Ecology

Comments from Ecology for the previous SEPA process included the following::

- Because wetland impacts were indicated in the JARPA (which was retracted and later revised) a wetland delineation will be required and wetland mitigation may be necessary;
- A shoreline substantial development and a conditional use permit appears to be required; and
- The lake management plan (higher summer levels) would be a consumptive use and water rights would be needed. No new rights are being issued so a transfer would be necessary.

In addition, Ecology's Shoreland and Environmental Assistance Program requested additional information in order to make a determination of the extent of impacts. The additional information included:

- the extent of direct wetland impact as a result of dam construction;
- a list of proposed monthly lake water elevations and comparison of those to existing levels; and
- detailed water surface and ground elevations for 2 ft above and below ordinary high water mark (OHWM) to assess potential indirect impacts to wetlands.

The majority of these comments and request for additional information will be addressed under previously specified action items. The need for a shoreline substantial development and a conditional use permit, and nature of that permitting process has not been investigated but will need to be examined (see **Section 5.3.3** below for more information).

Ecology indicates that consumptive use would need to be calculated and mitigated. The consumptive use would arise from additional evaporation due to an increased managed lake size during spring-summer months. This will need to be calculated in detail once managed levels have been decided upon, but to give a general estimate of the consumptive use monthly evaporation volumes are shown in **Table 5-2** for Option 1 and Option 2 identified above in **Section 5.2.2**. This preliminary analysis shows a small net consumptive use of 2.09 AF for both options. However, downstream flows are being increased during the majority of the time that consumptive use is occurring.

Table 5-2. Estimated Consumptive Use From Managed Lake Levels

	Natural Conditions		Option 1 Conditions				Option 2 Conditions			
Month	Avg. Level	Area (Acres)	New Lake Level	Area (Acres)	Acreage Change	Evap Loss (AF)[2]	New Lake Level	Area (Acres)	Acreage Change	Evap Loss (AF)[2]
Jan	1905.8	696.8	1903.0	691.2	-5.6	-----	1904.0	693.2	-3.6	-----
Feb	1905.7	696.6	1903.0	691.2	-5.4	-----	1904.0	693.2	-3.4	-----
Mar	1906.2	697.6	1906.7	698.6	1.0	-----	1906.7	698.6	1.0	-----
Apr	1907.4	700.0	1908.1	701.5	1.5	0.47	1908.1	701.5	1.5	0.47
May	1906.6	698.4	1907.1	699.4	1.0	0.48	1907.1	699.4	1.0	0.48
Jun	1905.7	696.6	1906.3	697.8	1.2	0.69	1906.3	697.8	1.2	0.69
Jul	1905.1	695.4	1905.4	696.0	0.6	0.45	1905.4	696.0	0.6	0.45
Aug	1904.9	695.0	1904.5	694.2	-0.8	-----	1904.5	694.2	-0.8	-----
Sep	1905.2	695.6	1903.6	692.4	-3.2	-----	1904.0	693.2	-2.4	-----
Oct	1905.5	696.2	1903.0	691.2	-5.0	-----	1904.0	693.2	-3.0	-----
Nov	1905.6	696.4	1903.0	691.2	-5.2	-----	1904.0	693.2	-3.2	-----
Dec	1905.8	696.8	1903.0	691.2	-5.6	-----	1904.0	693.2	-3.6	-----
Total:					-25.5	2.09			-14.7	2.09

1 With 10cfs released during shaded months
2 Based on pan evap rates from Spokane Airport

At the time of the previous SEPA process there were no analyses of consumptive use or a summary of a release schedule (and magnitude of downstream benefits) available to provide a measure of the issue. Because of this small consumptive use and in light of downstream benefits, Ecology should be consulted to determine the best way to address this issue. It may be that an appropriate analysis of consumptive use versus downstream benefits can be conducted.

A Dam Safety permit will also likely be required for this project in accordance with Washington dam safety statutes contained in Chapters 90.03, 43.21A, and 86.16 of the Revised Code of Washington (RCW), and in rules on dam safety are in Chapter 173-175 of the Washington Administrative Code. Guidelines indicate that "Anyone intending to construct or modify a dam or controlling works capable of retaining 10 or more acre-feet of water shall, before beginning such work submit detailed construction plans and specifications, which are to be drawn by a registered professional engineer, to the Department for approval". Ecology publishes Dam Safety Guidelines, intended to provide owners, operators and design engineers with information on procedures and statutory requirements. These guidelines can be found on the Ecology website at: http://www.ecy.wa.gov/programs/wr/dams/GuidanceDocs.html.

Action Items:

- Evaluate need for a shoreline substantial development and a conditional use permit and identify the information needed and procedure for obtaining the permit.
- Consult with Ecology to determine if an appropriate analysis of consumptive use versus downstream benefits can be applied and considered in their analysis.
- Identify necessity, procedures, and requirements for a dam safety permit.

WDFW

WDFW provided several comments following their review of the previous SEPA document. Those focused on the Hydraulic Project Approval (HPA) application include:

- recommendation that the fish passage facility deigns be reviewed by WDFW and NRCS engineering staff as part of the HPA process to ensure adequate fish passage;
- a wetland mitigation plan will be required as part of the HPA process if wetland habitat will be impacted by the project (the SEPA indicated filling of an abandoned channel west of the structure site);
- the linear extent of streambanks which will be altered or changed was not identified. A revegetation and project erosion control plan will need to be included as part of the HPA

During the evaluation of the existing control structure design or redesign, the fish passage facility and the extent of altered streambanks will need to be evaluated to make sure this information is provided to and accepted by WDFW. If existing wetlands are to be altered, a mitigation plan will be necessary, which could be addressed if the wetland restoration portion of this study is pursued.

