

## **5-YEAR REVIEW**

### **Warner Sucker (*Catostomus warnerensis*)**

#### **GENERAL INFORMATION:**

**Species:** Warner sucker (*Catostomus warnerensis*)

**Date listed:** September 27, 1985

**FR citation(s):** 50 FR 39117-39123 Determination of Warner sucker to be a threatened species, with a determination of its critical habitat.

**Classification:** Threatened

#### **BACKGROUND:**

**Most recent status review:** The previous Warner sucker 5-year review (U.S. Fish and Wildlife Service 2010), was finalized September 30, 2010, and is included in Appendix B; The document is also available at: [https://ecos.fws.gov/docs/five\\_year\\_review/doc3356.pdf](https://ecos.fws.gov/docs/five_year_review/doc3356.pdf). Please refer to the previous 5-year review for a complete review of the species' status, threats, and management efforts. No significant new information regarding the biological status of Warner sucker has become available since listing or since the last 5-year review that would warrant a change from its current threatened status.

**FR Notice citation announcing this status review:** 81 FR 7571, February 12, 2016. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 76 Species in Hawaii, Oregon, Washington, Montana, and Idaho. (also available at: <https://www.govinfo.gov/content/pkg/FR-2016-02-12/pdf/2016-02895.pdf>)

#### **ASSESSMENT**

##### **Information acquired since the last status review:**

##### **Summary**

The U.S. Fish and Wildlife Service's (USFWS or Service) Bend Field Office conducted this 5-year review. Information for this review was solicited from interested parties through a Federal Register notice announcing this review on February 12, 2016. We also contacted Oregon Department of Fish and Wildlife (ODFW) to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files. New information from ODFW and results of our literature search since the previous review is included in Appendix A.

**New information:** Since the previous Warner Sucker 5-Year Review, we have completed several recovery tasks synthesized below and broken into the following categories: Warner Sucker Recovery Workshop 2019, Warner Basin Aquatic Habitat Partnership and Strategic plan, and Warner Basin Thermal Regimes and Thermal Tolerances of the Warner Sucker (expected 2020).

## Warner Sucker Recovery Workshop 2019

A Warner Sucker Recovery Workshop was held May 21, 2019, in Bend Oregon. Workshop participants reviewed recovery criteria, discussed issues related to meeting recovery criteria, rated the issues derived from the recovery plan and USFWS internal discussions, discussed the threats assessment, and made recommendations for Warner sucker conservation. The threats assessment process was modeled off a similar process of ranking threats and management effectiveness outlined in the Service's bull trout recovery plan (USFWS 2015). Participants from the following entities were represented at the workshop: Bureau of Land Management (BLM); ODFW; USFWS; Lake County Umbrella Watershed Council; River Design Group; and the Oregon Watershed Enhancement Board.

Participants ranked threat severity (minor, moderate, high or severe) and management effectiveness (none, partially, mostly) for each of five identified threats, which included 1) connectivity; 2) non-native species; 3) land management practices; 4) Water quantity and quality; and 5) avian predation. Participants ranked these threats as follows: *connectivity* ranked as a moderate to high threat, predominantly high, with management effectiveness as partially effective. *Non-native species* ranked from a minor to high threat, with a predominant ranking of moderate, and management ranked as none or ineffective. Threat from *land management* practices ranked as a minor to moderate with management ranked as mostly effective, although without a clear predominant ranking. *Water quantity and quality* ranked as a minor to severe threat with the predominant ranking as high, management ranked between ineffective to partially effective. *Avian predation* ranked from a minor to high threat with most participants ranking it as moderate, management was predominantly ineffective.

The workshop participants identified the following Warner sucker research needs. Appendix C includes a summary of information presented and discussed as well as recommendations resulting from the workshop.

### Research Needs from Warner Workshop:

- Determine at what age and what time of year Warner sucker move from the stream environment into the lake environment.
- Evaluate water conservation opportunities to improve and maintain instream flows for Warner Suckers and other native fish.
- Evaluate the Warner sucker's use of lower Deep Creek and the canal north of Hart Lake.
- Evaluate the importance of the lakes in maintaining connectivity between tributary populations.

Based on discussions during the workshop, and new information available since the time the recovery plan was written, the Service has determined the need to make several clarifications regarding terminology associated with recovery criteria in the species' recovery plan. First, given

the Warner Lakes go dry (i.e., desiccate) on an occasional basis, we consider Warner sucker use of the lakes to be opportunistic; essentially a life history expression of the species extending from the stream populations in Deep, Honey and Twentymile creeks. The species' recovery plan utilizes the term *phenotypic plasticity* to describe the different life history expressions and the size differences between fish that rear in the Warner Lakes versus those that rear in the basin's streams (U.S. Fish and Wildlife Service 1998, p. 17). The adfluvial life history expression (i.e., spawning in streams but using lakes for rearing at some point in the life cycle) manifests when environmental conditions support it. From a life history standpoint, it is the species maximizing reproductive capacity and long-term persistence by utilizing productive lake habitat when available and accessible. Evidence suggests that occasionally Warner suckers may spawn in the lakes, but this is likely only when access to stream habitat is unavailable. Whether Warner suckers can successfully spawn in the Warner Lakes and contribute progeny to the population is unknown. Thus given this lack of evidence, we do not consider suckers that use the Warner Lakes to be "self-sustaining populations" nor do we consider them to be independent populations from those occupying stream habitats in the basin.

At this time the Service views the connection between Twentymile Creek and Crump Lake for Warner suckers as one directional with downstream movement during high water years possible, but no connection upstream from Crump Lake to Twentymile Creek due to stream channel modifications to water flow in the south-end of the basin. The Service does not consider this loss of upstream connectivity to inhibit recovery of Warner sucker.

Finally, the Service recognizes that control (i.e., suppression or eradication) of non-native fish in the Warner Lakes is not currently feasible, and that our position regarding non-natives is that we are managing for co-existence. Control of non-natives may become a management priority in the future, should effective tools become available. Given the age of the Recovery Plan the Service may ultimately choose to revise the recovery plan and/or recovery criteria to better reflect the role of the Warner Lakes in meeting the species' recovery needs.

### **Warner Basin Aquatic Habitat Partnership and Strategic Plan**

The Warner Basin Aquatic Habitat Partnership (WBAHP) is a collaborative group of local, state, and federal partners committed to the recovery of Warner sucker, formed to implement recovery actions benefitting Warner sucker and Warner Basin redband trout. The WBAHP is comprised of seven organizations including the Lake County Umbrella Watershed Council (LCUWC), Lakeview Soil and Water Conservation District (LSWCD), ODFW, USFWS, BLM, the U.S. Forest Service (USFS), and River Design Group, Inc. (RDG).

The WBAHP 2019 Strategic Action Plan (SAP) sets a course to meet the recovery criteria for the Warner sucker. As directed by the SAP there are ten projects in the Warner Basin targeted for completion over the next six years within the three primary streams in the basin. The WBAHP SAP is included in Appendix D.

The WBAHP has already completed several fish passage, screening, and habitat enhancement projects in the Warner Basin with a goal of expanding efforts to improve fish passage, and enhance and increase access to habitat in three tributary watersheds inhabited by Warner sucker and Warner Basin redband trout. The strategic plan focuses on ameliorating threats related to

irrigation diversions that impede up and downstream movement of Warner sucker and redband trout. Additionally, the completion of passage projects identified in the SAP will increase connectivity to the lakes for Warner suckers. Due to occasional desiccation the lakes serve as valuable but unreliable habitat. During years when the lakes have water they support large highly fecund (*i.e.*, greater number of eggs than smaller individuals) Warner suckers that benefit the species persistence. Conversely the lakes can be a population sink when they dry.

### **Warner Basin Thermal Regimes and Thermal Tolerances of the Warner Sucker**

Climate change will alter the precipitation patterns in the Warner Basin and result in changes in stream flow and water temperature. To better inform decisions around future status and recovery actions there is a need to understand both the future hydrological regime and the ability of these fish to adapt to increased temperatures. ODFW is completing a project to:

- *Model the current and future hydrological regime in Honey, Deep, and Twentymile creeks in the Warner Basin.* ODFW is currently developing a statewide approach to measure and predict stream flows at a reach scale under various climate change and land use scenarios. The model approach varies depending on the location, scale, and purpose. For the Warner Basin, we used the Visualizing Ecosystems for Land Management Assessments (VELMA) eco-hydrology model to model current and future stream flows. VELMA was developed by the EPA to predict how the hydrology, water quality, and plant growth in a basin may change under various management and environmental change scenarios.
- *Model current and future stream temperature regimes in Honey, Deep, and Twentymile creeks in the Warner Basin.* ODFW is currently developing a statewide approach to monitor current stream temperatures and project future temperatures at a reach scale under various climate change and land use scenarios. For the Warner Basin, this project used both existing instream and remote sensed data to develop a reach-specific temperature model for the three main tributaries in the basin.
- *Measure the temperature sensitivity of Warner sucker.* ODFW, in collaboration with UC Santa Barbara, is currently assessing the thermal sensitivity and tolerance of multiple native fish species to determine their potential ability to adapt to warmer stream temperatures. In 2019, ODFW measured the thermal sensitivity of Warner sucker. Results of this work are expected to be available early 2020.

**Progress Summary:** Since the previous 5-year review completed in 2010, the WBAHP completed four fish passage projects and two culvert replacement projects benefitting Warner sucker. These passage projects also include screening projects as determined appropriate by the partners. The Rookery Diversion Project on Honey Creek was completed in 2013; Dyke Diversion Project on Twentymile Creek was completed in 2015; Honey Creek Flood Ditch Project was completed in 2018; and the MC diversion project on Twentymile Creek was completed in 2018. Currently, the Adel town weir diversion project is under construction and the Plush town weir and Starveout diversion projects are in the planning and funding stage. The BLM and USFS continue to implement grazing practices to maintain and/or improve riparian conditions along streams under their management. Studies contributing to our knowledge of

habitat conditions and conservation needs of Warner sucker were conducted by ODFW (Appendix A). Funding to implement the SAP has been approved by OWEB, funding from the Service's Partners for Fish and Wildlife Program, and the Western Native Trout Initiative are secured. Other funding sources to implement the SAP are being pursued.

**Conclusion:**

After reviewing the best available scientific information, we conclude that the Warner sucker remains a threatened species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act, and our analysis of the status of the species in our 2010 5-Year review (USFWS 2010) remains an accurate reflection of the species current status.

**RECOMMENDATIONS FOR FUTURE ACTIONS:**

1. The WBAHP should continue to implement a comprehensive, prioritized passage and screening strategy to benefit Warner sucker and redband trout in the Warner Valley.
2. Continue to work with private landowners to reduce migration risks to Warner sucker.. Seek opportunities to assist landowners in improving irrigation efficiencies to create more water availability for both landowners and fish.
3. Continue ongoing and seek new opportunities to recognize contributions and cooperation from the landowners and irrigators in completing important fish passage and screening projects. Fifteen years of collaborative efforts have led to increased cooperation of multiple landowners in the Warner Basin, and we are grateful for their sincere interest and support. These efforts are the most important factors contributing to the recovery of Warner sucker and it is essential we continue to work with and support the efforts of landowners whose livelihoods depend on water in the Warner Basin.
4. Review recovery progress leading to delisting of the species based on the completion of irrigation diversion improvements resulting in fish passage allowing Warner sucker free and un-obstructed up and down stream movement. Evaluate progress toward recovery based on compartmentalized progress. For example, once all the diversion structures are complete for fish passage in Twentymile Creek, threat factor two would be ameliorated within the Twentymile Creek portion of Warner sucker habitat.
5. The WBAHP should continue to implement the SAP and monitoring plan for Warner sucker populations and the efficacy of passage and screening projects. Additionally, when feasible monitoring should seek to track fluctuations in fish abundance, quantity and quality of available habitat, and abundance and impacts of nonnative species.

**Lead Field Supervisor, Fish and Wildlife Service**

Approve



Date



## **Appendix A.**

### **New Warner Sucker Information Available Since the 2010 5-Year Review**

- DeHaan, P.W., J. Von Bargen, and P.D. Scheerer. 2017. Genetic variation and the relationship between stream and lake ecotypes of a threatened desert catostomid, the Warner sucker (*Catostomus warnerensis*). *Ecology of Freshwater Fish* 26:609-620. [DOI: 10.1111/eff.12305](https://doi.org/10.1111/eff.12305)
- Scheerer, P.D., S. Clements, R. Jacobsen, and J.T. Peterson. 2011. 2011 Warner sucker Investigations (Honey Creek). Oregon Department of Fish and Wildlife, Contracts: L10AC20301 (BLM), 134208J814 (USFWS), Annual Progress Report, Salem. 19p.
- Scheerer, P. D., S. Clements, and J. T. Peterson. 2012. 2012 Warner Valley fish investigations- Warner suckers. USFWS contracts F11AC00095 and F12AC01064, BLM contracts L10AC20356 and L12AC20619, and Ruby Pipeline funds. Annual Progress Report, Corvallis. 23 pp.
- Scheerer, P. D., J. T. Peterson, and S. Clements, 2013 Warner Sucker Investigations (Lower Honey Creek). Oregon Department of Fish and Wildlife, Fish Research Project Contract Numbers F11AC00095 and L12AC20619. Annual Progress Report, Corvallis. 12 pp.
- Scheerer, P. D., and S. Clements. 2013. Evaluating Warner sucker swimming performance to inform passage design in the Warner Basin, Oregon. Oregon Department of Fish and Wildlife, Information Report, Salem. 12 p.
- Scheerer, P.D., J.T. Peterson, and S.P. Clements. 2014. 2014 Warner Sucker Investigations (Lower Twentymile Creek). Oregon Department of Fish and Wildlife – Progress Reports. [pdf](#)
- Scheerer, P.D., J.T. Peterson, and S. Clements. 2015. 2015 Warner Sucker investigations (lower Twentymile Creek passage). Oregon Department of Fish and Wildlife – Progress Reports. [pdf](#)
- Scheerer, P. D., S. Clements, S. E. Jacobs, and J. T. Peterson, 2016. Status, distribution, and movement of the Warner sucker in the desert of southeastern Oregon. *Northwestern Naturalist* 97:205–225.
- Scheerer, P. D., and M.H. Meeuwig. 2017. 2017 Warner Sucker Investigations (Warner lakes and lower Honey Creek). Oregon Department of Fish and Wildlife, Fish Research Project Contract Numbers L12AC20619. Progress Report, Corvallis.

Scheerer, P.D., J.T. Peterson, and M.H. Meeuwig. 2017. 2016 Warner Sucker investigations (lower Twentymile Creek). Oregon Department of Fish and Wildlife – Progress Reports. [pdf](#)

U.S. Fish and Wildlife Service. 1998. Recovery Plan for the Native Fishes of the Warner Basin and Alakali Subbasin. Portland. OR. 86 pp.

U.S. Fish and Wildlife Service. 2010. Warner sucker (*Catostomus warnerensis*), 5-year review: summary and evaluation. Portland, OR. 35 pp.

## **Appendix B.**

**Warner Sucker (*Catostomus warnerensis*) 5-Year Review: Summary and Evaluation. September 30, 2010**

**Warner sucker**  
**(*Catostomus warnerensis*)**

**5-Year Review:**  
**Summary and Evaluation**



**August 2010**

**U.S. Fish and Wildlife Service**  
**Oregon Fish and Wildlife Office**  
**Portland, Oregon**

## 5-YEAR REVIEW

Species reviewed: Warner sucker (*Catostomus warnerensis*)

OFWO File number: 8183-4008

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**5-YEAR REVIEW**  
**Warner sucker (*Catostomus warnerensis*)**

**1.0. GENERAL INFORMATION**

**1.1. Reviewers:**

**Lead Regional Office:**

Region 1 Endangered Species Branch, Jesse D’Elia (503) 231- 2349

**Lead Field Office:**

Oregon Fish and Wildlife Office - Bend Field Office

Alan Mauer (541) 383-7146

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**Cooperating Field Office(s):**

Not applicable

**Cooperating Regional Office(s):**

Not applicable

**1.2 Methodology used to complete the review:**

In order to conduct this 5-year review for the Warner sucker, the U.S. Fish and Wildlife Service (Service): gathered information since the time of listing, including progress reports from the Oregon Department of Fish and Wildlife (ODFW) of surveys of Warner sucker inhabited lakes and streams conducted in 2006, 2007, 2008, and 2009; reviewed activities undertaken since the time of listing to determine if recovery actions have progressed; reviewed new information regarding the status of the threats to the species; reviewed the recovery criteria in the recovery plan; and made recommendations for future actions . This review was conducted by the Oregon Fish and Wildlife Office’s Bend Field Office. The ODFW Assistant Project Leader for the Native Fish Investigation Project reviewed the draft 5-year review.

The notice of initiation of a 5-year review was published in the *Federal Register* on April 11, 2006. This notice requested any information concerning the status of the Warner sucker. An additional request for information was sent out to potential interested parties, including the working group formed for recovery plan implementation on February 8, 2008. No information was received in response to the *Federal Register* notice or the letter to potential interested parties.

**1.3 Background:**

**1.3.1 FR Notice citation announcing initiation of this review:**

The Service announced the initiation of a 5-year review of 70 species including the Warner sucker, under section 4(c)(2)(B) of the Endangered Species Act (Act) in an April 11, 2006, *Federal Register* notice (71 FR 18345).

### **1.3.2 Listing History:**

#### Original Listing

**Federal Register notice:** Endangered and threatened wildlife and plants; Determination that the Warner sucker is a threatened species and designation of its critical habitat (50 FR 39117-39123).

**Date listed:** September 27, 1985

**Entity listed:** The species Warner sucker (*Catostomus warnerensis*)

**Classification:** Threatened

#### Revised Listing, if applicable

Not applicable

### **1.3.3 Associated Rulemakings:**

Warner sucker were listed September 27, 1985, with critical habitat designated. Warner sucker are included in “Special rules-fishes” in 50 CFR 17.44 (l). The rule has four parts and states:

“(1) No person shall take these species, except in accordance with applicable State fish and wildlife conservation laws and regulations in the following instances: (i) for educational purposes, scientific purposes, the enhancement of propagation or survival of the species, zoological exhibition, and other conservation purposes consistent with the Act. (ii) Incidental to State-permitted recreational fishing activities, provided that the individual fish taken is immediately returned to its habitat.

(2) Any violation of applicable State fish and wildlife conservation laws or regulations with respect to the taking of these species will also be a violation of the Endangered Species Act.

(3) No person shall possess, sell, deliver, carry, transport, ship, import, or export, by any means whatsoever, any such species taken in violation of these regulations or in violation of applicable State fish and wildlife conservation laws or regulations.

(4) It is unlawful for any person to attempt to commit, solicit another to commit, or cause to be committed, any offense defined in paragraphs (1) (1) through (3) of this section.”

**1.3.4 Review History:**

This is the first 5-year review for the Warner sucker.

