



**US Army Corps
of Engineers**®
Portland District

Long-term Withdrawal of Irrigation Water Willow Creek Lake, Morrow County, Oregon

Final Environmental Assessment



Willow Creek Dam and Lake, Heppner, Oregon
(Balm Fork arm on right; Willow Creek arm on left)

March 2008

ABBREVIATIONS AND ACRONYMS

AQI	air quality index
Corps	U.S. Army Corps of Engineers
cfs	cubic feet per second
CWA	Clean Water Act
cy	cubic yard(s)
DEQ	Oregon Department of Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
HAB	harmful algae bloom(s)
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NAGPRA	Native American Graves Protection and Repatriation Act
NPCC	Northwest Power and Conservation Council
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ONHP	Oregon Natural Heritage Program
OSU	Oregon State University
OWRD	Oregon Water Resources Department
PM	particulate matter
RCC	Roller Compacted Concrete
Reclamation	Bureau of Reclamation
SHPO	State Historic Preservation Officer
ug/L	micrograms per liter
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

English to Metric Conversion Factors

To Convert From	To	Multiply by
feet (ft)	meters	0.3048
miles	kilometers (km)	1.6093
acres	hectares (ha)	0.4047
acres	square meters (m ²)	4047
square miles (mi ²)	square kilometers (km ²)	2.590
acre-feet	hectare-meters	0.1234
acre-feet	cubic meters (m ³)	1234
cubic feet (ft ³)	cubic meters (m ³)	0.02832
feet/mile	meters/kilometer (m/km)	0.1894
cubic feet/second (cfs or ft ³ /s)	cubic meters/second (m ³ /s)	0.02832
degrees fahrenheit (°F)	degrees celsius (°C)	(Deg F - 32) x (5/9)

Long-term Withdrawal of Irrigation Water Willow Creek Lake, Morrow County, Oregon Draft Environmental Assessment

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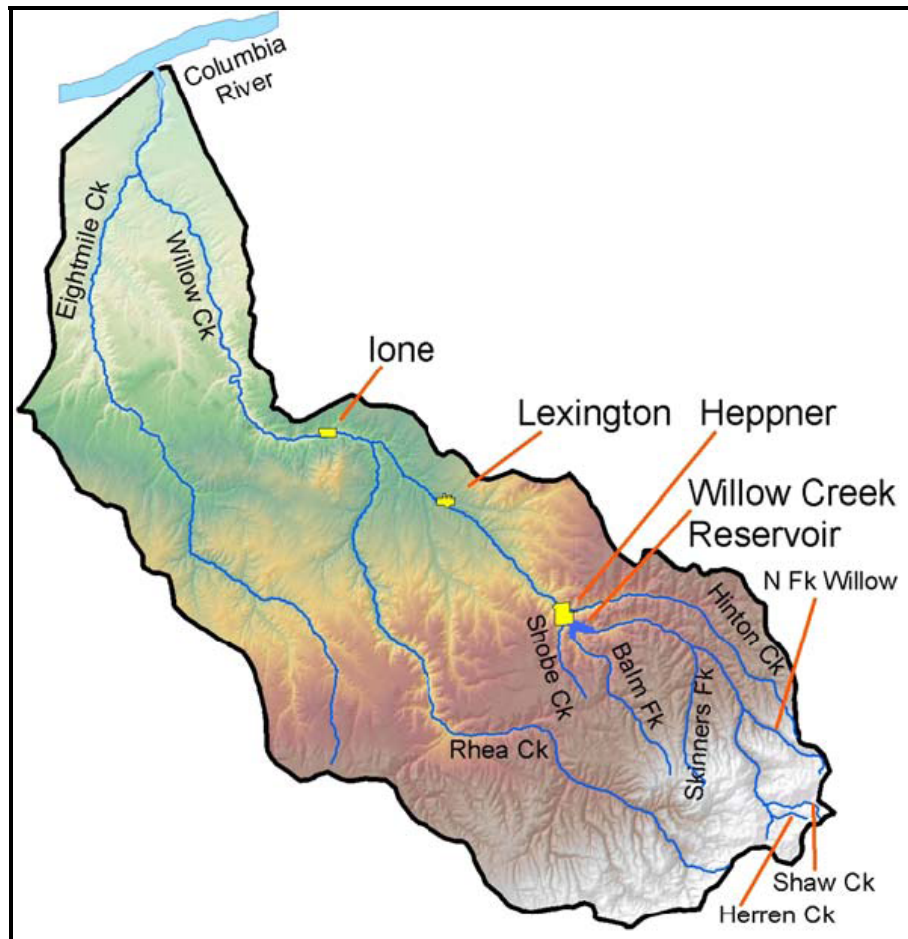
1. INTRODUCTION

1.1. Purpose and Need

Willow Creek Project consists of a dam and lake located on Willow Creek in Morrow County, Oregon, directly upstream from the City of Heppner (Figure 1). The project is operated and maintained by the U.S. Army Corps of Engineers, Portland District (Corps). Flood control and irrigation are the congressionally authorized primary purposes for the project. Recreation, fish and wildlife, and sedimentation (trapping of sediment from upstream sources) are congressionally authorized secondary uses of storage space (Corps 1984).

Since construction of the Willow Creek Dam, reservoir operations and regulation of lake levels have been primarily for the purpose of flood damage reduction, with project operations aimed at maintaining specific pool capacity in order to fill in response to rain or snowmelt events. Only in recent years has there been a request for use of stored water for the authorized purpose of downstream irrigation. In each of the last 5 years water has been released from the lake for irrigation purposes in response to emergency drought declarations.

Figure 1. Willow Creek Watershed



Source: DEQ 2007

The purpose of the proposed action is to provide for the long-term withdrawal of stored water from Willow Creek Lake to be used as an irrigation source for downstream agricultural lands. There is currently a need for supplemental irrigation water to avoid economic losses for downstream agricultural interests during the spring and summer growing season.

The physical, biological, and human environments of the Willow Creek project were described in a final Environmental Impact Statement (EIS) for construction and operation of the project (Corps 1979). A 1991 Environmental Assessment (EA) addressed the impacts of increasing the summer pool from elevation 2063.0 feet to 2076.5 feet to optimize recreation use [Corps 1991; all elevations are in reference to the National Geodetic Vertical Datum (NGVD)]. In 2003, an EA addressed the effects of an emergency water withdrawal from the lake for irrigation use, with a continuance of the Finding of No Significant Impact in 2004 and 2005 (Corps 2003). These documents are on file at the Corps' Portland District office and are incorporated by reference into this Environmental Assessment.

When the project was constructed, there was not a public demand for irrigation water and therefore the effects of irrigation withdrawals were not considered in the original EIS. Now that there is a formal request for annual irrigation withdrawals, the Corps is required by the National Environmental Policy Act (NEPA) to assess the impacts of this proposed activity.

The proposed irrigation plan set forth in this document is intended to provide the parameters for determining impacts of the general proposed action of annual irrigation withdrawals from the Willow Creek Reservoir. The actual quantities of water specified in the withdrawal plan are considered an upper limit (worst case) for irrigation withdrawal and would most likely only be used in a severe drought condition. Actual regulation of the reservoir may vary from the EA plan as long as it remains within the bounds that were evaluated for environmental impacts. Any request for operation outside these bounds requiring additional water withdrawals above the proposed amounts would therefore require further environmental impact assessment and documentation.

In addition, the natural and cultural resources at the project were described in the *Willow Creek Lake Master Plan for Resource Use* (Corps 1985). The focus of the master plan was on recreational, scenic, cultural values, wildlife, and fisheries at the Willow Creek project. Information from the master plan was used in preparing this Environmental Assessment.

1.2. Project Authorization and History of Use

The Willow Creek project was authorized for construction by the Flood Control Act of 1965 (Public Law 89-298, 89th Congress). The project as initially authorized was a multi-purpose dam and lake having a gross storage capacity of 11,500 acre-feet (Corps 1995). In the initial plan, exclusive storage was provided for flood control along with joint storage to be shared for irrigation, recreation, sport fishing, and wildlife. Other purposes considered were water quality, municipal and industrial water supply, and improvement of the Willow Creek channel through the City of Heppner (Corps 1995). The applicable portion of the authorizing Act, approved October 27, 1965, reads as follows:

“The project for flood protection on Willow Creek, Oregon, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 233, Eighty-ninth Congress, at an estimated cost of \$6,680,000.”

During subsequent pre-construction planning, municipal and industrial water supply, water quality, and downstream channel improvements were eliminated from the plan (Corps 1995). Provisions

for 3,500 acre-feet of future irrigation storage were recommended by the Chief of Engineers in a letter report dated May 15, 1974 to the Secretary of the Army (Corps 1995). This letter report was the basis for congressional re-authorization of the project to include storage for future irrigation as a project purpose; this authorization was contained in Public Law 95-482 dated October 18, 1978 (Corps 1995). To supply the 3,500 acre-feet of future irrigation storage, subsequent project design added 1,750 acre-feet of storage to the existing 1,750 acre-feet of joint-use irrigation and flood control storage planned for the reservoir (Corps 1995). Changes to the original plan led to the design and construction of a multiple-purpose dam and reservoir to serve the authorized purposes of flood control, irrigation, recreation, fish and wildlife, and sedimentation.

Section 14 of House Document 233 (89th Congress, 1st Session, 1965) described the operation of the Willow Creek project for irrigation as follows (p. 37-38):

“In general, the operation would be to fill the 8,300 acre-feet of active space by storing all creek flows in the winter and spring. Irrigation releases would begin in April and stored water would be released to sustain irrigation supplies later in the season. No carry-over operation would be utilized because, even with storage, all water supplies can be used beneficially each year.”

Appendix F to House Document 233 was prepared by the U.S. Department of Interior, Bureau of Reclamation (Reclamation; April 1962) and described irrigation needs in the project area (p. 110):

“As the runoff of Willow Creek is not adequate to provide a full supply for existing water right land, storage would probably be used to supplement the water supply to these lands. There are about 3,700 acres below the Heppner site that are covered by water rights. About 910 acres of these lands are between Heppner and Rhea Creek and the remaining 2,790 acres are below Rhea Creek.”

“Using an average annual diversion requirement of 4.0 acre-feet per acre, the total diversion requirement developed for the 3,700 acres is 14,800 acre-feet. The monthly distribution is as follows: April - 4%, May - 15%, June - 18%, July - 25%, August - 22%, and September - 16%.”

The final EIS (Corps 1979) stated that the proposed project would not be operated for irrigation, “. . . until such time as the Secretary of the Interior makes the necessary arrangements with non-Federal interests to recover the cost, in accordance with Federal reclamation law, which will be allocated to the irrigation purpose” (p. 4). The Bureau of Reclamation is responsible for contracting for the sale of irrigation water from federal projects and receives all payment for the U.S. Government for irrigation water.

The Willow Creek Dam was completed in 1983. The 1984 Water Control Manual for the project (Corps 1984) described the operation of the project with a maximum summer pool at elevation 2063 feet. The 1984 manual defined use priorities for Willow Creek as, “Flood control is the primary use of storage space in Willow Creek Lake. Recreation, fish and wildlife, sedimentation, and future irrigation are secondary uses of storage space. Regulation for water quality is considered an incidental use of storage space” (p. 7-2). Further, the 1984 manual stated that, “The storage space between elevations 2047 and 2063 would be reserved for exclusive future irrigation use. Prior to future irrigation use this space will be available for other purposes” (p. 8-1). The storage allocation for Willow Creek Lake in the 1984 manual is shown in Table 1.

Table 1. 1984 Storage Allocation for Willow Creek Lake

Storage Use	Elevation Range (feet NGVD)	Storage (acre-feet)
Exclusive Flood Control	2063.0 to 2113.5	9,765
Normal Pool Fluctuation*	2047.0 to 2063.0	1,787
Aesthetics and Environment	2039.5 to 2047.0	664
Sedimentation	1984.0 to 2039.5	1,875
Total	---	14,091

* Water stored within this space is used to supply future irrigation, desirable minimum flows, evaporation losses, and seepage losses. Source Corps 1984.

The 1984 Water Control Manual also stated that no special regulation is required for recreation activities (sport fishing, boating, hunting, etc.) or for fish and wildlife (p. 7-12). The manual states, “Normal regulation . . . will usually maintain the lake between elevations 2047 and 2063 and provide approximately 96 to 128 acres of lake surface area for recreation” and that, “Normal regulation will usually maintain the lake between elevations 2047 and 2063 and provide adequate storage for fish and wildlife habitat. Normal regulation will usually also provide continuous downstream flow.” Although water quality was not recognized as an authorized project function, the manual provided procedures to release “high-quality” water from the lake.