Other comments provided by WDFW include:

- a request for a reservoir management plan referenced in the SEPA document and identification of what entity will be responsible for overseeing flow adjustments;
- contact the Spokane County Building and Planning Department to ensure project compliance with the county's Critical Areas Ordinance. A habitat management plan for the project may be required by Spokane County;
- construction should occur between August and November to minimize impacts to nesting and wintering bald eagles, and an assessment should be prepared to address eagle impacts;
- it is recommended that pre and post monitoring of fish species be conducted to evaluate project impacts on fish resources and help refine a reservoir management plan;

The reservoir management plan will be addressed in the action items under **Section 5.6** (O&M) below. The Critical Areas Ordinance comment is addressed below in **Section 5.3.3**. When the plans for con-

struction are developed, the timing should be considered as noted to address bald eagle issues. The last item, pre and post monitoring of fish species, will need to be evaluated and discussed with WDFW.

Action Items:

- Identify areas of altered streambanks
- Assure that fish passage facility is adequate
- Adjust the timing of construction as appropriate
- Discuss need for pre and post fish monitoring with WDFW

5.3.3 Local

Local permitting issues raised during the previous SEPA process review were associated with Spokane County jurisdiction. Key issues include a Shorelands Conditional Use permit and a habitat management plan.

A Shorelands Conditional Use permit is issued by Spokane County and Ecology (and was referenced above in **Section 5.3.2**). For shoreline issues, Eloika Lake is under the jurisdiction of the Spokane County Shoreline Master Plan (SMP) and the Shoreline Management Act (SMA), and the control structure plan will need to be reviewed and permitted under the SMP. Appropriate permits would include a shoreline substantial development permit and a conditional use permit, both issued by Spokane County. Part of this permitting process would include shoreline erosion control measures.

A habitat management plan for the project may also be required by the Spokane County Building and Planning Department as it relates to the Critical Areas Ordinance. This requirement was not investigated in depth for and details will need to be evaluated as the project moves forward.

Action Items:

- Evaluate requirements for a shoreline substantial development permit and a conditional use permit;
- Determine if a habitat management plan for the project is required by the Spokane County Building and Planning Department as it relates to the Critical Areas Ordinance, and if so, what is needed to secure the permit.

5.6 Operation and Management Issues

A brief section on O&M was provided in the final design document for the control structure. A more detailed O&M plan will need to be developed that clearly specifies all aspects of the operation and maintenance of the control structure including:

- Monthly (or more frequent) lake levels and procedures for adjusting the controls to achieve those levels;
- Procedures for adjusting controls to address storm events or unusual conditions;
- Routine maintenance inspections, parameters, and repair procedures;
- Specification of any instrumentation, calibration and testing of that equipment, and replacement/repair procedures;
- Identification of responsible parties for O&M;
- Documentation procedures; and
- Security procedures.

Action Items: Once a final lake level management strategy has been developed and a final design completed, a detailed O&M plan will need to be developed that addresses all routine operations of the structure, maintenance checks and repair procedures, documentation, and any other relevant issues.

5.7 Potential Funding Sources

A number of action items have been recommended in the sections above that include planning and management decisions, impact analyses, field data collection, and documentation. Costs have not been estimated for these actions, but the actual construction of the control structure was estimated at about $307,000 in 1996 and costs have likely increased substantively. In addition to these costs, there will be regular ongoing expenses for operation and maintenance once the structure has been built and is functioning.

A preliminary evaluation of a few potential funding sources has been developed for this study, but a more thorough evaluation is warranted because there are other options available. In fact the ELA and the contractor producing the Eloika Lake Vegetation Management Plan are compiling a list of foundations and grants targeted toward non-profits like ELA (501-c-3) for water and wetlands projects. Initial information suggests that there appear to be any number of opportunities to acquire at least matching funds. In addition to one-time grants it is recommended that a regular source of funding be established to cover routine O&M costs.

Some potential funding sources include the following:

- Eloika Lake Residents: It is essential that residents of the lake provide some source of funding for this project. Indeed, it appears that this issue is one of the reasons the existing control structure did not get built. ELA members have continued to put time and effort into lake management issues but the level and nature of involvement needs to be reassessed.

  A regular revenue stream can be secured for O&M costs and as a base contribution to the other necessary work through the development of a Lake Management District or a Water and Sewer District. These two districts essentially function similarly, the difference being that a Lake Management District is permanent while a Water and Sewer District requires periodic renewal. Funding would be provided through taxes paid by lakeside residents.

  In addition to providing some funding, the District can be a mechanism to organize local labor that can be used in support of various project tasks including on-site support during the analysis phase and long-term O&M. The relationship and relative responsibilities of the District and the ELA will need to be specified. The necessary steps for the formation of a District were not evaluated for this study.

- NRCS: The NRCS was a major contributor to the previous control-structure efforts including developing the final design and providing funding for work conducted by SCCD. They have expressed an interest in continuing to be involved.

  The nature and potential of funding that NRCS could provide will need to be evaluated further. One option is technical engineering assistance, such as that provided by NRCS through their Multi-State Design Team (MSDT). Potential sources of funding through NRCS include a number of programs listed on their website at http://www.wa.nrcs.usda.gov/programs/index.html and include the Conservation Stewardship Program (CSP), Watershed Program (PL-566), Wetlands Reserve Program, and others.

- Ecology: Funding has been provided by Ecology through the WRIA 55/57 watershed planning process for studies and projects throughout the two WRIAs. This current investigation was funded through this process. Grant applications have been submitted for additional funding of WRIA activities including wetland restoration work. Some of that grant money may be available for portions of the Eloika Lake work, or additional grant applications could be developed if there is an opportunity. The potential of this funding source for Eloika Lake work will need to be further evaluated with the WRIA 55/57 WIT.

- Wetland Banking or Mitigation: If the wetland restoration component of this investigation is pursued, there may be an opportunity to secure funding through wetland banking or mitigation. Wetland banking is a process that allows the actual sale of wetland creation, restoration, enhancement, and preservation "credits" to offset wetland impacts, and would require an entity to develop and run the "bank". Alternatively, there may be opportunity for a given entity in need of wetland mitigation credit to fund, enact, and receive credit for such a project outside of the banking process. Although complex, these possibilities could be further explored as the Eloika Lake work proceeds.