**1.3.5 Species’ Recovery Priority Number at Start of this 5-year Review:**

The Warner sucker was assigned a recovery priority number of 2C. A priority number 2 means the species has a high degree of threat and a high potential for recovery. The species rank is elevated by adding the “C” designation to its numerical rank to indicate that there is or may be some degree of conflict between efforts for the species’ recovery and economic development. The conflict symbol C raises the priority number, so that 2C is a higher priority for recovery than if it were ranked 2.

**1.3.6 Current Recovery Plan or Outline:**

**Name of plan or outline:** “Recovery Plan for the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin”

**Date issued:** April 27, 1998

**Dates of previous revisions, if applicable:** Not applicable

**2.0 REVIEW ANALYSIS**

**2.1. Application of the 1996 Distinct Population Segment (DPS) policy**

**2.1.1 Is the species under review a vertebrate?**

*Yes*  
 *No*

**2.1.2 Is the species under review listed as a DPS?**

*Yes*  
 *No*

**2.1.3 Was the DPS listed prior to 1996?**

Not applicable

**2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?**

*Yes*  
 *No*

## 2.2 Recovery Criteria

### 2.2.1 Does the species have a final, approved Recovery Plan containing objective, measurable criteria?

*Yes*  
 *No*

The recovery criteria focus on delisting (see 2.2.3 below for the recovery criteria).

### 2.2.2 Adequacy of Recovery Criteria

#### 2.2.2.1 Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

*Yes*  
 *No*

The “Recovery Plan for the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin” (Recovery Plan) was finalized in 1998. New biological information on the Warner sucker and its habitat includes surveys conducted by the Bureau of Land Management (BLM) in 2001 (Hartzell et al. 2002), larval fish investigations (Kennedy et al. 2003), a study of ecological habits of early life stages (Kennedy and Vinyard 2006), and population estimates by the ODFW in 2006, 2007, 2008, and 2009 (Scheerer et al. 2006, 2007, and 2008 and Richardson et al. 2010).

#### 2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

*Yes*  
 *No*

### 2.2.3 List the recovery criteria as they appear in the Recovery Plan, and discuss how each criterion has or has not been met, citing information:

The Recovery Plan provides information to guide recovery for three listed fish species: the Warner sucker, Hutton tui chub, and Foskett speckled dace, (USFWS 1998). The Recovery Plan states: “The primary objective for the Warner sucker is the eventual delisting of the species.” The Recovery Plan also provides objectives and criteria for conserving Warner sucker. The recovery criteria for Warner sucker are described in the Recovery Plan as:

“The Warner sucker may be considered for delisting when:

1. A self-sustaining metapopulation (a group of populations of one species coexisting in time but not in space) is distributed throughout the Twentymile, Honey, and Deep Creek (below the falls) drainages,

and in Pelican, Crump, and Hart Lakes. Self sustaining populations will be determined based on parameters such as:

- multiple age-classes, including adults, juveniles, and young of the year, which approximate normal frequency distributions,
  - a stable or increasing population size,
  - documented reproduction and recruitment, and
  - self-sustaining populations form a viable metapopulation, large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat changes.
2. Passage is restored within and among the Twentymile, Honey, and Deep Creek (below the falls) drainages so that the individual populations of Warner suckers can function as a metapopulation.
  3. No threats exist that would likely threaten the survival of the species over a significant portion of its range.” (USFWS 1998, pp 40-41).

**Recovery Plan Criterion 1:** The Recovery plan states that specific information on Warner sucker life history and habitat requirements is necessary to determine the characteristics of a self-sustaining and viable population, and information on the extent and connectivity of habitat is needed. Specifically, the following data and research are needed to support the development of a population viability analysis: (1) abundance of young of the year, juveniles and adults of multiple year-classes in all populations, and the relationship of their abundance to climate; (2) factors influencing recruitment; (3) genetic variability; and (4) life history information.

Since the time of listing, studies have been conducted that document the range, status, abundance, and distribution of Warner sucker in stream habitat and prior to and after the desiccation of Crump and Hart Lakes (see section 2.3.1.1 and 2.3.1.2). However, because survey techniques and areas surveyed vary among the different studies conducted over the years, the results are difficult to compare.

ODFW conducted surveys of Warner suckers in the lakes and tributaries in 2006, 2007, 2008, and 2009 to obtain population and density estimates, determine distribution, document evidence of recent recruitment, and monitor trends in stream sucker distribution and abundance over time (see section 2.3.1.2). Additional population estimates will be needed before a population trend can be established (see section 2.3.1.2). The current available information is not enough to assess the population dynamics among the separate population segments to determine if there are self-sustaining populations that form a viable metapopulation.

**Recovery Plan Criterion 2:** Passage within and among the Twentymile Creek, Honey Creek, and Deep Creek (below the falls) has not been restored to assure that the individual populations of Warner suckers can function as a metapopulation. Although several screens have been installed, numerous impassable water diversion structures and unscreened canals exist on all major tributaries, impeding and preventing access to spawning habitat, fragmenting habitat, and separating populations (see section 2.3.2.1). In their 2007 investigations, the ODFW noted that “the presence of numerous impassable diversion dams and unscreened irrigation canals is a major obstacle to meeting recovery criteria” (Scheerer et al. 2007, p 13). These dams and canals act to fragment the habitat of Warner suckers in the basin. To accomplish recovery criteria number 2, a comprehensive screening and passage plan needs to be developed and implemented for the Warner Valley.

**Recovery Plan Criterion 3:** This species was listed in 1985 due primarily to the impacts to habitat through in-stream water diversions and artificial barriers which modify the habitat and prevent upstream migration and movement in and among streams, and by the introduction of exotic fish species which prey on larval and juvenile Warner sucker. Few actions have been taken to reduce these threats (see sections 2.3.1.5, 2.3.2.1, and 2.3.2.3).

## **2.3 Updated Information and Current Species Status**

### **2.3.1 Biology and Habitat**

#### **2.3.1.1 New information on the species’ biology and life history:**

The Warner sucker occurs in three stream systems and the lakes basin of the Warner Valley and a translocated population of Warner sucker at Summer Lake (see section 2.3.1.5). These populations of Warner sucker are believed to be comprised of two life history strategies in their reproductive behavior. Suckers residing in the lakes are lacustrine adfluvial or potamodromous fish which normally spawn in the streams. However, upstream migration may be blocked by low stream flows during dry water years or by irrigation diversion dams and spawning may occur in nearshore areas of the lakes (White et al. 1990 p 13). The lake suckers can become resident lake populations or migrate upstream to spawn (White et al. 1990, p 13). Lake resident suckers are generally larger than stream residents (USFWS 1998, p 18).

Suckers residing in streams inhabit and spawn in Twentymile, Honey and Deep creeks and their tributaries, and can migrate downstream and repopulate lakes that have refilled after desiccation due to drought. This life history strategy is believed to be a key survival mechanism in an area that can experience both prolonged drought which can result in drying up of the lake habitat or scouring flows which can affect the stream habitat (USFWS 1998, p18). Survey

information indicates that only stream morph suckers are exhibiting recruitment as evidenced by young-of-year and juveniles (White et al. 1990, p12, Tait and Mulkey 1993b, p 8-12, USFWS 1998, and Scheerer et al. 2006 p 13, 2007 p 12).

Although Warner sucker was first described by Snyder in 1908, limited life history information had been collected. In 1979, Coombs and Bond completed a report of the spawning and early life history of Warner sucker. Several studies were undertaken from 1990 through 2009 (White et al. 1990, White et al. 1991, Tait and Mulkey 1993a, Tait and Mulkey 1993b, Allen et al. 1994, Kennedy and Olsen 1994, Allen et al. 1995, Tait et al. 1995, Allen et al. 1996, Bosse et al. 1997, Hartzell et al. 2002, Kennedy et al. 2003, Kennedy and Vinyard 2006, and Scheerer et al. 2006, 2007, and 2008, and Richardson et al. 2010). These studies document the range, status, abundance, and distribution of Warner sucker in stream habitat and prior to and after the desiccation of Crump and Hart Lakes, lake recolonization by other native and nonnative fish, and surveys of stream characteristics (see sections 2.3.1.2, and 2.3.1.5).

#### **2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:**

Historical data on abundance are limited; Snyder (1908) made no estimate of populations in the lakes or streams. Anecdotal accounts by long time residents of Warner Valley reported that large numbers of suckers (called “redhorse”) ascended Honey Creek in the spring and would spawn far up in the canyon (Andreasen 1975, p 45). A population estimate was attempted in 1979 by Coombs et al. (1979), but the recapture and distribution of adult suckers did not allow a dependable population estimate to be made. They were able to estimate the population of suckers in the spillway canal north of Hart Lake to be 1,316 individuals. However, the 95 percent confidence interval (CI) was 666 to 6,667 individual suckers (Coombs et al. 1979, p 17).

White et al. (1990) conducted stream and lake sampling throughout the Warner Valley to assess current distribution and status of the sucker. The largest adult sucker population was observed in Hart Lake and Twelvemile Creek, 54% and 28%, respectively, of all suckers caught (White et al. 1990, p 8). Successful spawning was observed in Hart Lake, but no recruitment was documented. Populations found in Anderson, Crump, and Pelican lakes, and Twentymile Slough showed little evidence of recruitment. White et al. (1990 p 12-13) suggested that stream resident populations in the Honey Creek drainage and Twentymile Creek drainage may provide the only significant recruitment. Larval Warner suckers were not detected despite extensive sampling at the mouths of Honey Creek and Twentymile Creek (Allen et al. 1996). A study of Warner sucker drift ecology by Kennedy and Olsen (1994, p 11), suggested that larvae do not have a propensity to drift and may instead remain in natal stream habitat (Kennedy and Olsen, 1994, p 11) for an undetermined rearing period.

Investigations by White et al. in 1991 coincided with a winter fish kill, and the fifth year of drought conditions. Age and growth studies showed a wide variation in growth rate and a maximum age of 17 (White et al. 1991, p iii). By 1992 most of the lentic habitat in Warner basin was desiccated due to the drought and resulted in the loss of many of the lake and slough resident sucker populations (Allen et al. 1994). Allen et al. (1994, 1995, and 1996) conducted investigations from 1993 through 1996 to document the rate of recolonization of Warner sucker and other native and nonnative fishes in the Warner Lakes. Allen et al. (1996) concluded that there existed a viable population of Warner sucker in Hart Lake after the period of lake desiccation. They also estimated that the distribution of suckers was expanding into the lakes to the north after discovering Warner sucker in Anderson and Flagstaff Lakes and that the presence of Warner sucker in Crump Lake, after the lakes had thoroughly dried in 1991, indicated recruitment of Warner sucker in the basin (Allen et al. 1996, pp 17 and 18).

Tait et al. (1995, p 26) estimated the population of suckers within defined reaches in Twentymile and Honey drainages. The results from their snorkel surveys are best described as density or numbers of fish per mile of stream surveyed. Within the Twentymile Creek basin they estimated 70.5 young-of-year per mile of stream surveyed; 164.0 juvenile (1+); and 72.2 adult ( $\geq 2+$ ) suckers per mile of surveyed habitat. In Honey Creek basin they estimated 26.2 young-of-year; 21.9 juvenile (1+); and 20.2 adult ( $\geq 2+$ ) suckers per mile of surveyed habitat (Tait et al. 1995, p 26). These results are useful estimates of density of suckers per mile, but do not estimate the population of suckers in the Warner Basin.

No surveys were conducted from 1998 through 2000; surveys were resumed in 2001. Hartzell et al. (2002) sampled lake habitat and compared relative abundance results from past surveys. A total of 183 Warner suckers were captured with 176 from Hart Lake. This represents a 7.1 percent reduction in Warner sucker abundance from the 1997 total of 197 Warner sucker (Hartzell et al. 2002, p 6). This report also describes broad changes in relative abundance of the exotic fish present in the Warner Lakes basin (see section 2.3.2.3).

In 2006 ODFW conducted investigations to quantify the abundance of Warner suckers, to document recruitment, and to estimate abundance of Warner suckers relative to nonnative fish abundance. In addition, Warner suckers were tagged with Passive Integrated Transponders (PIT) to determine growth rates and movements, and radio tagged to document seasonal spawning migration. The 2006 surveys focused on lake dwelling Warner sucker and documented similar distribution of Warner sucker described in earlier investigations by Coombs and Bond (1980), and White et al. (1990 and 1991). Additionally, ODFW attempted to estimate the population of Warner sucker in Crump Lake and Hart Lake using a statistically-based sampling procedure. The number of Warner sucker recaptured in the lakes was not sufficient for a valid mark-recapture population estimate (Scheerer et al. 2006, p 6). The 2006 surveys were dominated by large sized,

older suckers, and ODFW did not find evidence of substantial recruitment of suckers (Scheerer et al. 2006, p 13).

Although a population estimate was not obtained in 2006, a comparison of the catch per unit effort for trap netting at Hart Lakes in 2006 is the lowest on record. Compared to 2001, the last year a substantial effort was made to net fish in Hart Lake, the number of Warner sucker catch per unit effort (CPUE) decreased approximately 90 percent (Scheerer et al. 2006, p 12). The catch rate for Crump Lake was highest on record, but the CPUE was still quite low (Scheerer et al. 2006, p 6). However, ODFW acknowledged that comparing the 2006 CPUE estimates with past estimates may be misleading if the past sampling techniques did not occur during similar spring months (Scheerer et al. 2006, p 6).

The ODFW found that: (1) minimal recruitment is believed to have occurred in recent years because the majority (91%) of the suckers captured was larger than 250 mm (8.84 inches) fork length (FL); and (2) the average length of suckers has increased substantially since 1994 (Scheerer et al. 2006, p 7). The ODFW concluded that the population of Warner sucker in Crump and Hart Lakes is severely depressed (Scheerer et al. 2006, p 12).

In 2007, ODFW conducted investigations of Warner basin tributaries to describe the current distribution of stream resident populations of Warner sucker and to quantify their abundance. Access through private lands to sample the streams was limited and only a fraction of the desired sample sites were actually surveyed. The 2007 population estimate for the streams of the entire Warner basin was 6,852 Warner sucker for fish larger than 60 mm (2.36 inches) fork length (FL) (95% CI: +/-92%) (Scheerer et al. 2007, p. 9). Because of the patchy distribution of Warner sucker (as described in section 2.3.1.5) in the streams and the presence of a few sites with high sucker densities, the abundance estimates had low levels of precision (Scheerer et al. 2007, p 12). Additional population estimates will be needed before a population trend can be established.

Samples also showed an irregular distribution of age classes. This is not uncommon for stream fishes where the younger age classes are very abundant. Warner sucker ranged in size from 22 mm (0.87 inches) to 330 mm (12.99 inches) FL with the majority (85 %) less than 100 mm (3.94 inches) FL and only a few (2%) larger than 200 mm (7.87 inches) FL (Scheerer et al. 2007, p 5). Warner sucker mature at 3 to 4 years at a length of 130 mm (5.12 inches) to 160 mm (6.30 inches) FL (Coombs et al. 1979, p 33). Most of the suckers collected were estimated to be less than one year old (Scheerer et al. 2007, p 5). The ODFW was uncertain if the scarcity of suckers less than 30 mm (1.18 inches) FL was due to low reproduction in 2007, or due to an inability to effectively sample small size suckers using backpack electrofishing equipment (Scheerer et al. 2007, p 5).

In 2007, the ODFW also obtained a mark-recapture population estimate of adult Warner suckers at the Summer Lake Wildlife Area. This population resulted

from natural production of adult suckers that were moved to the irrigation canal at the Wildlife Area when the Warner Lakes desiccated during the 1992 drought (see section 2.3.1.5). The population estimate was 142 fish (95% CI: 91-218) in the ditch that extends from the well head to the gated culvert (Scheerer et al. 2007, p 9).

In 2008, ODFW resumed survey work in the lake habitats of Crump and Hart Lakes (Scheerer et al. 2008 p 1). An additional attempt at a mark-recapture estimate was conducted but was not completed because only one Warner sucker was recaptured. However, an estimate of Warner sucker in Hart Lake was completed based on the recapture of Warner sucker marked in 2006. ODFW estimated 565 Warner suckers larger than 155 mm (6.10 inches) FL (95% CI: 250-1,114; 56-97%), and assumed a 33 percent mortality rate over the two year period between marking and recapture (Scheerer et al. 2008, p 4). Additionally, ODFW did not find evidence of substantial recruitment of suckers.

In 2009, the mark-recapture population estimate for 21.3 km (13.23 miles) of streams within the Twentymile Creek drainage was 4,612 Warner suckers (95% CI: 3,820-5,567) (fish larger than 59 mm, 2.32 inches FL). The 2009 estimate of adult Warner suckers (>159 mm, 6.23 inches FL) was 1,169 fish (95% CI: 969-1,412) (Richardson et al. 2010, p 8). In addition, 421 Warner suckers were PIT tagged, adding to the 86 tagged in 2007-2008 (Richardson et al. 2010, p 11). Recapturing of these tagged fish will be useful to assess movement patterns and growth rates in future years.

The ODFW also obtained a mark-recapture population estimate of adult Warner suckers at the Summer Lake Wildlife Area in 2009. The population estimate was 660 fish (95% CI: 421-1,024), up substantially from the 2007 estimate of 142 fish. Suckers ranged in size from 40-270 mm (1.57-10.63 inches) FL. The 2009 size distribution was broader than the distribution in 2007 (90-220 mm, 3.54 -8.66 inches FL) (Richardson et al. 2010, p 22). The presence of smaller, presumably younger fish recruited into the population, may explain the larger population size observed in 2009.

### **2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):**

No genetic research has been done on this taxon. Tissue samples have been collected and a proposal by the Abernathy Fish Technology Center has been submitted for future analyses but has not yet been funded.

### **2.3.1.4 Taxonomic classification or changes in nomenclature:**

At the time of listing, the Warner sucker was considered to be the species *Catostomus warnerensis*. Warner sucker was first described by Snyder in 1908. Snyder examined morphometric and meristic characters in samples from Deep

Creek (previously referred to as Warner Creek) in south-central Oregon. He determined that the morphometric and meristic data supports classification of Warner sucker as a distinct species. Andreasen (1975) studied the systematics of several suckers in southern Oregon and affirmed the distinction of Warner sucker and verified the Warner sucker as a distinct species. No additional studies on the taxonomy of the species are known.

**2.3.1.5 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors), or historic range (e.g., corrections to the historical range, change in distribution of the species' within its historic range):**

The Warner sucker is endemic to the Warner Basin in southeastern Oregon, northeastern California, and northwestern Nevada. The historic range of Warner sucker includes the basin's three permanent lakes, Hart, Crump, and Pelican; the ephemeral Anderson, Swamp, Mugwump, Flagstaff, Upper Campbell, Campbell, Stone Coral, and Bluejoint Lakes; and all the sloughs and canals connecting these lakes. Warner sucker also reside in the three major stream basins which are tributaries to these lakes (Deep Creek, Twentymile Creek, and Honey Creek). The southernmost known distribution of Warner sucker is in the upper reaches of West Barrel Creek in California. In 2001 Scoppettone and Rissler (2003, p 7) captured a single Warner sucker in West Barrel Creek while sampling for Cowhead tui chub (*Gila bicolor vaccaceps*). Discovery of the single fish indicates a connection to the lower Warner sucker inhabited reaches of Twelvemile Creek located approximately 8 kilometers (4.97 miles) downstream. The northern limit of known distribution is the waterway connecting Lower Campbell Lake and Turpin Lake (Bosse et al. 1997, p 12).

