

# Chapter 3 - Affected Environment and Environmental Effects

## 3.1 Introduction

This chapter describes the environment potentially affected by the no action alternative, the action alternative, and the predicted impacts of the alternatives. These impacts are discussed under the following resource issues: water resources; Weber Basin Project operations; water rights; water quality; public safety, access, and transportation; recreation; visual resources; socioeconomics; cultural resources; paleontological resources; wetlands and vegetation; wildlife resources; and threatened, endangered and sensitive species. The present condition or characteristics of each resource is discussed first, followed by a discussion of the predicted impacts under the no action and action alternative. The environmental effects are summarized in Table 3.9 at the end of this chapter.

## 3.2 Affected Environment

### 3.2.1 Water Resources

East Canyon Reservoir is one of the features of the Weber Basin Project located in Northern Utah. As a multi-purpose storage reservoir, East Canyon provides irrigation, municipal and industrial water for DWCCC and the Weber Basin Project. The water is primarily delivered to areas on East Canyon Creek, the Weber River, and through the Gateway Canal to the Weber and Davis Canals and Aqueducts for lands and communities in Morgan, Weber, Summit, Box Elder and Davis Counties in the Great Salt Lake Valley.

Coordinated releases from Lost Creek, Rockport, A.V. Watkins, Causey, and Pineview Reservoirs from the Weber Basin Project, Smith and Morehouse Reservoir owned by the WBWCD, and Echo Reservoir from the Weber River Project, provide irrigation and domestic water to lands along the Upper Weber and Ogden River Valleys and eastern slopes and lower valley lands of Weber, Davis, Morgan, Summit and Box Elder Counties. Table 3.1 depicts the average annual water quantities for the Weber Basin Project.

East Canyon Reservoir is operated in conjunction with the seven other reservoirs listed above and in addition to the dams, there are seven project well sources that were drilled and equipped by Reclamation to be used by WBWCD as backup for municipal and industrial demand in the system. The maximum flow through the wells is 46.64 cfs (cubic feet per second) with an annual capacity of 33,761 acre-feet (see Table 3.2).

In full operation, the Weber Basin Project provides an average of 206,900 acre-feet of water annually for irrigation and municipal and industrial use in heavily populated and industrialized areas. This water is supplied from WBWCD system storage capacity of 385,126 acre-feet. Additionally, there is 33,761 acre-feet capacity available from the project wells that can be utilized to meet project demands.

**Table 3.1: Weber Basin Project Average Annual Water Quantities**

	<b>Active Capacity (Acre-feet)</b>	<b>WBWCD Capacity (Acre-feet)</b>	<b>April-July Inflow (Acre-feet)</b>
<b>Weber River Basin</b>	<b>408,720</b>	<b>312,028</b>	<b>371,600</b>
East Canyon	48,110	20,110	32,000
Echo	73,940	6,288	180,000
Lost Creek	20,010	20,010	17,200
Rockport	60,860	60,860	138,000
Smith & Morehouse	7,600	6,560	4,400
Willard Bay	198,200	198,200	off-stream dam
<b>Ogden River Basin</b>	<b>117,020</b>	<b>73,098</b>	<b>135,300</b>
Causey	6,870	6,870	2,300
Pineview	110,150	66,228	133,000
<b>Total</b>	<b>525,740</b>	<b>385,126</b>	<b>506,900</b>

**Table 3.2: Weber Basin Project Wells**

<b>Well Name</b>	<b>Capacity (cfs)</b>
Riverdale	6.64
S. Weber #1	10
S. Weber #2	10
Laytona	5
Clearfield #1	5
Clearfield #2	5
Bountiful 500 West	5
<b>Total</b>	<b>46.64</b>

### 3.2.2 Weber Basin Project Operations

East Canyon Reservoir is a multiple purpose storage unit of the Weber Basin Project. Filling and release procedures conform with the downstream water requirements, serving needs for irrigation, municipal, industrial, power, and flood control. Storage and distribution of project waters are regulated in accordance

with the Weber Basin Project Operating Criteria. Water exchange agreements have been executed between the DWCCC and the downstream direct flow users.

Releases are generally determined in the following manner:

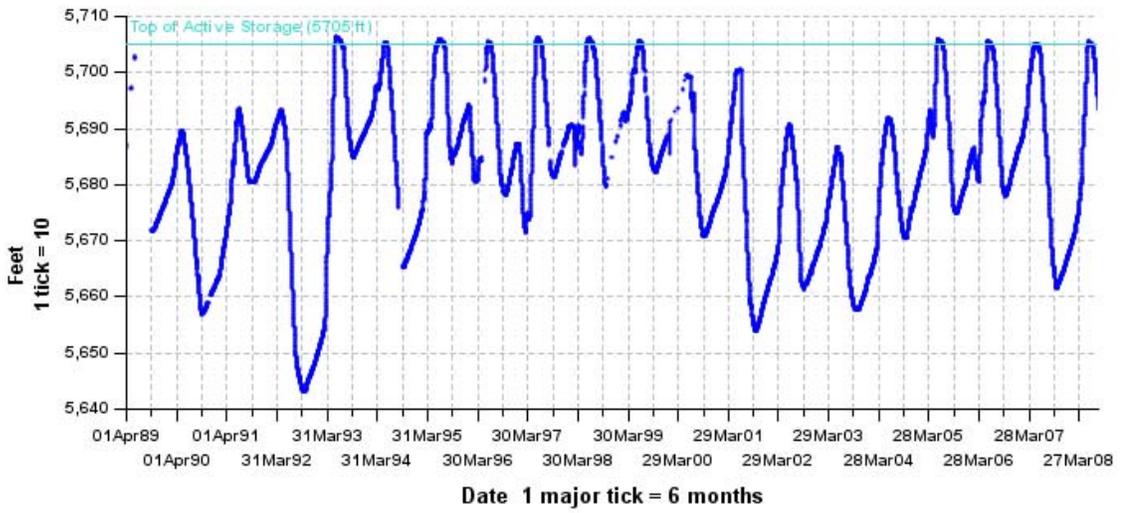
1. The DWCCC and the WBWCD provide authorization for water deliveries of their respective storage rights prior to the irrigation season, or whenever changes are required pursuant to their contract obligations.
2. The Weber River Water Commissioner, through his authorized Deputy Water Commissioner, takes delivery orders on a demand basis.
3. The Water Commissioner ascertains the maximum anticipated needs, including minimum fish and wildlife requirement, on a demand basis, and either personally makes or orders these releases to be made accordingly.

Most of the water is stored in East Canyon Reservoir from October to May. During this period, low releases are restricted to 5 cfs minimum flow. The remainder of the year, releases generally equal inflows plus storage releases. The reservoir stores water under the priority of the water rights (no time limits are associated with the water rights).

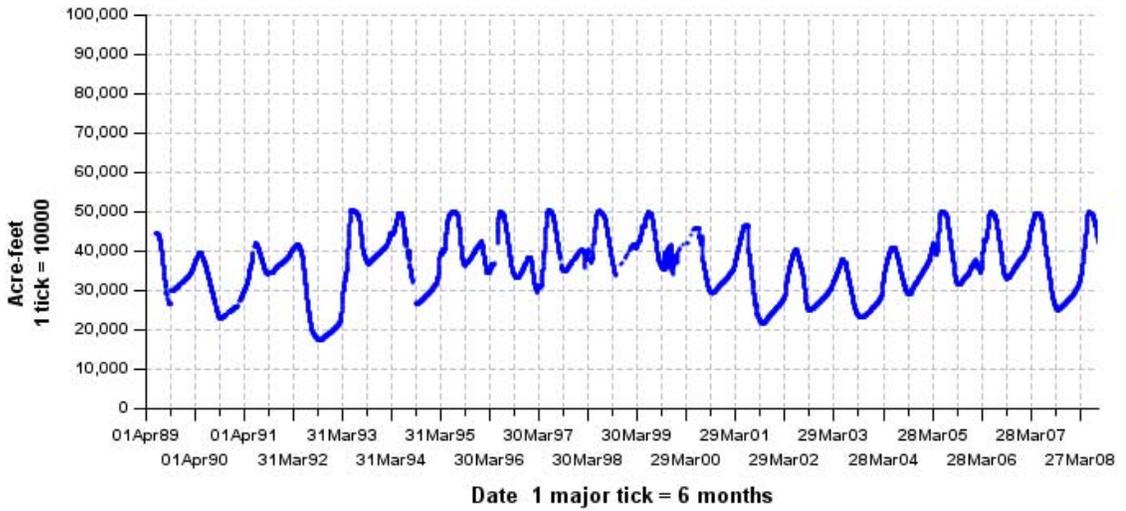
Forecasts of inflow to East Canyon Reservoir are made jointly by the National Weather Service and The Natural Resources Conservation Service. The forecasts are published as of the first of each month from January to June. The forecast numbers provide a basis for planning reservoir and project operations prior to and during the flood season and permit optimization and coordination of water supply and other reservoir functions.

Flood control regulations for East Canyon Reservoir have been developed by Reclamation and approved and issued by the USACE, as a comprehensive plan for flood control operations of the Weber Basin Reservoirs. The regulations provide that when water is stored within the flood control reservation of the reservoir, releases will be made as fast as possible without exceeding non-damaging capacities of the downstream channels. East Canyon Creek has a safe capacity of 200 cfs below the dam and 450 cfs at the mouth of East Canyon Creek.

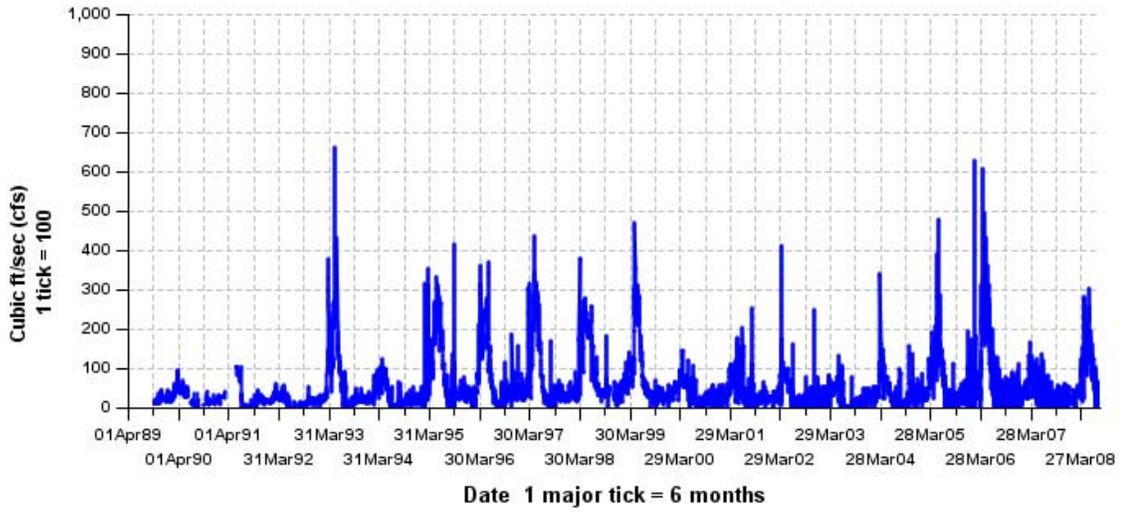
**Figure 3.1: East Canyon Reservoir Water Elevation**



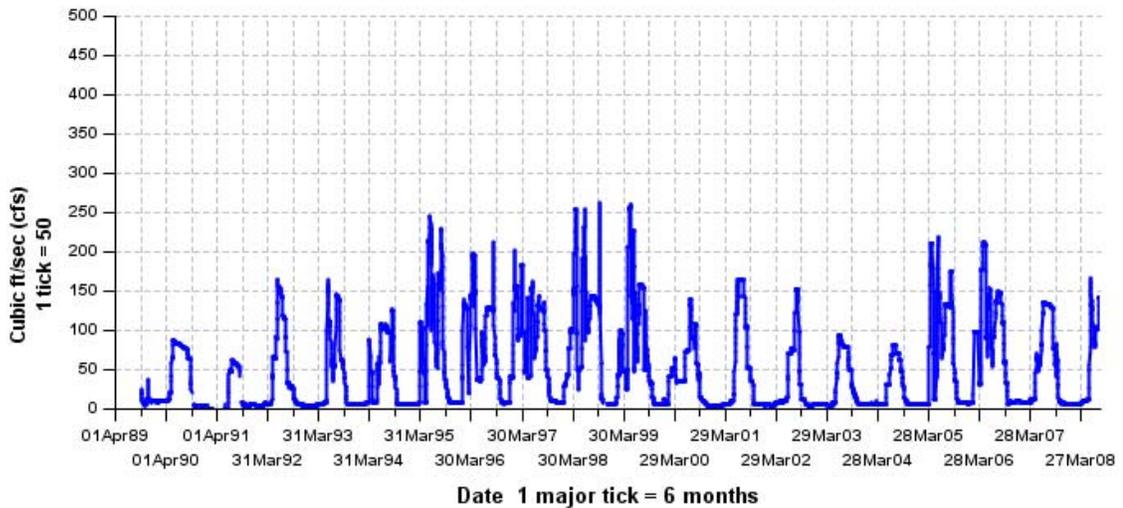
**Figure 3.2: East Canyon Reservoir Total Water Storage**



**Figure 3.3: East Canyon Reservoir Inflows**



**Figure 3.4: East Canyon Reservoir Releases**



Historically, East Canyon Reservoir fills about half of the years, and storage drawdown typically does not go below elevation 5660, which is 83 ft above the bottom of active storage at 5577. When the reservoir is filling (October through May) inflows are generally high and can exceed 400 cfs, but during drought years, inflows can fall below 5 cfs. When the reservoir is filling, dam releases are generally low to store water and can go down to 5 cfs when inflows are low. When the reservoir is releasing water for late season irrigation (June through

September), inflows are generally low and releases are generally high from 10 cfs to above 150 cfs.

East Canyon reservoir is unique in that it stores both private and Federal water. By contract DWCCC stores and uses the first 28,000 acre-feet of storage per year under their private water rights in East Canyon Reservoir. This private water is almost exclusively used for agricultural irrigation and secondary water systems within cities along the Wasatch Front. Reclamation can store and use up to 23,200 acre-feet of storage per year depending on Federal water right priority dates and hydrologic yield of the reservoir (see table 3.3). Federal water is used for authorized Weber Basin Project purposes such as municipal and industrial and agricultural irrigation and secondary water. Much of this water is exchanged to mitigate for impacts from new private wells both upstream and downstream of the reservoir within the Weber River drainage.