Action Items:

- Continue to compile and evaluate list of potential funding sources;
- Evaluate NRCS involvement in project and identify potential funding;
- Work with WRIA 55/57 WIT to identify existing or future funding opportunities.

5.8 Summary Table

A summary of the key issues and recommended actions that have been discussed in this section are shown in **Table 5-3**. The table also contains a column ranking the priority of each action from 1 (highest) to 3 (lowest). As work proceeds, it may become clear that some actions should be ranked with higher or lower priority, or that some actions may not be required. The initial priority ranking of activities is as follows:

Priority 1

Determination of Maximum and Minimum Lake Levels
Specification of Level Management and Downstream Benefits
Review of Existing Design Applicability, Location, and Design Completeness
Evaluation of Potential Downstream Water Quality Issues
Evaluation of Water Rights Issue with Ecology
Specification of O&M Responsibilities
Funding/Support Evaluation and Procurement

Priority 2

Redraw Existing Design (if necessary) or Redesign
Control Structure Cost Estimate
Specification of Lake Control Impacts/Survey
Landowner Interaction
Reevaluate Wetland Restoration Feasibility
Wetland Restoration Conceptual Design
Wetland Delineation
Wetland Mitigation Needs Assessment
Shoreline Permit Needs Evaluation
Dam Safety Permit Evaluation
WDFW Streambank, Fish Passage, and Fish Monitoring Issues

Priority 3

Wetland Restoration Final Design and Implementation
SEPA/JARPA Process Initiation
Detailed O&M Plan

Table 5-3. Key Issues and Associated Actions

Item	Sub-Topic	Actions	Priority
Management Strategies	Maximum and Minimum Lake Levels	Develop lake max/min scenarios and evaluate feasibility. Criteria will include landowner impacts, downstream flow benefits, and weed management issues.	1
	Level Management and Downstream Benefits	Develop potential schedules and evaluate feasibility for retaining and releasing water to maximize lake benefits (storage and weed management), and calculate downstream flow benefits. Continue to monitor level gages and update data tables and plots.	1
Outlet Control Structure Design	Existing Design Applicability	Decide if existing design conforms with the Management Strategies. If not then structure will need to be redesigned.	1
	Existing Design Location	Determine if proposed location for existing design is suitable in terms of acceptable impacts and willingness of landowner to allow construction. Relocate if necessary	1
	Existing Design Completeness	If the existing design parameters are acceptable, determine if the drawings are useable in their present form. If not then they will need to be redrawn.	1
	Redraw Existing Design and Update Cost Estimate	Redraw Existing Design if necessary. Update cost estimate.	2
	Redesign	If existing design cannot be used the outlet control structure will need to be redesigned.	2
Lake Control Impacts	Potential Impacts	Evaluate flooding and duration impacts from the chosen control structure design. May require detailed site survey and wetland delineation.	2
	Southern Landowners	Develop strategies for accommodating flooding impacts south of the lake in coordination with the impacted landowners.	2
	Other Landowners	Develop strategies for accommodating flooding impacts around the lake in coordination with the impacted landowners. Evaluate erosion control requirements.	2
	Water Quality	Determine whether water temperature and phosphorous loading issues from delayed release are problematic. If so decide if alternate design or management approach can solve the problem.	1
Wetland Restoration	Feasibility	Reevaluate wetland restoration potential south of the lake based on wetland delineation and site survey. Determine if landowner is willing to proceed.	2
	Conceptual Designs	Develop conceptual designs of restored wetland.	2
	Final Design and Implementation	Develop final design of wetland restoration and implement.	3
Permits and Processes	SEPA and JARPA	Complete and issue a SEPA checklist and JARPA application.	3
	Federal-Army Corps	Complete wetland delineation and functional assessment of the south and north wetlands.	2
	Federal-USFWS	Concerns likely addressed by action items already specified.	3
	State-Ecology (Water Rights)	Calculate consumptive use from extended water retention for water rights evaluation. Work with Ecology to determine water right needs and explore options for a transfer if needed.	1
	State-Ecology (Shore Permit)	Evaluate need for a shoreline substantial development and a conditional use permit. Identify the information needed and procedure for obtaining the permit.	2
	State-Ecology (Dam Safety Permit)	Verfiy a Dam Safety Permit is required, identify procedure for securing permit.	2
	State-WDFW	Identify altered streambank areas, assure fish passage facility is adequate, assure construction timing is protective of eagles, evaluate need for fish monitoring with WDFW.	2
	Local-Spokane County	Evaluate need for a shoreline substantial development and a conditional use permit and identify the information needed and procedure for obtaining the permit. Determine if a Habitat Management Plan is required by the Building and Planning Department.	2

Item	Sub-Topic	Actions	Priority
O&M Issues	Responsibility	Identify responsible parties for Operation and Maintenance of the structure.	1
	Documentation	Develop detailed O&M manual.	3
Funding	Lake District	Identify the necessary steps for forming a Lake Management District or Water and Sewer District for matching funding and possibly labor support. Specify the relative roles and responsibilities of the District and ELA.	1
	NRCS	Evaluate potential funding and support from NRCS, and consider bringing them into the project at least for control structure design and construction phases.	1
	Ecology/Spokane County/WIT	Explore options of securing funding from existing grant applications and identify opportunities for new grant applications with these organizations.	1
	Wetland Banking	Evaluate the potential to obtain mitigation funding to restore wetlands at Eloika Lake.	1

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Appendix A
Photographs

Figure A-1. WBLSR Above Eloika Lake Road Looking North (April 2009)

Figure A-2. WBLSR Below Eloika Lake Road Looking South (April 2009)

Figure A-3. Two Views of The Eloika South Potential Wetland Project Site Looking North From The County Road Showing Flooding (April 2009)

Figure A-4. Flooded Area Near Road Southwest of Eloika Lake Looking Northeast (April 2009)