In June 1984, the Portland District assumed responsibility for operation and maintenance of the Willow Creek project and its facilities; reservoir regulation was assumed by the Portland District in October 1984. In 1991, the Portland District changed the operation of Willow Creek when an Environmental Assessment was circulated for public review and a Finding of No Significant Impact was approved on December 24, 1991. This action allowed the maximum summer target pool elevation of the lake to increase from elevation 2063.0 feet to 2076.5 feet to optimize recreation use. This changed the storage allocations for the lake (Table 2). Subsequently, the Corps prepared a draft revised Water Control Manual for the Willow Creek project (Corps 2005; draft subject to change).

Table 2. Current Storage Allocation for Willow Creek Lake

Storage Use	Elevation Range (feet NGVD)	Storage (acre-feet)
Exclusive Flood Control	2076.5 to 2113.5	7,842
Joint Irrigation and Flood Control	2063.0 to 2076.5	1,923
Multiple Purpose	2047.0 to 2063.0	1,787
Aesthetics and Environment	2039.5 to 2047.0	664
Sedimentation	1984.0 to 2039.5	1,875
Total	---	14,091

Source Corps 2005.

1.3. Willow Creek Project Description

Willow Creek Dam is located at river mile 52.4 on Willow Creek directly upstream from the City of Heppner and just downstream from the confluence of the Balm Fork and Willow Creek. The dam was the world’s first gravity dam to be built completely by roller-compacted concrete methods. The dam forms a reservoir called Willow Creek Lake. At its normal operating levels, the lake has two arms that join together immediately behind the dam to form a small main lake body

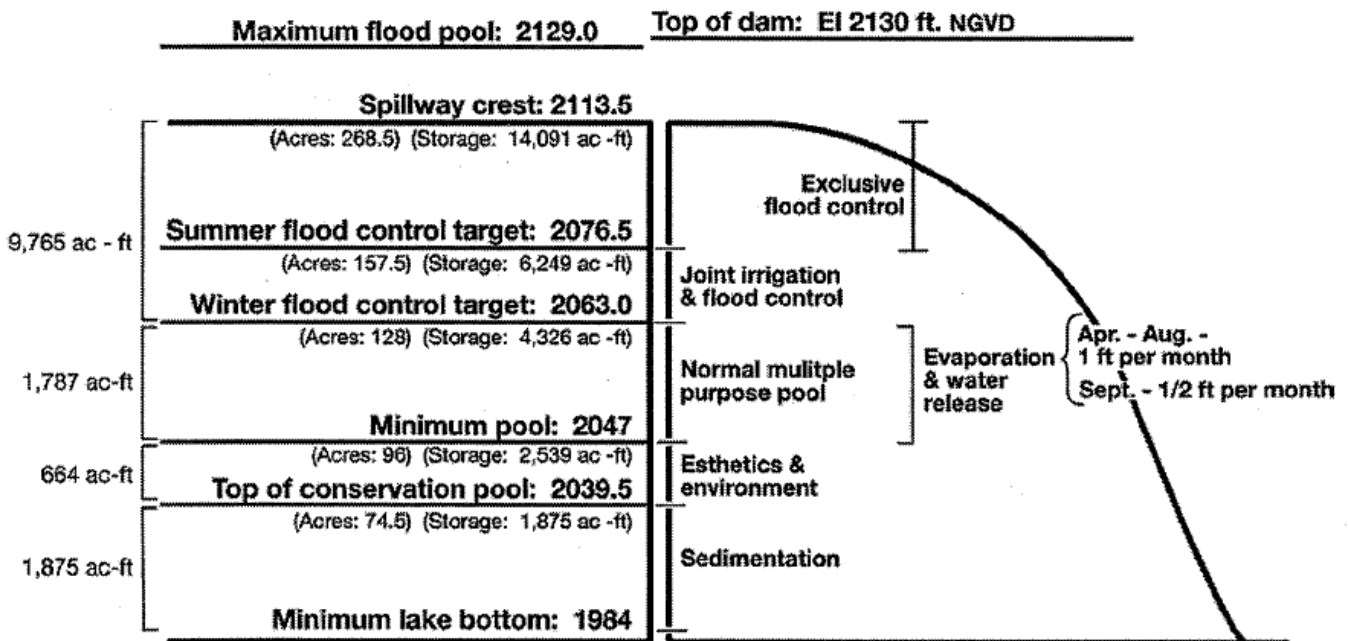
(see cover photo). The two arms of the lake inundated the major stream drainages in the project area, the larger being the Willow Creek arm and the smaller being the Balm Fork arm. Willow Creek dam has a crest length of 1,780 feet, a crest width of 16 feet, and a structural height of 154 feet above the streambed. The top of the dam is at elevation 2,130 feet at the upstream face. The spillway consists of a standard ogee-shaped overflow crest with rounded abutments and vertical training walls. The ungated spillway is located near the center of the dam. The spillway is 380 feet wide, has a crest elevation of 2,113.5 feet, and a downstream face design slope of 0.8 horizontal to 1.0 vertical. The spillway capacity is 91,700 cubic feet per second (cfs) at maximum reservoir elevation of 2,129 feet.

The dam has two outlets for discharging water: a low-level regulating outlet (420 cfs maximum) and a depth-selective withdrawal mechanism, referred to as a water quality outlet (95 cfs maximum). The water-quality outlet can selectively withdraw water ranging from elevation 2037.0 to 2076.0 feet. Currently the water quality outlet is set at a depth of 17 feet below the surface. The low-level outlet is a separate outlet which withdraws from an elevation of 1,984.0 feet. The water quality outlet is used during normal operations of the dam. The low-level outlet is primarily used during flood control operations when discharges in excess of the water quality outlet capacity (95 cfs) are required for flood regulation or when maintenance of the water quality outlet is needed.

1.3.1. Willow Creek Project Regulation

Willow Creek is a flood control project operated to maintain specific capacity to fill in response to rain or snowmelt events. When lake waters rise above a specific pool elevation, excess water is released. The discharge rate downstream of the dam is limited to 500 cfs minus the flow from Hinton and Shobe creeks. Figure 2 summarizes the current storage allocations for Willow Creek. The maximum controlled flood pool elevation of 2113.5 feet (spillway crest) would create a lake that extends about 1.8 miles upstream on Willow Creek and 1.3 miles on Balm Fork. At this elevation, the surface area of the lake is about 269 acres and has about 14,091 acre-feet of storage.

Figure 2. Willow Creek Lake Water Storage Schematic



The probability of a flood event of the magnitude necessary to fill the lake to its maximum controlled flood pool is extremely low. The normal operating range of the lake varies from a winter flood control pool elevation of elevation 2063.0 feet (surface area 128 acres, 4,326 acre-feet of storage) to a summer flood control pool elevation of 2076.5 feet (surface area 157.5 acres, 6,249 acre-feet of storage). During dry years the lake may be lowered to elevation 2047.0 feet (minimum pool) with a lake surface area of about 96 acres. The winter regulation period occurs from December 1 through January 31 and consists of maintaining the lake at elevation 2063.0 feet, which allows for 9,765 acre-feet of flood control storage from elevations 2063.0 to 2113.5 feet.

The spring refill period normally occurs from February 1 through April 15 and consists of filling Willow Creek Lake to elevation 2076.5 feet. Filling the lake to this elevation allows for recreation and irrigation needs. Flood control requirements, downstream flow requirements, and minimum release objectives are still required during this time. The probability of filling the lake to the summer elevation of 2076.5 feet is about 73%. Downstream flow requirements can take a significant portion of inflow starting in April, and in low flow years, senior water rights holders will call for inflow before April 1. This can make it more difficult to fill the lake to elevation 2076.5 feet. As the spring refill period progresses, the reservoir regulator continually assesses hydrologic conditions and volume forecasts for the watershed. The regulator has the discretion to delay the start of filling if conditions such as large snowpack or a large runoff volume forecast warrants it.

The summer regulation period normally occurs from April 16 through October 9 and consists of releasing flows through the water quality outlet for downstream requirements or the minimum release objective and maintaining at least 7,842 acre-feet of exclusive flood control space (elevation 2076.3 to 2113.5 feet) available for thunderstorm floods. The fall drawdown period normally occurs from October 10 through November 30 and consists of drafting Willow Creek Lake to its winter target pool elevation of 2063.0 feet. Project outflow rates can range from 20 to 30 cfs or higher during this period depending upon inflow rates.

Normal seasonal regulation of the Willow Creek project allows for recreational use (sport fishing, boating, hunting, etc) at the project. Regulation will normally maintain the lake between elevations 2,047 and 2,076.5 feet and provide between 96 and 157 acres of lake surface area for recreation (Corps 1995). No special regulation is required for fish and wildlife conservation (Corps 1995). Regulation for downstream water quality is achieved with selective withdrawals from various reservoir levels via the outlet works (Corps 1995).

Willow Creek Lake is operated so as to not adversely affect existing downstream water rights. Downstream flow needs are met by normal regulation either to meet specified requirements requested by the Watermaster, or by passing the actual inflows through the lake, whichever is less (Corps 1995). During the winter and spring, the flow objective of 3 cfs downstream of the project is normally satisfied. In low-water years, however, there may not be enough water stored between elevations 2,047 and 2,076.5 feet to maintain a 3 cfs minimum flow objective. When this occurs, the Corps may reduce the minimum flow objective to release no less than 1 cfs (Corps 2005).

2. PROPOSED ACTION AND ALTERNATIVES

2.1. Proposed Action

The Willow Creek project was authorized with 3,500 acre-feet of future irrigation storage (Corps 1995). As requested by downstream agricultural interests because of projected need, the proposed action will provide only up to 2,500 acre-feet of storage annually from the Willow Creek project for irrigation use during the spring and summer growing season. The remaining 1,000 acre-feet of the authorized 3,500 acre-feet cannot be used without a NEPA assessment and determination of environmental impacts associated with the use of the remaining authorized irrigation storage. As proposed, the 2,500 acre-feet of stored water in the lake would be used as an irrigation source for agricultural lands planted in alfalfa (75%) and small grains (25%). These crops require about 3 feet of water per acre (total) for adequate irrigation during the spring and summer growing season, of which about 1 foot of water per acre will need to be provided by lake storage. Small grains in the region are harvested in mid July. Water from lake storage would be used for irrigation by some users in lieu of groundwater, which has been declining in the region. Not having to pump groundwater eliminates what is for some farmers a significant financial cost associated with the electrical power used to lift the water. Some users do not have a permit to use groundwater as a supplemental supply to their primary surface water rights from Willow Creek, and water from lake storage will be their only back-up supply.

Under the proposed action, Willow Creek Lake will be drawn down earlier and farther than under present operations. If stored water for irrigation is available, irrigation withdrawals could start as early as April 15 and continue until September 30. Table 3 shows the maximum allowed release schedule by month for the proposed action. The proposed action would not change the winter flood control operation of the Willow Creek project. It could change the flood control operations during the rest of the year by drawing down the reservoir and increasing the amount of storage available for flood control.

The monthly release schedule in Table 3 was used for the purpose of determining impacts associated with the proposed action and represents the upper limit for water releases for irrigation. The actual release schedule used in real-time regulation may be less than described in this schedule due to availability of water, annual climate variability, or other significant circumstances.

Table 3. Monthly Release Schedule for the Proposed Action

Month	Percent to be Released*	Acre-feet Released (2,500 total)
April 15-30	4	100
May 1-31	15	375
June 1-30	18	450
July 1-31	25	625
August 1-31	22	550
September 1-30	16	400
Totals	100	2,500

* Based on the schedule provided in House Document 233 (1965).

The irrigators will divert water at 15 diversion points that have been used in the last few years to divert water under emergency water contracts. The pumps have been screened to protect fish. The downstream irrigators are in the process of forming an irrigation district. The irrigation district will sign a contract with the Bureau of Reclamation for use of stored water from Willow Creek Lake and for repayment of certain costs. Also, a secondary water right application will need to be filed with the Oregon Water Resources Department (OWRD) and a permit secured in order to use the stored water in the lake for irrigation.

2.2. Withdrawal of all Authorized Annual Irrigation Storage

The Willow Creek project was authorized with 3,500 acre-feet of future irrigation storage (Corps 1995). The use of ALL authorized irrigation was not proposed by the irrigation group. In developing the proposed 2,500 acre-feet of irrigation withdrawal plan, the potential irrigators have determined for themselves their level of participation in the proposed irrigation plan and that the authorized 3,500 acre-feet is not necessary to meet their needs. Willow Creek irrigation water is available only in set quantities spread over the several-month-long irrigation season. The existing state water rights limit the potential for new water users of Willow Creek waters. For these reasons, this alternative was not considered further in this Environmental Assessment.

2.3. No Action Alternative

For the No Action alternative, no annual reservoir storage would be made available from Willow Creek Lake for the irrigation of crops during the spring and summer growing season. The current uses of storage and operation of the lake during the spring and summer would not change. Also, the Federal Treasury would not be repaid for a share of the costs of constructing and operating the Willow Creek project. Water for irrigation would continue to be taken from natural flow rights and groundwater sources.