### **3.2.2.1 East Canyon Fish Flow Water**

In 1998, SWDC entered into an agreement with the Utah Division of Wildlife Resources (UDWR), to increase stream flows in East Canyon Creek and improve the fishery and natural steam environment of the creek above the reservoir. One of the significant provisions of the agreement was the voluntary dedication by SWDC of 2.0 cfs of pipeline capacity in the East Canyon Pipeline Project to UDWR, which allows UDWR to pump up to 2 cfs of water from East Canyon Reservoir to East Canyon Creek, in the Jeremy Ranch area of Summit County. Water from the dedicated capacity of the pipeline for non-consumptive flow of water would be released to East Canyon Creek near the SWDC East Canyon Water Treatment Plant to augment stream flows during periods of low flow and reduce water temperatures in the creek. Water used by UDWR for flow augmentation would be diverted for instream flow purposes and would be released at the discretion of UDWR. It is anticipated that flow augmentation would primarily occur during the late irrigation season when natural flows in East Canyon Creek are at their lowest.

Under another provision of the agreement, SWDC has also agreed to establish minimum instream flows above the reservoir at their water treatment plant point of diversion in East Canyon Creek under all of its water rights in the Snyderville Basin. Under the terms of the agreement, SWDC will not divert water from East Canyon Creek when flows in the creek are below 3.5 cfs, as measured at the East Canyon Water Treatment Plant. Following completion of the East Canyon Pipeline Project, the minimum instream flow limitation would be increased to 6.0 cfs, above the reservoir which is the minimum stream flow determined necessary to sustain a viable fishery in East Canyon Creek,

Because UDWR flow augmentation water would be pumped from the reservoir and released directly back into East Canyon Creek (which in turn flows directly back to East Canyon Reservoir), this water was not considered in the hydrology

for the East Canyon Pipeline Project but was considered in the water quality modeling.

### 3.2.3 Water Rights

Water is stored in East Canyon Reservoir under water rights held by Reclamation and by DWCCC. Table 3.3 below summarizes these water rights. Because East Canyon Reservoir was enlarged several times since it was originally built, these water rights span a wide range of priority dates. These rights are allowed to store water in the reservoir only when all downstream senior water rights are satisfied.

**Table 3.3: Summary of East Canyon Reservoir Storage Water Rights**

WR Number	Owner	Priority Date	Annual Diversion Limit (acre-feet)
35-8389 (Decree)	D&WCCC	1896	13,000
35-8400 (Decree)	D&WCCC	8/16/1912	15,000
35-830 (A27611)	Reclamation	10/08/1955	17,000
35-1213 (A32372)	Reclamation	9/29/1960	6,200
<b>Total</b>			<b>51,200</b>

During the non-irrigation season, East Canyon Reservoir is able to store the entire inflow, minus a 5 cfs minimum release for downstream fishery purposes in East Canyon Creek. During the irrigation season, the reservoir is able to store a significant portion of the peak spring runoff, minus 35-50 cfs needed to satisfy irrigation water rights along East Canyon Creek downstream of the dam.

Currently East Canyon Reservoir fills when runoff is at or above normal. During times of multiyear drought, the reservoir may not completely fill (Figure 3.1). The reservoir is operated in a manner to ensure sufficient water deliveries are made from the reservoir and to bring the water storage below 35,000 acre-feet in the fall to allow adequate room in the reservoir for the incoming spring inflows.

Water stored in East Canyon Reservoir is used by DWCCC shareholders and WBWCD water users, in conjunction with other water rights and storage reservoirs. Table 3.4 lists the water rights DWCCC holds for the direct diversion from the Weber River into the Davis and Weber Counties Canal. DWCCC is able to meet their full water demand under these water rights until mid-June during drought years and mid-July during wet years. DWCCC calls for their storage water when they can't meet their full demand with the direct flow rights. In addition to their 28,000 acre-feet in East Canyon Reservoir, DWCCC is entitled to 40 percent (or 29,600 acre-feet) of the storage in Echo Reservoir on the Weber River. DWCCC has the right and can use water from either reservoir to supplement their water needs. Historically, DWCCC water uses from these two reservoirs has generally followed the ratio of two-thirds Echo water to one-third East Canyon water.

**Table 3.4: Summary of DWCCC Direct Flow Water Rights**

WR Number	Priority Date	Annual Diversion Limit (cfs)
35-8044 (Decree)	1881	46.15
35-8048 (Decree)	1889	36.923
35-8058 (Decree)	1902	46.15
35-8068 (Decree)	10/06/1909	215.0

WBWCD uses its portion of the stored water in East Canyon Reservoir in conjunction with the stored water at six other Weber Basin Project and WBWCD reservoirs. Additionally, WBWCD can use high Weber River flows under Water Right No. 35-835, which allows up to an 825.0 cfs diversion at the Slaterville Diversion Dam and has a September 8, 1955 priority date.

WBWCD and DWCCC have under the current operation procedures how they individually meet their water demands and they may soon have additional flexibility to trade water between them. In 2006, DWCCC filed Change Application No. a31535 to allow their water rights to be diverted into Weber Basin Project facilities and used within the WBWCD service area. Likewise, at the same time, WBWCD and Reclamation filed Change Application No. a31534 to allow Weber Basin Project water rights to be diverted into the Davis and Weber Counties Canal. Although neither of these change applications have been approved, the Utah Division of Water Rights has advertised both of them and they were not protested. WBWCD currently has the necessary pumps installed to deliver water from the Slaterville Diversion Dam to the Davis and Weber Counties Canal. If these change applications become approved, WBWCD can exchange project water at the Slaterville Diversion Dam for water stored in East Canyon Reservoir under the DWCCC water rights.

East Canyon Reservoir water supply does not appear to be fully utilized at this time. DWCCC records show that during the past ten years a large portion of their rental shares have not been fully used. Reclamation estimates that in any given year there are a large number of shares in the DWCCC system not being fully used. Additionally, WBWCD has not sold all the water available under the Weber Basin Project. WBWCD has indicated that they may have at least 5,000 acre-feet of additional water they could sell out of East Canyon Reservoir. Given the population growth along the Wasatch front and in the Weber River Valleys, Reclamation anticipates that over the next 50 years WBWCD will sell all the water available under the Weber Basin Project and that DWCCC water will be nearly fully used.

### **3.2.4 Water Quality**

East Canyon Reservoir is classified and protected by the State of Utah for the following beneficial uses:

Class 1C - Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.

Class 2A - Protected for primary contact recreation such as swimming.

Class 2B - Protected for secondary contact recreation such as boating, wading, or similar uses.

Class 3A - Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.

Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.

The Weber River and tributaries, from Stoddard Diversion to headwaters, is classified for the following beneficial uses: Classes 1C, 2B, 3A, and 4. The Utah Division of Water Quality's "Utah 2006 Integrated Report Volume I:305(b) Assessment" dated June 15, 2006, states: "The major concern for the main stem of the Weber River is the possible impairment by total phosphorus. The periphyton community is changing to nutrient tolerant species which may cause a shift in the fisheries.<sup>1</sup> The Report also states regarding East Canyon Creek: "Total phosphorus is the major issue on this stream. The Utah Division of Water Quality (DWQ) required Snyderville Waste Water Treatment Plant to implement processing methods which would reduce the amount of phosphorus that was being discharged into the creek. A permit limit was set and monitoring is on going to determine if the limit will have a significant impact on the stream's aquatic vegetation, periphyton, and dissolved oxygen levels".

The Report also indicates that East Canyon Creek and tributaries from East Canyon Reservoir to the headwaters do not support their Beneficial Use Class 3A due to organic enrichment and low dissolved oxygen.

The DWQ is currently in the process of developing new or updated Total Maximum Daily Loads (TMDLs) for both the reservoir and the stream. The East Canyon Reservoir and East Canyon Creek TMDLs-Public Draft (East Canyon TMDLs, 2008) was made available in October 2008.

#### **3.2.4.1 East Canyon Reservoir**

The pollutants of concern for East Canyon Reservoir are low dissolved oxygen and excess total phosphorus. The defined targets/endpoints are expanded as follows (East Canyon TMDLs, 2008):

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<sup>1</sup> Utah 2006 Integrated Report Volume I:305(b) Assessment, Department of Environmental Quality, Division of Water Quality, Salt Lake City, Utah

### Trophic Status and Algae

In-reservoir mean seasonal chlorophyll a of 8 µg/L

Nuisance algal threshold of 30 µg/L not to be exceeded >10% of the season.

Algal dominance other than blue-green species

### Dissolved Oxygen (DO)

Mixed reservoir periods: 4.0 mg/L DO throughout at least 50% of the water column

Stratified reservoir periods: 2 meter layer throughout the reservoir in which

DO is maintained above 4 mg/ and temperature below 68°F

### Phosphorus

Mean total phosphorus concentration of 0.031 mg/L

Mean dissolved phosphorus concentration of 0.021 mg/L

In order to understand the targets of the East Canyon Reservoir TMDL it is important to understand certain reservoir processes and conditions described below such as thermal stratification, mixing periods, dissolved oxygen and phosphorus distribution, productivity, heavy metals, and discharges from the dam.

### **Thermal Stratification & Mixing**

Thermal stratification in the reservoir begins when surface waters of the reservoir are heated by the sun and warmer air, typically in April of each year.

Stratification is fully developed when there are three distinct thermal layers in the reservoir. The warm, upper layer is known as the epilimnion, the bottom colder layer is known as the hypolimnion, and the middle layer, known as the metalimnion, is a transition zone between the epilimnion and hypolimnion.

Figure 3.5 illustrates these layers in a temperature profile from East Canyon Reservoir. Full development of stratification in the reservoir typically occurs by July. Due to density differences between the stratified layers little wind-driven mixing occurs between the layers. Turnover begins as days become shorter and air temperatures begin to cool, typically in September at East Canyon. As the epilimnion cools it begins to mix with the metalimnion. Eventually there are no distinct thermal layers and the reservoir becomes completely mixed, usually in December. Winds are able to mix the reservoir through the entire water column during this period. During the winter, East Canyon stratifies as surface water cools to less than 39°F and then freezes. Wind-driven mixing does not occur after the reservoir has frozen over. After the spring thaw the reservoir is again completely mixed for a period before stratification begins anew.

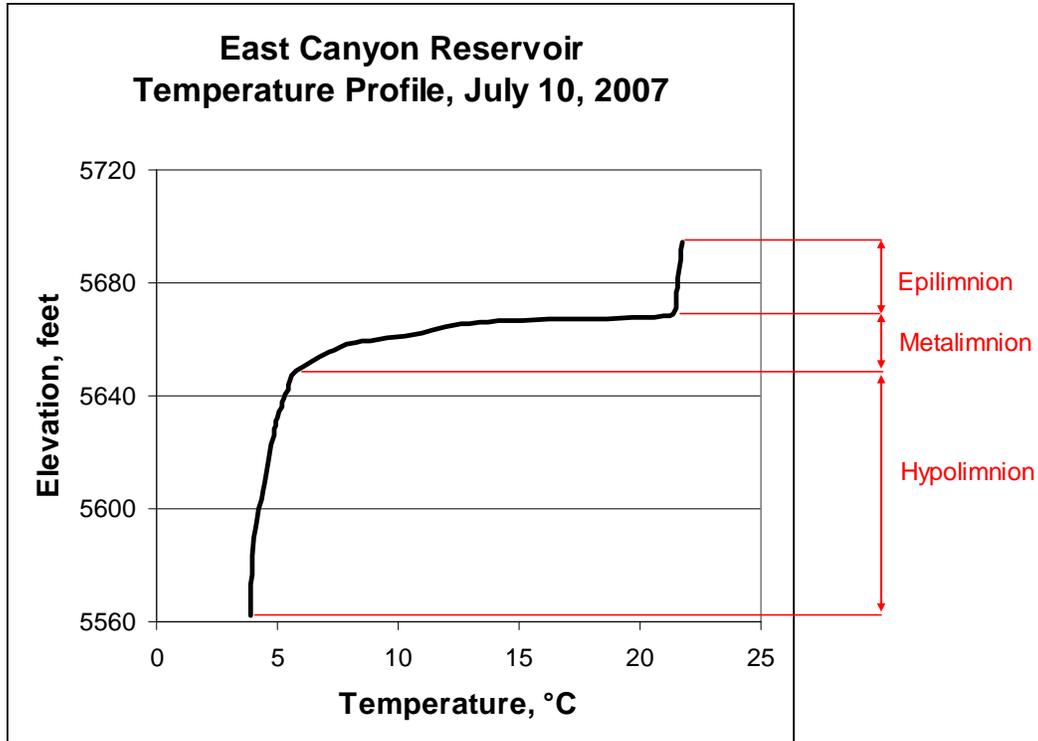


Figure 3.5: East Canyon Reservoir temperature profile illustrating thermal stratification.

### Dissolved Oxygen Distribution

The minimum dissolved oxygen concentration required for a cold water fishery is 4.0 mg/L. Concentrations below this limit occur routinely in East Canyon Reservoir (East Canyon TMDLs, 2008). The distribution of dissolved oxygen in East Canyon Reservoir typically changes along with thermal stratification, turnover, and complete mixing. Before stratification begins to develop and after turnover dissolved oxygen concentrations in the water column are typically above the 4 mg/L threshold. This is because the reservoir is re-aerated from top to bottom by wind-driven mixing. Once stratification develops, re-aeration of surface waters does not mix through the water column. The hypolimnion is not re-aerated and decay processes begin to deplete the dissolved oxygen until the entire hypolimnion becomes anoxic. The anoxic conditions typically begin in June and persist until turnover begins in September.

### Phosphorus

The State of Utah established total phosphorus criteria for lakes and reservoirs of 0.025 mg/L. Total phosphorus in East Canyon Reservoir exceeded the criteria in 52% of samples. Major sources of phosphorus loading to East Canyon Reservoir include discharge from East Canyon Water Reclamation Facility (ECWRF), forest and ski area management, runoff from agricultural lands, stormwater runoff, septic systems, natural background sources, and internal reservoir loading. In response to increased treatment at the ECWRF and nonpoint source pollution

control efforts phosphorus concentrations in East Canyon Reservoir have declined since 2001 (East Canyon TMDL, 2008).