Figure A-5. Eloika Southeast Potential Wetland Project Site Looking North From The County Road (April 2009)

Figure A-6. Eloika West Potential Wetland Project Site-Not Part of This Study Looking East Toward Eloika Lake (April 2009)

Appendix B

Soil Descriptions for Eloika South and Eloika Southeast Potential Wetland Project Sites

Cw—Cocolalla silty clay loam

Map Unit Setting
Elevation: 1,700 to 2,500 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition
Cocolalla and similar soils: 90 percent
Minor components: 5 percent

Description of Cocolalla

Setting
Landform: Depressions

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 12.4 inches)

Interpretive groups
Land capability (nonirrigated): 5w
Ecological site: WET MEADOW 15+ PZ (R009XY601WA)

Typical profile
0 to 5 inches: Silty clay loam
5 to 13 inches: Silty clay loam
13 to 60 inches: Stratified silt loam to silty clay loam

Minor Components

Semiahmoo muck
Percent of map unit: 3 percent
Landform: Alluvial cones

Emdent
Percent of map unit: 2 percent
Landform: Depressions

EkB—Eloika silt loam, 0 to 20 percent slopes

Map Unit Setting
Mean annual precipitation: 22 to 28 inches
Mean annual air temperature: 46 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition
Eloika and similar soils: 100 percent

Description of Eloika

Properties and qualities
Slope: 0 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 6 inches: Silt loam
6 to 24 inches: Loam
24 to 44 inches: Gravelly sandy loam
44 to 53 inches: Very gravelly sandy loam
53 to 60 inches: Very gravelly loamy sand

ElC—Eloika very stony silt loam, 0 to 30 percent slopes

Map Unit Setting
Mean annual precipitation: 22 to 28 inches
Mean annual air temperature: 46 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition
Eloika and similar soils: 100 percent

Description of Eloika

Properties and qualities
Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.7 inches)

Interpretive groups
Land capability (nonirrigated): 6s

Typical profile
0 to 14 inches: Very stony silt loam
14 to 24 inches: Loam
24 to 44 inches: Gravelly sandy loam
44 to 53 inches: Very gravelly sandy loam
53 to 60 inches: Very gravelly sand

HmA—Hardesty silt loam, moderately shallow, 0 to 5 percent slopes

Map Unit Setting
Mean annual precipitation: 16 to 25 inches
Mean annual air temperature: 46 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition
Hardesty and similar soils: 100 percent

Description of Hardesty

Properties and qualities
Slope: 0 to 5 percent
Custom Soil Resource Report
22
Depth to restrictive feature: 20 to 36 inches to bedrock (lithic)
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.0 inches)

Interpretive groups
Land capability classification (irrigated): 3w
Land capability (nonirrigated): 3w

Typical profile
0 to 11 inches: Silt loam
11 to 26 inches: Stratified loamy very fine sand to silt loam
26 to 30 inches: Unweathered bedrock

Minor Components

Cocolalla
Percent of map unit:
Landform: Depressions

NcA—Narcisse silt loam, 0 to 5 percent slopes

Map Unit Setting
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 16 to 27 inches
Mean annual air temperature: 45 to 46 degrees F
Frost-free period: 90 to 135 days

Map Unit Composition
Narcisse and similar soils: 100 percent

Description of Narcisse

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 36 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups
Land capability (nonirrigated): 3w

Typical profile
0 to 14 inches: Silt loam
14 to 25 inches: Loam
25 to 60 inches: Fine sandy loam

PeA—Peone silt loam, 0 to 5 percent slopes

Map Unit Setting
Elevation: 1,700 to 3,000 feet
Mean annual precipitation: 13 to 22 inches
Mean annual air temperature: 45 to 46 degrees F
Frost-free period: 90 to 120 days

Map Unit Composition
Peone and similar soils: 100 percent

Description of Peone

Setting
Landform: Depressions

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups
Land capability (nonirrigated): 6w

Typical profile
0 to 6 inches: Silt loam
6 to 30 inches: Silt loam
30 to 60 inches: Stratified loamy coarse sand to silt loam

Se—Semiahmoo muck

Map Unit Setting
Elevation: 10 to 1,300 feet
Mean annual precipitation: 35 to 70 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 250 days

Map Unit Composition
Semiahmoo and similar soils: 100 percent

Description of Semiahmoo

Setting
Landform: Depressions

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Very high (about 16.8 inches)

Interpretive groups
Land capability (nonirrigated): 5w
Custom Soil Resource Report
25

Typical profile
0 to 17 inches: Muck
17 to 53 inches: Muck
53 to 60 inches: Mucky peat

Appendix C

Water Rights Listings for Eloika South and Eloika Southeast Potential Wetland Project Sites