However, the No Action alternative is not responsive to the authorized project purpose of providing storage in the lake for irrigation needs and to help deter or reduce economic losses for downstream agricultural interests. It is difficult to accurately estimate losses attributable by not providing supplemental irrigation. Downstream irrigators have indicated a need for a supplemental irrigation source for about 2,500 acres of agricultural lands planted in alfalfa (75%) and small grains (25%).

Discussions with the U.S. Department of Agriculture (USDA) Farm Service office in Heppner provide some context for potential losses for alfalfa without adequate irrigation (Corps 2003). The average normal yield for alfalfa is 4 to 5 tons/acre. The average price for alfalfa in February 2008 for eastern Oregon (good quality) is approximately \$150 per ton (<http://www.ams.usda.gov/mnreports/lsamlgr313.pdf>). The USDA estimated a 50% loss in yield if this crop is not adequately irrigated. Based on providing supplemental irrigation for 1,725 acres of alfalfa, the estimated maximum total yield is 8,625 tons with an estimated maximum total value of \$1,293,750; 50% of that value is \$646,875. Also, there would be an unquantified monetary loss for small grains and the potential for additional impacts if the alfalfa plants themselves are damaged because it is a perennial crop with the potential for losses in future years, as well as likely increased costs for more frequent tillage and reseeded.

3. AFFECTED ENVIRONMENT

3.1. Watershed Characteristics

Willow Creek is a 79-mile long stream that drains into the Columbia River near river mile 253. Willow Creek and its tributaries drain an area of about 880 square miles. The drainage area above Willow Creek Dam is 96 square miles or 10.8% of the total watershed area. Watershed elevations range from about 200 feet at the mouth of Willow Creek to 5,990 feet to 5,775 feet at its headwaters near Bald Mountain in the Umatilla National Forest. The most widespread land use in the watershed is agriculture – dry land wheat and valley bottom irrigated crops. There are numerous irrigation diversions and structures along Willow Creek downstream of the dam.

Balm Fork is the only tributary that enters Willow Creek upstream of the dam. The Willow Creek project regulates flows from the Balm Fork and the mainstem of Willow Creek above Heppner. However, Hinton Creek and Shobe Canyon enter Willow Creek downstream of Willow Creek Dam in Heppner, and pose potential flood threats to the town. The major tributaries to Willow Creek, in downstream order, are summarized in Table 4.

Table 4. Major Tributaries to Willow Creek

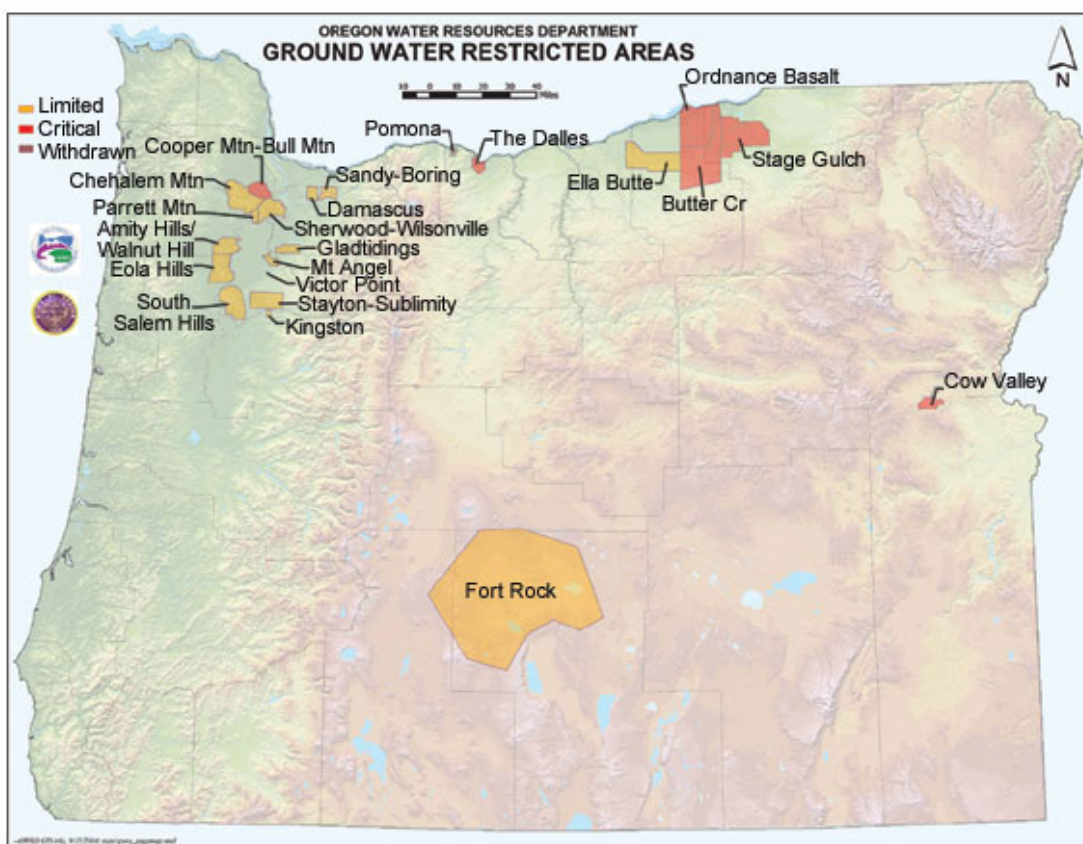
Tributary	Drainage Area (sq. miles)	Watershed Length (miles)
Balm Fork	28	11
Shobe Canyon	7	4
Hinton Creek	44	17
Blackhorse Creek	26	10
Clark Canyon	50	13
Rhea Canyon	226	35
Eight Mile Canyon	150	40

The climate for most of the watershed is semiarid with average annual precipitation ranging from 8 inches at the mouth of Willow Creek to 34 inches in the headwaters. Yearly precipitation occurs mostly from December to March. The climate in Heppner is characterized by low precipitation, wide variation of annual temperatures, low humidity, and high evaporation during the summer. The maximum and minimum recorded temperatures at Heppner are 110°F and -21°F, respectively, with an annual mean temperature of 50°F. Intense summer thunderstorms occur frequently and may deposit significant amounts of rainfall in a short period of time, usually less than 1 hour.

The oldest rocks in the area are Tertiary sedimentary strata of the Clarno Formation. This formation is exposed in Willow Creek Canyon about 15 miles southeast of the dam. Overlying the Clarno Formation are several hundred feet of Miocene Columbia River basalts, which form the basic bedrock strata in the area. Overlying the basalts on the slopes and ridges are fine-grained windblown silts, which vary in thickness from trace amounts to 10 feet. The valley floors consist of gravel deposits that are generally less than 10 feet in thickness. Willow Creek and its tributaries have eroded the gravel deposits and exposed the underlying basalt strata. Soils overlying bedrock consist of surficial silt and sandy silt deposits underlain by mixtures of silt and angular rock fragments above the top of the basalt. The thickness of the soil cover on the valley floor varies from less than 5 feet to localized areas of 18 feet. Soil types vary from rock-free silts to some silty sands found near stream areas. There are no known economic mineral deposits in the area.

According to the Willow Creek Local Advisory Committee (2003), extensive development of the basalt groundwater resource in the region began in the mid-1960s. Estimates of annual groundwater use and annual groundwater recharge to the basalts indicated that the available groundwater supply was being significantly overdrawn in some areas. The Oregon Water Resources Department (OWRD) documented declines in many wells, as well as interference between wells. Critical groundwater areas were established by order of the OWRD in the Ordinance and Butter Creek areas in Morrow County (Figure 3). The amount of water pumped from wells in critical groundwater areas is controlled and new water rights permits to use groundwater are not issued. Ella Butte is a withdrawn area in the Umatilla Basin Program Rules (Chapter 690, Division 507). Being a withdrawn area, OWRD does not regulate the groundwater users in the Ella Butte area but does not issue new water right permits to use groundwater.

Figure 3. Groundwater Restricted Areas in Oregon



Source OWRD at <http://egov.oregon.gov/OWRD/GW/index.shtml>

3.1.1. Hydrology

Streamflow records for gaging stations in the Willow Creek watershed are shown in Table 5 (Corps 2005). The average annual runoff at Heppner for October 1951 to September 1982 (31 years) is 13,830 acre-feet, which is about 2.70 inches of water over the 96 square mile watershed. Average annual runoff for individual years from 1951 to 1982 has varied from a minimum of 1,880 acre-feet (in 1968) to a maximum of 26,590 acre-feet (in 1958).

Prior to construction of the Willow Creek dam, peak annual flows in Willow Creek near the Heppner gaging station (downstream of the dam) generally occurred in the early spring and rapidly receded to low or no flow by mid-June. By late summer, Willow Creek usually dried up for short periods. This general pattern was occasionally changed by the occurrence of intense rainfall from spring or summer thunderstorms. Such storms caused a sharp increase in streamflow with a very high peak discharge followed by a rapid recession to base flow.

Table 5. Streamflow Records for the Willow Creek Watershed

Station	Station Number	Drainage Area (sq. miles)	Location (river mile)	Period of Record	Operator
Willow Creek above reservoir near Heppner	140344701	67.6	54.1	1982-present	USGS*
Balm Fork near Heppner	140344801	28	1.1	1982-present	USGS
Willow Creek at Heppner	14034500*	97	52.2	1951-present	USGS
Willow Creek near Morgan Street	WIMO	147	51.1	1996-present	Corps
Rhea Creek near Heppner	14034800	120	25.4	1960-1991	USGS
Willow Creek near Morgan	14035000	630	23.7	1921, 1929-1931	USGS
Willow Creek above Eight Mile Canyon	14035500	680	7.5	1905	USGS
Willow Creek near Arlington	14036000	850	3.7	1906, 1960-1979	USGS

* Project operation gage; USGS = U.S. Geological Survey

Since construction of the dam, peak flows have been controlled by the operation of the dam. The highest daily mean flow that has occurred since construction of the dam was 306 cfs on May 6, 1983 shortly after the Roller Compacted Concrete (RCC) was brought up to its final elevation. The highest instantaneous peak flow since dam construction was 333 cfs on May 11, 1995. The highest recorded daily mean flow prior to dam construction was 486 cfs on January 30, 1965. The highest recorded instantaneous peak flow prior to dam construction was 812 cfs on May 10, 1957.

3.1.2. Water Quality

Beneficial uses in the Willow Creek watershed include public and private water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetics (DEQ 2007). Of the beneficial uses of water in the watershed, the most sensitive uses for most waters is spawning and rearing of fish and water contact recreation. Also, municipal and industrial water supplies in the Willow Creek watershed are obtained from wells. The cities of Heppner, Lexington, and Ione each obtain their water from wells. The City of Heppner also has a water right to 1.75 cfs of surface water from Willow Creek.

Section 303(d) of the Clean Water Act (CWA) directs states to develop a list of water quality limited streams, which are streams that violate water quality standards and do not support their beneficial uses. The CWA also directs states to develop Total Maximum Daily Loads (TMDLs) for 303(d)-listed streams. These TMDLs result in allocations of pollutant loads, e.g. degrees of temperature or tons/acre of sediment, to different sources such as private agriculture, urban areas, and federal lands.

A Total Maximum Daily Load (TMDL) study recently completed by DEQ (2007) addressed the 303(d) listings for temperature, pH, and bacteria in the watershed (report available at <http://www.deq.state.or.us/wq/tmdls/umatilla.htm>). The TMDL for Willow Creek was approved by the U.S. Environmental Protection Agency (EPA) on February 19, 2007. According to this study, Willow Creek Lake maintains an important role in controlling flow, pH, and stream temperature in Willow Creek below the dam. The highlights of the TMDL study as related to Willow Creek Lake are summarized below (DEQ 2007).

- Typically during late July through August, Willow Creek becomes a dry streambed at some point below Lexington or Ione. Increased outflow from Willow Creek Lake for temporary irrigation contracts has occurred since 2003, pushing this point further downstream and giving the flowing stream more thermal assimilative capacity and improving water quality.
- Lake mixing using the aeration system can eliminate the pH problem in Willow Creek near Heppner, where the 303(d) listing originated. Deeper withdrawal can eliminate the temperature concern in the lake outflow; however, this is only true without mixing via aeration. Strategic timing of these controls is needed to address both pH and temperature.

Since its completion in 1984, Willow Creek Reservoir has been the most problematic in the Corps' Portland District in terms of water quality. Water quality issues include low dissolved oxygen, increased methane, toxic hydrogen sulfide, and increased ammonia, iron, and manganese. These unique water quality problems are monitored regularly by the Portland District for public safety reasons and because of the State 303(d) listing of the Willow Creek subbasin. Subbasin water bodies on the 303(d) list include: temperature for Willow Creek from the mouth to its forested headwaters (river mile 73), pH for Willow Creek below the Willow Creek Reservoir, and bacteria for Balm Fork. The *Willow Creek Subbasin Temperature, pH, and Bacteria Total Maximum Daily Loads and Water Quality Management Plan* was approved by the EPA on February 19, 2007; this plan lays out TMDLs and planning to address 303(d) listings for the Willow Creek subbasin.