### **Productivity**

Plankton growth, density, and distribution are important to the DO dynamics within the reservoir. They both produce and consume oxygen through photosynthesis, respiration, and decay. The anoxic conditions which develop in East Canyon Reservoir following stratification are largely due to the decay of dead algal cells. Phytoplankton are also an important part of the nutrient cycle, as they uptake phosphorus, nitrogen, and other nutrients before returning these nutrients to the water column through excretion or decay of dead algal cells.

### **Metals**

Results of samples from East Canyon Reservoir do not indicate any violation of water quality criteria for the elements arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, or silver. In particular, sample analyses for cadmium, mercury, selenium, and silver resulted in non-detection of the elements. Results for other elements were below limits established to protect water for domestic uses, for cold water aquatic life, and for agricultural uses (East Canyon TMDL, 2008).

### **Dam Discharge**

Water quality in East Canyon Reservoir and in East Canyon Creek below the dam is influenced by discharges from the dam. Water is discharged from East Canyon Dam through one of three features, a spillway, the outlet works, and a bypass. The spillway is an uncontrolled crest at elevation 5,705 feet. The outlet works withdraws water from an elevation of 5,535 feet. The bypass is at elevation 5,540.75 feet. The paths by which water flows before being discharged from the dam are unusual and complex due to existing submerged earthen and concrete dams located upstream of East Canyon Dam. Water discharged from East Canyon Dam must flow over the submerged earthen dam at an elevation of 5,573 feet and then either through a 5-foot diameter hole in the submerged concrete dam at elevation 5,567 feet or over its crest at 5,660 feet. Water discharged from the outlet works, therefore, is determined by reservoir elevations and by the flow paths over and through the submerged features.

#### **3.2.4.2 East Canyon Creek**

The pollutant of concern for East Canyon Creek is low dissolved oxygen associated with physical stream characteristics causing light and temperature pollution. The defined targets/endpoints are expanded as follows (East Canyon TMDLs, 2008):

1. Macrophyte biomass of 6.3 mg/cm<sup>2</sup> (Ash-free biomass)
2. Minimum dissolved oxygen no less than 4.0 mg/L

The factors contributing to impairment in East Canyon Creek are lack of shade and riparian vegetation along the creek, channel widening resulting in shallow reaches, and low stream velocity and flow during summer months.

### **Aquatic Vegetation**

Dense aquatic vegetation in East Canyon Creek in the form of macrophytes and periphyton causes large daily swings in dissolved oxygen concentrations and results in dissolved oxygen concentrations less than 4.0 mg/L (East Canyon TMDLs, 2008). The lack of shade along the creek, shallow creek depths, and low velocities and flows in the creek contribute to the growth of aquatic vegetation in East Canyon Creek.

### **Nutrients**

Among the conclusions of the TMDL's is phosphorus. Phosphorus is not the primary factor contributing to low dissolved oxygen in the creek and reducing phosphorus concentrations in the creek is unlikely to reduce aquatic vegetation (East Canyon TMDLs, 2008).

## **3.2.5 Public Safety, Access, and Transportation**

The towns and communities of Morgan and Summit Counties are located in high mountain valleys between the Uinta and Wasatch Mountains. In addition to Park City, area towns include Morgan, Henefer, Coalville, Wanship, and other small communities. Major Highways serving the county include I-80, I-84, SR-65, and SR-66. SR-65 extends northerly from I-80 past the proposed project construction site. SR-65 divides into SR-65 and SR-66 which extend northerly to I-84.

## **3.2.6 Recreation**

Recreational facilities at East Canyon State Park are managed by the Utah Division of Parks and Recreation under agreement with Reclamation. The managed season is all year with high use. The most preferred activities include boating, camping, fishing, and day use. The greatest numbers of fish caught are Rainbow Trout, Smallmouth Bass, and Brown Trout, respectively. Recreation facilities include at the more developed north end a boat ramp, boat storage area, day use, camping (including 4 yurt structures) rest rooms (wet and dry), sewage dump station and some facilities for the disabled. At the south end of the reservoir there is located two more smaller campgrounds.

Recreation use in 2006-07 totaled 109,446 and use in 2007-08 totaled 70,707. The majority of visitors come from the Wasatch Front.

## **3.2.7 Visual Resources**

Reclamation uses the Forest Service's Visual Management System (VMS) to analyze and classify the existing visual opportunities that may be experienced by East Canyon reservoir visitors.

Visual integrity is the naturalness or, conversely, the state of disturbance created by human activity or alteration. Visual integrity is developed by combining

Scenic Quality Ratings assigned to a given use area with the User's Sensitivity Rating. Possible visual levels include the following:

Very High Integrity

Generally management allows for ecological changes only.

High Integrity

Management allows for man-made facilities and disturbances which are not evident to the casual visitor.

Moderate Integrity

Management allows for man-made facilities and disturbance which would appear visually subordinate to the natural landscape and should blend with or complement it.

Low Integrity

Management allows for man-made facilities and disturbances which visually dominate the natural landscape when viewed from up to a five-mile distance. The result of the activity should, however, blend with or compliment the natural landscape.

Very Low Integrity

Management allows for man-made facilities and disturbances which visually dominate the natural landscape and may not blend with or compliment the natural landscape when viewed from up to a five-mile distance.

In the case of East Canyon Reservoir, the majority of management areas are identified as having a moderate Visual Integrity Level, which indicates that the long-range results of humankind's activities within the specific area should remain visually subordinate to the natural-appearing landscape and should borrow naturally established line, form, color, and texture. The remaining management areas are classified as having low integrity, meaning that the long-range results of humankind's activities may dominate the natural-appearing landscape but borrow naturally established line, form, color, and texture. Table 3.5 summarizes the resultant visual integrity levels for the management areas identified at East Canyon Reservoir.

**Table 3.5: Management Area Visual Integrity Rating**

<b>MANAGEMENT AREA INTEGRITY</b>	<b>RESULTANT VISUAL</b>
Primary Jurisdiction Area	Moderate
North & East Area – above Hwys. 65/66	Moderate
North Park Area	Low
North & East Area – below Hwys. 65/66	Moderate
Big Rock Area	Low
River Edge Area	Moderate
West Side	Moderate
West Beach Area	Moderate
Reservoir Inundation Area (Full Reservoir)	Moderate
Reservoir Inundation Area (Empty Reservoir)	Very Low
State Parks Property	Moderate

### **3.2.8 Socioeconomics**

As a water resource, East Canyon Reservoir has an active capacity of 48,110 acre-feet of project water for use by irrigators, municipalities, and other users in Morgan, Weber, and Davis County and other areas within the Weber Basin Project. As stated in the February 2006 Special Report, the population of the Park City/Snyderville Basin area is expected to grow from 23,859 to 86,327 by the year 2050. This represents a projected total future demand of approximately 30,600 acre-feet/year of water by the year 2050. The proposed action was one of two water supply options in the February 2006 Special Report, recommended for implementation to meet municipal and industrial needs in the immediate and near future.

East Canyon Reservoir serves as a significant source of recreation with the majority of visitors coming from the Wasatch front and from East Canyon Resort, located immediately upstream. Based upon visitation information, provided by the Utah Division of Parks and Recreation, and mean consumer surplus data for camping, fishing, and boating for State Parks in the Intermountain West taken from Kaval (2007), the annual benefit from recreation associated with East Canyon Reservoir over the past 5 years, was estimated to be approximately \$3.8 million per year.

### **3.2.9 Cultural Resources**

Cultural resources are defined as physical or other expressions of human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites as well as isolated artifacts or features, traditional cultural properties, Native American and other sacred places, and artifacts and documents of cultural and historic significance.

Section 106 of the National Historic Preservation Act of 1966 (NHPA), mandates that Reclamation take into account the potential effects of a proposed Federal undertaking on historic properties. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). Potential effects of the described alternatives on historic properties are the primary focus of this analysis.

### **3.2.9.1 Cultural History**

Planning of the Weber Basin Project began in 1942 and was discontinued during World War II. It was resumed in 1946 when it became apparent that the marked increase of population drawn to the area by military installations during the war became permanent. An acute demand for municipal and industrial and irrigation water precipitated Congressional authorization of the project in August 1949. East Canyon Dam and Reservoir was completed in 1966.

### **3.2.9.2 Cultural Resources Status**

According to the Section 106 regulations, 36 CFR Part 800 ("Protection of Historic Properties"), of the NHPA, the affected environment for cultural resources is identified as the APE (area of potential effects). The APE is the geographic area or areas within which a Federal undertaking may directly or indirectly cause alterations in the character or use of historic properties.

The APE defined in the action alternative analyzed for the proposed action, has been the subject of 100 percent pedestrian Class I and Class III cultural resource inventories by the Provo Area Office archaeologist in July, August, and September 2008, as well as May 2009. A total of 81 acres were inventoried. No historic properties were located. In compliance with 36 CFR 800.4(d)(1) and 36 CFR 800.11(d), a cultural resource inventory report and determination of no historic properties affected for the undertaking were submitted to the Utah State Historic Preservation Office (SHPO) for consultation and concurrence. In addition, copies of the report were also sent to tribes and additional consulting parties for consultation in compliance with 36 CFR 800.2.

### **3.2.10 Paleontological Resources**

A paleontological file search was conducted for the project area by the Utah Geological Survey (UGS). Martha Hayden, Paleontological Assistant with the UGS, was consulted regarding the potential for encountering previously documented and presently unknown, paleontological resources in the vicinity of the project area.

The UGS reply, dated September 3, 2008, on file at the Provo Area Office, Bureau of Reclamation, stated that the Quaternary and Recent alluvial deposits and the Tertiary Norwood Tuff that are exposed along this project right-of-way have a low potential for yielding significant fossil localities.

### **3.2.11 Wetlands and Vegetation**

#### **Riparian Habitat**

Riparian habitat exists along East Canyon Creek, both upstream and downstream of East Canyon Reservoir. This habitat varies from approximately 50 to over 100 feet in width and consists mostly of young willow (*Salix spp*), some Nebraska sedge (*Carex nebrascensis*) and in places an overstory of narrow leaf cottonwood. Smooth brome (*Bromus inermis*), timothy (*Phleum pratense*) as well as several other introduced and native grass species (mostly wheat grasses) exist in and above the riparian corridor. Canada thistle (*Cirsium arvense*) has invaded the area in small patches. The proposed construction would occur parallel to this creek upstream of the reservoir within the berm of the existing road.

#### **Upland Habitat**

Both nonnative and native species of vegetation are found within the project area. Upland habitat consist mainly of big sagebrush (*Artemisia tridentata*), rabbit brush (*Chrysothamnus spp.*), and snowberry (*Symphoricarpos oreophilus*) with an overstory of Gambel oak (*Quercus gambelii*). Other species present include yellow sweet clover (*Melilotus officinalis*), houndstongue (*Cynoglossum officinale*), broom snakeweed (*Gutierrezia sarothrae*), golden currant (*Ribes aureum*), wild rose (*Rosa woodsii*), basin wildrye (*Elymus cinereus*), Rocky Mountain aster (*Aster adscendens*), Indian paintbrush (*Castilleja angustifolia*), field wormwood (*Artemisia campestris*) and curlycup gumweed (*Grindelia squarrosa*). Crested wheatgrass (*Agropyron cristatum*) has been seeded in previously disturbed areas.

#### **Reservoir Habitat**

Wetlands occur in limited locations around the perimeter of East Canyon Reservoir where intermittent and perennial creek drainages convey fine-textured sediment to the reservoir. Jurisdictional waters include the area defined by the high waterline of the reservoir and streams feeding the reservoir.

Most of the reservoir's perimeter consists of sagebrush, rock, or bare ground. A few areas of cottonwood trees exist along the shoreline. East Canyon Creek has developed a delta of willow habitat as it enters the reservoir. These areas require periodic inundation that provide sufficient hydrology to support these habitats.

Exposed reservoir bottom (existing during seasonally low reservoir levels) consists of muddy and rocky substrates, depending on the topography of the exposed shoreline. Large expanses of muddy exposed reservoir bottom typically occur where perennial creek drainages deposit fine-textured sediment into the reservoir.

Lands immediately surrounding the reservoir are infested with weed species including: broadleaf dock (*Rumex obtusifolius*), houndstongue (*Cynoglossum officinale*), cheatgrass (*Bromus tectorum*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), common sunflower (*Helianthus annuus*), common

mallow (*Malva neglecta*), silversheath knotweed (*Polygonum argyrocoleon*), common cocklebur (*Xanthium strumarium*), lambsquarter (*Chenopodium album*), burdock (*Arctium minus*), black henbane (*Hyoscyamus niger*), Russian thistle (*Salsola tragus*), field bindweed (*Convolvulus arvensis*), woolly mullein (*Verbascum thapsu*), prickly lettuce (*Lactuca serriola*), white horehound (*Marrubium vulgare*), broadleaf plantain (*Plantago major*), prostrate vervain (*Verbena bracteata*), and salisfy (*Tragopogon dubius*).

### **3.2.12 Wildlife Resources**

Wildlife resources within the general area of the project include fish, big game, smaller mammals, raptors, water birds, and upland game birds, with a variety of other birds, reptiles, and amphibians.

#### **Fish**

East Canyon Creek was formerly a very productive cold-water fishery into the 1980s. However, important habitat parameters have been compromised including: lowered base flow level, increased water temperatures, decreased dissolved oxygen concentrations, and elevated phosphorous levels.

The fishery below East Canyon Reservoir consists mainly of brown trout (*Salmo trutta*) with lower numbers of mountain white fish (*Prosopium williamsoni*), rainbow trout (*Oncorhynchus mykiss*), and Bonneville cutthroat trout (*Oncorhynchus clarkii*). This reach is an important spawning tributary of the Weber River (UDWR 1998). A 5 cfs minimum release flow delivered to this reach from East Canyon Reservoir provides needed water during the critical months of fish egg incubation. Fall and winter flows are critical for successful spawning by brown trout.

East Canyon Creek above the reservoir has very few cutthroat trout. The rainbow trout population has also declined in the last few decades. A good population of brown trout is present in the reach. Kokanee (*Oncorhynchus nerka*) are no longer present.

The Kimball Creek fishery has been stocked with brown trout, but that will be discontinued and sterile tiger trout will be stocked in the future.

East Canyon Reservoir was the primary put-grow-take trout fishery in northern Utah from the late 1960's to the late 1980's (UDWR 1998). The reservoir also had a self-sustaining Kokanee population. Poor quality water and reduced inflow to the reservoir has reduced trout populations and eliminated the Kokanee population. Currently, catchable-size sterile rainbow trout and sub-catchable-size tiger trout are stocked by the UDWR in order to sustain a put-grow-and-take trout fishery. There are smallmouth bass and black crappie that were illegally stocked in the reservoir that are reproducing and contributing to the fishery.