Occupied habitat is estimated to be 54.72 kilometers (34 miles) of stream and three lakes as primary habitat for Warner sucker (FR 50, 188, pp 39122-39123, 1985). Critical habitat designated at the time included 69.20 kilometers (43 miles) of stream habitat including 15.24 meters (50 feet) on either side of the stream. Although the lakes comprise over 24 square miles of open water habitat, the lakes are prone to desiccation on a regular basis due to climate and weather cycles; therefore the area of lake habitat is typically less than the total area of the lakes. The lakes to the north of Hart Lake are occupied by Warner sucker when there is ample water flowing north for continuing years. These lakes are prone to desiccation more frequently than Crump, Hart, and Pelican Lakes.

An additional stream channel at the Summer Lake Wildlife Area in the Summer Lake Basin provides alternate habitat for Warner sucker. In 1991, Warner sucker were salvaged during the drying period to establish a refugial population. The drought at that time resulted in the complete desiccation of the lakes in the Warner basin. Suckers were transported from Hart Lake and were to be transported to the Dexter National Fish Hatchery for long term holding and possible experimental propagation to determine if Warner sucker can be reared in a hatchery. Because of a delay in the transportation, seventy five suckers were

temporarily held in an irrigation canal at the Summer Lake Wildlife Area. All 75 Warner sucker were collected from the ditch and transported to the Dexter National Fish Hatchery (all subsequently died) (White et al. 1991 p 10). The following year larval Warner sucker were observed in the ditch, apparently the progeny of the adult suckers temporarily stored there (White et al. 1991 p 10). The population at Summer Lake continues to persist (see section 2.3.1.2).

The results of the 2007 stream investigations conducted by ODFW indicate that the sucker populations in Warner basin tributaries have patchy distributions (Scheerer et al. 2007, p 5). At locations where Warner suckers were collected, densities were typically low. Survey results were similar to results from a previous stream assessment of Warner suckers, obtained in 1994 (Tait et al. 1995). Tait et al. (1995) also found sucker distribution to be patchy and densities to be relatively low. Both the ODFW 2007 survey and the survey conducted in 1994 (Tait et al. 1995, pp 8, 11-12) documented relatively high sucker numbers in lower Twelvemile Creek. Different methods were employed in 1994 (snorkel surveys) than in 2007 (multiple-pass electrofishing), thus actual density estimates are not directly comparable.

The surveys conducted in 2007 were more comprehensive than the previous surveys, which enabled a better description of current Warner sucker distribution and to identify additional areas of relatively high sucker abundance. The 2007 surveys documented a broader distribution of both adults and juvenile Warner suckers in the Honey Creek and Twentymile Creek drainages. In addition, both adult and juvenile Warner suckers were documented in lower Deep Creek. In 2006, ODFW surveyors noted that adult Warner suckers which were radio tagged in Crump Lake moved into lower Deep Creek during the spawning period (Scheerer et al. 2006). This observation suggests that lower Deep Creek may serve as important sucker spawning and rearing habitat.

In 2009, ODFW conducted an investigation of the population of Warner sucker in Twentymile Creek subbasin. Results of the surveys provided information on current sucker distribution. Most of the suckers were found between the Dyke diversion and the canyon reach (3,786; CI = 3,112-4,603) (Richardson et al. 2010, p 8). A large proportion of the suckers had parasites and/or lesions (>60%). Most parasites were fish lice (*Lernaea* sp.) (Scheerer 2009b, pers. comm.).

#### **2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):**

The Warner sucker's habitat is limited primarily to the three stream basins and lakes in Warner Basin as described above (see section 2.3.1.5). The Warner basin is a closed basin with no outflow and is located between two large fault blocks, Hart Mountain to the east and the Warner Mountains to the west (Allen et al. 1994, p 3). The drainage pattern of the basin tends south to north (White et al. 1991, p 1), with the small ephemeral lakes to the north being last to fill from

runoff in the spring. The floor of the valley encompasses a chain of shallow lakes, marshes, sloughs, potholes, and irrigation ditches. Although all the lakes in the basin are subject to desiccation, the three most permanent lakes are Crump Lake, Pelican Lake, and Hart Lake (White et al. 1991, p 1). The rest of the natural lakes are located to the north and flood only on years with ample water supply from run-off.

Crump and Hart Lakes provide habitat for Warner sucker throughout the seasons and years when water is retained in the lakes. Both lakes desiccate naturally on an irregular cycle. During the times of drying, the lake habitat is diminished or eliminated. Although the ephemeral cycle of the valley is natural, it has likely been aggravated by degradation of watershed conditions by a variety of human activities. Much of the irrigated land in the Warner Valley is managed for flood irrigation accomplished by diverting water from tributary streams using diversion dams, weirs, headgates, and lateral ditches (White et al. 1991, pp 1 and 2).

In years with ample water runoff, the amount of water diverted from streams would be only a portion of the total flow, but in drought years, the total stream flows do not meet the demand for existing water rights, so the entire stream flow may be diverted by the irrigators (USFWS 1998, pp 27-28). Over a series of droughts, reduced flows can cause the lake levels to drop, and in conjunction with pumping of water from the lake, result in complete drying of Hart Lake (USFWS 1998, pp 27-28). Irrigation practices can also cause sudden and drastic changes in water level in the lower reaches of the streams, thereby stranding fish in the streams, sloughs and lakes at the time of low flow (USFWS 1998, p 28).

Introduction of exotic fish for sport fishery drastically altered the lake environment and the ability for both Warner sucker and Warner redband trout to survive in the lakes. Crump and Hart Lakes were stocked with non-native fish for sport recreation in the early 1970's. Introduced fish include white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), brown bullhead (*Ameiurus nebulosus*), and largemouth bass (*Micropterus salmoides*) (see section 2.3.2.3). Introduction of these non-native piscivorous fish is thought to have sharply curtailed the successful recruitment to lake populations of Warner sucker (Williams et al. 1990, p 247). In addition to the Warner sucker, native fish present in the lake include tui chub (*Gila bicolor*) and a few redband trout (*Oncorhynchus mykiss*).

Possible benefit from the lakes drying is the severe depletion of the introduced game fish in the lakes and sloughs throughout the Warner Valley (White et al. 1991, p 14). Post drought, the lakes refill and fish begin to repopulate the lake habitat. Allen et al. (1994, p 2) studied the recolonization rates of Warner sucker and other fishes in the Warner Lakes. After the desiccation of the lakes in 1992, an abundant snowpack and wet spring in 1992 allowed most of the lakes in the Warner basin to refill. A monitoring study was implemented to determine the distribution, abundance and rates of recolonization of fish species which survived

the drought. Although the lakes were dry for an extended period of time, all species survived and repopulated the lakes. Allen et al. (1994 p. 7) concluded that Warner sucker were able to recolonize the lakes from the tributary streams (Twentymile, Deep, and Honey creeks) and that any lake population of Warner sucker is not likely to sustain itself as a strictly lake population (Allen et al. 1994, p 8).

Prior to the lakes drying in 1992, total fish captured during sampling of the Warner lakes was dominated by nonnative fishes, with white crappie being the most abundant nonnative fish captured. For several years following the drought in the early 1990's, native fishes dominated the catch, with tui chub being the most abundant native fish captured. Since 1997, nonnative fish have become reestablished and dominate catch records of sampling done since then (Scheerer et al. 2008, p 22).

Mortality of Warner sucker as a result of drought or winter kill, in conjunction with the barriers to outmigration, may limit the ability of the Warner sucker population to rebound after the lakes desiccate. The lake populations are dependent upon stream dwelling fish to recolonize the lakes as they did after the droughts of the 1930s. Currently, any out migrating Warner suckers would be imperiled by predation by introduced game fish and the possibility of being entrained into irrigation ditches (White et al. 1991, pp 13-14).

#### **2.3.1.7 Other:**

The State of Oregon enacted an Endangered Species Act (Oregon ESA) in 1987 and amended it in 1995. The Warner sucker was State listed as threatened as part of the original enactment of the Oregon ESA in 1987. See section 2.3.2.4 for a description of the Oregon ESA.

In 2002, the Oregon Fish and Wildlife Commission adopted the Native Fish Conservation Policy to ensure conservation and recovery of native fish in Oregon. As part of this policy, interim risk assessments were completed for selected native fish species in 2005. Warner sucker were not included in the status assessment (ODFW 2005). Although the ODFW Native Fish Status Report did not include an assessment of Warner sucker, the state defers to completed recovery plans if the species is listed under the federal Endangered Species Act, and likely would not complete an additional plan unless they find a specific need to cover actions of the State (S. Miller 2009 pers. comm.).

In 2006, the ODFW finalized their Oregon Conservation Strategy (Strategy) (ODFW 2006). The Strategy is an overarching State-wide approach for conserving fish and wildlife through the use of voluntary measures and collaboration. The Warner sucker is a "strategy species" for the Northern Basin and Range Ecoregion in southeast Oregon. Strategy species include rare and at risk species. The Strategy identifies species requirements, limiting factors, data

gaps, and actions needed to conserve these species. Limiting factors for the Warner sucker described in the Strategy are invasive species, forest and agricultural practices, road construction, irrigation structures which impede passage, and water withdrawals resulting in minimal flows in stream habitat and lower lake levels. The Strategy identifies that data gaps include information on genetics and long term habitat needs for self sustaining populations and information on spawning habitat. According to the Strategy, needed conservation actions include: 1) maintain or restore spring waters; and 2) maintain or restore migration corridors among habitats.

In 2007 the Corps of Engineers (Corps) constructed a nesting island in Crump Lake at the location of an eroded natural island for Caspian terns (*Sterna caspia*) to accommodate displaced Caspian terns from the nesting islands in the Columbia River estuary. The purpose of the island construction project was to provide an alternate nesting site for Caspian terns and to reduce Caspian tern predation on juvenile salmonids, while ensuring the conservation of the Caspian tern.

This project was determined to adversely affect Warner suckers through increased predation by Caspian terns resulting from the increase in nesting habitat. The Corps consulted under section 7 of the Endangered Species Act. In our biological opinion, the Service determined that the proposed action would not likely jeopardize the continued existence of the Warner sucker. It was estimated that 21 Warner suckers may be taken annually due to predation by a colony of an estimated 300 pairs of nesting Caspian tern (USFWS 2005).

Terms and conditions of the biological opinion require the Corps to monitor the Caspian tern nesting colony to determine the actual amount of predation on Warner sucker. During monitoring of the newly established nesting colony at Crump Lake in 2008, monitors observed at least one Warner sucker taken as forage by the nesting Caspian terns. The Corps notified the Service that based on monitoring surveys, they documented observations of five suckers in bill loads of Caspian terns, one of which was confirmed as a Warner sucker by the presence of a floy tag implanted by ODFW. Four additional suckers were also foraged on and brought back to the island colony. It is likely that the suckers are Warner suckers due to the proximity of the foraging area to Warner sucker occupied habitat. Some uncertainty has been presented as to the positive identification as Warner sucker as Caspian terns may be foraging as far away as the Goose Lake basin, where other species of sucker are present, approximately 54.72 kilometers (34 miles) to the west of Crump Lake (Corps 2009).

The Corps determined that the number of Warner sucker taken during the first year of nesting likely exceeded the take of 21 Warner sucker permitted by the biological opinion. Therefore, the Corps has reinitiated formal consultation and continues to gather more information on predation on Warner sucker by Caspian terns.

## **2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)**

### **2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:**

#### *Diversion Structures and Fish Passage:*

The 1985 listing rule noted that water diversions exist on all streams occupied by the Warner sucker and that these barriers and diversion structures have blocked the movement of suckers into spawning streams, particularly during periods of low flow. During periods of low flow all water is often diverted (FR 50 no. 188, pp 39119-39120).

Irrigation diversion structures constructed throughout the Warner Valley in the late 1930's were the first large scale impact to Warner sucker. There are water diversion structures on all major tributaries (Twentymile, Honey and Deep Creeks). Stern (1989) assessed the water diversion structures in Warner Valley; these included four cement dams with permanent retaining walls, approximately nine wooden weirs, five outlets running underneath the roadway along the north end of Hart Lake, and two spillways (one adjacent to the Greaser Reservoir dam, and one adjacent to the Hart Lake outflow dam/weir).

In Twentymile Creek, fish passage is needed at the Cahill/MC diversion and Greaser Reservoir dam (Stern 1989). Passage at the Greaser Reservoir dam would have limited benefit to Warner sucker, as the reservoir is not spilled on a regular basis and there is little opportunity for Warner sucker to negotiate an upstream passage from Crump Lake to Greaser Reservoir. The Dyke diversion on Twentymile Creek has a fish ladder, but is likely not suitable for passage of Warner sucker (Scheerer 2008, p 5). The ladder was installed at a steep angle typically used for salmonid passage, which may be too difficult for suckers to negotiate.

In Deep Creek, there is an impassable waterfall upstream approximately 8 kilometers (5 miles) west of Adel which is believed to be the upstream extent of Warner sucker distribution. Fish passage is also not provided at a concrete spillway/dam south of Adel. The O'Keefe/Cleland diversion on Deep Creek has recently been screened. Additional work is needed to construct fish passage at the site. There are seven diversions/impoundment structures within a two mile segment of Honey Creek. Stern concluded that upstream fish passage is critical for the Warner sucker in Honey, Twentymile and Deep creeks (Stern 1989).

The use of the diversion structures for irrigation in March generally coincides with the spring spawning run for Warner sucker (Stern 1989). Warner sucker have been able to persist, despite the diversion structures with no fish passage mechanism, either because they migrate upstream early in the spring prior to the

installation of boards used to raise the level of the water in the stream to diversion canals (USFWS 1998, p 27) or they are recruited into the lakes from successful spawning in the tributary streams. The result has been fewer fish are able to make the upstream migration during the artificially shortened migration period, especially in years of low stream flow (USFWS 1998, p 27). In addition to blockage of the stream channels to migrating fish, the irrigation diversions also impact young-of-year, juvenile, and post-spawn suckers moving downstream from spawning sites. Small fish are susceptible to moving down the irrigation canals, and getting trapped, unable to return to the stream. If the canals are drained as the result of irrigation practices attempting to use all the water in the canal or ditch, the fish entrained into the irrigation canal are likely trapped (USFWS 1998, p 27). Most likely, trapped fish will not survive through the end of the irrigation season.

In 1994, the ODFW contracted for an evaluation of fish passage at water diversions in Honey Creek (Campbell and Craven 1994). The report inventoried and made recommendations for passage and screening at eight diversion structures previously identified by Coombs and Bond (1980). White et al. (1990) also discussed passage problems at irrigation diversion throughout the Warner basin and suggested fish passage devices to be installed at several irrigation diversions.

Many irrigation diversions remain unscreened and passage structures at the irrigation diversions are lacking or do not adequately address sucker passage needs. A fish ladder was installed in cooperation with the BLM and private landowner at the Dyke diversion on Twentymile Creek (Stern 1989). The fish ladder at the Dyke diversion is a Denil steep-pass design. During the investigation conducted by ODFW in 2008, the trap on the fish ladder was operated from April 18, through June 17, 2008. No fish were captured in the trap (Scheerer et al. 2008, pp 4-5). Previously, the fish trap was run during the spring months in 2001 to assess redband trout passage in Twentymile Creek (ODFW 2001). During the trapping investigation, no Warner suckers were observed passing up the ladder. Recent studies of other sucker species show that a shallower slope and a design using vertical baffles to slowdown the waterflow, rather than vertical drops is needed for suckers to negotiate up-slope (Mefford et al. 2001, p 7). A thorough evaluation of the ladder is needed to determine if the passage structure meets current knowledge of sucker passage requirements and the state of the art for fish passage facilities.

In 2007, a screen was installed on one of the Deep Creek irrigation diversions; a small screen was installed on upper Honey Creek above Warner sucker distribution. From 2005 through 2007, NRCS assisted local landowners to install several spray type screens on lateral withdrawal points along the “main drain” irrigation canal in the Twentymile Creek watershed. Recently a passage structure was designed and constructed by the Service’s Partners for Fish and Wildlife Program in cooperation with ODFW for one of the upstream irrigation diversions

on Honey Creek. An additional fish passage and screening project has been identified on the Taylor Ranch middle diversion on Honey Creek and will be completed in Fall of 2010.

*Stream Habitat:*

The 1985 final listing rule states that “In addition to water diversions, channelization of streams and overgrazing have disturbed soils in the watershed and degraded streams even further by allowing siltation of gravel beds normally used for spawning”. The Recovery Plan completed in 1998 (USFWS 1998) reported that streams in the Warner Basin exhibited signs of degradation such as cut stream banks, damaged riparian zones, bare stream banks, large sagebrush flats which replaced wet meadows, springs with reduced riparian vegetation, and increased sedimentation. Since the time of listing, Federal agencies including Bureau of Land Management and the Forest Service have taken actions to reduce grazing and watershed impacts to Warner suckers and designated critical habitat.

The BLM responded to the listing of Warner sucker by modifying grazing allotments with potential to impact Warner sucker or its designated critical habitat in recognition that livestock trampling of stream side riparian vegetation could have a negative impact on Warner sucker. The BLM consulted on grazing allotments and modified allotments to either preclude cattle by building enclosure fences, or to set standards and monitor to ensure those standards are met in riparian areas of streams tributary to occupied habitat.

After implementation of changes to the grazing management in the Warner basin, the BLM completed a ten year long monitoring program of stream conditions of the Warner basin from 1997-2007. The report summarizes stream conditions over a ten year period and concludes that exclusion of livestock and management prescriptions has been effective at improving vegetative and channel conditions, although it stated that “there is still room for improvement” (Munhall 2007, p 3).

Recovery of riparian conditions has been hindered in some reaches of stream due to unauthorized use of allotments and excluded areas, and exceedence of authorized use periods, numbers, and rangeland utilization standards (Munhall 2007, p 1). The report also identifies roads and road maintenance as impacting stream conditions by confining and cutting off floodplains and contributing excess sediment to streams. Many remaining degraded stream conditions are the result of watershed level affects from water withdrawal, channelization, logging, and road construction (Munhall 2007, p 1). The report provided management recommendations including the need for instream work along some reaches to stabilize banks, rock placement to create pools, and stabilization of the channel around the Twelvemile O’Keeffe diversion to prevent a head cut. The report also stated that the Nevada reach of Twelvemile Creek could benefit from bank stabilization or stream habitat improvement projects (Munhall 2007, p 3).