File #	Cert #	Person	Doc	Priority Dt	Purpose	Qi	UOM	Qa	Ir Acres	TRS	QQ/Q	Src's	1stSrc
G3-048797CL		HELGESON & EMERSON	Claim S		DG		GPM			29.0N 43.0E 15		1	
G3-048798CL		HELGESON & EMERSON	Claim S		DG		GPM			29.0N 43.0E 15		1	
G3-048897CL		HELGESON GORDON L.	Claim S		IR,DG		GPM			29.0N 43.0E 15		1	
G3-27969CWRIS		LEESON CHET F	Cert	4/4/1985	MI	350	GPM	50		29.0N 43.0E 15	SE/NE	1	WELL
G3-080148CL		MARTIN LAWRENCE E.	Claim S		DG		GPM			29.0N 43.0E 15		1	
G3-25350GWRIS		PARKS E E	Cert	5/2/1977	IR	200	GPM	118	150	29.0N 43.0E 15	SE/NE	1	WELL
G3-*07200CWRIS	5375	PARKS F E	Cert	6/2/1964	IR	400	GPM	320	150	29.0N 43.0E 15	SW/NE	1	INFILTRATION TREN
S3-*11254CWRIS	8094	PARKS F E	Cert	4/18/1952	IR	0.4	CFS	150	75	29.0N 43.0E 15	NW/NE	2	UNNAMED STREAM
S3-072850CL		PARKS F. E.	Claim S		ST,DG		CFS			29.0N 43.0E 15		1	SPRING
G3-039064CL		PARKS WAYNE R.	Claim S		DG		GPM			29.0N 43.0E 15		1	
G3-164911CL		RIDDLE F B	Claim S		ST,IR		GPM			29.0N 43.0E 15		1	
S3-164912CL		RIDDLE F B	Claim S		DG		CFS			29.0N 43.0E 15		1	
G3-018884CL		FRANTZ LEE E.	Claim L		DG		GPM			29.0N 43.0E 16		1	
S3-018885CL		FRANTZ LEE E.	Claim L		IR		CFS			29.0N 43.0E 16		1	
S3-21999CWRIS		FRANZ LEE E	Cert	10/24/1973	DS	0.02	CFS	2		29.0N 43.0E 16	NW/SW	1	UNNAMED STREAM
G3-105003CL		HUTCHINSON ELLEN L	Claim S		ST,IR		GPM			29.0N 43.0E 16		1	
G3-105004CL		HUTCHINSON ELLEN L	Claim S		ST,IR		GPM			29.0N 43.0E 16		1	
S3-012690CL		PRATT JESSE	Claim L		ST,DG		CFS			29.0N 43.0E 16		1	
S3-*11742CWRIS	5676	SANTO W A	Cert	10/8/1952	IR,DS	1	CFS		80	29.0N 43.0E 16	SW/NE	1	UNNAMED SPRING
G3-059144CL		BURROW CHESTER A.	Claim S		ST,DG		GPM			29.0N 43.0E 22		1	
G3-134248CL		COX JAMES A	Claim S		ST,IR		GPM			29.0N 43.0E 22		1	
G3-134247CL		FERGUSON LYLE A	Claim S		ST,IR		GPM			29.0N 43.0E 22		1	
G3-134108CL		INGRAM JAMES I	Claim S		ST,IR		GPM			29.0N 43.0E 22		1	
S3-*19411CWRIS	10323	KELLER L G	Cert	1/22/1966	IR	0.15	CFS	30	10	29.0N 43.0E 22	SE/NE	1	WEST BRANCH LITTL
G3-003789CL		KELLER VIOLA M.	Claim L		DG		GPM			29.0N 43.0E 22		1	
S3-*18870CWRIS	9970	MANZER L H / E M	Cert	2/15/1965	IR	0.09	CFS	21	7	29.0N 43.0E 22	NE/NE	1	WEST BRANCH LITTL
S3-042131CL		MANZER LEWIS A.	Claim L		ST,IR		CFS			29.0N 43.0E 22		1	SPRING
G3-042132CL		MANZER LEWIS H.	Claim L		ST,DG		GPM			29.0N 43.0E 22		1	WELL
G3-019597CL		MORRIL ELDON B.	Claim L		DG		GPM			29.0N 43.0E 22		1	
S3-160880CL		REESE EARL J	Claim L		IR,DG		CFS			29.0N 43.0E 22		1	POND
G3-027155CL		SIMPSON ROBERT C.	Claim L		DG		GPM			29.0N 43.0E 22		1	
G3-109908CL		SMITH VRANCES M	Claim S		ST,DG		GPM			29.0N 43.0E 22		1	
S3-122499CL		TAYLOR ROBERT D	Claim L		ST,IR		CFS			29.0N 43.0E 22		1	RIVER
G3-122498CL		TAYLOR ROBERT D	Claim L		DG		GPM			29.0N 43.0E 22		1	WELL
File #	**Cert**	**Person**	**Doc**	**Priority Dt**	**Purpose**	**Qi**	**UOM**	**Qa**	**Ir**	**TRS**	**QQ/Q**	**Src's**	**1stSrc**