Non-game fish, including Utah Sucker (*Catostomus ardens*), Utah chub (*Gila atraria*) and redbreast shiner (*Richardsonius balteatus*) reproduce in the reservoir and serve as forage fish for game species.

### **Big Game**

The foothills and mountains surrounding the reservoir are covered mostly with sagebrush, grassland, juniper, and Gambel oak (*Quercus gambelii*) communities. This area provides summer and winter habitat for deer (*Odocoileus hemionus*) and elk (*Cervus elaphus nelsoni*). Moose (*Alces alces*) are occasionally observed along stream drainages near the reservoir. Mountain lion (*Felis concolor*), black bear (*Ursus americanus*), and coyote (*Canis latrans*) are present in the area.

### **Other Mammals**

Other mammals common within the area include: yellow-bellied marmot (*Marmota flaviventris*), badger (*Taxidea taxus*), least chipmunk (*Eutamias minimus*), meadow vole (*Microtus montanus*), northern pocket gopher (*Thomomys talpoides*), deer mouse (*Peromyscus maniculatus*), porcupine (*Erethizon dorsatum*), and striped skunk (*Mephitis mephitis*). Furbearers such as beaver (*Castor canadensis*), mink (*Mustela vison*), and muskrat (*Ondatra zibethicus*), and ringtail cat (*Bassariscus astutus*) use the wetland and riparian habitat around the reservoir and embankments of creeks. Bobcat (*Lynx rufus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), Uinta ground squirrel (*Spermophilus armatus*), mountain cottontail (*Sylvilagus nuttallii*), and various species of shrews (*Sorex spp.*), voles (*Microtus spp.*), and bats (*e.g. Myotis spp., Eptesicus fuscus*) occupy the area.

### **Raptors**

Birds of prey (raptors) have been observed within or adjacent to the project area. Cottonwood trees along the river and the edge of the reservoir provide nesting habitat for raptors such as the golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), osprey (*Pandion haliaetus*), and roosting sites for the great horned owl (*Bubo virginianus*) bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*). Winter months are the best time to view bald eagles near the reservoir. Other raptors observed in the area are the American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), western screech owl (*Otus kennicottii*), great horned owl (*Bubo virginianus*), and turkey vulture (*Cathartes aura*).

### **Water Birds**

Numerous water birds occur in the project area such as waterfowl, shore birds, and other wading birds typically associated with wetlands and open water. The reservoir provides high quality habitat for water birds due to the prevalence of emergent wetlands near the mouth of small drainages around the reservoir. These areas provide important forage and cover sites for waterfowl and wading birds.

East Canyon Reservoir serves as a migratory stopover for birds in the fall and spring. Emergent vegetation around the reservoir provides nesting habitat for a

variety of waterfowl from mid-March to mid-July. Brood rearing begins mid-July to Mid-August. Mud flats exposed in late summer and fall provide foraging areas for shore and wading birds.

Water birds commonly observed include the pied-billed (*Podilymbus podiceps*), eared (*Podiceps caspicus*), and western grebes (*Aechmophorus occidentalis*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), cinnamon teal (*Anas cyanoptera*), northern shoveler (*Spatula clypeata*), lesser scaup (*Aythya affinis*), green-winged teal (*Anas carolinensis*), northern pintail (*Anas acuta*), common loon (*Gavia immer*), American white pelican (*Pelecanus erythrorhynchos*), double crested cormorant (*Phalacrocorax auritus*), American coot (*Fulica Americana*), ring billed gull (*Larus delawarensis*), California gull (*Larus californicus*), great blue heron (*Ardea herodias*), killdeer (*Charadrius vociferous*), and Canada goose (*Branta canadensis*).

### **Upland Game Birds**

Upland game birds occurring in the area include the ring-necked pheasant (*Phasianus colchicus*), mourning dove (*Zenaida macroura*), California quail (*Lophortyx californicus*), and sage-grouse (*Centrocercus urophasianus*).

### **Other Birds**

The most common birds found within the project area are songbirds. Western kingbirds (*Tyrannus verticalis*), yellow warbler (*Dendroica petechia*) and mountain bluebird (*Sialia currucoides*) are among the various species of songbirds that use the riparian and wetland habitat.

Corvids, including jays (*Cyanocitta spp.*), the black-billed magpie (*Pica pica*), and the common raven (*Corvus corax*), exist in the area. Tree swallow (*Tachycineta bicolor*), violet-green swallow (*Tachycineta thalassia*), northern rough-winged swallow (*Stelgidopteryx serripennis*), and cliff swallows (*Hirundo pyrrhonota*) all occur within the area. Of these, the most abundant are the cliff swallows. In open, shrub-dominated habitats goldfinch (*Carduelis tristis*), western meadowlark (*Sturnella neglecta*), common nighthawk (*Chordeiles minor*) sage thrasher (*Oreoscoptes montanus*), green-tailed towhee (*Pipilo chlorurus*), and rufous-sided towhee (*P. erythrophthalmus*) occur.

### **Reptiles and Amphibians**

Reptiles and amphibians with potential to occur in the project area include the tiger salamander (*Ambystoma tigrinum*), boreal chorus frog (*Pseudacris triseriata*), great plains toad (*Bufo cognatus*), northern leopard frog (*Rana pipiens*), Great Basin gopher snake (*Pituophis melanoleucus deserticola*), and the Great Basin rattlesnake (*Crotalus viridis*). Historically, boreal toad (*Bufo boreas*) and Columbia spotted frog (*Rana lutiventris*) occurred in the area but have not been documented within the project area recently.

### 3.2.13 Threatened, Endangered, and Sensitive Species

Federal agencies are required to ensure that any action federally authorized or funded, would not adversely affect a federally listed threatened or endangered species. Several species listed as threatened or endangered occur within Morgan County or within the East Canyon Creek Drainage. These species are discussed below.

The bald eagle (*Haliaeetus leucocephalus*) (Formerly Threatened) is a winter resident of the area and is currently a Utah State species of concern. This species is protected under the Bald Eagle Protection Act. Bald eagles roost primarily in forested canyons or tall cottonwoods along streams and reservoirs. Migration of bald eagles from breeding areas generally takes place between September and December. These eagles use cottonwood trees and snags near open water as winter roosting sites.

Canada Lynx (*Lynx canadensis*) (Threatened), although they have not been seen, could possibly use forested areas and wetlands within or near the project area. The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (Candidate) may use the area during their breeding season but has not been seen in the area.

The State of Utah maintains a list of species of special concern. These species that may occur within the project area and are managed under conservation agreements are the Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), Columbia spotted frog (*Rana luteiventris*), bluehead sucker (*Catostomus discobolus*), and northern goshawk (*Accipiter gentilis*). Other species of special concern that may occur within the area but are not managed under a conservation agreement are: bobolink (*Dolichonyx oryzivorus*), deseret mountainsnail (*Oreohelix peripherica*), ferruginous hawk (*Buteo regalis*), grasshopper sparrow (*Ammodramus savannarum*), greater sage-grouse (*Centrocercus urophasianus*), Lewis's woodpecker (*Melanerpes lewis*), lyrate mountainsnail (*Oreohelix haydeni*), sharp-tailed grouse (*Tympanuchus phasianellus*), western pearlshell (*Margaritifera falcate*), and boreal toad (*Bufo boreas*).

## 3.3 Environmental Effects of Alternatives

Assumptions applied in analyzing the effects of both the no action and the action alternative in this EA include the following: (a) analysis of the no action alternative assumes existing water rights would be fully used in the future to satisfy the increasing demand for water; and (b) normal dam operations within historic flexibility would continue during construction and after the project is completed.

### **3.3.1 Water Resources**

#### **3.3.1.1 No Action Alternative**

The no action alternative would have no effect on water resources, except for lower operating water levels (average 25 to 35 feet below historic levels) in East Canyon Reservoir resulting from satisfying increased future downstream demands.

Under the no action alternative, other water delivery options would likely occur to satisfy demands, but which of these other options might be implemented cannot be determined at this time.

#### **3.3.1.2 Action Alternative**

The up to 12,500 acre-feet of water to be diverted to Park City and Snyderville Basin represents 3 percent of WBWCD total project storage rights. There is a contract agreement in place between SWDC and DWCCC, that DWCCC will immediately supply 5,000 acre-feet per year, which represents 17.86 percent of DWCCC storage water rights in East Canyon Reservoir, to SWDC upon completion of their East Canyon Reservoir Water Supply System. The existing contact was renewed this year. SWDC plans to use this water supply first, with subsequent water coming from their shares, additional water from DWCCC, or contracting with WBWCD for the remaining demand. SWDC is working with both entities to develop agreements to meet their long term needs.

The SWDC has 6,787 acre-feet of DWCCC water and may need up to an additional 5,713 acre-feet from WBWCD. Due to the number of storage facilities and the flexibility of operations within the project to meet demand, annually redirecting 5,713 acre-feet to the basin above the East Canyon Reservoir would not generate significant shortages for WBWCD and its water users on a project wide basis.

Flows in East Canyon Creek above the reservoir would be augmented by the proposed action increasing return flows. Immediate downstream releases may be reduced during dry periods to 5 cfs for a longer time. Return flows will increase inflow to the reservoir so releases will not fall to 5 cfs as often as the no action alternative. Spring releases will be slightly lower than the no action alternative (Figures 3.6 and 3.7).

Reservoir elevations may periodically exceed the no action alternative elevations due to return flows (Figure 3.8). Figure 3.8a shows that the proposed action average reservoir elevation is slightly higher than the no action average reservoir elevation. There would be no significant difference between the no action and proposed action alternatives.

East Canyon Reservoir Downstream Releases Avg Years (1995-1999)

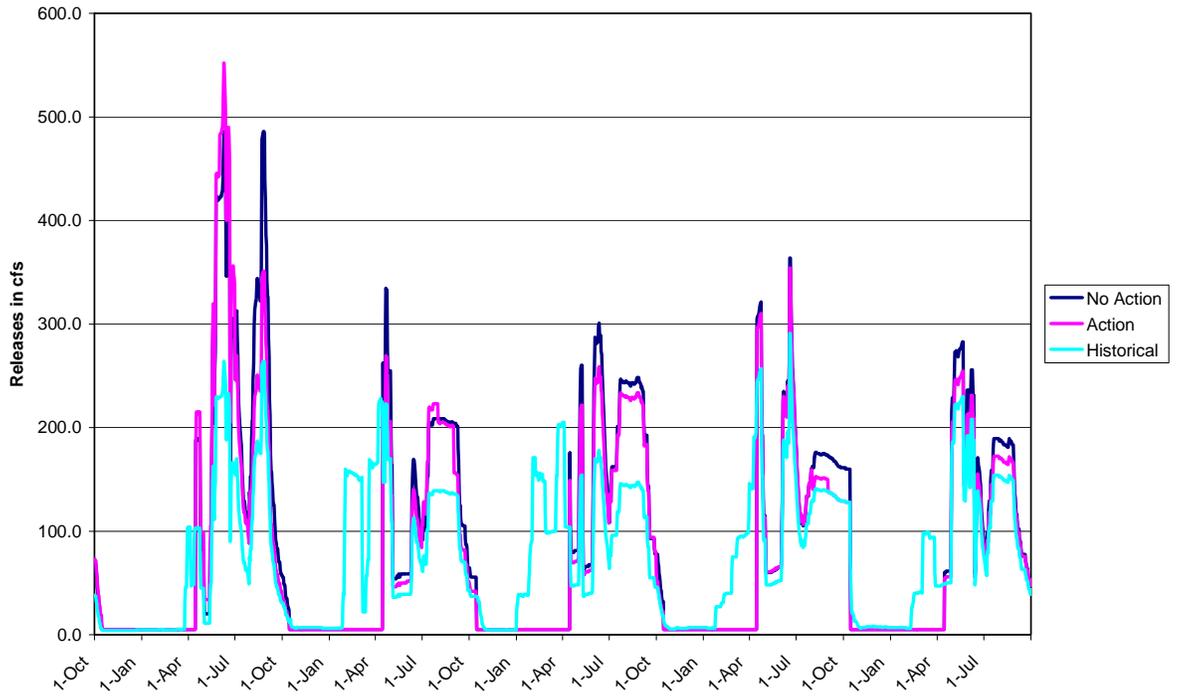


Figure 3.6

East Canyon Reservoir Downstream Releases Dry Years (1988-1992)