The Fremont-Winema National Forest (Forest) implements cattle grazing management via allotments in tributaries upstream of occupied Warner sucker habitat. The Forest modified grazing practices to implement standards that limit the utilization of riparian vegetation along streams tributary to Warner sucker inhabited streams or streams designated as critical habitat (USDA 1997 and 2007). In 2007, after following the terms and conditions of a biological opinion and monitoring their activities for ten years, the Forest re-evaluated the effects to Warner sucker and determined that the grazing activities currently are “not likely to adversely affect Warner sucker, their habitat, or designated critical habitat” (USDA 2007 p 54). The conclusion of the assessment was based on current stream habitat assessments and the past use of strict utilization standards on allotments previously determined to negatively affect Warner sucker habitat (USDA 2007 pp 54-57). The Service concurred with the Forests’ determination based on improved habitat quality, key elements in the grazing program to ensure use levels that maintain a proper functioning condition on an upward trend, and annual effectiveness monitoring.

*Lake Habitat:*

In addition to the occupied stream habitat, Warner sucker also inhabit the lakes of Warner Valley. Observations by White et al. (1990, p 12) indicate that Warner suckers grow larger in the lake environment than in the streams. The lake habitats are subject to drying during recurring periods of drought (see section 2.3.1.6). Presumably when the lake habitat desiccates to the point where it no longer supports the Warner sucker, the lake morph is lost and the stream morph persists. When the lakes refill, the lakes are repopulated by stream morphs invading from the tributary streams (USFWS 1998, p 17), sloughs, and canals that did not go dry. The lakes therefore represent a more productive, but less stable environment for Warner sucker to use on an opportunistic basis (USFWS 1998, p 17).

Habitat fragmentation and degradation due to agricultural development and the placement of irrigation structures in spawning streams are in part responsible for the decline in abundance and distribution of Warner sucker (Williams et al. 1990, p 247). Water flowing to the lakes in Twentymile, Deep, and Honey Creeks is diverted for irrigation purposes. Diversion of water from the streams tributary to the lakes reduces the amount of water available to flow into the lakes. Although there is some return flow from the irrigated fields, there is a net loss from transpiration and evaporation of water used for irrigation. Hart Lake is also used for irrigation. Water users pump water directly out of the lake. The irrigation practices, and in particular, pumping of water out of Hart Lake contributes to more rapid and frequent desiccation of the lake.

Additionally, the introduction of exotic fish for a sport fishery significantly altered the lake environment and the ability for both Warner sucker and Warner redband trout to thrive (USFWS 1998, p 29).

### **2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:**

The original listing of 1985 stated: “There is no evidence to suggest overutilization of the Warner sucker for any of these purposes.” No information is available to change this statement.

### **2.3.2.3 Disease or predation:**

The original listing of 1985 stated: “Exotic centrarchid (sunfishes and freshwater basses) and ichtalurid (catfishes) fishes have been stocked into lakes in the Warner Basin. Large centrarchids and ichtalurids are capable of preying on Warner suckers. Of particular concern are large numbers of crappie (*Pomoxis spp.*) in Hart and Crump Lakes. Exotic fishes also may introduce new parasites and disease organisms to which the sucker may be susceptible. Exotic salmonid fishes (trout) introduced into the streams may also exert predation pressures.”

Threats related to predation by nonnative fish continue to affect Warner sucker in the lake habitats of the Warner basin and in the lower reaches of the tributary streams. Exotic fish were first introduced into the lakes of the Warner Valley between 1971 and 1973 (White et al. 1990, and 1991). In addition to competing for resources such as food and shelter, the introduced fish are also piscivorous, and likely to feed on eggs, embryos, larval, and juvenile Warner sucker (USFWS 1998, p 29). Introduced fish include white crappie, black crappie, largemouth bass, brown bullhead, and brook trout (*Salvelinus fontinalis*).

White et al. (1990, p 17) found that all lacustrine habitats in the Warner Valley are dominated by introduced fish species to the extreme detriment of the native fish. Although the lakes dried in the early 1990s, when the water returned, the exotic fish were still present and their populations increased as the waters rose (Allen et al. 1994, p 7). Prior to the lake drying in 1992 Crump and Hart Lakes were dominated by nonnative fish. For a number of years after the drought, native fish, primarily tui chub, were the most abundant fish found in sampling efforts. Since 1997, introduced nonnative fishes dominated the fish fauna of the lakes. ODFW investigations in 2006 documented that nonnative fish (White crappie, Black crappie, juvenile crappie, Largemouth bass and Brown bullhead) made up 72% of the fish captured in Crump and Hart Lake (Scheerer et al. 2006, p 10). Only 114 Warner sucker and six Redband trout were captured.

It is likely that piscivory of Warner sucker in the lakes, primarily by white crappie, black crappie, and brown bullhead, has had a significant effect of reducing or eliminating young-aged Warner sucker from the lake populations leaving only the larger suckers. Although suckers may spawn successfully, the resulting offspring are not likely to survive predation and live to reproductive age.

No Federal, State, or private management plan, contingency plan, or on-going monitoring program is in place to limit, eliminate, or monitor extent of known exotic species, nor is there any plan in place to address future invasive species introductions.

#### **2.3.2.4 Inadequacy of existing regulatory mechanisms:**

The 1985 listing rule stated: “Oregon State law provides protection against taking of the Warner sucker by requiring a collecting permit, but the State has no provision for the protection of habitat.”

##### *Oregon Endangered Species Act:*

The Warner sucker was listed as threatened by the State of Oregon as part of the original enactment of the Oregon ESA in 1987. The Oregon ESA prohibits the “take” (kill or obtain possession or control) of listed species without an incidental take permit. The Oregon ESA applies to actions of State agencies on State-owned or leased land, and does not impose any additional restrictions on the use of private land (ORS 496.192). Under the Oregon ESA, State agencies (other than State land owning or managing agencies) determine the role they may serve in contributing toward conservation or take avoidance (OAR 635-100-0150).

The Oregon ESA also directs that Survival Guidelines (OAR 635-100-0130 and 0135) or an approved endangered species management plan (OAR 635-100-0140) be prepared. Because the Warner sucker was State-listed prior to these 1995 amendments, these requirements do not apply to the Warner sucker. The Oregon ESA regulates the “take” of Warner sucker, but does not directly regulate or restrict activities that affect Warner sucker habitat that is located on private land. Much of the Warner Valley floor is privately owned, with the exception of the larger lake beds which are property of the State of Oregon. The foothill and upland areas of the valley are mostly publicly owned with most of the lands divided between the BLM, Forest Service, and the Fish and Wildlife Service (White et al. 1991, p 2). Therefore, no protection of the habitat is included in the State ESA designation and no State management plan exists for the species.

The State of Oregon’s Native Fish Conservation Policy calls for conservation and recovery of native fish in Oregon. The policy is implemented through the development of collaborative conservation plans for individual species management units and then adopted by the Oregon Fish and Wildlife Commission. The ODFW has not conducted a risk assessment for Warner sucker. The Native Fish Conservation Policy does not provide regulatory protection for Warner sucker, and changes in management cannot be required on private land. The State has not initiated any additional conservation planning for Warner sucker.

Oregon Water Law:

Under Oregon law, all water is publicly owned. Water users must obtain a permit or water right from the State of Oregon. Oregon water laws are based on the principle of prior appropriation. Under the prior appropriation doctrine, the water right authorizes diversion of water only to the extent water is available and beneficially used. The water right priority date determines who gets water in a time of shortage.

In high water years, the amount of water diverted from Honey Creek, Twentymile Creek, and Deep Creek may be only a portion of the total flow, but in drought years, total stream flows often do not meet existing water rights, and so entire streams may be diverted (USFWS 1998, pp. 27-28). Over a series of drought years, reduced flows, and irrigation water diversion can cause drops in lake levels and in conjunction with lake pumping for irrigation can cause the lakes to dry up ((USFWS 1998, p 28).

In 1987, the State of Oregon added “instream water rights” as a beneficial use. Instream water rights establish flow levels to remain in a stream for protecting fish, minimizing the effects of pollution, or maintaining recreational uses (ORS 537.322 -537.360). Oregon Administrative Rule 635-400-0000-0040 establishes the methodologies for ODFW to apply for instream water rights. Instream water rights establish flow levels to remain in a stream and have a priority date and are regulated in the same way as other water rights. Under Oregon law, an instream water right cannot affect a use of water with a senior priority date. Oregon water law allows water right holders to sell, lease, or donate water rights to be converted to instream water rights. At this time there are no instream water rights for occupied Warner sucker habitat in the Warner Basin.

Oregon Fish Passage and Screening Statutes:

Oregon regulations regarding fish screening and by-pass devices for water diversions or obstructions (OAR 498.301-346) state that any person who diverts water in which fish subject to the State Fish and Wildlife Commission’s regulatory jurisdiction exist may be required to install, operate and maintain screening or by-pass devices to provide adequate protection for fish populations (OAR 498.306). The ODFW has established a cost-share program to implement the installation of screening or by-pass devices. The installation of a screening or by-pass device may be required only under certain criteria including: a) the water diversion is 30 cubic feet per second or more; b) a new water right is issued for the water diversion; c) the point of water diversion is transferred; d) ODFW receives fewer than 150 requests for installation of screens on diversions in a biennium; or e) the Fish Screening Task Force requires installation of screening or by-pass to complete the screening of a stream system or reach. Implementation of the Oregon screening and by-pass program is predominantly on a voluntary basis unless there is a new water right, change in water right, or permit status which

may include a fish screening requirement as a condition of the water right. See section 2.3.2.1 regarding existing screened and unscreened diversions within occupied Warner sucker habitat.

Oregon State policy requires upstream and downstream passage at all artificial obstructions in Oregon waters in which migratory native fish are currently or have historically been present (except under certain defined circumstances) (ORS 509.580-910 and OAR 635-412-0005-0040). Consistent with the Oregon Plan, ODFW seeks cooperative partnerships to remedy fish passage problems. The “triggers” requiring addressing fish passage are installation, major replacement, a fundamental change in permit status, or abandonment of the artificial obstructions. Addressing fish passage requirements includes obtaining one of the following: 1) ODFW approval for a passage plan; 2) a waiver from providing passage; or 3) an exemption for providing passage. Waivers for fish passage requirements are granted if it is determined that mitigation proposed by the applicant provides a net benefit to native migratory fish. Exemptions from fish passage may be granted if it is determined that the lack of fish passage has already been mitigated, a legal waiver has been granted, or there is no appreciable benefit to native migratory fish.

ODFW maintains a statewide inventory of artificial obstructions, in order to prioritize enforcement actions based on the needs of migratory fish (ORS 509.585). The prioritization shall include, but is not limited to the degree of impact of the artificial obstruction on native migratory fish, the biological status of the native migratory fish stocks, and any other factor established by ODFW by rule. Priority artificial obstructions are subject to the State Fish and Wildlife Commission’s authority as provided in ORS 509.625. The Commission may order a person owning or operating a lawfully installed obstruction on the priority list to install fish passage or to provide alternatives to fish passage if the Commission can arrange for nonowner/nonoperator funding of at least 60 percent. This provision is infrequently used and the program is primarily implemented through the above identified “triggers” or on a voluntary basis. Within the Warner Basin one passage obstruction on Honey Creek is listed on the existing Statewide Fish Passage Priority List as a medium priority. The priority list is in the process of being updated and ODFW plans to finalize the new list at an upcoming Commission meeting in 2011 (Apke 2010, pers. comm.).

#### **2.3.2.5 Other natural or manmade factors affecting its continued existence:**

The 1985 listing rule stated: “Any prolonged drought will hasten the demise of the Warner sucker if all or most of the water in the streams is diverted. During the 1930’s and early 1960’s, Hart and Crump Lakes were almost dry. During such times, maintenance of adequate stream habitat is critical to survival of the species and any diversion of stream flow would be particularly detrimental. The reduced numbers of populations and individuals make this species especially susceptible to any natural or manmade factors that adversely affect it.”

Warner suckers remain vulnerable to prolonged drought, particularly desiccation of lakes from drought and irrigation use and the drying or reduced stream flow of stream channels from irrigation water removal. Although the Warner sucker recolonized the lake habitat after the desiccation of the lakes in the early 1990's, future and possibly longer periods of drought could adversely affect the Warner sucker.

Additionally, due to the geographic limits and modification to stream habitat by constructed irrigation diversions and ditches in the closed Warner basin in which the Warner sucker are distributed, there is limited opportunity for the suckers to naturally disperse away from stress, habitat degradation, dewatering and other disturbance factors.

No conservation agreement or legal mechanism is in place with the private land owners to ensure long-term protection of the stream and lake habitat or to provide adequate stream flow or passage. No contingency plan exists in the event of lake desiccation, or catastrophic disturbance. Monitoring for desiccation of the lakes is limited to casual observations by ODFW field crews and other personnel passing through the Warner Valley. The Oregon Water Resources Department has proposed installing an automated staff gage that would provide real time information on lake levels. This device has not yet been installed.

## **2.4 Synthesis**

The Warner sucker was listed as threatened in 1985 because the range and numbers of Warner sucker had been reduced substantially; predation by exotic fish had reduced survival of juvenile suckers especially in lake habitat; and instream water diversions and artificial barriers restrict movement, migration, and spawning of suckers within and among streams.

The 1998 Recovery Plan recognized the vulnerability of the Warner sucker based on stream channel and watershed degradation, irrigation diversion practices, and predation and competition from introduced fishes. The Recovery Plan stressed the need to address the threats to this species through restoring and maintaining the natural aquatic and riparian habitats, protecting and rehabilitating populations, including conserving genetic diversity, controlling introduced exotic fishes, securing adequate water supplies for the continued survival of the species, monitoring populations and habitat conditions, and evaluating long-term effects of climatic trends (USFWS 1998, p 39).

To date, limited implementation of the Recovery Plan has occurred. Warner sucker habitat improvement has occurred through changes in grazing management on BLM and Forest Service lands, but few changes in land management have been made on private lands. Management of habitat on private land through conservation agreements, land exchanges, or acquisition has not occurred, and long-term management guidelines have not been developed and implemented. Progress has been accomplished through the construction of seven screens. Three screens have been installed on Deep Creek, three on Honey Creek, and one on the BLM diversion on the Hart Lake pump station. One

passage structure has been completed on Honey Creek and one on Twentymile Creek. An additional passage structure is under construction on Honey Creek and will be completed in Fall of 2010. However, many irrigation diversions remain unscreened and passage structures at the irrigation diversions are lacking or do not adequately address sucker passage needs (see section 2.3.2.1). These unscreened diversions on both the streams and Hart Lake remain priority screen points due to the potential for "take" of Warner suckers during pump operation.

Predation of Warner sucker by nonnative fish continues to impact Warner sucker in the lake habitats of the Warner basin and extends up into the lower reaches of the tributary streams. Monitoring by ODFW indicates that the lake populations of Warner sucker are seriously depressed, and that successful recruitment is limited, likely due to the competition and predation by non-native fish (Scheerer et al. 2006, p 12). Because of the patchy distribution of Warner sucker (as described in section 2.3.1.5) in the streams and the presence of a few sites with high sucker densities, the 2007 abundance estimates had low levels of precision (Scheerer et al. 2007, p 12). The estimates completed in 2009 had much higher levels of precision (Scheerer 2009b, pers. Comm.). Additional population estimates will be needed before a population trend can be established.

The Warner sucker is presently only known to occur in three stream basins and the series of lakes in the Warner basin. They remain vulnerable to predation by exotic fish and are affected by modification to habitat through the continued operation of water diversions and barriers that restrict movement and migration of Warner sucker. Prolonged drought, particularly desiccation of lakes from drought and irrigation use and the drying or reduced stream flow of stream channels from irrigation water removal, greatly impact Warner suckers' viability and recovery. Therefore, the classification for Warner sucker is warranted to be maintained as threatened status.

### 3.0 RESULTS

#### 3.1 Recommended Classification:

- Downlist to Threatened
- Uplist to Endangered
- Delist
  - Extinction*
  - Recovery*
  - Original data for classification in error*
- No change is needed

#### 3.2 Recovery Priority Number: 2C

##### Brief Rationale:

We recommend maintaining the recovery priority number at 2C which is a high degree of threat with a high potential for recovery based on the on-going threats described in section 2.3.2. and the potential for recovery through the development

of fish passage structures, screening of diversions, and stream flow management. Recovery of the Warner sucker will depend upon the construction of fish passage structures to interconnect population segments and allow access to spawning habitat in streams, screening of diversions to avoid direct take of individuals, and stream flow management strategies to ensure adequate flows to sustain all life stages and histories of Warner sucker. Additionally, control of non-native fish will help to maintain the lake morph life history of the Warner sucker. The development and implementation of these necessary measures is expected to have a high level of conflict because: 1) the utility and additional costs and maintenance of fish passage and screening projects are a concern to some private landowners; 2) water in the Warner basin is already the subject of conflict by water users in the basin; and 3) the non-native fish in the Warner Lakes are a popular recreational fishery.

#### **4.0 RECOMMENDATIONS FOR FUTURE ACTIONS**

1. Develop and implement a comprehensive, prioritized screening and passage strategy for the Warner Valley. Work with the ODFW to identify priority artificial obstructions within Honey Creek, and Twentymile Creek to be included on the Statewide Fish Passage Priority List.
2. Reconstruct the fish ladder on Dyke diversion on Twentymile Creek to adequately provide passage for Warner suckers.
3. Work with private land owners to reduce the risk to migrating Warner sucker as they move up and down stream, particularly during and after spawning periods. Assist land owners in the installation of passage structures and improvements to irrigation water diversion structures to reduce impact to Warner sucker while also improving the efficiency of water used so instream flows may be conserved to benefit Warner sucker and other fish species present. Investigate use of water leasing as a means to assure adequate instream water for Warner sucker habitat.
4. Work with the ODFW to develop a long-term management and monitoring plan for the Warner sucker population and its habitat. Monitoring should be sufficient to track fluctuations in fish abundance, quantity and quality of available habitat, and abundance of nonnative or invasive aquatic plant, invertebrate, or fish species. Surveys every other year in streams and lakes would limit injury or mortality due to handling while providing information on multiple age classes of fish, and population trends.
5. Collect key life history information, including population age structure, age and size at maturity, longevity, and spawning timing and duration. Determine whether the Warner sucker population is self-sustaining and “large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat changes” as stated in the recovery plan (USFWS 1998).

6. Evaluate the potential for control of introduced non-native fishes. Also consider potential for preventing introduction of other invasive species.
7. Evaluate the genetic variability that exists within the stream tributary populations. Determine if there is population structuring among the distinct habitat areas that contain suckers (Honey Creek, Deep Creek, Twentymile Creek, Crump Lake, and Hart Lake). Use of genetic analysis would aid in determining the distinction between potential populations. Genetic studies will aid in determining population structuring, provide evidence of bottlenecks or low genetic diversity, and if structuring occurs may allow us to determine origins of lake fishes from these signatures. Distinguishing between these populations will aid in answering questions regarding the potential for relying on metapopulations for conservation of the species.
8. Evaluate the health of Warner sucker. Recently, surveyors handling Warner sucker have observed lesions and external parasites. An assessment of hematological parameters would provide an assessment of current and potential health concerns.