	#								Acres				
G3-037477CL		THOL JAMES L.	Claim L		DG		GPM			29.0N 43.0E 22		1	WELL
G3-039084CL		WEBER LOREN E.	Claim S		DG		GPM			29.0N 43.0E 22		1	
S3-*19724CWRIS	10015	WILBRECHT L D	Cert	6/20/1966	IR	0.03	CFS	6	3	29.0N 43.0E 22	NE/NE	1	WEST BRANCH LITTL
S3-*11026CWRIS	4959	ARNOLD F D	Cert	2/5/1952	IR	0.1	CFS		10	29.0N 43.0E 23	SW/NW	1	WEST BRANCH LITTL
G3-127323CL		DEAN FARLEY L	Claim S		ST,IR		GPM			29.0N 43.0E 23		1	
S3-28510		Kidder Evelyn	Cert	8/26/1988	IR	0.022	CFS	1	0.5	29.0N 43.0E 23	SW/SE	1	WEST BRANCH LITTL
S3-*13113CWRIS	7121	MILLER C C ET AL	Cert	9/3/1954	IR	1	CFS	240	80	29.0N 43.0E 23		3	WEST BRANCH LITTL
S3-*04020CWRIS	1930	MOODY V	Cert	8/6/1934	PO,IR	0.1	CFS		7	29.0N 43.0E 23	SE/SE	1	WEST BRANCH LITTL
G3-140922CL		POCHEL LYLE	Claim S		DG		GPM			29.0N 43.0E 23		1	SPRING
S3-127147CL		POCHEL LYLE E	Claim L		ST,IR		CFS			29.0N 43.0E 23		1	RIVER
S3-20410CWRIS		Smethers John	Cert	11/16/1972	IR	0.07	CFS	7.8	2	29.0N 43.0E 23	SW/NW	1	WEST BRANCH LITTL
G3-045733CL		SMETHERS JOHN T.	Claim L		DG		GPM			29.0N 43.0E 23		1	WELL
G3-152317CL		WEAVIL LEVI F	Claim S		ST,IR		GPM			29.0N 43.0E 23		1	
G3-152318CL		WEAVIL LEVI F	Claim L		ST,IR		GPM			29.0N 43.0E 23		1	SPRING
S3-29158		Williams Brian	Pmt	2/27/1992	FR,DS	0.02	CFS	2		29.0N 43.0E 23		1	WEST BRANCH LITTL
G3-123069CL		BATTERS GARY N	Claim S		DG		GPM			29.0N 43.0E 25		1	
S3-123068CL		BATTERS GARY N	Claim S		IR		CFS			29.0N 43.0E 25		1	RIVER
S3-28288C		Grizzly Bear Bluff Trust	Cert	3/9/1987	ST,IR	0.044	CFS	12.7	3	29.0N 43.0E 25	NE/NW	1	LITTLE SPOKANE RI
S3-051131CL		MORAN LARRY A.	Claim L		DG		CFS			29.0N 43.0E 25		1	SPRING
S3-051130CL		MORAN RUTH	Claim L		DG		CFS			29.0N 43.0E 25		1	SPRING
S3-012190CL		MORAN RUTH I.	Claim L		IR		CFS			29.0N 43.0E 25		1	
S3-051129CL		MORAN RUTH I.	Claim L		IR		CFS			29.0N 43.0E 25		1	LITTLE SPOKANE R
S3-29264		Burrows John	Cert	8/24/1992	DS	0.02	CFS	2		29.0N 43.0E 26	NE/SE	1	LITTLE SPOKANE RI
G3-27797		Dean Farley	Cert	3/29/1984	DM,CI	650	GPM	117	0	29.0N 43.0E 26	NW/SW	3	WELL
G3-25508CWRIS		DEAN FARLEY	Cert	7/12/1977	DM	80	GPM	66		29.0N 43.0E 26	NW/SW	1	WELL
G3-25304CWRIS		DEAN FARLEY L	Cert	3/31/1977	DM	20	GPM	22		29.0N 43.0E 26	SW/SW	1	WELL
G3-021306CL		HILLIARD RAYMOND H.	Claim L		DG		GPM			29.0N 43.0E 26		1	
G3-153589CL		JORDAN JIMMY D	Claim L		IR,DG		GPM			29.0N 43.0E 26		1	WELL
G3-000535CL		NIELSEN HENRY K.	Claim L		ST,IR		GPM			29.0N 43.0E 26		1	
G3-089027CL		REESE LENORE J.	Claim S		ST,IR		GPM			29.0N 43.0E 26		1	

Appendix D

Potential Permit Needs for Wetland Projects at Eloika South and Eloika Southeast

Permit Name:	**Discharge of Dredge or Fill Material Into Water (Section 404 Permit)**
Agency:	US Army Corps of Engineers (Federal)
Legal Authority:	Section 404 of the Clean Water Act; and Section 7 of the Endangered Species Act
Application:	Joint Aquatic Resource Permit Application (JARPA)
Permit Fee:	Individual permit = $100. No cost for a letter-of permission, nationwide permit or regional permit.
Time Frame:	6 – 8 months
Contact:	US Army Corps of Engineers Seattle District Regulatory Branch PO Box 3755 Seattle, WA 98124-2255 Telephone: (206) 764-3495 Fax: (206) 764-6602
Comments:	If you plan to discharge dredged or fill material into the waters of the United States, including special aquatic sites such as wetlands, you must get a Section 404 permit. The U.S. Army Corps of Engineers (Corps) can authorize activities by a standard individual permit, letter-of-permission, nationwide permit, or regional permit. The Corps will make the determination on what type of permit is needed. If your project might affect threatened or endangered species or their designated critical habitat under the Endangered Species Act, the Corps must consult with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service before they make a permit decision and you will be required to submit a Biological Evaluation. *http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=REG&pagename=mainpage_Permit_Applicant_Info*

Permit Name:	**Archaeological Excavation Permit**
Agency:	Department of Archaeology & Historic Preservation (Federal)
Legal Authority:	Chapter 25-48, Archaeological Excavation Permit WAC; Chapter 27.44, Indian Graves and Records RCW; and Chapter 27.53, Archaeological Sites and Resources RCW
Application:	Archaeological Excavation Permit
Permit Fee:	None for technical assistance.
Time Frame:	45-60 days
Contact:	Department of Archaeology & Historic Preservation Suite 106 1063 South Capitol Way Olympia, WA 98501 Telephone: (360) 586-3065 Fax: (360) 586-3067
Comments:	A permit from the Department of Archaeology and Historic Preservation (DAHP) must be obtained prior to any excavation that will alter, dig into, deface, or remove archaeological resources, Native Indian graves, cairns, or glyptic records. DAHP should be contacted before beginning a project. *http://www.dahp.wa.gov/pages/Documents/Archaeology.htm*

Permit Name:	**Section 106 Review**
Agency:	Department of Archaeology & Historic Preservation (Federal)
Legal Authority:	National Historic Preservation Act of 1966
Application:	Unknown – Contact agency
Permit Fee:	None
Time Frame:	Unknown – Contact agency
Contact:	Department of Archaeology & Historic Preservation Suite 106 1063 South Capitol Way Olympia, WA 98501 Telephone: (360) 586-3065 Fax: (360) 586-3067
Comments:	The Department of Archaeology and Historic Preservation (DAHP)and affected tribes must be consulted when projects are subject to review under Section 106 of the National Historic Preservation Act of 1966 (NHPA). This act requires that all federal agencies take into account the affect of its actions on historic properties. Requirements of Section 106 review apply to any federal undertaking, funding, license, or permit. DAHP and affected tribes are consulted to help determine if the site has been surveyed, if there are identified historical resources on-site, and if the property is listed or eligible for listing on the National Register of Historic Places. The federal agency involved is responsible for initiating and completing Section 106 review.