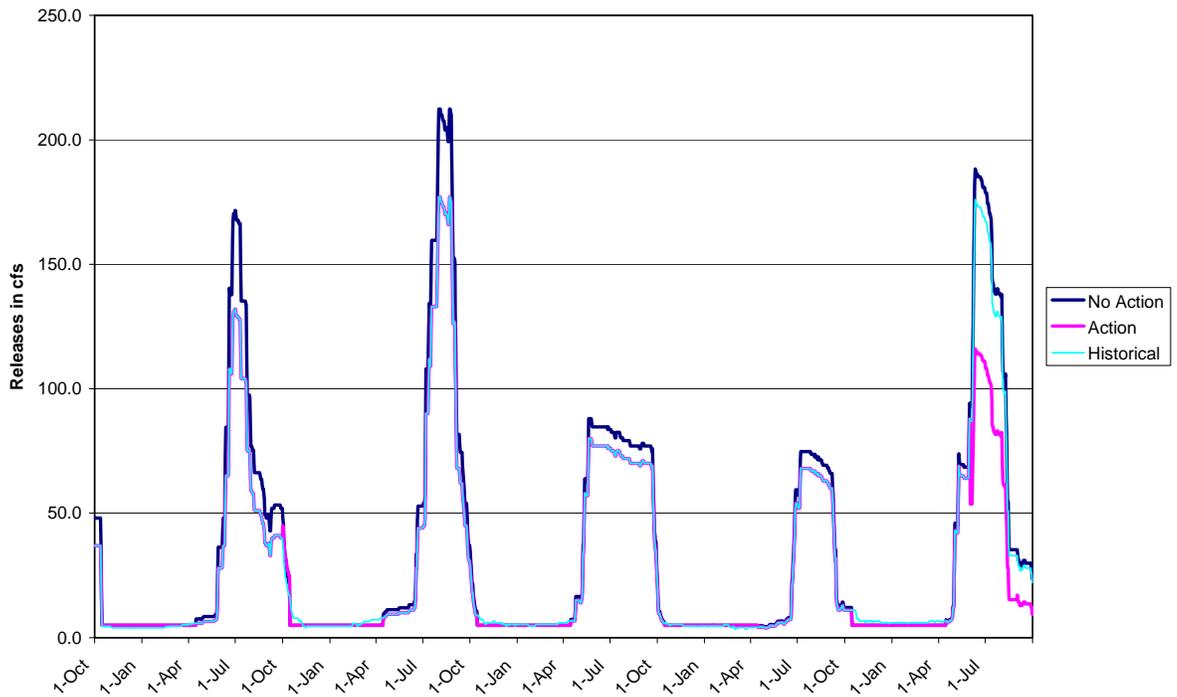


Figure 3.7

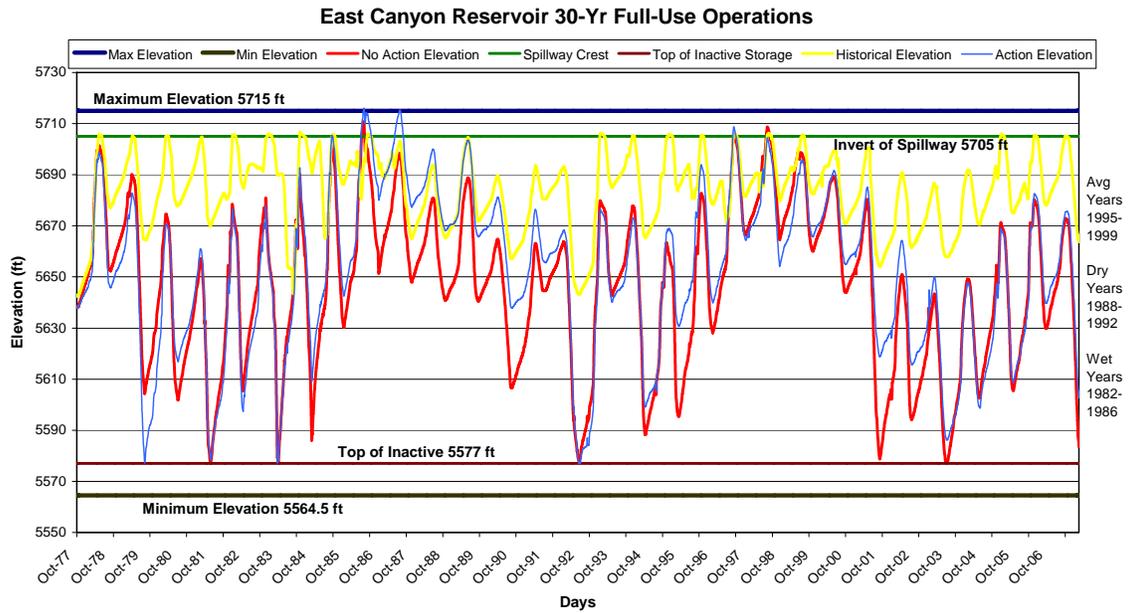


Figure 3.8

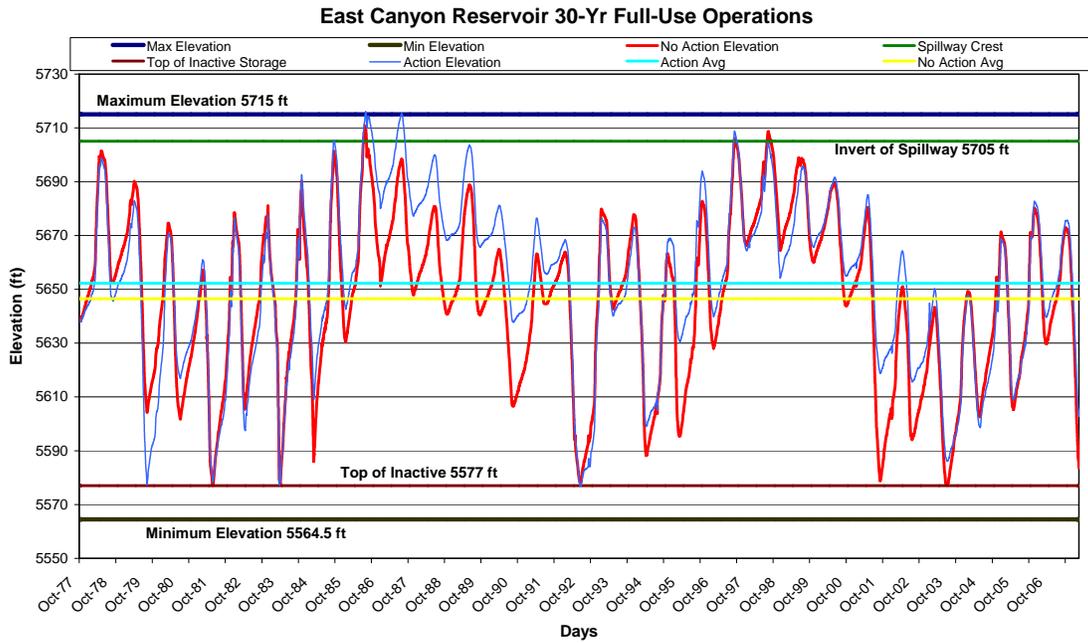


Figure 3.8a

### **3.3.2 Weber Basin Project Operations**

#### **3.3.2.1 No Action Alternative**

It is unknown what adjustments would be required as water use increases under the no action alternative. However, the no action alternative would probably not affect existing Weber River Project operations, because of the wide range of flexibility within current operations.

Under the no action alternative DWCCC private water would continue to be used for agricultural, irrigation and secondary water systems. It is likely that additional agriculture water would be converted into secondary water system and domestic water systems downstream of the reservoir to meet increasing demands. Under the no action alternative more of the Federal water would be used for municipal and industrial, secondary irrigation, and domestic use. The Federal water would be delivered directly to downstream users or by exchange to local ground water and surface sources.

Historically, East Canyon Reservoir fills about half of the years, and storage drawdown typically does not go far below elevation 5660, which is 83 ft above the bottom of active storage at 5577 (Figure 3.1). At full development of Weber Basin Project water, the reservoir would fill less often and storage drawdown may reach the bottom of active storage regularly during dry periods. Average reservoir levels would be much lower than historical (or present) levels (see Figure 3.8).

#### **3.3.2.2 Action Alternative**

The impact to Weber Basin Project operations of either alternative is the same as full development of Weber Basin Project water occurs. The total volume of up to 12,500 acre-feet (3 percent of Weber Basin Project water) that could be diverted annually would not significantly impact the current operations of East Canyon Dam.

Under the action alternate at least 5000 af of DWCCC private water would be delivered into the pipeline to the Snyderville Basin upstream of the reservoir. Downstream delivers of DWCCC water would be decreased by the same amount of water deliver upstream in the pipeline excluding return flows. It is likely a portion of the Federal water (up to 5000 af) would be delivered to the pipeline for use within the SWDC service area for municipal and industrial purposes and snow making. Downstream delivers of Federal water would be reduced by the amount equivalent to the amount being piped upstream excluding the return flows.

Under the action alternative, the reservoir would reach slightly higher levels and maintain a higher average than the no action alternative. Reservoir elevations would probably fluctuate more under the action alternative. Stream flows in East Canyon Creek above the reservoir would increase due to return flows of the pipeline water. Releases would increase in the non-storage season to match

inflows. Peak releases should increase in average years but the duration of lower flows would be longer so average release flow would be less under the action alternative.

### **3.3.3 Water Rights**

#### **3.3.3.1 No Action Alternative**

Under this alternative, the proposed project would not be constructed. Therefore, no effects would occur to the existing water rights. The East Canyon Reservoir water right would be more fully used in the future, as WBWCD contracts for all the water available in the Weber Basin Project and as DWCCC shares are committed to the growing municipalities.

#### **3.3.3.2 Action Alternative**

To date, SWDC has entered into a perpetual lease agreement, dated October 13, 1999, with DWCCC for 5,000 acre-feet per year. Change Application a21859 (35-10539), that has been approved by the State Engineer, is based on the decree water rights held by DWCCC and allows the leased water to be diverted from East Canyon Reservoir for use in the Snyderville basin area of Summit County.

In addition to the 5,000 acre-feet committed under the water lease contract, there is the potential for SWDC to acquire up to an additional 7,500 acre-feet of storage rights for the project by dedicating some or all of its DWCCC shares to the project, acquiring additional DWCCC shares, and/or entering into a contract with WBWCD.

Water rights supporting the diversion and use of water under the proposed action would be based on existing storage rights in East Canyon Reservoir. There would be no effect to downstream water right holders.

### **3.3.4 Water Quality**

Water quality impacts were evaluated using a two-dimensional hydrodynamic and water quality model, CE-QUAL-W2 of East Canyon Reservoir. This model is best-suited for long, narrow reservoirs such as East Canyon. A calibrated historic model of the reservoir was used to simulate both the no action and action alternatives. Simulating the no action alternative provides baseline conditions with which to compare results from the action alternative. Please refer to Appendix B for more information on the historic, no action, and action CE-QUAL-W2 models used in this analysis.

#### **3.3.4.1 No Action Alternative**

Since no construction would occur, there would be no temporary construction-related water quality impacts. However, as development occurs in the Weber River Basin, waters currently unused to meet existing water rights would no longer be stored in the East Canyon Reservoir, but could be used upstream or downstream from East Canyon Reservoir, resulting in future long-term water quality impacts in East Canyon Reservoir and downstream, with or without the

proposed action. No impacts to water quality in East Canyon Creek upstream of the reservoir are anticipated.

### **East Canyon Reservoir**

Results from reservoir water quality modeling of the no action alternative are generated by simulating the no action hydrology scenario from 1991-2007 in the CE-QUAL-W2 model. All other inputs used in the CE-QUAL-W2 no action alternative model are historic 1991-2007 values. These values do not reflect future conditions as it is not possible to anticipate climatic changes or other changes in the watershed which may impact water quality or other parameters. Rather, the results provide a baseline condition of water quality in East Canyon Reservoir for the no action alternative hydrology scenario.

#### Thermal Stratification and Mixing

When dam releases are controlled by the hole in the submerged concrete dam, water is withdrawn initially from the hypolimnion layer and then from the metalimnion or epilimnion layers as reservoir elevations decline. Model results indicate that these changes will result in a smaller volume of water in the hypolimnion and will also draw the metalimnion down. Water temperatures are warmer in the smaller hypolimnion. The stratification period will be reduced as the smaller reservoir enables turnover to occur earlier in the fall.

#### Dissolved Oxygen Distribution

In the no action alternative shorter durations of stratification will reduce the duration of anoxic conditions in the hypolimnion. Model results indicate that the frequency of meeting the TMDL target for temperature and dissolved oxygen in stratified periods is largely dependant on hydrology. The targets are least likely to be met during drought periods, a conclusion which was also reached in a separate modeling investigation (Miller, 2008). During mixed periods the smaller reservoir volume enables more mixing from the surface and dissolved oxygen near the bottom of the reservoir may be higher as a result.

#### Phosphorus

Phosphorus retention and distribution in East Canyon Reservoir may be affected by lower reservoir elevations in the no action alternative. Retention of phosphorus in the reservoir may be reduced when elevations are below 5,660 feet. Below this elevation, water is only withdrawn through the borehole in the submerged concrete dam and could increase export of high phosphorus water. The reduced duration of stratification and smaller hypolimnion volume also could reduce leaching of phosphorus from the bottom sediments.

#### Productivity

Effects to the productivity of phytoplankton in the no action alternative will be influenced by smaller reservoir volumes and changes in the distribution of nutrients. Smaller reservoir volumes will shift the productive zones further downstream though the location of phytoplankton in the reservoir is greatly

influence by the wind (East Canyon TMDL, 2008). Earlier turnover of the reservoir which mixes nutrients from the hypolimnion layer may result in earlier fall algal blooms, but the blooms could be smaller in size as a result of the smaller hypolimnion volume from which relatively higher nutrient concentrations are mixed.

### Metals

In the no action alternative effects on the distribution or concentration of metals in East Canyon Reservoir are expected to be minimal. The reduced duration of anoxic conditions in the reservoir will reduce the period when leaching of metals from bottom sediments can occur.

### Dam Discharge

Historically discharges from the dam are a mix of water withdrawn from over the crest and through the 5-foot hole of the submerged concrete dam. Reservoir elevations in the no action alternative will be lower than historic reservoir elevations (see Figure 3.8). The no action hydrology simulation results show that reservoir elevations drop below 5,660 feet in 28 out of 30 years. Below this elevation releases from the reservoir are controlled by the 5-foot diameter hole through the submerged concrete dam.

During periods of thermal stratification in the no action alternative when reservoir elevations are above 5,660 feet, discharges are a blend of warmer, lower nutrient water from the epilimnion or metalimnion, and colder, higher nutrient water from the hypolimnion. When reservoir elevations drop below 5,660 feet, discharges from the dam flow through the 5-foot diameter hole in the submerged concrete dam. When this initially occurs during thermal stratification, the releases from the dam will be colder and have higher nutrient concentrations. As reservoir elevations decline and more of the hypolimnion volume is exported, release temperatures increase and nutrient concentrations decrease until turnover begins in the fall. Release temperatures will be highest when reservoir elevations are near the inactive storage elevation. Dissolved oxygen concentrations in the dam discharge are expected to be near saturation because the discharge is open to the atmosphere and there is a freefall from the outlet to the stream bed.

### **East Canyon Creek**

In the no action alternative, effects to water quality in East Canyon Creek above the reservoir will not occur. Water quality in East Canyon Creek below the reservoir is dependant on water quality of dam releases, with most of the effects evident during the summer and fall. Under the no action alternative, temperature in East Canyon Creek will vary with reservoir elevation as previously explained. Temperatures could be colder during the summer if dam discharges withdraw water from only the hypolimnion of the reservoir. Temperatures could potentially reach or exceed 68°F in the creek if reservoir elevations declined to near the inactive storage pool before fall turnover begins to cool the reservoir. Reservoir elevations near that level most often occur during September and October when

fall turnover has begun and reservoir temperatures have cooled to below 68°F. Nutrient concentrations in the creek will be higher when discharges from the dam withdraw water from the hypolimnion of the reservoir.