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**Signature Page**  
**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of *Catostomus warnerensis***

**Current Classification:** Threatened

**Recommendation resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

**Appropriate Listing/Reclassification Priority Number, if applicable:**

**Review Conducted By:** Alan Mauer

*Acting* Monty Knudsen Date 9/30/10  
Field Supervisor, Fish and Wildlife Service

## **Appendix C.**

### **Warner Sucker Workshop 2019 Summary and Evaluation**

## **Warner Sucker Recovery Planning Workshop Summary**

### **May 21, 2019**

The goal of the workshop: Update the vision of Warner sucker recovery through an inter-agency dialogue on current and future threats.

The Objective of the workshop: Solicit information, perspectives and recommendations through discussion and exercises that will contribute to the Service's Warner sucker 5-year review. Workshop participants included representatives from the Oregon Department of Fish and Wildlife (Klamath Watershed District, Native Fish Investigations Program, and Conservation and Recovery Program); Lake County Umbrella Watershed Council; Lake County Soil and Water Conservation District; Oregon Watershed Enhancement Board; Bureau of Land Management (Lakeview Resource Area); U.S. Fish and Wildlife Service; and River Design Group.

### **Background Information Presented at the Workshop**

- The Service is completing a 5-year review for Warner Sucker, to be completed in 2019. This review began in 2016.
- As part of this process, the applicability of the recovery criteria outlined in the 1998 recovery plan will be assessed, along with the 2010 5-year review.
- The goal of this 5-year review is to assess the Warner sucker populations, assess threat factors, and consider recommendations to further conservation of the Warner sucker.
- Fish passage is identified as a priority for recovery of the species. Recommendations in the past 5-year review included a screening and fish passage strategy for all occupied Warner basin streams.
- Consideration of new science to inform the 5-year review.

### **Additional Background on the Recovery Plan**

Recovery plans are guidance, not regulatory documents. Recovery criteria identified in recovery plans should be specific, measurable, achievable, realistic, and time based. Current recovery criteria for Warner sucker specify the need for a self-sustaining metapopulation distributed throughout the three lakes and three major tributaries, and that passage is restored within and among the three streams so that suckers can function as a metapopulation. The current criteria are not sufficiently objective and measurable. Improved recovery plan guidance may include clarification regarding what represents a viable Warner sucker population, and additional clarification regarding the importance of populations within each lake and tributary versus a metapopulation encompassing the lakes and tributaries.

### **Role of Connectivity in Warner Sucker Recovery**

The workshop participants discussed current connectivity compared to historic connectivity among streams and lakes in the Warner basin. Historically Warner sucker populations from Honey, Deep and Twentymile creeks were connected through Crump, Hart, and Pelican lakes. Currently irrigation infrastructure (diversions and canals) impacts connectivity. In particular, Twentymile Creek appears to be the most disconnected stream, making it unlikely to function as part of a metapopulation.

Genetic differences identified by DeHann et.al (2017) indicate that Warner suckers in Crump and Hart lakes assign to (or originate from) Deep Creek and Honey Creek. Two-thirds of the fish collected in Hart Lake that were used in the genetic assessment originated from Deep Creek and all but two collected in Crump Lake originated from Deep Creek. Warner suckers from Twentymile Creek did not comprise any of the fish collected from the Warner Lakes most likely due to the extensive water development projects that prevent connectivity to Crump Lake. The genetic analysis indicated that Warner suckers in Twentymile Creek showed signs of a genetic bottleneck perhaps caused in part from recent isolation of this subpopulation.

**Summary:** The group expressed uncertainty that the Twentymile Creek population could be reconnected to Crump Lake or Deep Creek. Inventory and mapping of the irrigation system's streams, canals, and ditches throughout the Warner Basin was identified as a research need. Additionally, due to the long term presence of passage barriers between lakes and tributaries Warner sucker may have been limited in expression of their life histories. However, the group did feel that stream populations were more important for Warner Sucker persistence than lake populations because the stream environments are more stable, largely free of non-natives, and provide spawning habitat.

### **Warner Sucker Metapopulation**

The current recovery plan delisting criteria recommend a self-sustaining metapopulation of Warner sucker throughout the three main tributary streams and lakes in the Warner Basin. We currently lack evidence that Warner suckers move between the tributaries. However current movement between drainages is unlikely due to the number of barriers and impediments to movement in the basin. The intent of a metapopulation is to provide connectivity throughout the system such that a site can be recolonized if a population gets extirpated. In a true metapopulation some sub-populations are not self-sustaining because migration renews populations that wink out. The metapopulation concept was originally applied in the recovery plan to ensure stream populations can be repopulated if there are local extirpations.

To maintain a Warner sucker metapopulation there needs to be connectivity and passage between the tributaries and lakes. In order to meet the connectivity goals, the Warner Basin Aquatic Habitat Partnership and Strategic Action Plan are implementing a comprehensive fish passage and screening plan for all the irrigation diversions in the Warner Valley that block fish passage.

**Summary:** Currently the metapopulation goal is not likely met because we lack evidence of fish moving between tributaries. However, anthropomorphic actions such as moving fish or construction of fish passage structures may sufficiently maintain metapopulation dynamics. Assisted migration or moving fish from one stream to another could be a conservation-reliant approach to re-establish populations in the event of local extirpations. Alternatively, if a comprehensive fish passage program is implemented, assisted migration may not be necessary. Current delisting criteria could be re-framed as maximizing life-history diversity for the species by promoting fish passage and screening in basin tributary streams and connectivity to the Warner Lakes. The Service may review the delisting criteria and decide if a revision to the recovery plan is warranted.

### **Population Viability in Lakes and Streams**

The workshop participants discussed the criteria for viable populations in streams and lakes. In particular, questions were raised regarding the feasibility of lake residing fish constituting a viable population, as the lakes go dry occasionally. Although the lake residing Warner sucker have been described as a separate morph, it is likely the lake dwelling Warner suckers originate from upstream reaches and move into lakes when opportunity arises and are not a separate morph. The recovery plan (pg. 17) notes that the two morphs are examples of phenotypic plasticity, where when lake habitat is available, the stream morph opportunistically migrates downstream and grows to become a lake morph.

Larval sucker drift studies in the Warner basin (Kennedy and Olson 1994) suggest larvae do not appear to drift downstream from stream environments to the Warner Lakes. It is unknown when Warner sucker move into the lakes. Delayed movement from streams to lakes could be an adaptation due to historic lake drying. In addition to lake desiccation, streams also go dry, however streams typically provide more stable habitat. Movement to and from different stream sections may be important for fish to escape drying stream habitats.

The existing recovery criteria calls for self-sustaining populations distributed throughout the lakes as well as streams. Providing passage to the lakes may boost stream populations when the lakes produce large, fecund females. If these fish pass upstream it will enhance stream populations. Historically, runs from the lakes were substantial and thus may be important. The lake habitat is valuable, but the group did not agree on how essential it is. The group discussed the value of the adfluvial life-history type, stating that it should be conserved as an additional life history strategy that likely contributes to improving the status of the species when environmental conditions are favorable.

**Summary:** Workshop participants agreed that sustainable stream populations are critical to recovery. Lake habitat is valuable, but we are uncertain how essential lake populations are for recovery. Several participants agreed that passage through the lakes was important. At the time the recovery plan was written it was known the lakes naturally dried up periodically and the lake habitat was used on an opportunistic basis when it was available. Clarification about the

distribution of self-sustaining populations could be beneficial. The group discussed the need for three main tributary populations. Those populations should be self-sustaining and have access to lake habitat. Additional information on the movements of Warner sucker, into the lakes (including Pelican and Greaser Reservoir) and the use of lower Deep Creek is recommended.

### **Climate Change Effects to Warner Sucker**

The group discussed concerns about climate change and its influence on long-term persistence of Warner sucker. Current ODFW work is modeling the effects of climate change on local stream flow and temperature, and measuring thermal tolerances of Warner sucker with the goal of determining the impact on Warner sucker resilience and potentially their persistence.

### **Definition of Foreseeable Future for Warner Sucker Recovery Planning**

The group discussed how the Service defines the foreseeable future. The foreseeable future period is used to assess threats considered in listing decisions. Workshop participants supported a 30-year cycle in order to assess the effects of climate cycles over a reasonable period of time. They also discussed the time period in relation to human factors.

### **Threats Assessment Matrix Exercise - Factors Impeding Recovery:**

In order to help structure discussions of threats currently or potentially affecting Warner suckers, workshop participants completed a threats assessment matrix. The threats assessment exercise followed guidance outlined in the Fish and Wildlife Service's bull trout recovery plan (USFWS 2015). The threats considered, based on information in the Warner sucker recovery plan, were: water quality/quantity, connectivity, non-native fish, avian predation, land management, and fish disease. Participants evaluated each threat separately, taking into account the effects of climate change. Threats were ranked into four categories describing the severity of the threat: minor, moderate, high, and severe. Minor threats were those that would not be expected to cause any populations to be extirpated, whereas severe threats would lead to the extirpation of all populations over an approximately 30 year period. For the purpose of this exercise populations were defined as the three stream populations (Honey, Twentymile and Deep). Participants also considered how management is playing a role in threat amelioration. Management effectiveness ranged from none (no effect on threat), partially, mostly, to effective (threat largely ameliorated).

#### **1. Water quality/quantity**

Severity: high (ranged minor-severe)

Management Effectiveness: ineffective-partially effective

Uncertainty among participants regarding the effects of climate change on this threat explains the high level of disagreement over the severity of this threat. The participants discussed water use and efficiency. As irrigation system infrastructures are upgraded, there are requirements to install water gauging devices and to size diversions for water rights.

**Summary:** Participants concluded that water quality and quantity continues to be a threat and should be a high priority. Projects should continue to be developed with consideration of stream flow timing and require minimal need for ongoing maintenance in order to make the habitat improvement projects palatable to landowners and other cooperators. The level of threat is unknown as future climatic conditions are uncertain. However, research being conducted by ODFW will improve our understanding of the potential severity of impacts to water quality and quantity from climate change.

## **2. Connectivity**

Severity: moderate - high

Management Effectiveness: partially effective

We do not know whether poor environmental conditions such as desiccation of the lakes, triggers fish movement. During periods when there is water in the lakes, the lake environment could be a better refuge than upstream where the stream may be drying due to drought or irrigation water withdrawal. Climate change projections predict changes in the timing and amount of annual precipitation, which could result in dry lakes and stream segments. Most predictions call for warmer overall temperatures, more winter precipitation (with more rain than snow), less snowpack, and earlier spring runoff. Streams may become dryer and warmer in summer but lakes may still receive the same (or more) annual amount of water. Unknown effects from climate change make it difficult to assess the threat without anticipating a greater need for connectivity because populations that become extirpated from desiccated habitat would not be naturally recolonized without connectivity.

The group questioned whether there are resident suckers in Deep Creek. The Deep Creek population may depend on connectivity to Crump Lake. The only place juvenile suckers were found when sampling the shoreline of Crump Lake was at the mouth of Deep Creek. Passage and connectivity to the lake may be necessary to keep the Deep Creek population viable. Determining life history and presence of Warner sucker migrating in and out of Deep Creek was identified as a research need.

**Summary:** There was a high degree of divergence in opinions on the importance of connectivity as a threat to Warner sucker recovery. Some participants thought that conserving habitat for Warner sucker in the lakes could be more important in a climate-change future. One participant noted that lack of connectivity has not led to extinction in the past 50 years so it probably won't in the next 50. Several participants agreed that allowing fish to move around the system and to adjust to changing conditions is a good strategy. Connectivity may ameliorate other threats and has been important for persistence of Warner sucker in the face of past threats.

## **3. Non-native Fish**

Severity: moderate (ranged minor – high)

Management Effectiveness: none or ineffective

It was noted that lake drying might be the most effective form of non-native control. Most of the discussion was in regards to predation by non-natives rather than competition or niche occupation. If predation is high in the lake environment, it still would not “wipe out” stream populations. It was asked if the lake populations aren’t critical, can nonnative threat be severe? The current passage strategy intentionally does not open specific barriers to prevent the spread of non-natives.

One person suggested managing for coexistence of Warner suckers and non-native fish. There is uncertainty regarding impacts of non-native fish on Warner sucker. However, we expect the benefits to Warner sucker from improved passage to outweigh the impacts from non-native fish in the streams. The most effective control of non-natives in the lakes is drought and drying of the lakes. The group agreed that active management to control non-natives is impracticable, therefore managing for coexistence is the current approach.

**Summary:** There was no clear consensus regarding the impacts associated with non-native fish on Warner sucker. The main point of concurrence was that control of non-natives was impracticable and that currently the species are co-existing.

#### **4. Avian predation**

Severity: moderate (ranged minor to high)

Management Effectiveness: ineffective

To mitigate salmon take in the Columbia River, the Corps of Engineers built an island on Crump Lake to encourage nesting Caspian terns. However, the terns did not use the island as much as anticipated but, other birds such as cormorants and gulls began using the constructed island for nesting, increasing potential avian predation in the area. The Corps of Engineers monitored nesting and foraging at the island, but stopped prior to making a determination of the impact to Warner sucker and other fish in the basin.

Up to sixty percent of Passive Integrated Transponder (PIT) tags from Warner sucker studies were recovered on bird nesting areas, indicating that the impact could be substantial. The number varied among years, so it might be a minimal impact over some time periods.

**Summary:** Participants concluded that increasing habitat for these predators is likely having a negative impact on Warner sucker. However, avian predators have always been part of the system and while they may pose a threat, the priority of that threat is low. Further analysis of the impact from avian predation is needed, however was not a high priority.

#### **5. Land management**

Severity: minor-moderate

Management Effectiveness: mostly effective

Most of the basin is managed by federal agencies, and riparian areas are in relatively good condition. The Forest Service and BLM actively work to improve riparian management practices. Cattle numbers were substantially reduced to meet riparian management goals for the past two decades and BLM has documented the impact of this change in management. The Forest Service is working closely with permittees to improve riparian habitat and improve monitoring techniques. Improvements in grazing management have also been reported on private lands, however it is unknown if there is documentation to support this claim. The most common land management action occurring on the forest is tree thinning to improve overall forest health and resiliency from wildfires with a goal to ameliorate impacts from beetle kill, tree mortality and wind patterns.

**Summary:** Watershed conditions are being actively managed for beetle kill and riparian conditions. Working with land managers is important and should include collaborative processes.

## **6. Fish disease**

Fish disease was not included in the threats ranking exercise, but was discussed by workshop participants. Although the original listing did not identify disease as a threat, the workshop participants discussed the possibility of this as a threat. Several non-lethal diseases were identified during a fish health assessment conducted from 2013 to 2015 (Lujan 2015). In addition to common diseases caused by *lernea* and nematodes, he also identified the presence of brain spores however, there was no indication it was contributing to mortality, and there was no recommendation for additional study.

**Summary:** The group questioned whether climate change would exacerbate potential threats of disease from increased water temperatures and degraded water quality. Participants concluded that there could be increased rates of disease, and the seriousness of disease as a threat should be determined. Delisting criteria should take this threat into account.

## **7. Summer Lake**

The group discussed the translocated sub-population at Summer Lake. There was a high level of disagreement among participants regarding the importance of these fish, ranging from totally unnecessary to others stating that the greatest conservation benefit is to retain them as a redundant sub-population or backup in case of severe impacts to the native habitat, e.g., resilience in the population.

### **Overall Workshop Summary:**

One of the major goals for the next five years is to implement passage and screening projects identified in the Warner Basin Aquatic Habitat Partnership's Strategic Action Plan. These actions are priority recovery actions for Warner sucker. Clear criteria are needed to assess and explain progress made and which recovery tasks remain to be completed. Recovery goals should consider representation, redundancy, and resiliency in defining criteria to describe delisting

criteria. Delisting is a desired outcome demonstrating the success of conservation and recovery of the species.

**Recommendations/Information Needs:**

The following recommendations and information needs were identified by Workshop participants to assess progress in meeting recovery goals:

1. Determine at what age and what time of year Warner sucker move from the stream environment into the lake environment.
2. Evaluate water conservation opportunities to improve and maintain instream flows for Warner Suckers and other native fish.
3. Evaluate the Warner sucker's use of lower Deep Creek and the canal north of Hart Lake.

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## **Appendix D.**

**Summary of new information continued: Warner Basin Strategic Action Plan and Technical Report. Warner Basin Aquatic Habitat Partnership 2019.**



# Warner Basin Strategic Action Plan

Warner Basin Aquatic Habitat Partnership

June 1, 2019



# Warner Basin Strategic Action Plan

WARNER BASIN AQUATIC HABITAT PARTNERSHIP

JUNE 1, 2019

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## Executive Summary

The Warner Basin Aquatic Habitat Partnership (WBAHP) was formally established in 2017 to complete fish passage, irrigation diversion intake screening, and habitat restoration projects with the goal of recovering Warner Sucker and expanding Warner Lakes Redband Trout populations in the Warner Basin. To meet these goals, the Warner Basin Strategic Action Plan (Plan) outlines the WBAHP members and their responsibilities, acknowledges the important relationships with local ranchers and water users who rely on surface water diversions for their economic livelihood, and identifies the actions that will be necessary to improve stream corridor conditions for Warner Sucker. The WBAHP seeks to address fish passage, irrigation diversion network screening, water availability, and habitat in the three tributaries and terminal lakes that comprise Warner Sucker habitat. These waterbodies also support Warner Lakes Redband Trout and actions that benefit Warner Sucker are anticipated to similarly benefit Warner Lakes Redband Trout.

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## 1. Introduction

The Warner Basin Aquatic Habitat Partnership (WBAHP) is a collaboration of local, state, and federal partners committed to the recovery of Warner Sucker (*Catostomus warnerensis*, Oregon and federally-threatened species) and Warner Lakes Redband Trout (*Oncorhynchus mykiss newberrii*, Oregon and federal sensitive species). The WBAHP is comprised of seven organizations including the Lake County Umbrella Watershed Council (LCUWC), Lakeview Soil and Water Conservation District (LSWCD), Oregon Department of Fish and Wildlife (ODFW), U.S. Fish and Wildlife Service (USFWS), U.S. Bureau of Land Management (BLM), U.S. Forest Service (USFS), and River Design Group, Inc. (RDG). The WBAHP members have completed fish passage, screening, and habitat enhancement projects in the Warner Basin, and have a goal of expanding these efforts to address fish passage and habitat limiting factors across the three focal tributary watersheds that support Warner Sucker and Warner Lakes Redband Trout. The WBAHP also recognizes that a successful restoration program requires the willing participation and support of the local community, landowners, and irrigators who own and manage the land where restoration activities will be completed. The WBAHP members have developed productive relationships with the Adel Water Improvement District, the Hart Lake Water Users Association, and the local communities of Adel and Plush, Oregon. These relationships have resulted in rapid project development, design, and implementation over the past decade.