Permit Name:	**Hydraulic Project Approval (HPA)**
Agency:	Department of Fish and Wildlife (State)
Legal Authority:	Chapter 220-110 Hydraulic Code Rules WAC; and Chapter 77.55 Construction Projects in State Waters RCW
Application:	JARPA
Permit Fee:	None
Time Frame:	Maximum of 45 calendar days after complete application is received and SEPA compliance is complete for a standard HPA
Contact:	Department of Fish and Wildlife 600 Capital Way North Olympia, WA 98501-1091 Telephone: (360) 902-2464 Fax: (360) 902-2945
Comments:	Any form of work that uses, diverts, obstructs, or changes the natural flow or bed of any fresh water or saltwater of the state, requires a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife (WDFW). Permit processing can take up to 45 days following receipt of a complete application package. A complete application package for an HPA must include a completed Joint Aquatic Resource Permit Application (JARPA) form, general plans for the overall project, and complete plans and specifications of the proposed work within the mean higher high water line in salt waters or within the ordinary high water line in fresh waters of the state, complete plans and specifications for the proper protection of fish life, and notice of compliance with any applicable requirements of the State Environmental Policy Act (SEPA). *http://wdfw.wa.gov/hab/hpapage.htm*

Permit Name:	**Noxious Aquatic and Emergent Weed Transport Permit**
Agency:	Department of Agriculture -Noxious Weed Coordinator. (State)
Legal Authority:	Chapter 16-752 Noxious Weed Control WAC; and Chapter 17.10 Noxious Weeds-Control Board RCW
Application:	Unknown – Contact agency
Permit Fee:	None
Time Frame:	7 days.
Contact:	Department of Agriculture 111 Washington Street SE PO Box 42560 Olympia, WA 98504-2560 Contact Greg Haubrich at (509) 225-2604
Comments:	Permit from the Department of Agriculture's Noxious Weed Coordinator required for transporting various plants or plant parts found on the quarantine list. No permit is required to transport plants or plant parts, as a part of a noxious weed control activity, to a sanitary landfill, to be burned or otherwise for disposition so long as such activities are conducted under the supervision of an official weed control agency. Washington State Noxious Weed Board: *http://www.nwcb.wa.gov/index.htm* Quarantine List (*http://www.nwcb.wa.gov/documents/weed%20lists/State%20Weed%20List%202009.pdf*)

Permit Name:	**401 Water Quality Certification**
Agency:	Department of Ecology (State)
Legal Authority:	Chapter 173-201A State Water Quality Rule WAC; Chapter 173-225 Federal Clean Water Act, Section 401 WAC; and Chapter 90.48 State Water Quality Law RCW
Application:	JARPA
Permit Fee:	No fee for certification
Time Frame:	90 days – 1 Year
Contact:	Department of Ecology Governor's Office of Regulatory Assistance 300 Desmond Drive PO Box 47600 Olympia, WA 98504-7600 Telephone: (360) 407-7037 Toll Free: (800) 917-0043 Fax: (360) 407-6711
Comments:	Applicants receiving a section 404 permit from the U.S. Army Corp of Engineers are required to obtain a section 401 water quality certification from the Department of Ecology (Ecology). Issuance of a certification means that Ecology anticipates that the applicant's project will comply with state water quality standards and other aquatic resource protection requirements under Ecology's authority. The 401 Certification can cover both the construction and operation of the proposed project. Conditions of the 401 Certification become conditions of the Federal permit or license Information required with Application If applicable to the project: Mitigation plans, Operation and maintenance plans, Stormwater site plans and Restoration plans. Review of applications will include the following timeframes based on the type of permit application: Individual 401's - Minimum twenty day public notice; up to one year to approve, condition, or deny. Usually less than three months, see notes/comments. Nationwide permits that have been partially denied may take a few days or weeks, after receipt of the JARPA and a letter from the Corps issuing a LOV. Letter of Verification (LOV): Usually takes 30 days but can take up to 180 days.

Permit Name:	**State Environmental Policy Act (SEPA)**
Agency:	Department of Ecology (State)
Legal Authority:	SEPA Rule, WAC 197-11l; and SEPA Statute, RCW 43.21C
Application:	Environmental Checklist
Permit Fee:	Fees vary
Time Frame:	Lead agency must make a threshold decision no later than 90 days after the application and supporting documentation are determined complete.
Contact:	Department of Ecology SEPA Unit PO Box 47703 Olympia, WA 98504-7703
Comments:	Any proposal that requires a state or local agency decision to license, fund, or undertake a project, or the proposed adoption of a policy, plan, or program can trigger environmental review under SEPA. (See WAC 197-11-704 for a complete definition of agency action.) SEPA environmental review usually starts when an applicant applies for a permit or approval from a state or local agency. The completed environmental checklist is submitted to the SEPA lead agency as a prerequisite to issuing the permit or approval. The checklist should include attachments such as a site plan, vicinity map and any technical reports or studies that have been prepared for the project. The standard checklist form is in WAC 197-11-960 and available on the SEPA website listed under the links section below, however most jurisdictions have their own version. Filing fees will vary by jurisdiction because each state and local agency determines how much they will charge for SEPA review. *http://www.ecy.wa.gov/programs/sea/sepa/e-review.html*

Permit Name:	**Floodplain Development Permit**
Agency:	Spokane County (State)
Legal Authority:	Chapter 173-158 Flood Plain Management WAC; Chapter 86.16 Flood Plain Management RCW; Title 42, Ch 50, S 4001 et seq USC; and Title 44, Ch I, S 60.3 CFR
Application:	Floodplain Development Application
Permit Fee:	Determined by local government.
Time Frame:	Permit processing time varies by jurisdiction and project complexity.
Contact:	Spokane County Public Works Department Division of Engineering and Roads Environmental Program & Special Projects 1026 W. Broadway Avenue Spokane, Washington 99260-0170 (509) 477-3600
Comments:	Any development (see definition below) within the 100 year floodplain. Development is defined as: any man-made change to improved or unimproved real estate, including but not limited to building or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials located within the area of special flood hazard. Local governments participating in the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA) are required to review proposed development projects to determine if they are in identified floodplains as shown on the FEMA maps. If a project is located in a mapped 100-year floodplain (A or V zone), the local government must require that a permit be obtained prior to development (see definition below). Proposed projects are reviewed and conditions imposed on any permits issued to reduce the potential for damage from floodwater. Permits are required for any development (see definition below) in the floodplain. Permit processing time varies by jurisdiction and project complexity. Though a public hearing is not normally required, there are exceptions. State law requires that local entities have a local floodplain ordinance that meets or exceeds NFIP requirements. Ecology has approval authority over these ordinances. *http://www.spokanecounty.org/engineer/content.aspx?c=1487*