Every year during spring runoff, nutrients and organic matter attributed largely to agricultural fertilizers, livestock wastes, and human sewage are deposited into Willow Creek Reservoir from the upper watershed. This loading stimulates algae blooms that create oxygen demands in the reservoir and fuel a series of processes creating anoxic conditions (without oxygen) and the production of methane, hydrogen sulfide, and ammonia. Low dissolved oxygen alters the reservoir chemistry leading to the release of phosphorous, nitrogen, iron, and manganese from bottom sediments.

Aeration

In June 2004 an aeration system composed of one oil-less generator, 12 aerator disks, and piping was installed in the forebay of Willow Creek Reservoir. The aerator disks were weighted to the bottom of the reservoir and activated throughout the summer. This system was installed to increase dissolved oxygen in the hypolimnion and inhibit the release of nutrients and the production of methane, hydrogen sulfide, and ammonia from bottom sediments. In general, increasing oxygen at depth increases circulation in the lake, incorporates oxygen into the water at depth, speeds up algal decay, and increases the utilization of nutrients.

Since the installation of the aeration system, there has been increased circulation throughout the water column. The aerators have increased oxygen levels in the hypolimnion (or bottom of the reservoir), which in pre-aeration years went anoxic (without oxygen) every summer and fall. For example on September 11, 1995 (pre-aeration), anoxic conditions were measured in the reservoir

starting at about 16.5 feet in depth and continuing to the bottom. Since the installation of the aerators, the reservoir has stayed oxygenated from top to bottom. With the increase in oxygen, the production of methane and hydrogen sulfide has decreased. The release of phosphorous, nitrogen, iron, and manganese from bottom sediments has also decreased.

Consequently, the aerators have mixed nutrients that would usually concentrate on bottom into the middle and upper portions of the lake's water column, increasing nutrient concentrations in these areas as compared to historic conditions. Furthermore, the aerators have destratified the temperature structure in the reservoir creating warmer, more uniform temperatures from top to bottom than historically measured. Because of vertical mixing from operation of the aerators, the temperature difference between surface and bottom water in Willow Creek Lake has decreased; surface temperature reaches about 71.6°F and bottom temperature reaches about 64.4°F.

During the past two years the severity of algae blooms has appeared to increase in Willow Creek Lake and health advisories have been issued each year for harmful algae blooms (HAB). The main species involved are the blue-green algae *Anabaena flos-aquae*, *Microcystis aeruginosa*, *Aphanizomenon flos-aquae* and *Oscillatoria limnosa*. In fall 2007 algae data collected before and after aeration will be compared to determine if aeration is associated with an increased incidence of HAB in the lake.

Blue-green algae blooms can lead to the production of toxins harmful to humans and animals that come in contact with the water either by drinking it or by contacting it with the skin, or by inhaling it via water sports activities such as water skiing. There are generally three types of toxins – liver toxins (hepatotoxins), nerve toxins (neurotoxins), and skin toxins (dermatotoxins). Microcystin is an example of a liver toxin and anatoxin an example of a neurotoxin. Both of these toxins could potentially be produced by the blue-green algae species involved in health advisories at Willow Creek Lake.

The Oregon Department of Human Services recommends that concentrations of microcystin not exceed 8 ug/L (micrograms per liter) in water samples in order to lift a health advisory due to a HAB. To date, water samples from the reservoir have only been analyzed for microcystins. The highest concentration measured was at the boat dock on September 12, 2006 at 1,150 ug/L. On the same day, at the deep lake station near the middle of the dam, the concentration of microcystin was 2.30 ug/L. Under these conditions, it would be important for water contact activities to be restricted at the boat dock area.

In the last 10 years research data indicates that water containing blue-green algae toxins, when sprayed on plants, may enter the plants and inhibit photosynthesis. Furthermore, lettuce that was spray-irrigated from a water source containing the blue-green alga *Microcystis aeruginosa* and microcystin toxins contained *Microcystis aeruginosa* colonies on the leaf surfaces and microcystins throughout the plant. This type of research is in its early phases but may bear on the use of water for irrigation from Willow Creek Lake. In that regard, it is important to know that water can be withdrawn from the reservoir from different depths because the selective withdrawal device can be moved up-and-down in the water column to release water from different depths as needed. Since most algae growth occurs in surface waters, release water can be selected from a depth where algae toxins are not present or are in low concentrations.

The timing of toxins release in the cycle of a bloom or whether a HAB will even produce toxins is highly unpredictable. In summer 2006 the Corps detected toxins at a high concentration in two samples (1,150 ug/L and 416 ug/L) taken from Willow Creek Lake. However, in summer 2007 the

Corps collected toxins data during two HAB events at the lake and found mostly non-detects for microcystin toxins in surface water samples and at mid-depth and bottom water samples.

Because of the HAB problems at Willow Creek Lake, the Corps is considering other management approaches such as shutting down the aerators; turning off the aerators at night; using another technique that does not mix lake water from top to bottom but just surface water in order to maintain the thermal structure of the reservoir; or reduce nutrient input from the bottom and interfere with harmful algae habitat (the algae prefer still water). Also, the Corps' property on Willow Creek, between the highway bridge and the upper end of the lake, could be turned into a wetland that may reduce nutrient inputs into the reservoir. In any case, more data collection over a period of years will be needed to determine an acceptable HAB management technique.

Withdrawal Structures

There are two withdrawal structures at Willow Creek Dam – the water quality outlet and the low level outlet. Release flows are typically discharged through the water quality outlet which can be adjusted within a 40-foot range from the surface of the reservoir at full pool, from elevation 2076 to 2036 feet. The water discharged through the upper outlet is similar in water quality to that of average epilimnion (top-most lake layer) and metalimnion (middle layer) reservoir conditions. In late summer and fall, warm water temperatures may force operational changes and the release of water through the deep, low level outlet (elevation 2009 feet). This water is somewhat cooler in temperature and richer in nutrients and organic material.

Conclusions

Although the water quality of the reservoir has improved, Willow Creek Lake is still considered eutrophic (high in nutrients) and water quality impaired. Upstream land use practices continue to contribute high nutrient loads to Willow Creek Reservoir during the spring run-off, and harmful blue-green algal blooms continue to frequent the lake during the summer and fall months.

Despite public concerns to the contrary, irrigation withdrawals are not expected to impact water quality in the reservoir. From 1984 through 1992 the reservoir was operated at a lower full pool elevation of 2063. Since then the operating full pool has been to elevation 2076. Water quality information has been collected for the last two decades and has encompassed varying pool elevations at Willow Creek Lake. In comparing water quality data from 1984 through 2003, the two different operating pool elevations show no significant difference in temperature, nutrient load, pH, and dissolved oxygen. Therefore water quality in the reservoir is not expected to be impacted by irrigation withdrawals and subsequent lower pool elevation in Willow Creek Lake.

3.1.3. Air Quality/Noise/Light

The air quality in the project area is generally good. The air pollutants of greatest concern in Oregon include ground-level ozone (smog); carbon monoxide (mostly from motor vehicles); fine particulate matter (mostly from wood smoke, other combustion sources, cars, and dust) known as PM₁₀ (10 micrometers and smaller in diameter) and PM_{2.5} (2.5 micrometers and smaller in diameter); and hazardous air pollutants (DEQ 2006). Motor vehicles are currently the primary source of air pollution in Oregon. Emissions from cars can contribute to ground level ozone pollution (smog) especially on hot summer days. Other major sources of pollution are from individual actions such as using wood stoves, gas-powered lawn mowers, motor boats, paints, solvents, aerosol products, charcoal barbecues, and outdoor burning (DEQ 2006).

The DEQ uses an air quality index (AQI) to assess ambient air quality. The AQI is calculated using monitoring data and then posted under various descriptors (good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy). The AQI is reported for various cities and includes Pendleton, which is the closest city to the project area with air quality monitoring. In 2005 for Pendleton, 301 days were classified as good, 58 days were moderate, and 3 days were classified as unhealthy for sensitive groups (DEQ 2006). From 1999 to 2005, there were no exceedances of the National Ambient Air Quality Standards for PM₁₀ and PM_{2.5} in Pendleton (DEQ 2006).

Existing noise levels in the project area consist of those generated by trucks and automobiles traveling on the roads near Willow Creek Lake, and by watercraft on the lake. Also, there are no practices in the project area that substantially affect natural light conditions.

3.2. Biological Environment

3.2.1. Vegetation

Shrub-steppe habitat dominates the Willow Creek project area. Rabbitbrush and cheatgrass are the dominant vegetation in shrub-steppe areas. This habitat typifies the sloping banks and hills surrounding the project. Some riparian habitat is found along Willow Creek, Balm Fork Creek, and at South Canyon. There is no riparian vegetation around the perimeter of the lake. The majority of wet meadow habitat in the project area is situated at the east end of the Willow Creek arm of the lake. A small woodland is also located in this area. Another wet meadow area is located at the end of the Balm Fork arm of the lake. A poplar woodland is located at a spring on the north shore of the lake. As the water is drawn down each season, mudflats are exposed around the perimeter of the lake. Mudflats are most extensive at the ends of the Balm Fork and Willow Creek arms.

3.2.2. Fish

No anadromous salmonids occur in the Willow Creek watershed. Willow Creek Lake supports a warmwater fishery primarily consisting of smallmouth bass (*Micropterus dolomieu*) black crappie (*Pomoxis nigromaculatus*), brown bullhead (*Ictalurus nebulosus*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and pumpkinseed (*Lepomis gibbosus*). Many of these species spawn and rear in the shoreline areas of the lake. To support the sport fishery purpose of the project, the Oregon Department of Fish and Wildlife (ODFW) operates a put-and-take rainbow trout (*Oncorhynchus mykiss*) fishery in the lake. The lake is stocked annually with 16,000 trout fingerlings (500 pounds) in May and 2,000 legal size trout in April (personal communication with Steve Cherry, ODFW Heppner Field Office, October 2007).

The ODFW uses electrofishing to inventory warmwater fish populations in the lake. The latest fish sampling occurred in June 2006. As shown in Table 6, smallmouth bass and black crappie were the most common species encountered during 2006 sampling, followed in abundance by brown bullhead, largemouth bass, bluegill, and pumpkinseed (ODFW 2006).

Table 6. Electrofishing Catch-per-unit-effort for Fish in Willow Creek Lake, 1988-2006

Species	Catch-per-unit-effort							
	1988	1989	1996	1997	1999	2001	2004	2006
Largemouth bass	1.4	54.5	29.8	11.7	9.1	13.3	4.7	5.8
Smallmouth bass	65.6	80	19.8	18.3	6.9	53.3	47	21.7
Black crappie	20.1	12	93	15.7	3.3	0.6	69.7	34.8
White crappie	---	3	---	2.1	---	---	---	---
Bluegill	---	---	9.6	8.6	5.5	6.7	---	4.4
Pumpkinseed	11.4	36	22.5	10	3.6	20.3	9.3	1.7
Brown bullhead	---	---	0.9	---	0.4	6.7	4.7	21.3
Bridge-lip sucker	74.3	7	1.8	1.7	1.8	4.1	1.0	2.7

Source: ODFW 2006

According to ODFW (2006), largemouth bass recruitment success has decreased in Willow Creek Lake in the last 10 years. The condition of large-sized largemouth bass, although lower than seen in recent years, remained high due to low population density and abundant available forage. Also, smallmouth bass successfully recruited fish to the population more frequently (three times) since 2000 than largemouth bass. Smallmouth bass spawn deeper and over a greater depth range and are less vulnerable to water level fluctuations. Smallmouth bass condition was not as good as that for largemouth bass but is typical of a higher density population.

3.2.3. Wildlife

In the Willow Creek project area, the woodland, riparian, and wet meadow habitats are of major importance to wildlife populations. Small game animals (e.g., pheasant, quail, dove), small mammals (e.g., ground squirrels, jack rabbit, skunk), and many species of birds are dependent upon these habitats for cover and nesting. Food sources for animals and birds are readily available because of the nearby grain fields and abundance of weed seeds. The *Willow Creek Master Plan* (Corps 1985) indicates that 80 species of birds, 35 species of mammals, 14 species of reptiles, and 5 amphibian species occur in the project area. The limiting factor to wildlife populations in the area is believed to be suitable winter cover. Big game animals such as elk, black bear, and mule deer are mostly restricted to the timbered headwater region of the Willow Creek watershed.