The Warner Basin Strategic Action Plan (Plan) is intended to present the approach the WBAHP will take to pursue fish passage, screening, and habitat enhancement projects leading to the satisfaction of USFWS recovery criteria for the eventual delisting of Warner Sucker. Additionally, the Plan is anticipated to result in improved Warner Lakes Redband Trout population connectivity as fish passage constraints are addressed. The Plan defines the roles of the WBAHP member organizations, how the members will work together on pursuing future projects, identifies the primary limiting factors affecting the species of concern, and determines the pathways for addressing the limiting factors. The Plan is the result of numerous meetings, one-on-one and small group discussions, and the application of the members' individual and group experiences from working in the Warner Basin. The WBAHP's understanding of limiting factors affecting Warner Sucker and Warner Lakes Redband Trout, is based on a long record of scientific investigations completed by ODFW, USFWS, and other organizations over the past 40+ years. Recent efforts to develop collaborative relationships with landowners and irrigators have provided WBAHP members with the opportunity to implement projects that will address the long-recognized fish passage issues that affect the two target fish species and other native fish in the Warner Basin.

The Plan will serve as the guiding document for WBAHP coordination, project development, and project implementation. The WBAHP will periodically review and update the Plan to reflect project successes and opportunities for Plan improvement. Although the WBAHP currently includes all of the organizations pursuing restoration projects in the Warner Basin, other organizations interested in joining the WBAHP in the future will be invited to participate in the improvement and execution of the Plan.

## 2. Outcomes

Warner Suckers were historically abundant and widely distributed throughout the Warner Basin (Scheerer et al. 2007, 2011; Richardson et al. 2009), but poor connectivity among the lakes and

tributaries due to irrigation infrastructure, habitat degradation, and non-native fish effects, have diminished Warner Sucker and Warner Lakes Redband Trout populations. Habitat fragmentation within the Warner Basin and non-native fish impacts reduce or preclude the potential for a naturally functioning Warner Sucker metapopulation. As Warner Lakes Redband Trout have a similar geographic distribution as Warner Sucker, redband trout are similarly affected by the noted limiting factors.

The *Recovery Plan for the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin* (USFWS 1998) sets recovery criteria for delisting Warner Sucker. These criteria require that: 1) a self-sustaining metapopulation is distributed throughout the Twentymile Creek, Honey Creek, and Deep Creek (below the falls) drainages, and in Pelican, Crump, and Hart lakes, 2) passage is restored within and among the Twentymile Creek, Honey Creek, and Deep Creek (below the falls) drainages so that the individual populations of Warner Sucker can function as a metapopulation, and 3) no threats exist that would likely threaten the survival of the species over a significant portion of its range.

Project outcomes focus on water user participation in fish passage and screening, and landowner participation in habitat enhancement projects. The WBAHP will also develop educational outreach materials highlighting the value of Warner Basin native fish and the impacts of introduced fish species on the unique Warner Basin fish community. Additionally, WBAHP will investigate water conservation measures that may be instituted in the future to improve water use efficiency. The following project outcomes have been identified.

**Outcome #1:** By 2021, WBAHP will complete fish passage projects with the three irrigation districts in the Warner Basin.

**Outcome #2:** By 2025, WBAHP will have completed fish passage projects at ten diversions in the Warner Basin and documented Warner Sucker passage at selected diversions. Fish passage project execution will require support of the local community, landowners, and irrigators.

**Outcome #3:** By 2025, WBAHP will coordinate with ODFW the development of educational outreach materials concerning non-native fish in the Warner Lakes with the intent to educate anglers about the native fish community and the impacts of introduced fish species.

**Outcome #4:** By 2025, WBAHP will coordinate with the local community and irrigators to develop water conservation actions to increase water use efficiency.

**Outcome #5:** By 2035, WBAHP projects will achieve USFWS Warner Sucker recovery criteria. Project completion reports and monitoring reports will be provided to USFWS on a periodic basis during Plan implementation. Because species delisting follows a USFWS rulemaking process, WBAHP does not have the authority to delist Warner Sucker, but WBAHP will provide information that may lead to species delisting.

The WBAHP believes these outcomes are achievable long-term goals for the Plan.

### 3. Scope and Vision

The following section includes the WBAHP's vision and guiding principles to execute the WBAHP's vision.

**Vision** – Streams and lakes in the Warner Basin will comprise a connected watershed that provides access to the high quality spawning, rearing, and adult holding habitats that are necessary for Warner Sucker and Warner Lakes Redband Trout to complete their diverse life-history strategies. Addressing existing limiting factors will require a collaborative effort among WBAHP members, the local community, landowners, and water users. Recovery of Warner Sucker and Warner Lakes Redband Trout will preserve and ensure the valued fish community that is unique to the Warner Basin.

The **Guiding Principles** for the execution of the Vision include:

**A collaborative approach to project development and execution.** Plan implementation will require coordination among WBAHP members. Members will contribute their respective expertise regarding fisheries, vegetation communities, wetlands, monitoring, water rights, diversion infrastructure, and project funding.

**Coordination with landowners and water users.** The WBAHP will coordinate projects with the local community, landowners, and water users. Project execution will benefit from landowner and water user information. The WBAHP will strive to maintain trust and support from the local community.

**Securing project funding to support design, implementation, and monitoring.** The WBAHP will coordinate project funding opportunities. Many of the WBAHP members have funding sources they can apply to Warner Basin projects. Based on past completed projects, member organizations often account for a substantial portion of the project funding needs. Members' contributed funds and other outside funding opportunities the WBAHP will pursue, will provide the match-funding required by the Oregon Watershed Enhancement Board (OWEB) in order to receive OWEB funding either under the traditional competitive funding program, or the Focused Investment Partnership (FIP) program.

**Retain local contractors to execute project construction.** Rural communities and their economies benefit from funding dollars spent on projects in the surrounding area. The WBAHP will solicit bids from local and regional contractors that are typically small businesses that hire or subcontract local residents. Contractors also support the local economy through fuel, food, and material purchases over the course of projects.

**Institute project monitoring and implement adaptive management to inform future designs.** The WBAHP will take a systematic approach to completing baseline, as-built, and out-year monitoring. Baseline monitoring is important for establishing existing conditions to compare as-built and out-year monitoring results to. Monitoring data are reviewed as part of an adaptive management program that applies lesson learned through data collection to improve future project designs. Sharing lessons learned with the WBAHP members and other restoration program practitioners is an instructive way to advance the restoration field especially in the realm of native, non-game fish species passage which is generally an understudied area of ecological restoration.

**Maintain current agricultural-based economy and rural lifestyles.** The WBAHP will coordinate Plan execution within the context of maintaining and improving existing irrigation systems and land use. The

management and operation of Warner Basin diversions have relied on the experience and knowledge of generations of Warner Basin water users and changes to diversion operations will be approved by water users during the design process. The WBAHP will pursue projects with landowners and water users who agree to a reasonable level of responsibility in maintaining the project.

**Ensure diversion project success and improve agricultural efficiency over time.** The WBAHP will remain involved with irrigation diversion projects after they are completed to ensure the diversion modifications function as expected. Meaningful diversion infrastructure improvements are often beyond the financial capacity of small irrigation districts or individual irrigators. WBAHP funding will seek to improve fish passage and screening while also making irrigation diversions safer and easier to operate. Future projects may also increase agricultural efficiency, a result that could leave more water in-stream and require less intensive agricultural practices.

#### 4. Governance/Partnerships

The following section provides a summary of the core implementation partners comprising the WBAHP, and the key leaders of each organization. Since the individual representatives for each organization have been in their current position for over 5 years, the role of the individual representatives is presented. We expect that over time as representatives move on to other challenges; the underlying organizations will continue to participate in the WBAHP and other qualified individuals will assume the responsibilities necessary for the continued success of the WBAHP.

Marci Schreder is the program manager of the LCUWC, the regional watershed council based in Lakeview, Oregon. Marci has worked with landowners and irrigators in the Warner Basin since 2010. Marci is the nucleus of the WBAHP and she is responsible for coordinating the other WBAHP members, conducting outreach with cooperating landowners and irrigators, pursuing broad funding for project engineering and implementation, and completing overall project coordination. Marci has been a locally-based, consistent voice for both the LCUWC and the WBAHP, her participation has been essential to the WBAHP's project success. Marci has overseen projects in the Twentymile Creek and Deep Creek drainages of the Warner Basin. She will continue to work with landowners and irrigators in these two watersheds while assisting with Honey Creek projects to a lesser extent.

Justin Ferrell is the LSWCD district manager. Like Marci, Justin is a Lakeview-area resident and he is integrated into the economic and social fabric of the Lakeview community. In addition to managing the LSWCD, Justin also manages his own ranch outside of Lakeview and he is attuned to the many economic pressures agricultural producers face in eastern Oregon. Justin often serves as a bridge between local agricultural producers and federal and state agencies responsible for improving habitat for species of concern. His perspectives provide balance to the conservation-focused agency participants on the WBAHP. Justin also provides an educated perspective on water rights and water use issues in the basin. Justin is the WBAHP's lead for Honey Creek projects.

Alan Mauer and Dirk Renner are based in the USFWS Bend Field Office. Alan and Dirk provide technical expertise, guidance for addressing habitat and fish passage needs for Warner Sucker, project funding, and regulatory perspective. Alan annually organizes the Oregon Desert Fishes Working Group Meeting which serves as a forum for sharing project successes and learning opportunities. USFWS guidance and

funding have been instrumental in developing and implementing Warner Sucker-focused projects throughout the Warner Basin.

Jimmy Leal is a fisheries biologist with the BLM based in Lakeview. Like Alan, Jimmy has worked on eastern Oregon endemic fish issues for over 15 years. In addition to Warner Sucker, Jimmy also collaborates with USFWS on the recovery of other federally-listed fish species including the Hutton Tui Chub (*Gila bicolor ssp.*) and Foskett Speckled Dace (*Rhinichthys osculus ssp.*). Jimmy is locally-based and also part of the Lakeview community. The BLM provides fisheries expertise, project funding, landowner and irrigator outreach, restoration project experience, and project monitoring and evaluation. Jimmy also serves as an authority on the BLM's Aquatic Restoration Biological Opinion (ARBO), a restoration programmatic review process that shortens the project permitting process.

Rich Pyzik is a fisheries biologist with the USFS Fremont-Winema National Forest based in Lakeview. Although Rich primarily focuses his work on Forest lands in the Warner Basin and surrounding watersheds, USFS provides restoration project and fisheries expertise and funding for Warner Basin projects on private land. Rich has participated in many restoration projects throughout Lake County. Past projects have brought the National Forest and private landowners together to implement large landscape-scale projects that have important conservation outcomes.

Historically, ODFW has maintained a strong presence the Warner Basin Watershed. Recently retired fisheries biologist Paul Sheerer, conducted monitoring research in the basin for the past twenty years. His research provided WBAHP and other conservation partners with valuable and inciteful information regarding the Warner Sucker and Warner Lakes Redband Trout. This information and his techniques have been passed on to Justin Miles, the assistant District Biologist who covers Lake County, and Fred Monzyk, ODFW's Native Fish Investigation Program manager based in Corvallis. Justin contributes to WBAHP through technical input and understanding of Warner Basin fishes. Justin also provides project assistance including fish salvage and monitoring. Fred is the newest participant on the WBAHP, having recently joined the Native Fish Investigations Program. Fred provides technical input and is overseeing ODFW's monitoring of Warner Basin fish passage and screening projects.

The Warner Lakes Basin has three irrigation districts and multiple members who utilize and maintain water resources. John Taylor (Honey Creek), Don Robinson (Twentymile Creek) and Jason Jaeger (Deep Creek) lead the irrigation districts in their annual plans for water distribution throughout the Adel and Plush area. The irrigation district managers are extremely instrumental in working with the stakeholders in the watershed. They have effectively encouraged members of their districts to participate in restoration actions with the goal of Warner Sucker recovery. They see these projects as important for the future success of the species, as well as preserving the use of stream flows that is a critically important to the local ranches who need water for their livestock, hay production, and to support their economic investments.

The WBAHP is comprised of both local and regional partners who each play instrumental roles in project outreach, funding, development, and monitoring. The WBAHP members' common goal of improving connectivity in the Warner Basin, their long-term participation in the WBAHP, and their local presence and participation in the Lakeview area community will continue to be critical to the WBAHP's success.

## 5. Context: Profile of the Focus Area

### Physical Geography

The Warner Valley is an endorheic (i.e., no outlet) basin approximately 60 miles long and 8 miles wide located in south-central Oregon (Figure 5-1). The valley has two regions commonly referred to as the South Warner Valley and the North Warner Valley with the area of separation between Crump Lake and Hart Lake, known as the Narrows.

Similar to adjacent endorheic basins, the Warner Valley was formed by horst and graben geology whereby a central downward-trending block of ground is bordered by two adjacent uplifted blocks of ground in a general north-south orientation (USFWS 1998). During the Pleistocene era (2 million to 10,000 years ago), the Warner Valley contained a large pluvial lake. Since this time there have been glaciations (wet periods) creating large lakes in each basin, and arid periods creating many smaller lakes. The result of these periodic episodes of isolation and joining of habitats has been differentiation, and in some instances, speciation of the native fishes of the region. Today (a period of isolation), the fish assemblages in the Warner Basin show varying levels of differentiation relative to fish assemblages in adjacent endorheic basins.

Both sides of the South Warner Valley have steep cliffs rising from 1,000 to 2,000 ft above the valley floor (Figure 5-2). The eastern cliffs run the entire length of the valley, while the western wall turns into rolling hills at the north end of the valley. The Coyote Hills are the western boundary through the middle of the North Warner Valley, with the Rabbit Hills bounding the northwest corner of the valley. From the hills, the ground slopes west up to the crest of Abert Rim (Warner Ridge). The eastern boundary of the valley is Hart Mountain, a massive cliff face that rises 3,600 ft above the valley floor. Warner Peak with an elevation of 8,065 ft is the highest point on Hart Mountain.



**Figure 5-1.** The location of the Warner Basin within the Basin and Range region in southern Oregon, northwestern Nevada, and northeastern California.



**Figure 5-2.** The South Warner Rim forms the southwestern boundary of the Warner Basin.



sage steppe, dry forest, and rimrock. Wild rose, choke cherry, wild plum, cottonwood, and willow are located in riparian areas. Vegetation in drier uplands includes sagebrush, greasewood, and western juniper.

Wildlife in the Warner Valley includes common high desert mammal species, resident birds, and migrant waterfowl. There are forty-two mammal species that live in Warner Valley include larger mammals such as pronghorn, bighorn sheep, elk, mule deer, cougar, bobcat, and coyotes. Smaller mammals include jackrabbits, ground squirrels, and chipmunks.

There are 239 species of birds that live in the area or migrate through the Warner Valley. Species that nest in the areas around Crump Lake and Hart Lake include American white pelicans, double-crested cormorants, willets, Wilson's phalaropes, Canada geese, gadwalls, northern shovelers, black-crowned night herons, and numerous varieties of ducks and terns. In addition, sandhill cranes, white-faced ibis, great white egrets, and American avocets are found in the marshes and along the lake shores. A broad variety of neotropical migrants, owls, falcons, hawks and eagles also inhabit the valley either as residents or migrants.

Native fish species found in the Warner Basin planning area include Warner Sucker, Warner Lakes Redband Trout, Tui Chub, and Speckled Dace. Non-native species include White Crappie (*Pomoxis anularis*), Black Crappie (*P. nigromaculatus*), and Largemouth Bass (*Micropterus salmoides*) were planted by ODFW into the Warner Lakes between 1971 and 1973 (White et al. 1990), and were well established by the late 1970s. Brown Bullhead (*Ameiurus nebulosus*) also inhabit the basin, although the year of introduction is unknown.

### **Warner Sucker**

The following information is largely adapted from Scheerer et al. (2016).

The abundance and distribution of Warner Sucker has declined over the past century, and the species was listed as threatened under the U.S. Endangered Species Act in 1985 due to habitat fragmentation from impassable irrigation diversions and threats posed by the proliferation of piscivorous non-native game fishes (USFWS 1985).

The Warner Sucker inhabits the lakes and low gradient stream reaches of the Warner Valley. The species exhibits two life-history forms: lake and stream morphs (Figure 5-5). The lake-residing suckers have a lacustrine-adfluvial life history, spend most of the year in a lake environment, and migrate up the tributary streams in large aggregations to spawn (USFWS 1998). The adfluvial form generally matures later, lives longer, and is much larger and more fecund than the stream form. When upstream migration of lake-residing suckers is hindered by low stream flows during drought years or by irrigation diversion weirs, lake-residing suckers may spawn in nearshore areas of the lakes (White et al. 1991). Large lake-residing populations of introduced fishes may reduce sucker recruitment by preying upon young suckers (USFWS 1998). Periodic lake drying also threatens the lake-residing suckers, and suckers from the tributaries have recolonized the lakes after past drying events (mid-1930s and early 1990s; Allen et al. 1994). The stream-residing suckers have a fluvial life-history pattern and rear-spawn in the three major tributary drainages (Twentymile, Deep, and Honey creeks). Threats specific to the stream form include water withdrawals for irrigation and habitat degradation associated with grazing and agricultural practices. Both the lake- and stream-residing Warner Suckers spawn in the spring (April–June) (Coombs

and others 1979) in response to temperature and flow cues (Scheerer et al. 2016). Warner Suckers in the lakes are long-lived (17 years; White et al. 1991) and mature at 3 to 4 years of age (Coombes et al. 1979).



**Figure 5-5.** Stream form (top) and lake form (bottom) male Warner Suckers in spawning condition. Photos courtesy ODFW.

### Warner Sucker Distribution

The following Warner Sucker distribution information is adapted from USFWS (1998).

**Historical** - The probable historical range of the Warner Sucker includes the main Warner Lakes (Pelican, Crump, and Hart), and other accessible standing or flowing water in the Warner Valley, as well as the low to moderate gradient reaches of the tributaries which drain into the Valley. The tributaries include Deep Creek, up to the falls 3.1 miles west of Adel, the Honey Creek drainage, and the Twentymile Creek drainage. In Twelvemile Creek, a tributary to Twentymile Creek, the historical range of the sucker extended through Nevada and back into Oregon, but probably not as high as the California reach of the stream.

Early collection records document the occurrence of the Warner Sucker from Deep Creek up to the falls west of Adel, the sloughs south of Deep Creek, and Honey Creek (Snyder 1908). Andreasen (1975) reported that long-time residents of the Warner Valley described large runs of suckers in the Honey Creek drainage, even far up into the canyon reach.

**Current** – Figure 5-6 includes the current Warner Sucker distribution and designated critical habitat in the basin. Between 1977 and 1991, eight studies examined the range and distribution of the Warner Sucker throughout the Warner Valley. These surveys showed that when adequate water is present, Warner Suckers may inhabit many of the lakes, sloughs, and potholes in the Warner Valley. The documented range of the sucker extended as far north into the ephemeral lakes as Flagstaff Lake during high water in the early 1980s, and again in the 1990s.