#### **3.3.4.2 Action Alternative**

Implementation of the action alternative will require construction activities related to installation of pipeline and the intake structure in the East Canyon Reservoir basin. Potential water quality effects from construction include disturbance and mobilization of soils along the pipeline corridor and sediments in the submerged area surrounding the intake structure. Applicable State and/or County Best Management Practices (BMPs) would be implemented during construction to reduce the disturbance and mobilization of soils and sediments should be employed during construction. Following construction, the affected area should be restored to its prior condition as much as practical and monitored to assure recovery of the area. Disturbed sediments in the reservoir basin should be monitored in the water column with a turbidity meter prior to, during, and following construction of the intake. Operation of the intake should not begin until turbidity in the withdrawal zone of the intake has returned to pre-construction levels, with an increase of no more than 10 nephelometric turbidity units (NTU).

#### **East Canyon Reservoir**

Under expected operations of the action alternative, an intake structure will withdraw water from the hypolimnion of East Canyon Reservoir at an elevation of about 5,565 feet. The expected water quality of the withdrawal is estimated using samples collected by DWQ near the intake location and depth. Data for the samples are summarized in Table 3.6. Raw water will be treated at the SWDC East Canyon Water Treatment Plant for phosphorus removal and filtered before distribution. Water used for snowmaking will also be treated at the SWDC facility. Total phosphorus will be reduced to 0.1 mg/L after treatment (Campbell, personal communication, 2009). The instream fish flows of up to 2 cfs will not be treated at the SWDC East Canyon Water Treatment Plant but will flow through packed column degassing structures before discharged directly to East Canyon Creek (agreement between UDWR and SWDC, May 26, 1998). Phosphorus concentrations for these flows were assumed to be the same as in the reservoir. The majority of return flow to East Canyon Creek will be treated at the Snyderville Basin Water Reclamation District (SBWRD) East Canyon Water Reclamation Facility (ECWRF). Treatment and phosphorus removal at the ECWRF reduces total phosphorus concentrations from an influent concentration of approximately 6 mg/L to an effluent concentration of 0.1 mg/L or lower (SBWRD data 2002-2008). All return flows were assumed to have a phosphorus concentration of 0.1 mg/L based on treatment at the SWDC treatment facility and ECWRF. The instream fish flows of up to 2 cfs would not be treated at the SWDC East Canyon Water Treatment Plant but would flow through packed column degassing structures before discharge directly to East Canyon Creek (agreement between the UDWR and SWDC, May 26, 1998). Phosphorus concentrations for these flows were assumed to be the same as in the reservoir.

**Table 3.6: Summary of East Canyon Reservoir water quality samples at elevation 5,565 feet, +/- 30 feet, 2002-2007 (source – EPA STORET database)**

<b>Constituent</b>	<b>Mean</b>	<b>Minimum</b>	<b>Maximum</b>
Temperature, °C	5.1	3.6	6.7
Dissolved Oxygen, mg/L	1.4	0.0	4.7
pH	7.5	6.9	7.9
Specific Conductance, µS/com	929	828	1039
Total Phosphorus, mg/L	0.11	0.05	0.20
Dissolved Phosphorus, mg/L	0.09	0.03	0.18
Ammonia, mg/L	0.11	Non-detect	0.36
Nitrate/Nitrite, mg/L	0.25	Non-detect	0.43

Results from reservoir water quality modeling of the action alternative are generated by simulating the action hydrology scenario from 1991-2007 in the CE-QUAL-W2 model. Water quality of the return flows are based on treatment methods and permit limits. All other inputs used in the CE-QUAL-W2 action alternative model are historic 1991-2007 values. These values do not reflect future conditions as it is not possible to anticipate climatic changes or changes in the watershed which may impact water quality or other parameters.

Water quality effects resulting from implementation of the action alternative, are determined by comparing water quality modeling results of the action alternative model to baseline conditions which were determined from the result of the no action alternative model. The specific criteria used to determine whether the action resulted in a negative impact are the targets of the 2008 East Canyon Reservoir TMDL (see Section 3.2.4.1). The methods are further explained in Appendix B.

Results presented in this section are qualitative for the purpose of evaluating the impacts to water quality, if any, of the action alternative. The results are based on hydrologic scenarios, historical water quality in the reservoir and creek, and projected water quality of return flows and 2 cfs instream flows associated with the action alternative. These results are useful for comparing the water quality of the assumed no action alternative with the water quality of the action alternative. They do not project water quality in any future scenario, with or without the action alternative, as it is not possible to account for other possible changes to variables such as the climate, development in the watershed, etc.

#### Thermal Stratification and Mixing

Modeling results from the action alternative were compared to the no action alternative to determine effects on thermal stratification in the reservoir. Reservoir water surface elevations are typically higher in the action alternative than in the no action (see Figure 3.8a). When reservoir elevations are below 5,660 feet, which is the crest elevation of the submerged concrete dam, all releases from the dam are controlled by the borehole in the submerged concrete

dam which is located at an elevation of 5,567 feet. Withdrawals through the intake in the action alternative are made at an elevation of 5,565 feet, or two feet lower than the elevation of the borehole in the submerged concrete dam. Considering the frequency that reservoir elevations in the no action alternative are below 5,660 feet the withdrawals in the action alternative are similar. Comparisons of thermal stratification during periods when the reservoir water surface is drawn below elevation 5,660 feet, show that the action alternative often results in cooler temperatures throughout the water column due to the higher reservoir water surface elevations (see Figure 3.9).

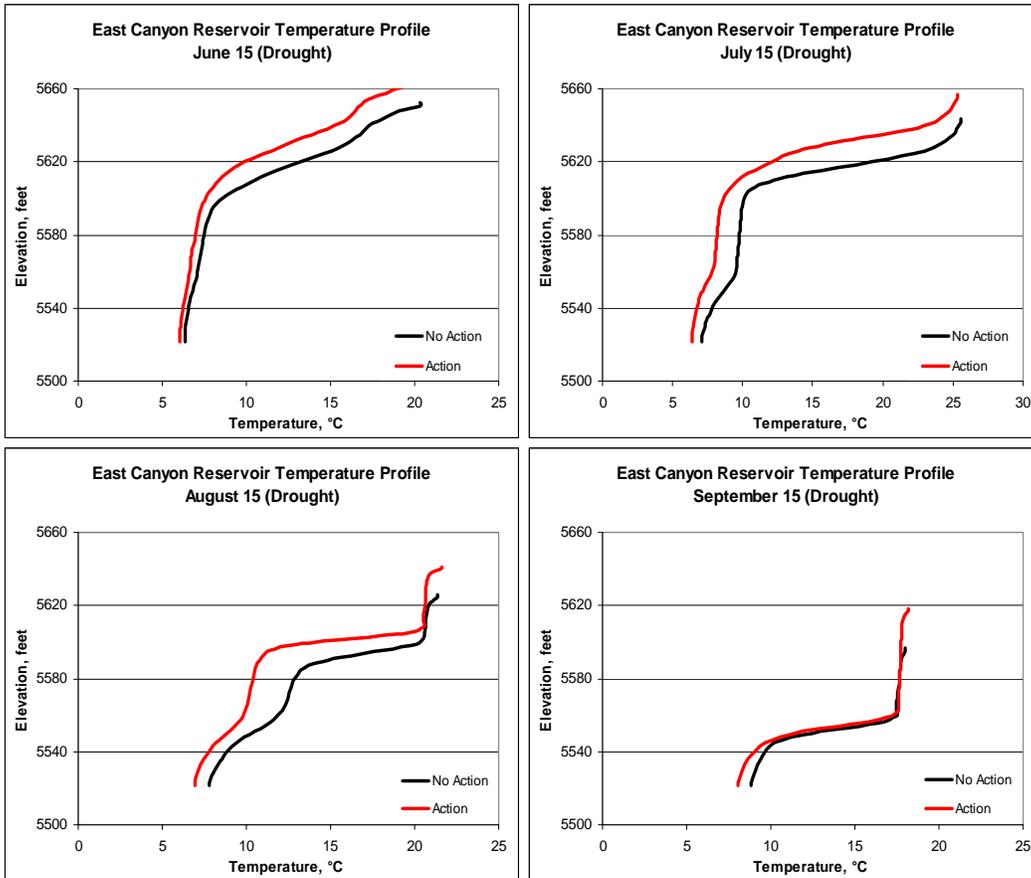


Figure 3.9: Comparison of thermal stratification in East Canyon Reservoir for the No Action and Action Alternatives during drought conditions.

At times the action alternative elevations are lower than or equal to, the no action alternative. These instances do not occur as frequently as the reverse scenario described in the previous paragraph. During these periods, water temperatures of the action alternative are higher in both the metalimnion and hypolimnion of the reservoir. Although water temperatures in the action alternative are higher during these instances, the dissolved oxygen concentrations in the action alternative are also higher throughout the water column (see Figure 3.10). The action alternative contains more water which meets the TMDL target for dissolved oxygen and temperature during stratified periods.

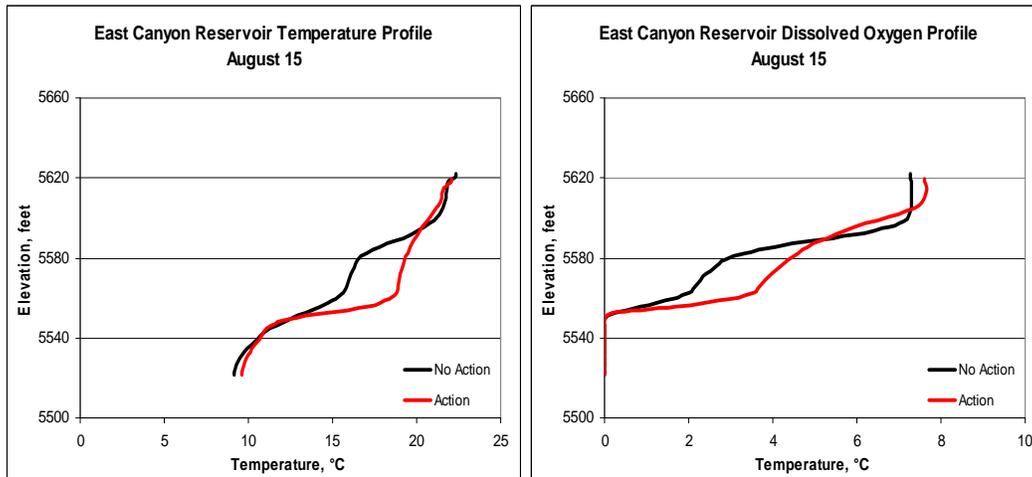


Figure 3.10: Comparison of thermal stratification and dissolved oxygen in East Canyon Reservoir, No Action and Action alternatives.

#### Dissolved Oxygen Distribution

Modeling results for dissolved oxygen content of the reservoir for the action alternative do not show significant effects when compared to the no action alternative. Table 3.7 shows the percent of profiles from each location and for each alternative which meet the TMDL target for dissolved oxygen for the mixing periods. A slightly higher percentage of mixed profiles in the action alternative meet the target than in the no action alternative. Table 3.8 shows the percent of profiles from each location and for each alternative which meet the TMDL target of dissolved oxygen and temperature for the stratified periods. A slightly lower percentage of stratified profiles in the action alternative meet the target than in the no action alternative, but further examination of the profiles shows there is an increase in the total volume of water in the action alternative which meets the TMDL targets for dissolved oxygen and temperature during stratified periods. This is due to the increased reservoir storage in the action alternative compared with the no action alternative (see Figure 3.8).

**Table 3.7: Percent of monthly profiles that meet the TMDL dissolved oxygen target for mixed periods (1991-2006)**

<i>Location</i>	<i>No Action</i>	<i>Action</i>
<b>Above Dam</b>	98%	99%
<b>Mid-Lake</b>	100%	100%
<b>Upper Lake</b>	94%	98%

**Table 3.8: Percent of monthly profiles that meet the TMDL dissolved oxygen and temperature target for stratified periods (1991-2006)**

<i>Location</i>	<i>No Action</i>	<i>Action</i>
<b>Above Dam</b>	94%	93%
<b>Mid-Lake</b>	92%	92%
<b>Upper Lake</b>	86%	84%

Phosphorus

Modeling results for dissolved phosphorus for the action alternative including the 2 cfs instream flow, show a decrease of 12% (an improvement) when compared to the no action alternative. Figure 3.11 displays the daily average dissolved phosphorus in the reservoir for the two alternatives. Based on the targets in the 2008 TMDL for phosphorus there are not any significant effects resulting from implementation of the action alternative.

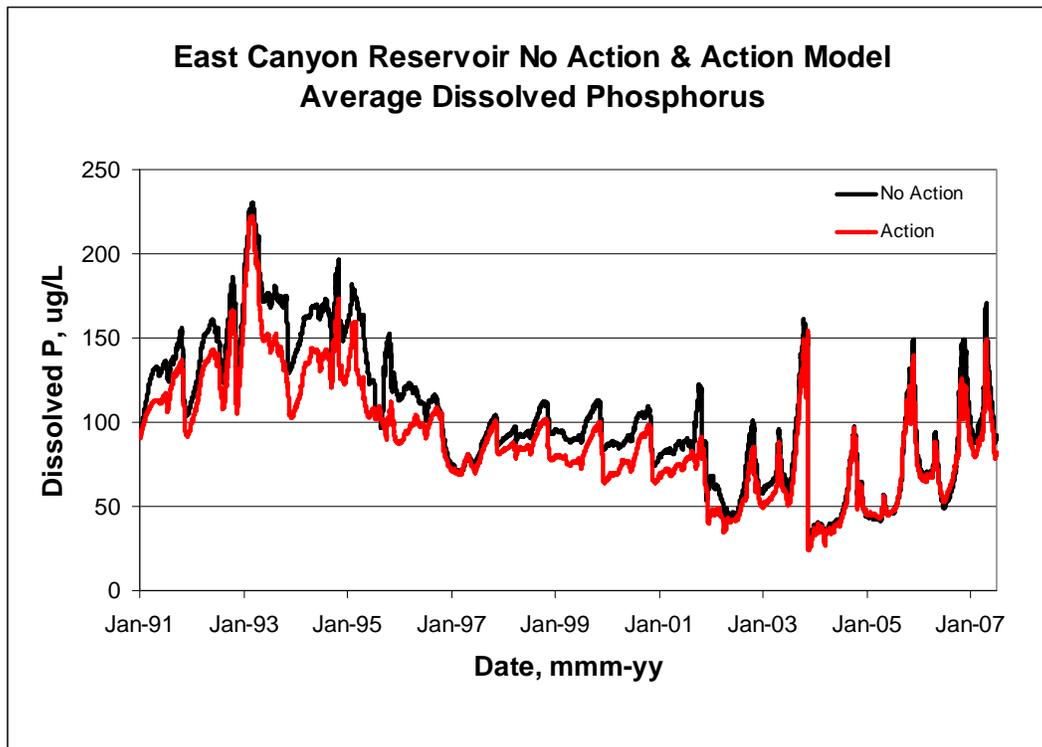


Figure 3.11: East Canyon Reservoir average dissolved phosphorus, no action and action alternatives.