Bald eagles (*Haliaeetus leucocephalus*) may occur in the vicinity of the Willow Creek project. There are no known bald eagle nests in or near the project. Minimal winter use of the project area for foraging may occur during October through March.

3.2.4. Threatened and Endangered Species

By letter dated April 18, 2007, the U.S. Fish and Wildlife Service (USFWS) provided a listing of the fish and wildlife species listed under the Endangered Species Act (ESA) that may occur in Morrow County (Table 7). There are no federally proposed species listed for Morrow County. The bald eagle was delisted by the USFWS in June 2007.

Table 7. Federally Listed Species for Morrow County, Oregon

Listed Species and Scientific Name	Federal Status	Critical Habitat Designation	Description of Critical Habitat
Snake River steelhead* <i>Oncorhynchus mykiss</i> ssp.	Threatened	01/02/2006	Columbia River to confluence with Snake River; Snake River and tributaries.
Middle Columbia River steelhead* <i>Oncorhynchus mykiss</i> ssp.	Threatened	01/02/2006	Columbia River to confluence with Yakima River and tributaries.
Upper Columbia River steelhead* <i>Oncorhynchus mykiss</i> ssp.	Endangered	01/02/2006	Columbia River to Chief Joseph Dam and tributaries.
Snake River sockeye salmon* <i>Oncorhynchus nerka</i>	Endangered	12/28/1993	Columbia River to confluence with Snake River; Snake River and tributaries.
Upper Columbia Chinook salmon* <i>Oncorhynchus tshawytscha</i>	Endangered	01/02/2006	Columbia River to Rock Island Dam and tributaries.
Snake River Chinook salmon* <i>Oncorhynchus tshawytscha</i>	Threatened	12/28/1993	Columbia River to confluence with Snake River; Snake River and tributaries.

Note: *Species under the jurisdiction of the National Marine Fisheries Service; N/A = not applicable.

No listed steelhead, Chinook salmon, or sockeye salmon species occur in the Willow Creek watershed. Although it is likely that Willow Creek historically supported a population of steelhead, fish passage problems are the most likely factor contributing to the extirpation of steelhead in Willow Creek (NPCC 2004). Passage is blocked during most of the year in Willow Creek below Heppner by diversion dams. Also, flows in Willow Creek are only substantial enough in the spring to allow passage of steelhead over the diversion dams. It is unclear whether the Willow Creek watershed historically had a Chinook salmon population; evidence suggests that the watershed was not historically an important spawning or rearing area (NPCC 2004). Sockeye salmon are not found in the Willow Creek watershed.

3.3. Cultural and Historic Resources

Prior to construction, archeological and historic surveys were performed in 1980 in the Willow Creek project area (Corps 1985). No prehistoric archaeological remains were encountered during surveys and subsurface explorations carried out in the project area. The historical survey identified seven historic structures or features, all of which are now inundated by the lake. None of these sites were considered eligible for the National Register of Historic Places (Corps 1985). However, at the end of construction human remains were found within the project area in disturbed contexts. Investigations by the University of Idaho in March of 1982 confirmed this finding and prehistoric archaeological site 35MW32 was recorded within the project area. At that time the site was not deemed eligible for the National Register because of its disturbed context.

3.4. Socio-economic Resources

3.4.1. Population and Economy

The population of Morrow County and the cities in the Willow Creek area are shown in Table 8. The population of these cities has remained relatively stable since 1970. Heppner is the largest city in the project area and is the county seat. Morrow County's population has increased substantially since 1970. For the county, the percent change in population from 1990 to 2000 was 44.2%. The population increase was caused mainly by development in and near the City of Boardman.

Table 8. Population of Morrow County and Cities in the Willow Creek Area

Location	1970	1980	1990	2000	2005 Est.
Heppner	1,429	1,498	1,412	1,395	1,438
Ione	355	345	255	321	333
Lexington	230	307	286	263	273
Morrow County	4,465	7,519	7,625	10,995	11,666

Sources: Corps 2005; U.S. Census Bureau at <http://quickfacts.census.gov>

In 2004, the median household income in Morrow County was \$43,869, which was slightly higher than the median household income for Oregon (\$42,568). The percent of persons below poverty in Morrow County was 13.7% in 2004 as compared to 12.9% for Oregon. The principal industries in Morrow County include agriculture, food processing, lumber, livestock, and recreation. Morrow County is an important agricultural center including both dryland and irrigated crop farms, as well as ranching. The major crops grown in the irrigated northern part of the watershed include potatoes, onions, corn, and alfalfa hay. Smaller acreages of high value crops such as mint and vegetables are also important to this area. Wheat is the major crop in the dryland central portion of the watershed and cattle are the major commodity in the southern region. In 2006, Morrow County ranked seventh in the state in gross farm and ranch sales at nearly \$250 million (ODA 2007). Over 50% of gross farm sales in the county came from crops (Table 9). In 2006, Morrow County was one of Oregon's top producing counties for cattle (4th), hay (2nd), potatoes (1st), and wheat (2nd; ODA 2007).

Table 9. Morrow County Gross Farm Sales, 2006-2007 (in dollars)

Commodity	2007 (preliminary)	2006
Crops		
Grains	73,365,000	32,608,000
Hays and Forage	33,849,000	37,378,000
Grass and Legume Seeds	5,720,000	5,138,000
Field Crops	44,975,000	38,443,000
Tree Fruit and Nuts	441,000	501,000
Vegetable Crops	6,806,000	17,248,000
Other Crops	12,263,000	13,504,000
All Crops	177,419,000	144,820,000
Animal Products		
Cattle and Calves	51,701,000	44,693,000
Misc. Animals	195,000	178,000
Livestock not disclosed	93,078,000	60,180,000
All Animal Products	144,974,000	105,051,000
Total Gross Sales	322,393,000	249,871,000

Source: OSU Extension Service 2007

State Highway 74 connects Heppner with Interstate 84 (Columbia River Highway) and also provides a route to Pilot Rock and Pendleton. State Highways 206 and 207 provide connections between Condon, Heppner, Lexington, and Umatilla. County roads provide an adequate network that serves the rural areas within the Willow Creek watershed.

3.4.2. Recreation

Willow Creek Lake provides residents and visitors with water-related recreation opportunities that were not available prior to construction of the project and contribute to the overall economic health of the region. Two recreation facilities were constructed on project lands. One facility was constructed on a point of land between Willow Creek and Balm Fork and consists of a picnic area, parking lot, boat launch ramp with parking and a floating dock, and drinking water and restroom facilities. The second recreation facility is a baseball field which is located just downstream of the spillway stilling basin. An RV Park is located on the land between Willow Creek and Balm Fork and is maintained by the Willow Creek Park District.

Fishing, boating, and swimming are the primary recreation uses for Willow Creek Lake. A key element of the recreation plan at Willow Creek is maintaining the lake at or above elevation 2063.0 feet during summer and early fall to provide an adequate lake surface area and depth for water-based recreation. Project recreation facilities just upstream of the dam normally receive heavy use from residents of Heppner and other nearby communities. An estimate of visitation to Willow Creek Lake is shown in Table 10. This information was taken from the Corps RecSTATUS database. Most of this use occurs during peak use periods on summer weekends by local residents of Heppner and southern Morrow County. Willow Creek Lake is the only body of water within convenient day-use driving distance (up to 25 miles) for local residents. The lake has been receiving increased use by non-residents traveling through the region. The route from the Columbia River through Baker City has been designated by the U.S. Forest Service as the Blue Mountain National Scenic Byway.

Table 10. Visitation at Willow Creek Lake, 2004-2006

Total Visits*	2004	2005	2006	% Change 2005 to 2006
Corps' Managed Areas	15,743	34,573	19,661	---
Non-Corps' Managed Areas	56,116	49,596	95,468	---
Recreation Area – Non-Corps Managed Area in Italics				
<i>Boat Ramp</i>	24,956	16,562	24,350	47.0
<i>Lower Playfield</i>	14,796	19,886	37,508	88.6
<i>Viewpoint</i>	16,364	13,148	33,610	155.6
Willow Creek Campground	15,743	34,573	19,661	-43.1

*All visits are counted whether visiting one or multiple areas.
Source: Corps' RecSTATUS database accessed on 3/25/2008.

The Corps' "Value to the Nation" website (<http://www.vtn.iwr.usace.army.mil/>) was updated since publication of the draft EA. According to the website, in 2006 there were a total of 126,748 person-trips to six recreation areas at Willow Creek Lake. Of this amount, recreation use was estimated to include 23,030 picnickers, 4,278 campers, 3,574 swimmers, 1,724 water skiers, 15,134 boaters, 35,984 sightseers, 28,024 anglers, 608 hunters, and 28,734 others. This amount of visitation was estimated to result in \$2.73 million in visitor spending within 30 miles of the lake. About 53% of the spending was captured by the local economy as direct sales effects. With multiplier effects, visitor trip spending resulted in \$1.61 million in total sales, \$0.86 million in total income, and supported 27 jobs in the local community surrounding the lake.

4. ENVIRONMENTAL EFFECTS

4.1. Physical Effects

Modeling was used by the Corps to create two irrigation release plots illustrating the effect that the proposed action would have on the elevation of Willow Creek Lake during a normal water year and a very dry water year¹ (Figures 4 and 5, respectively). For the purposes of determining the effects of releasing 2,500 acre-feet of water for irrigation, the modeling used the maximum amount totaling 2,500 acre-feet of water released annually for irrigation use and that the water would be released according to the monthly release schedule provided in House Document 233 (1965), as shown in Table 3. In actuality, the 2,500 acre-feet of water is not guaranteed annually but is subject to availability. Also, the distribution of water through the irrigation system may vary depending on availability of water, annual climate variability, or other significant circumstances.

Typically starting about April 15, Willow Creek Lake is kept at its summer pool elevation of 2076.5 feet if possible until about October 15 when the drawdown to its winter pool elevation begins. For the proposed action, Figure 4 (normal water year) shows that in about late April, the lake would begin a 1- to 3-foot monthly drawdown and would reach an elevation of about 2053 feet by October 15, which is about 18 feet below the lake elevation calculated without irrigation releases (elevation ~2071 feet). The lake's elevation would then increase during the winter months. If the pool does not reach summer pool elevation of 2076.5 feet then uses may be scaled back. Discussions between the Corps and Bureau of Reclamation would occur to determine if all irrigation contracts could be fulfilled or if irrigation releases would have to be scaled back by some percentage.

During a very dry year, similar physical effects to the lake would be expected for the proposed action; however, the drawdown would begin earlier in April and would approach the lake's minimum pool elevation (2047 feet) by November (see Figure 5). Drawing down Willow Creek Lake to its minimum pool elevation would reduce the water surface area to about 96 acres. This action would expose about 38 acres of bottom area that is normally inundated at the winter pool elevation of 2063 feet. During the period when water is released for irrigation, downstream flows would increase from 3 cfs to as much as 20 cfs.

Willow Creek Lake would be expected to refill for the following year during the winter and spring under typical climate conditions. However, if less than normal precipitation would occur during winter, then the lake may not fill to its summer pool elevation of 2076.5 feet the following spring.

¹“Normal water year” is defined as 100% of average inflow for the 51 year period 1952 to 2003. “Very dry water year” is defined as 50% of average inflow for the same period. (For the 51 years of data used, only 7 years had less inflow than the amount used to model a “very dry water year.”)