Stream resident populations are found in Honey Creek, Snyder Creek, Twentymile Creek and Twelvemile Creek. Intermittent streams in the drainages may support small numbers of migratory suckers in high water years. No stream resident suckers have been found in Deep Creek since 1983 (Smith et al. 1984, Allen et al. 1994), although a lake resident female apparently trying to migrate to stream spawning habitats was captured and released in 1990 (White et al. 1990). The known upstream limit of the Warner Sucker in Twelvemile Creek is through the Nevada reach and back into Oregon (Allen et al. 1994). However, the distribution appears to be discontinuous and centered around low gradient areas that form deep pools with protective cover. In the lower Twentymile Slough area on the east side of the Warner Valley, White et al. (1990) collected adult and young suckers throughout the slough and Greaser Reservoir. This area dried up in 1991, but because of its marshy character, may be important sucker habitat during high flows. Larval, young-of-year, juvenile and adult suckers captured immediately below Greaser Dam suggest either a slough resident population, or lake resident suckers migrating up the Twentymile Slough channel from Crump Lake to spawn (White et al. 1990, Allen et al. 1996).

### Conservation History

Conservation actions in the Warner Basin are relatively recent. Fish passage projects have been completed on upper and lower Honey Creek (2008 and 2010, and 2013 and 2017, respectively) and Twentymile Creek (2014 and 2017). WBAHP is currently working with landowners, individual irrigators, and irrigation districts on fish passage projects in the three focal tributaries.

ODFW completed biological monitoring on fish passage projects on Twentymile Creek (Dyke Diversion, Scheerer et al. 2017) and Honey Creek (Rookery Diversion, Scheerer and Meeuwig 2017) and confirmed passage of Warner Sucker in the completed fish passage structures using PIT-tagged Warner Suckers. ODFW has also documented Warner Sucker passage at the MC Diversion, but the data have not been



**Figure 5-6.** Warner Sucker occupied and designated critical habitat, and the Focused Investment Partnership planning area.

published. A second fish passage project on lower Honey Creek (Flood Ditch) was completed in 2017 and has not been studied by ODFW.

The continued pursuit of fish passage, screening, and habitat enhancement work on the three focal tributaries in the Warner Valley, is anticipated to result in the future recovery of Warner Sucker and improved conditions for Warner Lakes Redband Trout. Lessons learned on each project are discussed among the WBAHP members and applied during the development of future projects.

### **Local Communities/Human Population**

People have lived in the Warner Valley for more than 10,000 years as evidenced by Native American occupation noted by petroglyphs, hunting blinds, flakes from obsidian tools, and other material artifacts. The Kidütökadö band of Northern Paiute were the most recent Native American people to frequent the Warner Valley and the uplands of Hart Mountain.

Euro-American sheep herders and small cattle ranch operators settled the Warner Valley in the late 1800s. The town of Adel was found in the late 1880s and the Adel post office was established in 1896. The town of Plush located near Honey Creek, was founded during a similar time and the town's post office was established in 1888. Adel and Plush remain small communities supported by surrounding cattle ranches. Lakeview remains the regional economic and social hub of Lake County.

### **Local Economy**

The "working landscape" is a key component of the basin economy. Agriculture is historically one of the region's principal industries and continues to support the local economies of Plush, Adel, and Lakeview. Historically, ranches raised sheep, but over time, cattle became the predominant agricultural industry in the region. Agricultural crops such as hay, alfalfa, and other feed are primarily raised for local livestock consumption. Timber harvest, tourism, energy production, and public works are other revenue sources for the region.

## **6. Conservation Need**

Warner Sucker and Warner Lakes Redband Trout are the primary focus of the conservation need. The following section is largely taken from USFWS (1988) and the information remains relevant today.

The Warner Sucker was federally listed as threatened in September 1985 (USFWS 1985). The species is also listed as threatened by the State of Oregon, and sensitive by the State of Nevada. There is essentially one metapopulation of Warner Sucker which is endemic to the streams and lakes geographically delineated by the Warner Basin.

The major threats to the continued existence of the native fishes in the Warner Basin and Alkali Subbasin are human induced stream channel and watershed degradation, irrigation diversion practices, and predation and competition from introduced fishes. These three factors have worked both independently and in unison to threaten the viability of Warner Sucker and probably affect other native aquatic and riparian associated species. The Warner Sucker and the Warner Valley Redband Trout generally appear to occupy similar habitats in the same watersheds (although trout reside more in the upper reaches of streams than suckers do), so impacts affecting Warner Suckers likely also affect Warner Valley Redband Trout.

## 7. Conservation/Restoration Targets

The USFWS (1998) recovery plan for Warner Sucker outlines steps designed to recover the Warner Basin and Alkali Subbasin aquatic ecosystems with specific goals for Warner Sucker and other listed species (Hutton Tui Chub and Fosskett Speckled Dace) which are located outside of the Plan area. Fosskett Speckled Dace is currently (2019) being considered for de-listing by USFWS (2018). The primary recovery objective for the Warner Sucker is the eventual delisting of the species. Species delisting is an administrative process overseen by USFWS. WBAHP can execute projects that achieve recovery criteria, but WBAHP does not have the authority to delist the species.

USFWS is currently (2019) reviewing threats and recovery criteria for Warner Sucker, however, based on the 1998 recovery plan, USFWS may consider delisting the Warner Sucker when the following recovery criteria are met:

1. A self-sustaining metapopulation (a group of populations of one species coexisting in time, but not in space) is distributed throughout the Twentymile Creek, Honey Creek (Figure 8-1), and Deep Creek (below the falls) drainages, and in Pelican, Crump, and Hart lakes. Self-sustaining populations will be determined based on parameters such as:
  - Multiple age-classes, including adults, juveniles, and young of the year, which approximate normal frequency distributions,
  - A stable or increasing population size,
  - Documented reproduction and recruitment, and
  - Self-sustaining populations form a viable metapopulation, large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat changes.
2. Passage is restored within and among the Twentymile Creek, Honey Creek, and Deep Creek (below the falls) drainages so that the individual populations of Warner Suckers can function as a metapopulation.
3. No threats exist that would likely threaten the survival of the species over a significant portion of its range.

Actions needed for Warner Sucker recovery include:

1. Protect and rehabilitate Warner Sucker populations and habitat.
2. Conserve genetic diversity of Warner Sucker populations.
3. Ensure adequate water supplies are available for Warner Sucker recovery.
4. Monitor Warner Sucker populations and habitat conditions.
5. Evaluate long-term effects of climatic trends on the recovery of Warner Sucker.

## 8. SMART Goals and Objectives

In the following section, goals and objectives are assigned to each outcome included in Section 2. Figure 8-1 includes the locations of irrigation diversions proposed for fish passage and screening improvements.

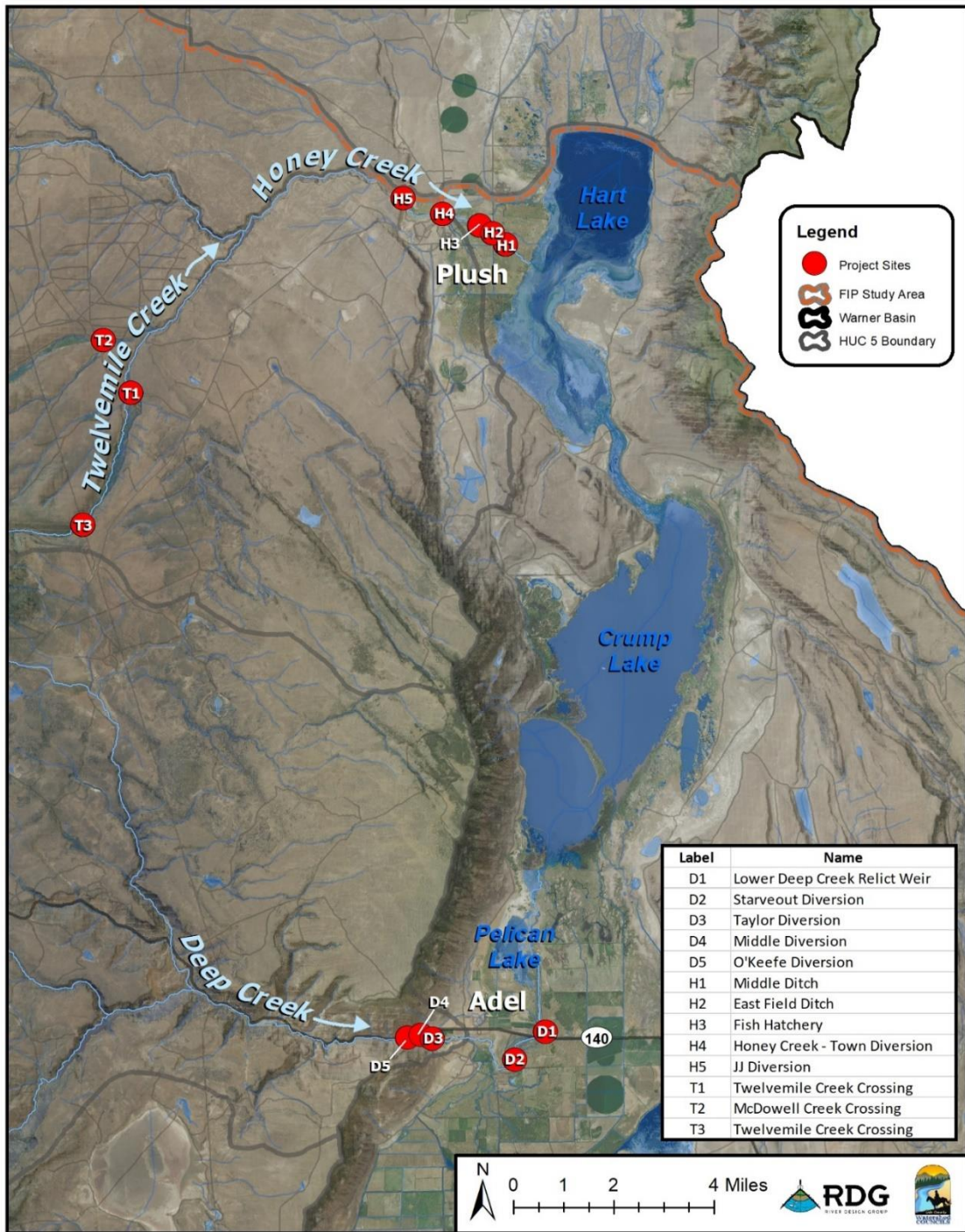


Figure 8-1. Proposed fish passage and screening project locations in the Warner Basin.

**Outcome #1:** By 2021, WBAHP will complete four fish passage projects with the three irrigation districts in the Warner Basin.

**SMART Goal 1:** Restore fish passage and screening on Deep Creek (Figure 8-2) and Honey Creek and monitor existing fish passage project on Twentymile Creek.

**Objective 1A: Achieve fish passage at Lower Deep Creek Relict Diversion, Starveout Diversion, and Taylor Diversion on Deep Creek, and the Town Diversion on Honey Creek.**

Action 1A1: Complete outreach to the MC, Adel, and Plush water users to develop project concepts, get project buy-in, and determine project goals, objectives, and constraints.

Action 1A2: Complete field data collection, engineering designs, acquire funding, permit, implement, and monitor fish passage at four irrigation diversions.

Action 1A3: Complete field data collection, engineering designs, acquire funding, permit, implement, and monitor fish screens at three irrigation diversions.

Action 1A4: Confirm fish passage at addressed diversions through biological monitoring (e.g., tag fish and monitor passage).



**Figure 8-2.** Deep Creek emerges from the Deep Creek canyon into the broader Warner Valley. The view is from upstream of Adel, to the east with Coleman Ridge in the distance.

**Outcome #2:** By 2025, WBAHP will have completed fish passage projects at ten diversions in the Warner Basin and documented Warner Sucker and Warner Lakes Redband Trout passage at each diversion. Fish passage project execution will require support of the local community, landowners, and irrigators.

**SMART Goal 2:** Restore fish passage and install screens on Deep Creek and Honey Creek, and monitor existing fish passage project on Twentymile Creek.

**Objective 2A: Achieve fish passage at O’Keefe Diversion and Middle Diversion on Deep Creek, and at JJ Diversion, Hidden Diversion, Fish Hatchery Diversion, and East Field Diversion on Honey Creek. Also address three road crossing fish passage concerns in the Honey Creek drainage.**

Action 2A1: Complete outreach to the MC, Adel, and Plush water users to develop project concepts, get project buy-in, and determine project goals, objectives, and constraints.

Action 2A2: Complete field data collection, engineering designs, acquire funding, permit, implement, and monitor fish passage at six irrigation diversions and three road crossings.

Action 2A3: Complete field data collection, engineering designs, acquire funding, permit, implement, and monitor fish screens (Figure 8-3) at six irrigation diversions.

Action 2A4: Confirm fish passage at addressed diversions through biological monitoring (e.g., tag fish and monitor passage).



**Figure 8-3.** A roll drum fish screen located on the lower Taylor Diversion on Honey Creek.

**Outcome #3: By 2025, WBAHP will coordinate with ODFW the development of educational materials concerning Warner Basin native fish and threats from non-native fish. WBAHP will also coordinate a fishery outreach and education program to reduce the potential for future re-introductions of non-native species.**

**SMART Goal 3:** Develop an educational outreach plan on the benefits of Warner Basin native fish and threats from non-native fish. The plan will include public outreach and informational materials.

**Objective 3A: Develop non-native fish management plan.**

Action 3A1: WBAHP review feasibility of managing non-native fish in Warner Lakes.

Action 3A2: ODFW review fishing regulations, angler use, and survey for angler input on removing non-native fish for native fish conservation in the Warner Lakes.

Action 3A3: Compile survey input and develop strategy for addressing non-native fish.

Action 3A4: Rollout education strategy through public meetings and by making materials publicly available through ODFW website and local information sources.

**Outcome #4: By 2025, WBAHP will coordinate with the local community and irrigators to determine the feasibility for water conservation, and develop water conservation concepts to increase water availability to support the native fish community.**

**SMART Goal 4:** Develop water availability goals and strategies with water users.

**Objective 4A: Meet with water users to discuss potential strategies.**

Action 4A1: Review water users’ irrigation infrastructure and provide concepts that meet water users’ needs and increase water availability. Concepts may include piping irrigation networks, soil moisture monitoring, and water leasing opportunities.

Action 4A2: Hold local water user meetings to present potential strategies.

Action 4A3: If determined to be viable, develop a water leasing entity for interested water users.

**Outcome #5: By 2035, WBAHP projects will achieve USFWS Warner Sucker recovery criteria, and provide information support to USFWS for consideration in Warner Sucker delisting.**

**SMART Goal 5:** Warner Sucker recovery and consideration for delisting.

**Objective 5A1: Provide USFWS with Plan information to support species review and delisting consideration.**

Action 5A1: Provide annual project monitoring data and reports in support of species review.

Action 5A2: Complete any outstanding monitoring or fish passage confirmation efforts that are necessary.

Action 5A3: Support USFWS in gathering additional information and coordinating public meetings.

## 9. Funding Needs: Estimated Costs/Leverage Opportunities

The WBAHP has been very successful in acquiring project funding and leveraging diverse funding sources to implement fish passage projects. To successfully carry out the Plan, the WBAHP will continue to rely on funding from both WBAHP members, OWEB, and outside funding sources. Table 9-1 includes possible funding sources and potential annual contribution amounts to match OWEB funds.

**Table 9-1.** Potential match funding sources for Warner Basin fish passage, screening, and habitat improvement projects. The Potential Annual Contribution Amount is based on recent funding levels for fish passage projects completed in the Warner Basin.

Funding Source	Potential Annual Contribution Amount
U.S. Fish and Wildlife Service - Partners Program	\$50,000
U.S. Fish and Wildlife Service - Endangered Species Program	\$50,000
U.S. Bureau of Land Management	\$200,000
U.S. Forest Service – Resource Advisory Committees (RAC)	\$50,000
Western Native Trout Initiative	\$50,000
Ruby Pipeline Mitigation Fund	\$25,000
ODFW/ODOT Fish Passage and Screening	\$50,000

Table 9-2 includes SMART goal funding information.

**Table 9-2. SMART goals, lead groups, funding partners, and estimated costs.**

SMART Goal	Lead Group	Objective and Project Type	Potential Funding Partners	Estimated FIP Cost	Estimated Total Project Cost
1 – Preliminary Passage and Screening	LCUWC, LSWCD	Restore passage (4 diversions) and complete screening (3 diversions)	USFWS, BLM, WNTI, Ruby	\$2,000,000	\$2,597,500
2 – Remaining Passage and Screening	LCUWC, LSWCD	Restore passage (6 diversions), 3 road crossings, and complete screening (6 diversions)	USFWS, BLM, WNTI, ODOT	\$3,541,500	\$4,669,250
3 – Native and Non-native Fish Educational Outreach	ODFW, BLM, USFWS	Native fish benefits and non-native fish educational plan	ODFW, USFWS, BLM	\$50,000	\$57,000
4 – Increase Water Availability	LCUWC, LSWCD	Water efficiency	LSWCD, BLM	\$221,500	\$97,500
5 – Warner Sucker Recovery	USFWS	Provide information to inform Warner Sucker delisting	USFWS	\$50,000	\$57,000
<b>Total</b>				<b>\$5,863,000</b>	<b>\$7,478,250</b>

## 10. Evaluating Success

Plan success will be evaluated annually at the project level and biennially at the Plan level. Long-term monitoring completed at 3-yr and 5-yr post-project periods will be completed to ensure longer-term project success. Long-term monitoring to be completed beyond the life of the FIP is anticipated to be funded by WBAHP member organizations. The monitoring regime is described below.

### **Project-level Monitoring**

The WBAHP partners will either complete the effectiveness monitoring or retain a consultant to complete the monitoring. Monitoring may include 1) as-built survey and project completion documentation, 2) out-year monitoring, and 3) biological monitoring. The as-built survey will document project completion and ensure the project was built as designed. The consultant will provide the WBAHP with an as-built surface model that will be used to prepare a design sheet including a plan view, profile view, and cross-section views. Photo points established during the pre-project survey, will be replicated. Out-year monitoring will include a site visit and repeated photo points to assess how the project site has changed and whether the project goals are still being met. If necessary, a site survey may be completed to quantitatively compare the out-year and as-built conditions. Hydraulic measurements may also be necessary to ensure the project meets fish passage criteria and to document hydraulic conditions as they relate to fish passage.

Biological monitoring will be overseen by or coordinated with ODFW. Biological monitoring may include documenting fish passage through fish passage structures with PIT-tag technology. ODFW has completed similar fish passage monitoring for passage projects completed on Twentymile Creek and Honey Creek. Other biological monitoring methodologies may be developed to address specific project questions.