Permit Name:	**NPDES Aquatic Pesticides General Permit**
Agency:	Department of Ecology/ Department of Agriculture (State)
Legal Authority:	Unknown
Application:	Aquatic Noxious Weed Permit; Aquatic Mosquito Control Permit; Aquatic Plant and Algae Management Permit; and Irrigation System Aquatic Weed Control Permit
Permit Fee:	Unknown – Contact agency
Time Frame:	Permit time frame is determined by each local government.
Contact:	Department of Ecology 300 Desmond Drive PO Box 47600 Olympia, WA 98504-7600 Telephone: (360) 407-6000
Comments:	Department of Ecology issues 4 NPDES General Aquatic Pesticide Permits. **Aquatic Noxious Weed Permit to control** noxious and quarantine weeds list along lake and river shorelines, in rivers, wetlands, and estuaries. **Aquatic Mosquito Control Permit** for the control of mosquitoes and mosquito larvae by mosquito control districts and government entities. **Aquatic Plant and Algae Management Permit** to manage plants and algae in lakes and ponds. **Irrigation System Aquatic Weed Control Permit** to control weeds and algae in Washington State irrigation systems. The application for an individual permit, which is called NPDES Aquatic Pesticides General Permits., is online and can be downloaded at *http://www.ecy.wa.gov/programs/wq/pesticides/index.html* .

Permit Name:	**NPDES Construction Stormwater General Permit**
Agency:	Department of Ecology (State)
Legal Authority:	Chapter 173-201A WAC; Chapter 173-220 WAC; Chapter 173-224 WAC; Chapter 173-226 WAC; Chapter 90.48 RCW; and Federal Clean Water Act
Application:	Notice of Intent (NOI) application Form for Construction Stormwater General Permit
Permit Fee:	Permit fees for the Fiscal Year 2008 (7/1/07 to 6/30/08) range from $409 to $1,526 depending on the number of disturbed acres.
Time Frame:	Ecology will issue coverage under the general permit within 30 days of receiving a completed application or 31 days after the second public notice, whichever is later.
Contact:	Department of Ecology Water Quality Program 300 Desmond Drive PO Box 47600 Olympia, WA 98504-7600 Telephone: (360) 407-6400 Fax: (360) 407-6426
Comments:	Federal law under the National Pollutant Discharge Elimination System (NPDES) requires this permit. The permit requires construction site operators to install and maintain erosion and sediment control measures to prevent stormwater from washing soil, nutrients, chemicals and other harmful pollutants into local water bodies. Ecology requires any construction activity which disturbs one acre or more and which may result in a discharge of stormwater to surface waters of the state, which includes storm drains, ditches, wetlands, creeks, rivers, lakes and marine waters to obtain permit coverage. The applicant must prepare a Stormwater Pollution Prevention Plan (SWPPP) prior to starting construction, but you do not need to submit it with the application. *http://www.ecy.wa.gov/programs/wq/stormwater/construction/#Application*

Permit Name:	**NPDES General Permit Coverage**
Agency:	Department of Ecology (State)
Legal Authority:	Chapter 90.48 RCW; and Clean Water Act
Application:	General NPDES permit
Permit Fee:	Fees are variable and are set by regulation (Chapter 173-224 WAC).
Time Frame:	Unknown – Contact agency
Contact:	Department of Ecology Water Quality Program 300 Desmond Drive PO Box 47600 Olympia, WA 98504-7600 Telephone: (360) 407-6400 Fax: (360) 407-6426
Comments:	The discharge of pollutants into the state's surface waters is regulated through National Pollutant Discharge Elimination System (NPDES) permits. Ecology issues these permits under authority delegated by the U.S. Environmental Protection Agency (EPA). General permits are written to cover a category of dischargers instead of an individual facility. Application for coverage under a general permit is by submitting a "notice of intent" and is much less rigorous than applying for an individual permit. General permits may place limits on the quantity and concentration of pollutants allowed to be discharged and typically require operational conditions called Best Management Practices.

Permit Name:	**Water Right, New (Permit to Withdraw or Divert Surface or Ground Water)**
Agency:	Department of Ecology (State)
Legal Authority:	Chapter 90.03 RCW; and Chapter 90.44 RCW
Application:	Application for a Water Right
Permit Fee:	Variable
Time Frame:	Unknown – Contact agency
Contact:	Department of Ecology Water Resources Program 300 Desmond Drive PO Box 47600 Olympia, WA 98504-7600 Telephone: (360) 407-6600 Fax: (360) 407-7162
Comments:	Washington State law requires certain users of public waters to receive approval from the state prior to use of the water - in the form of a water right permit or certificate. Any use of surface of water (lakes, ponds, rivers, streams, or springs) requires a water-right permit or certificate. Likewise, ground-water withdrawals require a water-right permit or certificate, with the following exceptions: Stock watering Single or group domestic purposes using less than 5000 gallons per day Industrial purposes using less than 5000 gallons per day Watering a lawn or non-commercial garden that is not larger than one-half acre Fees vary depending on amount of water, $50 minimum. The fee to appropriate new water will be assessed at the rate of $1 per one hundredth cubic foot per second (cfs), and the fee for new water-storage projects will be $2 per acre-foot of storage. The maximum application fee to appropriate or store water is $25,000. The application for a permit can be downloaded at the following site: *http://www.ecy.wa.gov/biblio/ecy040114.html*