Figure 4. Modeled Irrigation Release Plots for Normal Water Year

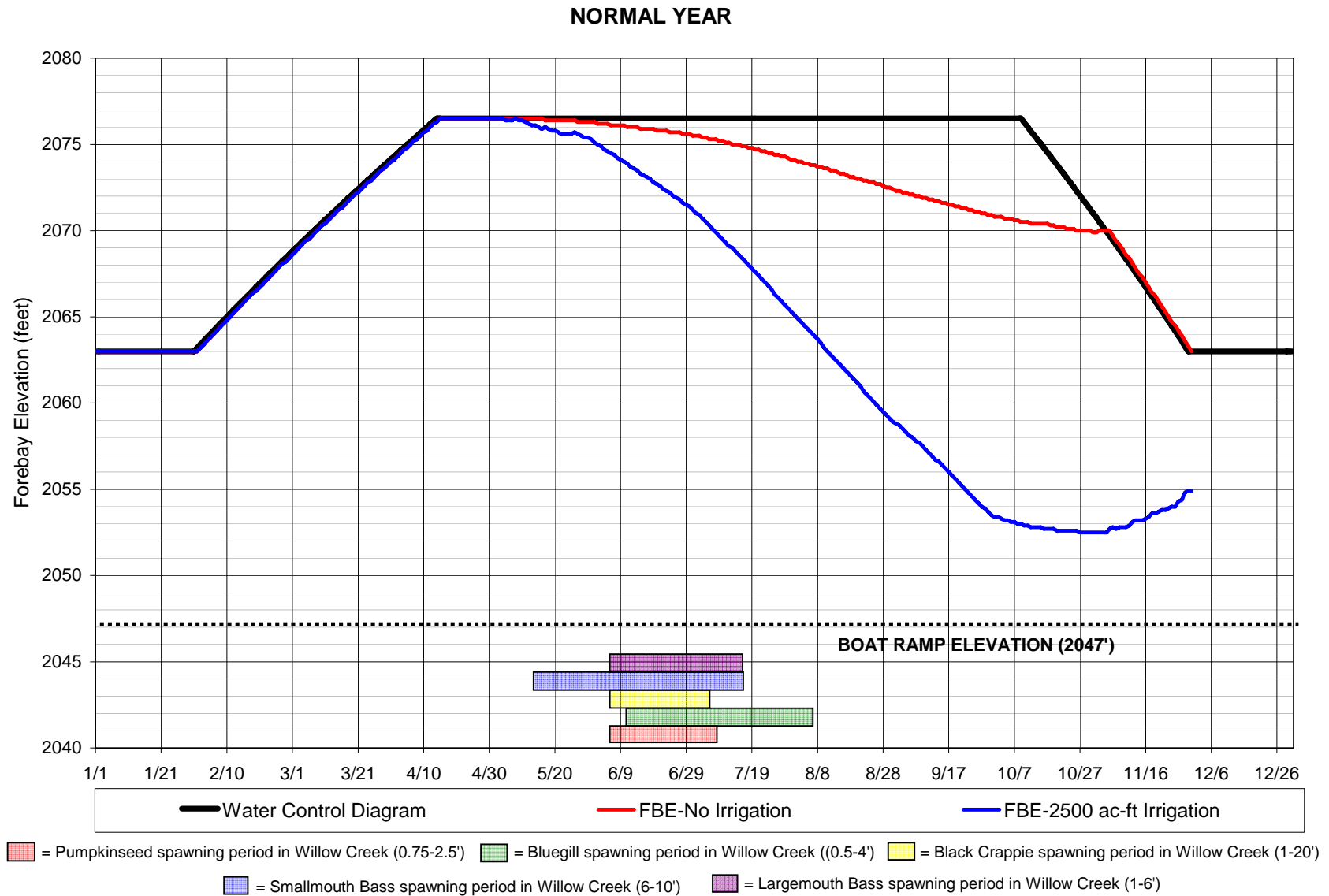
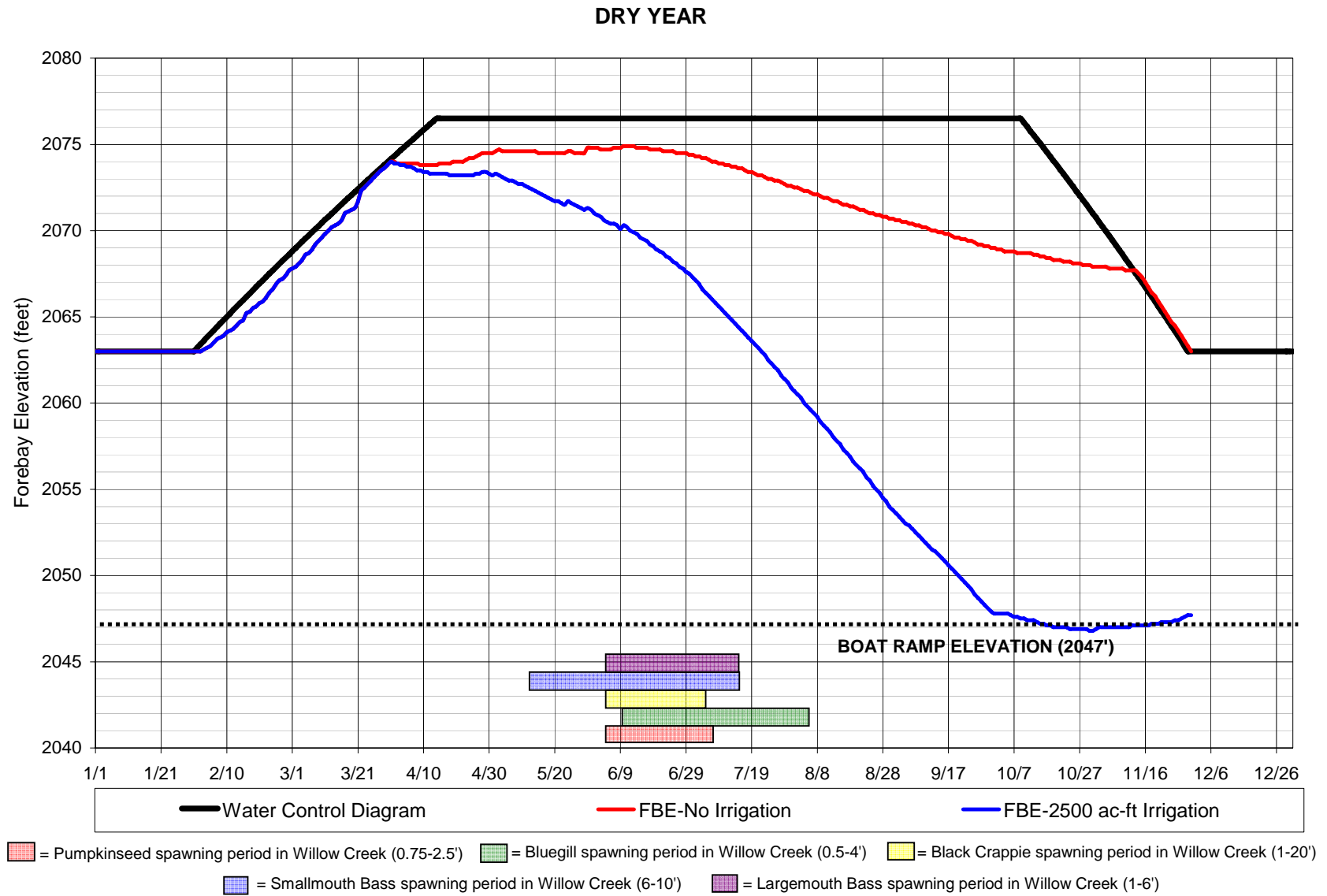


Figure 5. Modeled Irrigation Release Plots for Dry Water Year



4.1.1. Water Quality

Willow Creek Lake is currently eutrophic (has a high nutrient content) and water quality impaired, with frequent algal blooms during the summer and fall months (see Section 3.1.2). The proposed action will create a smaller summer pool in Willow Creek Lake and may cause overall poorer water quality in the lake.

The proposed action may have a small, positive influence on the water temperature of Willow Creek over a very short distance below the dam before the environment, including air temperatures and sun exposure, would return the stream to pre-irrigation release temperatures. However, even with increased outflow from the lake for irrigation releases, the amount of water in Willow Creek during summer and early fall would not be sufficient to reach the Columbia River. Usually between Lexington and Ione, irrigation withdrawals (natural flow rights), bed losses, and/or evaporation entirely attenuate the flow of the creek. Between this point and river mile 5, much of Willow Creek has a dry stream bed in parts of July, August, and September (DEQ 2007).

The proposed action does not involve the placement of fill material into waters of the United States.

4.1.2. Air Quality/Noise/Light

There would be no reduction in air quality, increases in noise levels, or changes to natural light conditions resulting from the proposed action.

4.2. Biological Environment

4.2.1. Vegetation

The additional release of stored water annually for irrigation would draw the lake down earlier and farther than under typical operations (see Figures 4 and 5), which would impact shoreline vegetation including willows, sedges and rushes, and expose additional mudflats around the perimeter of the lake.

4.2.2. Fish

The ODFW (2006) provided an assessment of the effects to warmwater fish populations from lake storage provided for temporary irrigation water contracts in 2003-2006. Spawning information for fish species in Willow Creek Lake is shown in Table 11. According to the ODFW (2006), the three warmwater species that appear to have been affected most by the change in the lake's water level management are pumpkinseed, largemouth bass, and black crappie. These three species have some combination of shallow preferred spawning depth, later initiation of spawning, or short spawning duration. The two species that do not appear to have been greatly impacted by increased water withdrawals, smallmouth bass and bluegill, either spawn deeper and/or have a protracted spawning period.

The ODFW (2006) stated that the effects of increased irrigation withdrawals on pumpkinseed, largemouth bass, and black crappie could be decreased by delaying the initiation of the water withdrawal until the end of the spawning period (July 15). In March 2008 (see Section 5, *Coordination*), the ODFW recommended holding the lake level steady from June 10 to July 10 in order to minimize impacts to largemouth bass [these dates are tied to key water temperatures (surface water temperature reaching 60°F for 2 or 3 days) for increased spawning success]. If water level drawdown can be minimized until the fry leave the nest, then losses of largemouth bass and

pumpkinseed may be lessened. This same strategy would also reduce nest mortality of black crappie, but may not lessen mortality of black crappie fry because of entrainment (also called stranding). Black crappie fry tend to move to the pelagic zone following swim-up making them much more susceptible to entrainment than the more demersal fry of the other warmwater species in the lake.

Table 11. Spawning Information for Fish Species in Willow Creek Lake

Species	Temperature @ initiation of spawning (°F)	Preferred (range) depth of spawning (feet)	Duration of spawning/fry dispersion (days)	Timing of spawning period in Willow Creek
Largemouth bass	60	2 (1-6)	12-17	June 7-July 15
Smallmouth bass	55	7 (6-10)	12-14	May 13-July 15
Black crappie	59	9.5 (1-20)	7-9	June 7-July 7
Bluegill	63	2 (0.5-4)	10	June 10-August 7
Pumpkinseed	59	(0.75-2.5)	11	June 7-July 9

Source: ODFW 2006. Values for the first three columns are taken from a variety of literature sources, while the dates given for spawning time period in Willow Creek Lake were generated after considering the previous three columns and then comparing Willow Creek Lake recorded temperatures to observed water temperatures and spawning of smallmouth bass and crappie in Brownlee Reservoir from 1991 to 1996.

Figures 4 and 5 illustrate the effect that the proposed action would have on the elevations of Willow Creek Lake during representative normal and dry water years, respectively. The figures also show the spawning periods/depth of spawning for pumpkinseed, bluegill, black crappie, smallmouth bass, and largemouth bass in the lake. Based on these plots, the following fishery impacts of the proposed irrigation release are anticipated.

- The proposed irrigation release would result in a water level drawdown of about 2-3 feet per month in the June and July period. This may eliminate successful spawning of largemouth bass and pumpkinseed in the lake because these species spawn in shallower water; their nests may be dewatered as the water level in the lake is drawn down (Table 11). The lake would likely change to a smallmouth bass/black crappie/bluegill fishery. Smallmouth bass and black crappie spawn in deeper water, while bluegill has an earlier spawning period.
- Fish would be concentrated in a smaller summer pool, which may also affect fish spawning and cause higher mortalities to adult fish because of higher water temperatures, poorer water quality, and chance for increased predation.
- The drawdown for irrigation may also affect fingerling trout planted in the lake by ODFW for the next year's harvest.

4.2.3. Wildlife

The proposed action is not expected to adversely affect small game animals, small mammals, raptors, passerine birds, game birds, shorebirds, and reptiles in the project area. Potential impacts to wildlife from a lowering pool level include a potential increase from avian predation on waterfowl broods, and potential impacts to amphibian species living in shoreline areas of the lake. There are no known bald eagle nests in or near the Willow Creek project. Minimal winter use of the project area for foraging may occur during the months of October through March. Therefore, the proposed action would not affect bald eagles or their habitat.

4.2.4. Threatened and Endangered Species

Table 7 shows the federally listed species that may occur in Morrow County. No listed anadromous salmonid species or their critical habitat under the jurisdiction of the National Marine Fisheries Service occurs in the project vicinity.

4.3. Cultural and Historic Resources

The proposed action will not affect cultural resources or National Register listed or eligible historic properties.

4.4. Socio-economic Resources

Water-based recreation uses of Willow Creek Lake would be affected by the proposed action. The lake would be drawn down earlier and farther than under typical operations (see Figures 4 and 5). The early, lower drawdown would reduce the lake area available for recreational boating use. However, the usability of the boat launching facility at the project should not be affected. In addition to the decreased surface area, the drawdown for irrigation would expose muddy slopes and banks that are aesthetically unappealing and restrict access to the shoreline of the lake. Also, some economic losses in the local area would occur because of the reduction in water-based recreation use. Sport fishing opportunities may be decreased as the population of largemouth bass and fingerling rainbow trout could be reduced or eliminated by the proposed irrigation drawdown. However, ODFW restocks catchable trout in the lake on an annual basis, which will help alleviate some of the effects to the recreational fishery.

4.5. Cumulative Effects

Cumulative effects are defined as, “the 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 (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). No known activities are reasonably certain to occur that would compound the environmental effects of the proposed action.