Project-level monitoring outputs will include:

- Effectiveness monitoring plan methodology
- Annual monitoring data and memo
- Adaptive management feedback for engineering design, construction, and monitoring
- Annual program presentation summarizing completed work and monitoring outcomes

### **Plan-Level Monitoring**

Plan-level monitoring will include tracking of project progress and overall success. Plan-level monitoring will be led by LCUWC and LSWCD. Biennial monitoring reports will include a summary of goals and objectives, actions completed to-date, project and monitoring status, and future work in the subsequent biennium. Plan-level monitoring will serve as a check on the WBAHP members to ensure program accountability. The following typical milestones and issues would be included in the monitoring report:

- Funding status:
  - Summarize secured funds and sources
  - Summarize new or potential funding sources
  - Provide a review of lessons learned on applying for/using FIP funding and match funding sources

- Construction/implementation period:
  - Description of projects that were planned, initiated, and completed
  - Project partners who were engaged in projects
  - Issues and lessons learned from completed projects
  - Review of engineering consultants and construction contractors
- Post-construction establishment period:
  - Project metrics (stream miles, restoration acres, number of barriers removed, revegetation, etc.) for completed projects
  - Monitoring methodology review, what worked, what didn't
  - Monitoring data and memo review
  - Issues and lessons learned from project monitoring
- Long-term monitoring:
  - Monitoring tracker spreadsheet and geodatabase review
  - WBAHP members will spot-check projects at years 10 and 15 after implementation

#### **Watershed Indicators Monitoring/Long-Term Monitoring Network**

Watershed indicators monitoring would consist of long-term monitoring networks and studies typically administered by USFWS, BLM, and ODFW. The long-term monitoring would be used to assess how Plan goals and objectives are being met and if the Warner Sucker recovery is on-track. With the ultimate goal of Warner Sucker recovery and species delisting, the watershed indicators monitoring would be a more holistic effort to confirm Warner Sucker fish passage, populations comprised of multiple age class, and increasing population sizes in both the tributaries and the lakes. We would anticipate that future studies will replicate past studies regarding fish populations in the Warner Lakes and the focal tributaries, Warner Sucker movement within and among the tributaries and lakes, and Warner Sucker demographics and genetics.

### **11. Adaptive Management**

Annual project monitoring results will be reported to WBAHP and OWEB. Monitoring results will compare monitoring results to the project goals and objectives in order to assess project effectiveness. Information sharing among WBAHP members and participation in regional science review meetings are effective means for gathering feedback on project designs and monitoring results. Additionally, feedback from landowners and irrigators on how the project is functioning within their maintenance and operation schedules will also be informative. The extensive monitoring completed by ODFW and others over the past 20 years provides important information that is reviewed by project stakeholders during the assessment and design processes.

### **12. Sustainability**

While the WBAHP has formally existed for only 2 years, the member organizations have coordinated on projects for over 10 years. Cooperation among WBAHP member organizations has resulted in strong working relationships both among the members, but also with local landowners and irrigators in the Warner Basin. This success has been in large part due to a flexible approach to continued learning and

adaptation that enables the WBAHP to sustain changes in funding, project opportunities and challenges, and other unexpected changes. Over the years, WBAHP members have come to understand how political, social, funding and technical issues can converge to either increase or decrease the pace of restoration work. Based on this perspective and assuming that funding continues to be available, WBAHP members believe consideration for the delisting of Warner Sucker should be possible by 2035. With the onset of fish passage projects in the Warner Valley beginning in 2010, this 25-year time frame may seem like a considerable period of time. However, each fish passage project yields incremental improvements in available habitat and watershed connectivity. WBAHP members also anticipate that periodic drying of the Warner Lakes and low water periods in the tributaries have the potential to disrupt Warner Sucker recovery and Warner Lakes Redband Trout population connectivity. This time frame also equates to less than two complete Warner Sucker generations, but the proposed time period would account for potentially more than five cohorts reaching reproductive age.

Although a 25-year timeframe is much longer than envisioned by most conservation and funding organizations, and local landowners and water users, the timeframe is consistent with emerging thinking from leading northwest conservation organizations that are starting to promote 50-year visions for watershed restoration. These long-term approaches are still relatively short when compared to the over 125 years of agricultural alteration the Warner Valley has experienced.

While the WBAHP may face project funding pressures in the future, the solid project development and landowner outreach program that has been achieved will ensure long-term success of the partnership. USFWS will continue to be responsible for managing Warner Sucker, ODFW and BLM will also continue to share in these responsibilities. The member representatives participating in the WBAHP today, will welcome and instruct their future replacements in order to maintain the partnership.

### 13. Communications Plan

**Communication Goal** – Generate local community support for conservation of Warner Sucker and Warner Lakes Redband Trout through implementation of fish passage improvement and habitat enhancement projects. Provide outreach and educational materials to local landowners and water users on the benefits of Warner Sucker delisting and irrigation infrastructure and management improvements.

**Audience** – The primary audience will be the landowners, water users, and community members of Adel, Plush, and Lakeview. While the plan will target landowners and water users primarily, providing educational materials for younger community members will be beneficial for educating future generations.

**Communication Objectives** – Objectives include providing community members with information on the unique qualities of Warner Sucker and Warner Lakes Redband Trout, healthy stream corridors and lakes, problems with introducing non-native fish species, and how agricultural producers and fish and wildlife can coexist and mutually benefit from watershed restoration.

**Key Messages** – The key message will focus on how delisting endangered species is expected to benefit the species, landowners, and water users. Impacts to Warner Sucker and Warner Lakes Redband Trout is due to long-term land use, ODFW introduction of non-native predatory fish species, and limited water in

a high desert environment. Warner Sucker recovery will require a combined effort of landowners, water users, agency personnel, and local community members.

**Implementation Strategy** – WBAHP will implement the communication strategy through local public meetings, meeting with landowners and water users, and by making annual reporting documents available to the public. The communication strategy will ensure transparent access to information and data.

**Evaluation** – Surveys will be provided during public meetings to inquire about how the local community, landowners, and water users would like to interact with WBAHP members, what information they would like to have made available, and how the WBAHP can meet the local needs in the context of project development. Survey information and other feedback will be used to update the communication plan to ensure it is a living document that meets the needs of the WBAHP, landowners, water users, and the local community.

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## 15. Partnership Certification

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## Memorandum of Understanding Warner Basin Aquatic Habitat Partnership

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*Official Copy-Adopted and Signed*

### **Between**

Lake County Umbrella Watershed Council

Lakeview Soil and Water Conservation District

USDA Bureau of Land Management Lakeview District

Oregon Department of Fish and Wildlife

US Fish and Wildlife Service

USDA Forest Service (Fremont-Winema) National Forest

Adel Water Improvement District

Plush Irrigation District

River Design Group, Inc.

This Memorandum of Understanding, here after called (MOU), is entered into by and between Lake County Umbrella Watershed Council, Lakeview Soil and Water Conservation District, Bureau of Land Management Lakeview District, Oregon Department of Fish and Wildlife, USDA Forest Service Fremont-Winema, Adel Water Improvement District, Plush Irrigation District, and River Design Group, Inc., hereafter called, Cooperators.

## **A. Authority:**

This MOU is made under the Authority of the Cooperative Partnership established April 1, 2016 when the Warner Basin Aquatic Habitat Partnership officially agreed to formalize their partnership.

## **B. Purpose:**

All of the above-mentioned agencies and entities, as Cooperators, have a combined interest in the establishment of the Warner Basin Aquatic Habitat Partnership for the Warner Lakes Basin Watershed in Lake County, Oregon. The Warner Basin Aquatic Habitat Partnership (WBAHP) is comprised of seven organizations including U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, U.S. Forest Service, Oregon Department of Fish and Wildlife, Lakeview Soil and Water Conservation District, Lake County Umbrella Watershed Council, and River Design Group, Inc.

The WBAHP is focused on improving fish passage and habitat for Warner Sucker and Warner Lakes Redband Trout, the two focal, native fish species inhabiting the three Warner Basin tributaries included in the Warner Basin Fish Passage and Habitat Improvement Initiative (Initiative). The WBAHP has identified fish passage and habitat concerns, and has built productive relationships with basin landowners and irrigation districts that operate diversions. Implementation funding will be used for project engineering, permitting, and construction of fish passage, screening, and habitat improvement projects.

The vision of the WBAHP is to have streams and lakes in the Warner Basin that will provide a connected watershed that provides access to the high-quality spawning, rearing, and adult holding habitats that are necessary for Warner Sucker and Warner Lakes Redband Trout to complete their diverse life-history strategies. Addressing existing limiting factors will require a collaborative effort among WBAHP member, the local community, landowners and water users. Recover of Warner Sucker and Warner Lakes Redband Trout will ensure conservation of the native fish community that is unique to the Warner Basin.

The Partnership will invest in restoration projects in the Warner Lakes Basin. The Partnership will achieve USFWS (1998) recovery criteria for Warner Sucker including restoring passage among the three priority tributaries to reconnect individual populations and to restore a self-sustaining metapopulation among the three tributaries and the Warner Lakes.

This goal will be accomplished through the general direction of the WBAHP consisting of the six organizations listed above.

### C. Mutual Benefit:

All cooperators to the MOU agree that it is to their mutual interest and benefit to work cooperatively in inventorying, implementing, and monitoring projects, while leveraging for project funding to reach the goals of the Partnership. The goals of the Partnership include the conservation and recovery of the focal species through habitat restoration and enhancement, ultimately leading to de-listing the endangered Warner Sucker. The WBAHP will work across jurisdictional and ownership boundaries within the Warner Lakes Basin Watershed. All cooperators also agree it is to their mutual benefit to work cooperatively to educate, train and share technology and information with agency and general public personnel about focal fish species, including producing and sharing documents that pertain to these species. The Partnership will work cooperatively to make the best use of available funds to improve connectivity and habitat conditions associated with the three primary streams in the watershed.

### D. Items of Agreement and Guiding Principles:

- 1. The WBAHP will use a collaborative approach to project development and execution.** Strategic Action and Design Plan (Plan) implementation will require coordination among WBAHP members. Members will contribute their respective expertise regarding natural resources (fisheries, vegetation, wetlands, etc.) monitoring, funding, agriculture, water rights, and diversion infrastructure.
- 2. The WBAHP will coordinate with landowners and water users.** The WBAHP will coordinate projects with the local community, landowners, and water users. Project execution will benefit from landowner and water user information. The WBAHP will strive to maintain trust and support from the local community, through communication, transparency, and project accomplishment and support.
- 3. The WBAHP will secure funding to support design, implementation, and monitoring.** The WBAHP will coordinate project funding opportunities. Many of the WBAHP members have funding source they can apply to Warner Basin projects. Based on past completed projects, member organization often account for a substantial portion of the project funding needs. Members' contributed funds and other outside funding opportunities the WBAHP will pursue, will provide the match-funding required by granting agencies.
- 4. The WBAHP will retain local contractors to execute project construction, as practicable.** Rural communities and their economies benefit from funding dollars spent on projects in the surrounding area. The WBAHP will solicit bids from local and regional contractors that are typically small business that hire or subcontractors' local residents. Contractors also support the local economy through fuel, food, and material purchases over the course of the project.

5. **The WBAHP will institute project monitoring and implement adaptive management to inform future designs.** The WBAHP will take a systematic approach to completing baseline, as-built, and out-year monitoring. Baseline monitoring is important for establishing existing conditions to compare to as-built and out-year monitoring results. Monitoring data are reviewed as part of an adaptive management program that applies lessons learned through data collection to improve future project designs. Sharing lessons learned with the WBAHP members and other restoration program practitioners is an instructive way to advance the restoration field especially in the realm of native, non-game fish species passage which is generally an understudied area of ecosystem restoration.
6. **The WBAHP will maintain the current agricultural-based economy and rural lifestyles.** The WBAHP will coordinate Plan execution in the context of maintaining and improving existing irrigation system and land use. The management and operation of the Warner Basin diversions relies on the experience and knowledge of generations of Warner Basin water users. Changes to diversion operation will be approved by and coordinated with water users during the design process. The WBAHP will pursue projects with landowners and water users who agree to a reasonable level of responsibility in maintaining the project.
7. **The WBAHP will ensure diversion project success and improve agricultural efficiency over time.** The WBAHP will remain involved with irrigation diversion projects after they are completed to ensure the diversion modifications function as expected. Meaningful diversion infrastructure improvements are often beyond the financial capacity of small irrigation districts or individual irrigators. WBAHP funding will seek to improve fish passage and screening while making irrigation diversions easier and safer to operate. Future projects may also increase agricultural efficiency, a result that could leave more water in-stream and require less intensive agricultural practices.
8. **This MOU is neither a fiscal nor a funds obligation document.** An endeavor involving reimbursement, contribution of funds, or transfer of anything of value between the parties and this instrument will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized by appropriate statutory authority. Specifically, this instrument does not establish authority for noncompetitive awards to the cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.
9. **Supporting Partners, whether private citizens or organizations, in the WBAHP must have vested interests in the WBAHP and provide the assistance necessary to reach the goal of species conservation, connectivity, and habitat enhancement throughout the watershed.** New cooperators may join the MOU by submitting a signed letter indicating agreement with the terms of the MOU. It is intended that the WBAHP remains open and inclusive of all organizations and individuals who wish to work cooperatively on implementing high priority restoration actions.

10. The MOU in no way restricts Cooperators from participating in similar activities with other public or private agencies, organizations, and individuals.
11. Cooperators have, through any authorized representative, the right of access to, and the right to examine all records related to this MOU to the extent provided by law. As used in this clause, “records” includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.
12. This MOU is executed as of the last date shown below and expires no later than 12/31/2030, at which time it is subject to review and renewal or expiration.
13. Any Cooperative Member, upon written address to the WBAHP requesting to terminate their membership of the MOU, shall be deemed automatically terminated. Any Cooperative Member that terminates may be reinstated by the WBAHP by majority vote.

## **E. Roles Identified for WBAHP Members:**

**Warner Basin Aquatic Habitat Partnership:** The WBAHP shall be made up of representatives of the cooperating entities. The WBAHP shall operate as a steering group, and will be responsible for development and approval of the Strategic Action and Design Plan for the activities of the WBAHP. These activities include, but are not limited to, the planning, fiscal operations, project identification, accomplishments, inventory, monitoring, public awareness, and reporting of WBAHP projects.

### **Lake County Umbrella Watershed Council:**

- Contracting with facilitator, engineers and implementation contractors
- Schedule quarterly meetings with WBAHP group
- Project management (Deep & Twentymile sub-basins)
- Fiscal administration of contracts for Deep and Twentymile sub-basins
- Outreach and planning with Water Districts
- Seek grant opportunities to leverage funds – future implementation
- Project implementation

### **Lakeview Soil and Water Conservation District:**

- Project management (Honey Creek sub-basin)
- Contracting with engineers and implementation contractors
- Schedule quarterly meetings with WBAHP group – conference call
- Outreach and planning with water districts
- Seek grant opportunities to leverage funds – future implementation
- Project Implementation

**Bureau of Land Management:**

- Technical expertise
- Outreach and planning with water districts
- Project funding
- Assist with project implementation and monitoring as necessary and practicable
- Provide local, state, federal, and regional management plans relevant to the project/species (to be utilized by contractors for plan development) tools to guide all actions and outcomes identified in the Strategic Action and Conceptual Design Plan

**US Forest Service:**

- Technical expertise
- Project planning
- Provide local, state, federal, and regional management plans relevant to the project/species (to be utilized by contractors for plan development) tools to guide all actions and outcomes identified in the Strategic Action and Conceptual Design Plan

**Oregon Department of Fish and Wildlife:**

- Technical expertise
- Monitoring
- Project planning
- Provide local, state, federal, and regional management plans relevant to the project/species (to be utilized by contractors for plan development) tools to guide all actions and outcomes identified in the Strategic Action and Conceptual Design Plan

**US Fish and Wildlife Service – Partners Program:**

- Technical expertise
- Project funding
- Project planning
- Provide local, state, federal, and regional management plans relevant to the project/species (to be utilized by contractors for plan development) tools to guide all actions and outcomes identified in the Strategic Action and Conceptual Design Plan

**US Fish and Wildlife Service – Endangered Species, Bend Field Office:**

- Technical expertise
- Provide species recovery criteria
- Provide updates and information regarding listed species status
- Project funding
- Project planning
- Safe Harbor Agreement Guidance
- Provide local, state, federal, and regional management plans relevant to the project/species (to be utilized by contractors for plan development) tools to guide all actions and outcomes identified in the Strategic Action and Conceptual Design Plan

**River Design Group Inc.:**

- Meeting facilitator
- Technical expertise
- Survey, engineering, design concepts and final designs
- Permitting
- Engineering construction oversight

**Strategy Plan:** Each year the WBAHP will identify activities, projects and responsible parties to carry out the WBAHP Strategic Action and Design Plan.

**Financial Plan:** A table identifying projects with estimated costs and potential sources of funding is attached to this MOU and included within the Strategic Action Plan. This table will be updated annually by the Lake County Umbrella Watershed Council and/or Lakeview Soil and Water Conservation District.

**Funds Manager:** The Lake County Umbrella Watershed Council (LCUWC) and Lakeview Soil and Water Conservation District (LSWCD) shall manage grant funding based on project location. Those projects associated with Deep and Twentymile Creeks will be managed by the LCUWC. Projects located in the Honey Creek sub-watershed will be managed by the LSWCD.

**Facilitator:** The facilitator (River Design Group, Inc.) shall provide written minutes of the WBAHP meetings. The Lake County Umbrella Watershed Council and Lakeview SWCD will retain copies of meeting minutes.

**F. Principle Contacts:**

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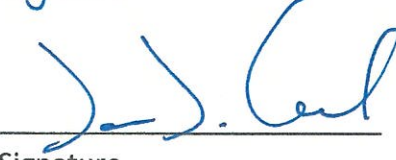
Email: [taylorranch33@gmail.com](mailto:taylorranch33@gmail.com)

**G. Signature Page:**

IN WITNESS WHEREOF, the Warner Basin Aquatic Habitat Partnership, the Lake County Umbrella Watershed Council, Lakeview Soil and Water Conservation District, Bureau of Land Management, Oregon Department of Fish and Wildlife, US Fish and Wildlife Service, and US Forest Service have executed this Memorandum of Understanding, effective as of the last date written below.

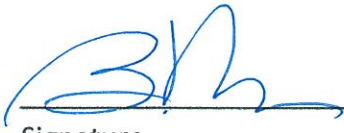
By: Justin Miles  11-6-2018  
Print Name Signature Date  
Authorized Representative

By: Justin Ferrells  11/6/2018  
Print Name Signature Date  
Authorized Representative

By: James J. Leal, BCM  11/6/2018  
Print Name Signature Date  
Authorized Representative

By: Richard Pyzik, USFS  11/6/2018  
Print Name Signature Date  
Authorized Representative

By: Marci Schreder  11/6/2018  
Print Name Signature Date  
Authorized Representative

By: Bridget Moran  1-30-19  
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Authorized Representative

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**Warner Basin Strategic Action Plan  
Warner Basin Aquatic Habitat Partnership**

**June 1, 2019**