The TMDL recommends efforts to reduce internal phosphorus loads should be focused in the late summer and early fall. The withdrawal of water from the hypolimnion of the reservoir through the intake in the action alternative will potentially minimize internal phosphorus loading in East Canyon Reservoir and was recommended as a possible method to improve water quality in the reservoir in the report on reservoir water quality modeling for the TMDL (Miller, 2008). A number of lakes and reservoirs employ a withdrawal of water from the

hypolimnion, as a restoration technique (Cooke et al., 2005). The benefits of this technique include increased export of nutrients and decreased periods of low dissolved oxygen levels. The water intake in the action alternative will export relatively nutrient rich waters from the bottom of the reservoir and reduce the low dissolved oxygen period by increasing the flushing rate in the hypolimnion. This will reduce internal phosphorus loading in East Canyon Reservoir in several possible ways. Withdrawals from the reservoir will be treated for phosphorus removal at the SWDC treatment facility before distribution for municipal and industrial uses, and return flows from the ECWRF will also be treated for phosphorus removal. This will result in a net reduction in phosphorus concentrations and loads. Phosphorus could also be reduced through shorter anoxic or low dissolved oxygen periods in the reservoir when phosphorus is leached from bottom sediments (East Canyon TMDL, 2008). Decreasing the duration of anoxic periods in the reservoir will decrease the amount of nutrients leached from the reservoir sediments. Additionally, the increased flushing rate of the hypolimnion will increase the response time of the reservoir to external load reductions from the TMDL implementation plan (East Canyon TMDL, 2008).

#### Productivity

Modeling results for phytoplankton for the action alternative show a decrease in both chlorophyll a concentrations and blue-green biomass from the no action alternative. Chlorophyll a concentrations decrease by 14 percent (an improvement) from the no action to the action alternative. Figure 3.12 displays the daily average chlorophyll concentrations in the reservoir for the two alternatives. Blue-green algae biomass decrease by 21 percent (an improvement) from the no action to the action alternative. Figure 3.13 displays the daily average blue-green algae biomass in the reservoir for the two alternatives.

#### Metals

The action alternative is not expected to affect the concentration or distribution of metals in the reservoir. Anoxic conditions in reservoirs can promote the release of metals from sediments (Cooke, 2008). With implementation of the action alternative, release of metals from reservoir sediments will be reduced due to the decreased duration of low dissolved oxygen levels in the reservoir hypolimnion.

The withdrawal of water through the intake will not cause resuspension of sediments on the reservoir bottom. The intake will be located a minimum of 15 feet above the reservoir bottom. The velocity of water passing through the screen will not exceed 0.5 feet per second (fps) and the velocities at a distance of 15 feet from the intake, assuming uniform flow will be approximately 0.02 fps during the maximum flow rate of 31 cfs (Appendix A – 29 cfs flow rate in July plus 2 cfs instream flow). Equations of sediment erosion were used to determine if scour will occur at a water velocity of 0.04 fps for non-cohesive sediments with a very fine clay particle size of 0.5  $\mu\text{m}$  and particle density of 1600  $\text{kg}/\text{m}^3$ , and for cohesive sediments with a bed bulk density 5 percent greater than the density of water. No erosion is anticipated to occur under those conditions.

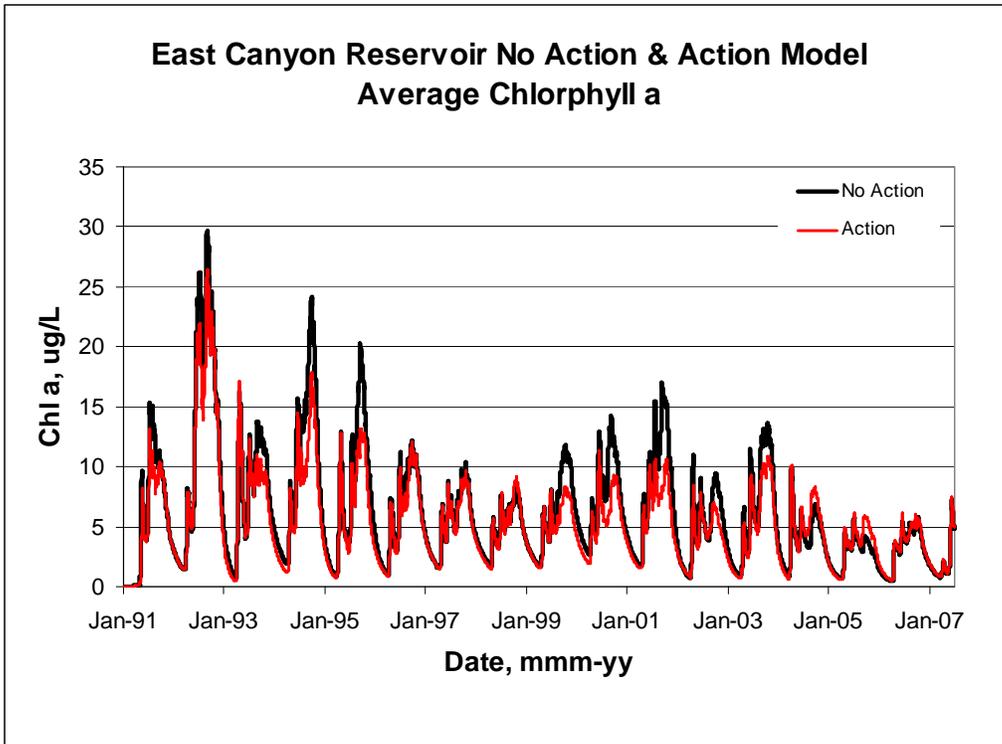


Figure 3.12: East Canyon Reservoir average chlorophyll a, No Action & Action Alternatives.

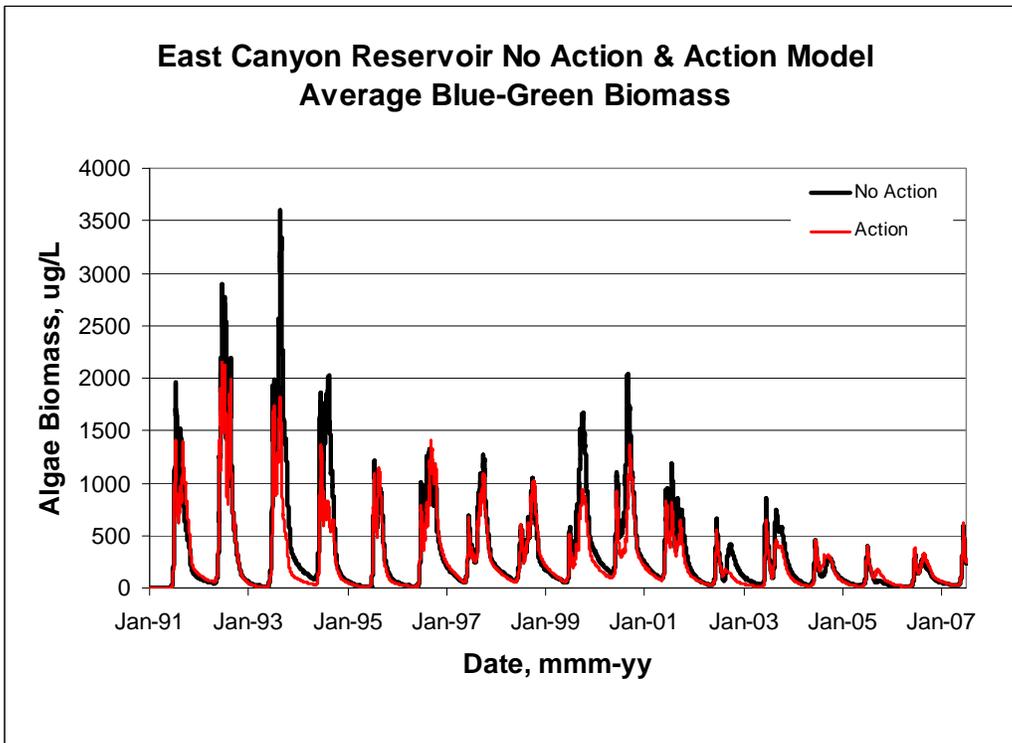


Figure 3.13: East Canyon Reservoir average blue-green algae biomass, No Action and Action Alternatives.

### Dam Discharge

Water quality effects from the action alternative on dam discharges were evaluated by comparing model results for the action and no action alternatives. Water quality in dam discharges for both alternatives was similar and differences between the water quality appears to occur when reservoir elevations in one of the alternatives drops below 5,660 feet. This occurs more frequently in the no action alternative. The water temperature of dam discharges in the action alternative is also less likely to be near 68°F based on higher average reservoir elevations.

### **East Canyon Creek**

Implementation of the action alternative will increase flow in East Canyon Creek from the ECWRF outfall to the reservoir. SWDC will also increase the instream minimum flow which determines when diversions to the water treatment facility are made as discussed in Section 3.2.2.1. These effects will contribute to improved conditions in East Canyon Creek by helping to achieve objectives of the TMDL for streamflow (East Canyon TMDL, 2008). Phosphorus concentrations in the return flow, even with treatment to reduce concentrations to 0.1 mg/L, could increase phosphorus concentrations in East Canyon Creek. Mitigation measures include reducing non-point source loading of phosphorus through informing and educating the community to maintain and improve water quality in the watershed.

The East Canyon TMDL recommends implementing flow augmentation immediately because it has the greatest potential for meeting TMDL targets immediately. The East Canyon Creek Implementation Plan in the TMDL, identified several options for flow augmentation, including pumping water from East Canyon Reservoir. Up to 2 cfs of instream flows provided as part of this project will be discharged to the creek downstream of the location recommended location, but will still provide flow augmentation through critical reaches as identified in the TMDL (East Canyon TMDL, 2008). This water will not be treated at the SWDC treatment facility but will flow through a packed column degassing structure before being discharged to the creek. The degassing structure will increase dissolved oxygen of the water to near saturation. Addition of 2 cfs to East Canyon Creek will increase phosphorus concentrations in the creek based on reservoir concentrations (Table 3.6). According to the TMDL, low dissolved oxygen in the creek and macrophytes are not controlled by water column nutrients. but increasing channel velocity and flow during critical summer periods will contribute to higher dissolved oxygen concentrations and other targets (East Canyon TMDL, 2008). Because there is uncertainty of the effect of higher phosphorus concentrations resulting from instream flows anytime, water pumped from East Canyon Reservoir is used for flow augmentation monitoring of dissolved oxygen and aquatic vegetation distribution in the creek from the discharge location to the ECWRF effluent point should be conducted at least initially.

Water quality in East Canyon Creek below the reservoir is determined by water quality in the reservoir. Comparing model results of the action and no action alternatives for water quality of reservoir does not indicate that the action alternative will have significantly different water quality. Additionally, reservoir elevations in the action alternative will be near the inactive storage pool elevation of 5,577 feet less frequently and there will be a lower possibility of water temperature in the creek reaching or exceeding 68°F.

### **3.3.5 Public Safety, Access, and Transportation**

#### **3.3.5.1 No Action Alternative**

This alternative would have no effect on access, transportation, or public safety.

#### **3.3.5.2 Action Alternative**

This alternative would require the transport of heavy equipment, pipe, and concrete, to construction sites and construction near roadways. Although the intake structure and some of the pipeline alignment are not along major roadways, some of the proposed pipeline and powerline alignments are along SR-65 and SR-66. For safety reasons, flagmen may be required as trucks enter and exit the construction sites, and for potential lane closures for construction near roadways. Traffic delays would occur creating an inconvenience and a safety concern.

This alternative would create minor public safety, access, and transportation impacts.

### **3.3.6 Recreation**

#### **3.3.6.1 No Action Alternative**

The no action alternative, due to the prospects of having water rights eventually fully used, could see the reservoir elevation at certain times of the year 25-35 feet lower than has generally been seen to date (Figure 3.8). This situation would affect recreation. Less surface area would make East Canyon Reservoir less attractive to visitors and could result in a decline in visitor use.

#### **3.3.6.2 Action Alternative**

Under the action alternative, it is anticipated that over half of the pumped-out water would find its way back to East Canyon Reservoir. This would affect elevation levels in the positive. Figure 3.8a shows the average reservoir elevation a little higher under the action alternative in comparison to the no action alternative. With water elevations slightly higher, recreation would be at about the same level when comparing the no action and action alternatives.

### **3.3.7 Visual Resources**

#### **3.3.7.1 No Action Alternative**

The no action alternative would remain in the Moderated Integrity Level on the West Side area of the reservoir where the project would be built. Management at Moderate Integrity Level allows for man-made facilities and disturbance which

would appear visually subordinate to the natural landscape and should blend with or complement it. Under this alternative, the visual integrity would probably not change even with the expected lower reservoir levels as water rights are used and more exposed shore line would occur in the future.

### **3.3.7.2 Action Alternative**

Construction impacts on the West Side of the reservoir related to burying the power and pipeline in the existing gravel road would, in themselves, be minimal. However, enlarging the road to two-lanes will mar the hillside and views to the west from Utah State Route 65. Over time the road cut and fills would improve as they revegetate. The pump house and parking area around the pump house would be designed to blend in to the existing area; however, these impacts would lower the Visual Integrity Level from Moderate to Low.

Long term impacts within the North Shore area, when done responsibly, would be absorbed in the existing Low Integrity Level which allows for man-made facilities and disturbances which visually dominate the natural landscape when viewed from up to a five-mile distance. The result of the activity should, however, blend with or compliment the natural landscape.

### **3.3.8 Socioeconomics**

The potential socioeconomic effects focus upon the changes in water supply, water quality, water use, and recreation.

#### **3.3.8.1 No Action Alternative**

This alternative would not significantly affect the existing socioeconomic conditions in the short-run; however, with available water supplies already behind the projected demand curve, the no action alternative would lessen the likelihood of meeting time constraints imposed by rapid growth in the Park City/Snyderville Basin area. Without sufficient water supply, future development may be limited, and in the broad sense, may indirectly affect conditions of the regional economy in the long-run.