5. COORDINATION

The draft EA was distributed for a 30-day public comment period. By public request, the comment period was extended to 45 days. Review comments were requested from federal, state, and local agencies and groups including but not limited to:

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Bureau of Reclamation
U.S. Forest Service, Heppner Ranger District
Nez Perce Tribe
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Confederated Tribes and Bands of the Yakama Indian Nation
Oregon State Historic Preservation Office
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Water Resources Department
Oregon Parks and Recreation Department
Morrow County Planning Department
Morrow County Parks
City of Heppner
City of Lexington
City of Ione
City of Boardman
Oregon Trail Library District, Heppner Branch
Boardman Library
Ione Public Library

A summary of the major comments from the 60 comment letters received is provided below. The final EA has been revised to reflect these comments, as appropriate.

- Oppose the permanent release of water for irrigation; only allow irrigation withdrawals from Willow Creek Lake after a drought declaration has been issued.
- The proposed project was not adequately publicized and a public meeting in the local community is needed.
- Used ambiguous recreation numbers (visitation/economic) in the draft EA.
- The past two summers have seen algae blooms that have greatly affected the water quality and fish habitat of the lake.
- Increase the lake level to provide the additional irrigation water.
- The loss of recreational value will be a great loss to the people of the region and most profoundly to the people and businesses of Heppner. The proposed project helps a few farmers to the detriment of the rest of the Heppner community.
- The increased drawdown of the reservoir will only leave recreation users with faster appearing mudflats earlier in the year, an increase in water temperature sooner, and toxic blue-green algae blooms that will occur earlier in the year.

- Two warmwater recreational fisheries at Willow Creek will be lost forever if the proposed action is adopted. The proposed action will disrupt the spawn cycles of largemouth bass and crappie to the point that reproduction will be lost completely.
- The Willow Creek RV Park was constructed in conjunction with the lake to encourage people to use the lake, stay in the community, and promote a positive economic impact on the community. The loss of water and recreation has a direct effect on this financial gain.
- The aesthetics and recreation values will be seriously diminished particularly since there have been problems already with algae bloom as the water warms. The large mud flats from draw down would be very unattractive to recreational users, thus reducing this type of use greatly. Recreational dollars lost if the proposed water release takes place would be much greater than the small amount of dollars that the communities of south Morrow County would see from a very small amount of additional hay or other crops.
- Concern that the permanent drawdown will stop any and all recreation as the water level will be so low that boats larger than 12 feet will not be able to launch. The docks have been sitting in mud in the past 2 years. During the recent blue-algae alert, kids and dogs could not swim in the lake. It seems logical that higher content of rich nutrient waters and less water dilution will make this problem more extreme in future years.
- The Willow Creek basin is impacted by the Ella Butte Classified Groundwater Area designation, and there are diminishing water levels in the area. The use of reservoir water for irrigation could be part of a long-term plan to address this groundwater classified area and the basin as a whole. The impacts of using less groundwater may have benefits to more entities than just the agricultural community. But it is also recognized that there will be impacts to the varied users of the reservoir from irrigation, such as a lowering of the water levels in the mid- to late summer months. A balance between the varied reservoir uses is needed.
- Since dam construction, water has been held in the reservoir until October each year and then released to rush down to the Columbia River. This is after any productive use of it could be made of it for growing a crop. This is also after the creek has gone dry and fish and other wildlife have perished or suffered. At last some economic benefit can be realized from the stored water in the reservoir.
- Historically irrigators have used water from the creek to irrigate crops and in the 1970s wells were developed to supplement creek flow. However, flow in the creek is diminishing and water from the creek can only be used until about mid-July. The wells offer a source of supplementary water but their reliability over a long period of time is questionable. The wells are basalt wells and they recharge very slowly, if at all. The past 4 years of emergency irrigation has given irrigators a reliable water source throughout the growing season. This process has also allowed irrigators to not use their wells. With a stable water source, irrigators will be able to maintain agriculture viability and can expand crop options and increase economic contributions to Morrow County.
- Most reservoirs in eastern Oregon are used for mixed purposes: McKay Creek, Unity, Phillips, Rowe Creek, Beulah, Chickahominy, Prineville, etc all are combination recreation and irrigation lakes. The fisheries, boating, and irrigation needs have all held up well over the years. Willow Creek reservoir can be used for all purposes as well, if managed properly.
- Willow Creek is probably the only reservoir in Oregon which is not annually drawn down and the water used for irrigation. Nearly all of the other reservoirs support healthy fish populations and produce good fishing. Many sportsmen have learned to fish these reservoirs with changing water levels and adjust their fishing methods accordingly. Good catches of trout can be taken in the upper shallow water of the Willow Creek arm of the reservoir during the late season.
- Making the stored water available to irrigators will conserve valuable groundwater. The additional water will allow for a longer growing season and allow for more diverse crops. The economic gains derived will directly benefit local businesses.

- During the summer months, water flow in the creek typically becomes too low for irrigation. By releasing water, this would allow irrigators to continue growing crops and this also increases the need for fertilizers, sprays, labor, electricity, freight, and fuel, many commodities which are purchased locally. This results in significant economic gains for the local economy. In addition, the Willow Creek valley will remain green well into the summer and fall months. This increases the aesthetic beauty of the area during a time when most visitors frequent the area again contributing to the economy of south Morrow County.
- Released water for irrigation is important as it helps grow cover and crops that makes the Willow Creek valley great habitat for upland birds as well as other wildlife. Being able to depend on the Corps to supply a dependable source of water is paramount to keeping up the habitat that supports not only the wild game bird population, but also the other species of wildlife in the Willow Creek drainage. The money that hunters spend on tourism in small towns like Heppner is also an important part of the economic viability of these rural communities. Many of the jobs once linked to the timber and agriculture industries are disappearing and tourism dollars are important to sustain small business in these towns.
- The additional water available from Willow Creek for irrigation has made it possible for producers to grow higher dollar row and vegetable crops. Crops of this nature also require a much higher level of crop input, such as crop nutrients, crop protection products, fuel, seed, parts, and machinery, resulting in a significant economic gain for local businesses.

Based on the initial public comments, the Corps held a public information meeting in Heppner on February 19, 2008. Approximately 85 people attended the public meeting. An overview of the Willow Creek project, the proposed action for irrigation withdrawal, and the irrigation water contract process was presented by Corps' staff. A discussion of Oregon water law and water rights was provided by Oregon Water Resources Department staff. A question and answer session followed the presentations. The public comment period for the proposed action was extended to March 5, 2008. An additional 24 comment letters were received after the public meeting and many were similar to the comments summarized above. Additional comments raised are summarized below. The final EA has been revised to reflect these comments, as appropriate.

- Fill the reservoir earlier so that drawdown does not impact the uses of the lake, the dock and boat ramp late in the season.
- No drawdown during fish spawning season.
- A compromise is needed to benefit both recreation and irrigation.
- Provide a wetland at the Balm Fork end of the reservoir to reduce organic inflows to the lake.
- Water skiing would not be practical or safe during much of the summer with drawdown.
- The release of large amounts of water in October for winter storage in the reservoir causes extensive and irreparable streambank erosion downstream because of the volume and length of time of the release.
- Releases during irrigation season help TMDLs for temperature and water quality downstream, as well as downstream fishery and riparian plantings.
- Steep banks, limited grassy marshland, little shoreline vegetation, and algae blooms are all issues that should be addressed separately from the irrigation withdrawals.
- The growers involved with the irrigation project purchased about \$1 million in products and services from the Morrow County Grain Growers in 2007. These growers also employ 11 people; their employees purchased \$23,000 in products and services from Morrow County Grain Growers. The money earned by irrigated agriculture in the Willow Creek valley does not just go to the irrigated producer; it gets reinvested into the local communities and local businesses and helps to keep all the businesses in the valley financially strong.

The Morrow County Court provided a letter dated March 5, 2008 (letter is attached at the end of the final EA), which clarified their role with respect to the state permit, “. . . to construct the reservoir and store water. . .,” and drought declarations which were made, “. . . based on annual rainfall, available water and other significant factors.” The drought declaration is only one step in a process that requires approval, coordination, and contracts from other agencies before water stored in Willow Creek reservoir can be used for irrigation.

By letter dated March 26, 2008 (letter is attached at the end of the final EA), Michael Ladd, the Regional Manager for the Oregon Water Resources Department, provided a clarification of a comment he made at the public meeting in Heppner on February 19, 2008:

I made a comment that water right Permit R-10880 issued by Oregon Water Resources Department (OWRD) for storage in Willow Creek Reservoir had two priority dates. I mentioned that the storage permit was first issued to allow recreation use with a priority date of April 1966 and the irrigation portion of the permit had a priority date of August 1983. I have since researched records in our main office in Salem and need to correct the record as to what the permit allows. The April 1966 priority date allows the storage of 3,500 acre feet for irrigation purposes and 6,700 acre feet for recreation for a total of 10,200 acre feet. The August 1983 priority date allows the additional storage of 3,050 acre feet for recreation also. Therefore, Permit R-10880 allows a total storage of 13,250 acre feet for irrigation and recreation. I am attaching a copy of the permit to help clarify the priority dates and the storage entitlements.

The above paragraph speaks only to the water right permit entitlements, and should not be used to interpret what Congress authorized the reservoir for, or the particular order they prioritized for the use of the reservoir.

On March 21, 2008, the Corps met with staff from ODFW, OWRD, and the Irrigators Group to discuss the fishery issues at Willow Creek Lake. ODFW indicated that warmwater game fish are a key component of the ODFW mission to protect and enhance Oregon’s fish and wildlife and their habitats for present and future generations. Non-native gamefish are managed throughout the state for recreation benefits with consideration to potential impacts they could have on native populations. The *Warmwater Fish Plan*, which provides formal direction for managing warmwater gamefish, was adopted by the Commission in 1987.

Production of successful year classes of warmwater fish is affected by a variety of factors, both biological and physical, and the interplay of those factors. Water level management in a reservoir can influence the ability of a species to recruit a strong year class to the population. Drawdown of water levels in the spring can affect reproductive success of bass and panfish that spawn in the shallow water areas. Factors such as entrainment (stranding), water quality, pool level retention, and zooplankton production can influence the ability of those fish to recruit successfully. It was noted that many reservoirs in the state are managed for warmwater fisheries in spite of annual irrigation withdrawals. It was also noted that there are other reservoirs within the state which have no minimum pool requirements and could be drained to much lower levels for irrigation purposes than will be allowed at Willow Creek.

Annual trout releases and warmwater fishery sampling have been a consistent management action by ODFW at Willow Creek Lake to maintain the lake fishery. ODFW currently requests that some flow be maintained below Willow Creek Dam for the benefit of downstream fish and wildlife.² ODFW

² Corps’ note: The *Water Control Manual for Willow Creek* calls for a minimum release objective of 3 cfs to maintain continual surface flow in the Willow Creek channel through Heppner. However, maintaining the lake

also annually stocks catchable trout downstream from the dam which benefit from the releases for irrigation. ODFW will continue to stock the lake and Willow Creek downstream of the dam with trout.

Available data indicates that the drawdown of reservoir water during spawning may impact the composition of warmwater fish at Willow Creek Lake. To minimize impacts to largemouth bass, ODFW recommended holding the lake level steady from June 10 to July 10; these dates target key water temperatures (surface water temperature reaching 60°F for 2 or 3 days) for increased spawning success. It was also noted by ODFW that other factors, such as the ongoing water quality concerns in the lake, may impact the overall health of the fishery in the lake.

It was agreed at the meeting that although irrigation withdrawals would likely be required by some irrigators during the period of June 10 through July 10, the irrigation district would work to minimize withdrawals during this period to minimize potential spawning impacts. It was also agreed at the meeting that the formation of an advisory group is needed to address on-going water quality concerns, fishery issues (including habitat enhancement to encourage deeper spawning), and recreational access at Willow Creek Lake. Representatives from all interest groups would be invited to participate. Potential participants include the Corps, OWRD, ODFW, Irrigators Group, Willow Creek Park District, recreation interest groups, and other local agencies. It was proposed that this advisory group would determine the organizational structure and goals of the group. It was indicated that there may be state and/or federal funding as well as grant money available to address some of the concerns expressed by recreation and fishery interests at Willow Creek Lake.

6. COMPLIANCE WITH LAWS AND REGULATIONS

6.1. National Environmental Policy Act

The Nation Environmental Policy Act (NEPA, 42 U.S.C. 4321 et seq.), requires that all agencies of the federal government must conduct an appropriate environmental review before taking any action. This Environmental Assessment satisfies the requirements of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.).

6.2. Endangered Species Act

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. As discussed in Section 4.2.4, no impacts to federally listed fish and wildlife species are expected from the proposed action.