Under the no action alternative as the water is fully utilized, reservoir levels would be much lower. It is likely that the economic activity stimulated by recreation, may be negatively impacted in the future when the water is fully used.

#### **3.3.8.2 Action Alternative**

The action alternative would temporarily increase the economic activity in the area due to construction activities. Without a further extensive economic study, the actual estimates are not available. With the increasing demand for the water downstream, it is expected that the water available will eventually be diminished and the economic activity will be impacted in the long term with or without the proposed action alternative. There is no significant difference between the action and no action alternatives.

### **3.3.9 Cultural Resources**

#### **3.3.9.1 No Action Alternative**

Under the no action alternative, there would be no effect to historic properties. SWDC would not construct the action alternative, and there would be no need for ground disturbance for any potential borrow or staging areas, spoils deposit areas, or new roads. The existing conditions would remain intact and would not be affected.

#### **3.3.9.2 Action Alternative**

For the APE included in the alternatives, a 100 percent cultural resource inventory has been completed by the Provo Area Office archaeologist. Although several cultural resources lie near the proposed project area, there were no historic or prehistoric archaeological sites located within the APE. Reclamation submitted a determination of no historic properties affected for the proposed project to the SHPO. Reclamation received concurrence on the determination of no historic properties affected in letters dated November 20, 2008 and July 1, 2009. Under the action alternative, there would be no effect to historic properties.

### **3.3.10 Paleontological Resources**

#### **3.3.10.1 No Action Alternative**

Under the no action alternative, there would be no effect to paleontological resources. SWDC would not construct the action alternative, and there would be no need for ground disturbance for any potential borrow or staging areas, spoils deposit areas, or new roads. The existing conditions would remain intact and would not be affected.

#### **3.3.10.2 Action Alternative**

A file search for the APE, as presently designed, of the action alternative by the UGS in Salt Lake City, was completed on September 3, 2008. The geological formations present in the proposed APE, have a low potential for yielding significant fossil localities. Unless fossils are discovered as a result of construction activities, the UGS determined that this project should have no impact on paleontological resources.

### **3.3.11 Wetlands and Vegetation**

#### **3.3.11.1 No Action Alternative**

Under this alternative, the proposed project would not be constructed. Over time, as the water rights are fully used to meet future demands, dam releases would be the minimum 5 cfs more often, and minor impacts would occur to riparian habitats below the dam.

### **3.3.11.2 Action Alternative**

#### **Riparian Habitat**

Under the proposed action alternative, the historic wide flexibility in the operation of East Canyon Dam would continue. Therefore, riparian and riverine habitats below the dam would have the same impacts as the no action alternative.

The proposed pipeline and powerline would be built within the berm of the existing road and very little disturbance would occur beyond the berm. The road crosses the East Canyon Creek and small perennial drainages several times over existing culverts. Approximately 0.04 acres of riparian habitat adjacent to the road would be temporarily disturbed.

All disturbed riparian habitats would be recontoured and reseeded with appropriate native vegetation during the final stages of construction activities. Over time, the disturbed riparian areas would revegetate and provide appropriate habitat again.

Since eventual recovery of all riparian habitats disturbed by this project is expected, no long term detrimental effects from the proposed project are expected.

#### **Upland Habitat**

The proposed intake structure, powerline, and pipeline construction would temporarily disturb 57.86 acres (57.9-0.04 riparian acres =57.86) and permanently displace 4.9 acres of upland habitat (Figure 2.4). Much of this habitat is presently degraded with a high concentration of weeds. All disturbed habitats would be recontoured and reseeded with appropriate native vegetation (including a component of forb species) during the final stages of construction activities. Over time most disturbed areas would revegetate and provide appropriate habitat again.

### **3.3.12 Wildlife Resources**

#### **3.3.12.1 No Action Alternative**

Under this alternative, the proposed project would not be constructed. Over time, as the water rights are fully used to meet future demands, dam releases would be the minimum 5 cfs more often and the reservoir elevation would experience large fluctuations with a lower average reservoir level (25 to 35 feet lower). Impacts could occur to wildlife resources using shoreline and downstream habitats.

#### **3.3.12.2 Action Alternative**

This alternative may temporarily disturb trout spawning beds in East Canyon Creek above the reservoir (limited in number due to prior habitat degradation), as a result of sediment released by construction activities. Best management practices (BMPs) would be employed to minimize the effects. These spawning beds should be restored naturally to their previous condition after spring runoff,

following construction activities. Flows within the creek above the reservoir should slightly increase over the no action alternative and remain at levels sufficient to support the current fishery. Fish populations within East Canyon Reservoir and East Canyon Creek below the reservoir would likely remain at the same levels as with the no action alternative.

Wildlife habitats would be temporarily disturbed during construction. Big game would be able to obtain water and any other needs provided by undisturbed riparian habitat in other nearby areas. Only a relatively small riparian area will be temporarily disturbed (0.04 acres). Big game may be temporarily displaced from small areas during actual construction activities, but would move back in a short period of time. Due to the relatively small extent of disturbance, big game would not be measurably affected and other mammals existing in riparian areas where construction occurs would be temporarily excluded from these areas.

Osprey use cottonwood trees in the area for roost, nest, and observation perches. Removal of these trees either living or dead should be avoided. It is not anticipated that any of these trees would need to be removed because most of the work is within existing roads. However, loss of a tree would only move these birds to other nearby trees and not reduce the overall capacity of the area to support the current population. Conversely, the construction of power poles in the project area could increase raptor populations above natural levels. Higher raptor populations could negatively impact sage-grouse populations. Therefore, power poles would be constructed with appropriate structures to discourage their use as raptor perches or nesting sites.

Construction activities could temporarily disturb other bird species from preferred breeding, nesting, or foraging habitat. These effects would be limited to a relatively small area, and birds would be capable of moving to very similar habitat nearby. This would also be true for any sage-grouse that may use the area.

Construction associated with this alternative could disturb reptiles and amphibians from preferred habitat. These effects would be limited to a relatively small area (0.04 acres) and these disturbed areas would return to suitable habitat after they are revegetated.

Noise from the pump station would be well insulated and exist as a minor disturbance to people, but could be audible to wildlife for the life of the project. Wildlife would eventually become accustomed to the noise and likely use most of the area as they did prior to the installation of the station. Noise from periodic maintenance of the proposed facilities would have short term impacts on resident wildlife populations to a lesser degree than the initial construction disturbance.

After construction, disturbed areas would be contoured and vegetated with native plants. A process of vegetative succession would then begin. This process would eventually establish a vegetative community favorable to native species and

provide appropriate wildlife habitat once again. Effects to wildlife would be temporary.

Entrainment of reservoir fish through the water intake structure is a concern. Presently the low oxygen levels on the reservoir bottom likely deter the presence of fish. However, as the project is implemented it is possible the oxygen levels could improve and increase the chance of fish occurring on the bottom of the reservoir. The withdrawal of water through the intake should be designed such that flow velocities are low and fish are not entrained.

### **3.3.13 Threatened, Endangered, and Sensitive Species**

#### **3.3.13.1 No Action Alternative**

Under this alternative, the proposed project would not be constructed. Over time as the water rights are fully used to meet future demands, dam releases would be the minimum 5 cfs more often and the reservoir elevation would experience more fluctuations with a lower average elevation than present. No effects are expected to occur to any threatened, endangered, candidate, or state sensitive species.

#### **3.3.13.2 Action Alternative**

Bald eagles are winter residents of this area and may be displaced by construction activities (noise and habitat disturbance). Cottonwood trees and dead snags would be avoided during construction. However, loss of one or several trees may occur, this could displace eagles. These effects would be short term or very limited in extent and would have no significant negative effects since these birds would be able to use abundant similar roost sites or other habitat elements in the immediate vicinity of the project. All winter construction activities occurring within ½ mile of any bald eagle roost site would be restricted to hours between 9:00 a.m. and 4:00 p.m., from November 1<sup>st</sup> to March 31<sup>st</sup> and into April, if necessary, until all bald eagles have left the area.

Canada lynx may have occurred in the general area in the past, but have not been seen in the area for many years; therefore, no effects would occur to them.

The Western yellow-billed cuckoo has not been observed within the area affected by this alternative. However, a few individuals may migrate through the area, or even possibly use the area for some segment of their life cycle. The extent of disturbance associated by this project would leave a large area of suitable habitat unaffected, allowing any possible use by these birds to occur in these adjacent areas.

Fish species managed under conservation agreements (i.e., bluehead sucker, Bonneville cutthroat trout, Columbia spotted frog, Northern goshawk) may temporarily be disturbed within areas where construction activities affect riparian or riverine habitats. These species would likely move to areas unaffected by the proposed project, either upstream or downstream of the reservoir. Sedimentation

of the river below constriction areas would disturb spawning and feeding beds temporarily until flushing flows restore these habitats.

Spotted frogs have not been found in the area. Any other frogs that are present would be displaced by construction activities in riparian and wetland habitats until these areas recover.

Northern goshawk may use habitats within the area of disturbance. The extent of disturbance associated by this project would leave large areas of suitable habitat unaffected, allowing any possible use by these birds to occur in these adjacent areas. Therefore, affects to them would be negligible.

Greater sage-grouse are present within the project area. The proposed construction of an above ground powerline would likely increase the available perching sites for raptors which prey on these birds. All power poles should be constructed with raptor perch-deterrent devices. Sage-grouse accomplish breeding and brood rearing activities from March through June. The nearest known lek (sage-grouse breeding area) is 4 miles from the project area and would be unaffected by construction or operation.

A 'No Effect' determination is made for all species listed under the Endangered Species Act.

### **3.4 Summary of Environmental Effects**

Table 3.9 describes environmental effects under the no action alternative and the action alternative.

**Table 3.9: Summary of Environmental Effects**

<b>Resource Issue</b>	<b>Alternatives</b>	
	<b>No Action Alternative</b>	<b>Action Alternative</b>
Water Resources	With future full water-right use and no augmented inflow, reservoir elevation is expected to decline.	With future full water-right use and expected return flow of 60-80%, reservoir levels are expected to be higher than the no action alternative. Flow in East Canyon Creek above the reservoir would be augmented by the proposed action. Downstream of East Canyon Dam releases are expected to decrease but will maintain required minimum fish flow.
Weber Basin Project Operations	No effect	The effect to Weber Basin Project operations of either alternative is the same. The total volume of up to 12,500 acre-feet that would be diverted annually would not significantly impact the operations of East Canyon Dam. No effect to downstream water right holders.
Water Rights Water Quality	No effect As water rights are fully utilized there are potential effects from future use of this same project water when used elsewhere.	Minimal temporary effects during construction. Water quality is expected to slightly improve when compared to the no action alternative.
Public Safety, Access, and Transportation Recreation	No effect  As average reservoir elevation declines impacts could occur to recreation	Minor traffic delays are expected during construction activities. Minimal effects are expected during construction activities. Long term effects are expected to be similar to the no action alternative.
Visual Resources	The reservoir level will fluctuate more frequently as the water rights are fully used. Minor visual impacts are expected.	There is potential for visual resources impacts as the West Side road is enlarged with cuts and fills. These will heal over time. However, the visual integrity is expected to decrease from Moderate to Low on the West Side of the reservoir. Mitigative actions will be taken to ensure the structures blend in with the existing environment.
Socioeconomics	Potential effects continue to exist in the long term because available water supplies are already behind the projected demand.	Minimal temporary impacts to socioeconomics are expected in the short term. No effect on socioeconomics beyond those described for the no action alternative.
Cultural Resources	No effect	Potential effect to subsurface cultural material during construction.
Paleontological Resources Wetlands and Vegetation	No effect Minimal effects	No effect to paleontological resources is expected. Minimal and temporary effects during construction. Long term impacts will be minor and mitigated. Similar long term effects as the no action alternative due to lower reservoir elevations.
Wildlife Resources	Minimal effects	Minimal and temporary effects during construction. Same long term effects as the no action alternative.
Threatened and Endangered Species	No effect	No effect.

### **3.5 Cumulative Effects**

In addition to project-specific impacts, Reclamation analyzed the potential for significant cumulative effects to resources affected by the proposed action and by other past, present, and reasonably foreseeable activities in the watershed including the no action alternative. According to the Council on Environmental Quality's regulations for implementing NEPA (50 CFR §1508.7), a “cumulative impact” is an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. It focuses on whether the proposed action, considered together with any known or reasonable foreseeable actions by Reclamation, other Federal or state agencies, or some other entity combined to cause an effect. There is no defined area for potential cumulative effects.

The no action alternative was analyzed under the assumption that full utilization of Weber Basin Project water rights would be utilized in the future. Based on Reclamation resource specialists' review of the proposed action alternative, Reclamation has determined that this proposed action alternative would not have a significant adverse cumulative affect on any resources.

### **3.5 Indian Trust Assets**

Indian Trust Assets are legal interests in property, held in trust by the United States for Federally recognized Indian tribes or Indian individuals. Assets can be real property, physical assets, or intangible property rights, such as lands, minerals, hunting and fishing rights, and water rights. The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to such tribes or individuals, by treaties, statutes, and executive orders. These rights are sometimes further interpreted through court decisions and regulations. This trust responsibility requires that all Federal agencies take all actions reasonably necessary to protect trust assets. Reclamation would carry out its activities in a manner which protects these assets and avoids adverse impacts when possible.

When impacts cannot be avoided, Reclamation would provide appropriate mitigation or compensation. Implementation of the proposed action would have no foreseeable negative impacts on Indian Trust Assets.

### **3.6 Environmental Justice**

Executive Order 12898 established environmental justice as a Federal agency priority, to ensure that minority and low-income groups are not disproportionately affected by Federal actions. East Canyon Reservoir is located in Morgan County. As of 2006, the population of Morgan County was 8,134, consisting of 374 individuals living below poverty level and 309 individuals belonging to various

minority groups. Statistics for the year 2006 are the most recent available (Utah Governor's Office of Planning and Budget).

Implementation of the proposed action would not disproportionately (unequally) affect any low-income or minority communities within the project area. The reason for this is that the proposed project would not involve major facility construction, population relocation, health hazards, hazardous waste, property takings, or substantial economic impacts. This action would therefore have no adverse human health or environmental effects on minority and low-income populations as defined by environmental justice policies and directives.