6.3. Bald Eagle Protection Act

The Bald Eagle Protection Act of 1940, as amended, provides for the protection of the bald eagle and golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. As discussed in the Environmental Assessment, the proposed action is not expected to affect bald eagles.

at or near elevation 2047 feet has a higher priority than does maintaining the 3 cfs release; thus, the lake elevation should not be allowed to drop below elevation 2047 feet in order to maintain the 3 cfs release, but rather the release should be set at a lesser value depending upon the amount of water in storage. The release should not be set at less than 1 cfs.

6.4. Clean Water Act

Section 401 of the Clean Water Act of 1977, as amended, requires certification from the state or interstate water control agencies that a proposed water resources project is in compliance with established effluent limitations and water quality standards. Storage of water does not require a Section 401 Water Quality Certificate from the State of Oregon and irrigation runoff is exempt from the National Pollution Discharge Elimination System (NPDES) permit based on the regulations found at 40 CFR 122.3(f). A Section 404(b)(1) Water Quality Evaluation is not required because the proposed action does not involve the placement of fill material into waters of the United States.

6.5. Clean Air Act

The Clean Air Act of 1970, as amended, established a comprehensive program for improving and maintaining air quality throughout the United States. Its goals are achieved through permitting of stationary sources, restricting the emission of toxic substances from stationary and mobile sources, and establishing National Ambient Air Quality Standards. Title IV of the Act includes provisions for complying with noise pollution standards. There would be no reduction in air quality or increases in noise levels from the proposed action.

6.6. National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that a federally assisted or federally permitted projects account for the potential effects on sites, districts, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places. No cultural resources would be affected by the proposed action.

While cultural resources surveys, identification studies and NHPA Section 106 coordination were completed for the Willow Creek project prior its construction, it was noted in a 19 Nov 2007 letter from the Oregon State Historic Preservation Office (SHPO Case No. 07-2681) that human remains were found within the project area in disturbed contexts at the end of construction. Investigations by the University of Idaho in March of 1982 confirmed this finding and prehistoric archaeological site 35MW32 was recorded within the project area. At that time the site was not deemed eligible for the National Register because of its disturbed context.

The operation of the project since construction keeps site 35MW32 inundated except during extreme drought conditions. Instituting the proposed irrigation release schedule discussed in this EA will subject the site and areas where human remains were found to more frequent and prolonged exposures as the water level drops. Several decades have passed since the discovery of 35MW32 and National Register eligibility criteria have changed. Because the site is currently inundated it is impossible to re-evaluate it with regard to the changes proposed within this EA prior to water withdrawals. However, using current information, no historic properties eligible for the National Register would be affected by the proposed action. Consultation with the Oregon SHPO regarding these matters has resulted in a request that the Corps demonstrate compliance with NHPA under Section 110 of the act by having professional archaeologists examine and evaluate the condition of any resources including the recorded site within the fluctuation zone at the first practical opportunity presented by low water conditions. A letter confirming that the Portland District will comply with this request is being coordinated with SHPO.

6.7. Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act provides for the protection of Native American and Native Hawaiian cultural items, established ownership and control of Native American cultural items, human remains, and associated funerary objects to Native Americans. It also establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on federal land. Because human remains were found within an area where the lake level fluctuates and the lake bed is exposed from time to time, it is possible that additional potential human remains could be exposed. However, the proposed impoundment and release schedule outlined in this EA does not differ appreciably from the recent history of operations at the Willow Creek Project, and will not change current conditions. Portland District will notify tribes and SHPO in the case of any inadvertent discoveries of human remains. As noted in 6.6 above, professional archaeologists will examine the currently inundated fluctuation zone at the earliest practical opportunity.

6.8. Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act of 1934 states that federal agencies involved in water resource development are to consult with the USFWS, NMFS, and state agency administering wildlife resources concerning proposed actions or plans. The proposed action is being coordinated with the USFWS and ODFW in accordance with the Act.

6.9. Comprehensive and Environmental Response, Compensation and Liability Act

The location of the proposed action is not within the boundaries of a site designated by the EPA or the State of Oregon for a response action under Comprehensive and Environmental Response, Compensation and Liability Act, nor is it a part of a National Priority List site.

6.10. Executive Order 11988, Floodplain Management

This executive order requires federal agencies to consider how their actions may encourage future development in floodplains, and to minimize such development. The proposed action would not affect floodplains or the management of floodplains.

6.11. Executive Order 11990, Protection of Wetlands

This executive order requires federal agencies to protect wetland habitats. The additional release of stored water annually for irrigation would draw Willow Creek Lake down earlier and farther than under typical operations, which would impact shoreline vegetation including willows, sedges, and rushes.

6.12. Executive Order 12898, Environmental Justice

This executive order requires federal agencies to consider and minimize potential impacts on subsistence, low-income or minority communities. The goal is to ensure that no person or group of people should shoulder a disproportionate share of the negative environmental impacts resulting from the execution of this country's domestic and foreign policy programs. The proposed action will not cause changes in population, economics, or other indicators of social well being. The proposed action

will not result in a disproportionately high or adverse effect on minority populations or low-income populations. There are no environmental justice implications from the proposed action.

6.13. Analysis of Impacts on Prime and Unique Farmlands

No impacts to prime and unique farmlands would occur from the proposed action.

7. REFERENCES

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Oregon

Theodore R. Kulongoski, Governor

Water Resources Department
North Central Region
116 S.E. Dorian Avenue
Pendleton, OR 97801
Phone (541) 278-5456
FAX (541) 278-0287

March 26, 2008

District Engineer
US Army Corp of Engineer District, Portland
Attn: CENWP-PM-E/Carolyn Schneider
P.O. Box 2946
Portland, OR 97208-2946

RE: Long-term Withdrawal of Irrigation Water from Willow Creek Project

Dear Ms. Schneider,

I am writing to clarify a comment I made at the public meeting you hosted on February 19, 2008, in Heppner, Oregon, regarding the proposed long term withdrawal of water from Willow Creek Reservoir for irrigation.

I made a comment that water right Permit R-10880 issued by Oregon Water Resources Department (OWRD) for storage in Willow Creek Reservoir had two priority dates. I mentioned that the storage permit was first issued to allow recreation use with a priority date of April, 1966 and the irrigation portion of the permit had a priority date of August, 1983. I have since researched records in our Salem office and need to correct the record as to what the permit allows. The April, 1966 priority date allows the storage of 3,500 acre feet for irrigation purposes and 6,700 acre feet for recreation, for a total of 10,200 acre feet. The August, 1983 priority date also allows the additional storage of 3,050 acre feet for recreation. Therefore, Permit R-10880 allows a total storage of 13,250 acre feet for irrigation and recreation. I am attaching a copy of the permit to help clarify the priority dates and the storage entitlements.

The above paragraph speaks only to the water right permit entitlements, and should not be used to interpret what Congress authorized the reservoir for, or the particular order they prioritized for the use of the reservoir.

I apologize for the error I made and hope this letter clarifies what the storage permit does allow. If you have any further questions, or you would like me to communicate this message to anyone, please let me know.

Sincerely,

Michael F. Ladd
Region Manager

Attachment: Permit R-10880

c: Joel Clark, Watermaster District 21



STATE OF OREGON

County of MORROW

PERMIT to CONSTRUCT a RESERVOIR and to STORE for BENEFICIAL USE the PUBLIC WATERS

This is to certify that I have examined APPLICATION R-42065 and do hereby grant the same SUBJECT TO EXISTING RIGHTS AND THE FOLLOWING LIMITATIONS AND CONDITIONS:

This permit is issued to Morrow County Court, Courthouse, Heppner, Oregon, 97836 and U.S. Bureau of Reclamation, Box 043 - 550 W. Fort Street, Boise, Idaho 83707, phone (503)676-9233, for the construction of Willow Creek Reservoir and storage of water from Willow Creek for recreation and irrigation, a tributary of the Columbia River, to be maintained by appropriation under Application 67436, Permit 50064, for *

The dam will be LOCATED in the: E 1/2 of SW 1/4 and W 1/2 of SE 1/4 of Section 35, Township 2 South, Range 26 East, WM, in the County of Morrow.

The maximum height will be 165 feet above the stream bed or ground surface at the centerline. The top width will be 16.0 feet, slope of upstream face vertical, slope of downstream face 8:1, and height of dam above water line when full 15.0 feet.

The area submerged by the reservoir, when full, will be 268.0 acres, and the maximum depth of water will be 165.0 feet.

* recreation, and applications to be submitted for use of stored water for irrigation.
** water is otherwise available.

The dimensions of the spillway are: The bottom width of the spillway will be 380.0 feet. The top width of the spillway will be 380.0 feet. The distance between the crest of the dam and the crest of the spillway will be 15.0 feet.

The location and dimension of the outlet conduit will be: Old channel of stream. Outworks: 2-42" conduits to valve; 1-36" water quality conduit.

The dam is out of the channel.

The dam will be roller compacted concrete.

The right hereunder shall be limited to the storage of 13,250.0 acre-feet, being 3,500 af for irrigation and 9,750 af for recreation, annually during the nonirrigation season or when excess**
The PRIORITY DATE of this permit is April 7, 1966 for 10,200 af and August 17, 1983 for 3.05Q af

Actual construction work shall begin on or before October 29, 1988, and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1989.

Witness my hand this 29th day of October, 1987.

/s/ WILLIAM H. YOUNG
WATER RESOURCES DIRECTOR

This permit, when issued, is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.

APPLICATION R-42065

PERMIT

R10880



P.O. Box 788 • Heppner, Oregon 97836
(541) 676-5620 FAX: (541) 676-5621

COUNTY COURT

March 5, 2008

District Engineer
US Army Corp of Engineer District, Portland
Attn: CENWP-PM-E/Carolyn Schneider
P.O. Box 2946
Portland, OR 97208-2946



TERRY K. TALLMAN, Judge
email: ttallman@co.morrow.or.us
Boardman, Oregon
JOHN E. WENHOLZ, Commissioner
email: jwenholz@co.morrow.or.us
Irrigon, Oregon
KEN GRIEB, Commissioner
email: kgrieb@co.morrow.or.us
Heppner, Oregon

RE: Long-term Withdrawal of Irrigation Water
Willow Creek Project

Dear Ms. Carolyn Schneider:

Members of the Morrow County Court have continued to watch the proceedings related to irrigation withdrawals from the Willow Creek Reservoir with interest. As stated in our December 12, 2007, letter we support this project, but do hope that balances can be achieved between irrigation and recreation uses.

Based on new information and discussion with Water Resources the County Court would like to offer some additional comment. Specifically we want the record to be clear concerning how the water is managed on both sides of the reservoir and the impact of a County Court declared drought on the use of Willow Creek Reservoir water.

The County Court recently learned that the Court is named as one of the holders for a State of Oregon "Permit to Construct a Reservoir and to Store for Beneficial Use the Public Waters." The Court holds this permit jointly with the Bureau of Reclamation. This permit allows for the storage of up to 3,500 acre feet of water within the reservoir for irrigation purposes. The Authorized Uses of the Willow Creek Reservoir are flood control and irrigation as stated in the (Federal) Flood Control Act of 1965, which authorized the construction of the Willow Creek Reservoir. At that time Aesthetics and Environment, which includes recreation, fish and wildlife, and sedimentation, were identified as Secondary Uses. What the County Court wants to make clear is that the act of storing the water for irrigation purposes is a separate act from the utilization of the water for irrigation purposes. The dam acts as both a physical separator of the water and a separator for the purposes of permitting. The irrigation users on the down river side of the dam need approval from Water Resources to use the water for beneficial purposes, but they do not need the approval of the Morrow County Court or the Bureau of Reclamation as holders of the storage permit.


As a separate act for the last several years the County Court has been asked to make a drought declaration based on annual rainfall, available water and other significant factors. A drought declaration is a beneficial action as it makes a number of resources available to local farmers and ranchers. One of those benefits is the acquisition of water, if available. In many counties when a drought declaration is made it opens the door to recovery through crop

insurance. In Morrow County, because there is an available water source, for the past several years irrigation water has been available on an emergency basis. The County Court wants to be clear, however, that the signing of a drought declaration does not turn on a valve and release the water stored behind the Willow Creek Reservoir. The farmers and ranchers wishing to use the stored irrigation water behind the Willow Creek Reservoir must make application for beneficial use of that water, and while a drought declaration is a requirement for emergency release, it is not the only requirement to be met.

The current request is to make available for irrigation up to 2,500 acre feet of the 3,500 acre feet of stored irrigation water. As discussed earlier there is no direct connection in the permitting process to the stored water and the water used for irrigation beyond the fact that the water has been stored and is available for irrigation - the purpose of the storage permit.

If the Army Corps of Engineers should have any questions concerning this letter or the comments of the Morrow County Court please feel free to contact Carla McLane, Planning Director, at 541-922-4624.

Sincerely,



Terry K. Tallman
Terry K. Tallman
Judge

John Wenzel
John Wenzel
Commissioner

Ken Grieb
Ken Grieb
Commissioner