United States Department of the Interior

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Robert Willis
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Portland District
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Portland, OR 97208-2946

Subject: Formal consultation on proposed Caspian tern management to reduce predation on juvenile salmonids in the Columbia River Estuary. Fish and Wildlife Service reference # 1-7-05-F-01883.

Dear Misters McKay and Willis:

This letter transmits our biological opinion on effects to threatened Warner sucker (*Catostomus warnerensis*) from proposed Caspian tern management activities in Oregon to reduce predation on juvenile salmonids in the Columbia River Estuary.

The biological opinion was prepared in response to a January 5, 2005, request for consultation for proposed actions at East Sand Island, Fern Ridge Reservoir, Summer Lake, and Crump Lake, Oregon, associated with a Final Environmental Impact Statement (FEIS) for Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary. The proposed project entails development and management of habitat for Caspian terns at these locations. The Action Agencies for the proposed action include the Fish and Wildlife Service (Service) and the U.S. Army Corps of Engineers (Corps).

The Service has determined the proposed action will not jeopardize the continued existence of the Warner sucker, nor will it affect designated critical habitat. The Service concurs with your not likely to adversely affect determinations made for bald eagle, California brown pelican, Oregon chub, Bradshaw's lomatium, Kincaid's lupine, and Fender's blue butterfly.

If you have questions regarding this consultation, please contact Alan Mauer or Nancy Gilbert from the Bend Field Office (541) 383-7146, or Chris Allen at the Oregon Fish and Wildlife Office (503) 231-6179.

Sincerely,

Kemper M. McMaster
State Supervisor

cc:
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Endangered Species Act – Section 7(a)(2) Consultation

Biological Opinion on

Proposed Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary, and effects to:

Warner sucker (*Catostomus warnerensis*), bald eagle (*Haliaeetus leucocephalus*), California brown pelican (*Pelecanus occidentalis californicus*), Oregon chub (*Oregonichthys crameri*), Bradshaw's lomatium (*Lomatium bradshawii*), Kincaid's lupine (*Lupinus sulphureus kincaidii*), and Fender's blue butterfly (*Icaricia icarioides fenderi*).

Date: 02/28/05

Kemper M. McMaster
State Supervisor

Action Agencies: **U.S. Fish and Wildlife Service, Migratory Birds and State Programs**
U.S. Army Corps of Engineers, Portland District

Consultation Conducted by: Fish and Wildlife Service, Oregon Fish and Wildlife Office

Date issued: February, 28, 2005

USFWS Log Number: 1-7-05-F-01883

CONSULTATION HISTORY

The Fish and Wildlife Service, Migratory Birds and State Programs and the U.S. Army Corp of Engineers (Action Agencies) provided a project proposal to the Fish and Wildlife Service Bend Field Office on November 29, 2004. The Biological Assessment (USDI 21005) and request for formal consultation were provided January 5, 2005. Subsequent telephone conversations have occurred between the Action Agencies, the Oregon Fish and Wildlife Office, and the Bend Field Office to clarify information regarding the proposed project.

CONCURRENCES

Bald eagle (*Haliaeetus leucocephalus*)

The Service concurs that the proposed action may affect, but is not likely to adversely affect bald eagle at East Sand Island, Fern Ridge Lake, Summer Lake Wildlife Management Area, or Crump Lake. Our concurrence was made for the following reasons: (1) proposed construction activities will not result in destruction or degradation of bald eagle habitat, nor will they significantly disrupt normal bald eagle behavior patterns; (2) forage competition for fish prey between nesting bald eagles and Caspian terns would be considered insignificant due to the substantial forage base available to bald eagles in the action area, and the significant (spatial) distance between the tern colony and the nearest nesting eagles and foraging perches; (3) forage competition for fish prey between overwintering bald eagles and Caspian terns would be considered absent, due to the lack of temporal overlap in presence of both species; (4) the likelihood and magnitude of displacement resulting from annual maintenance activities are not expected to significantly disrupt normal bald eagle behavior patterns; and (5) research actions to monitor and evaluate Caspain tern in the action area would not significantly disrupt normal bald eagle behavior patterns because of the limited nature (spatially) of the research actions, the use of blinds, and the extensive area of available foraging habitat for bald eagles.

Bradshaw's lomatium (*Lomatium bradshawii*), Kincaid's lupine (*Lupinus sulphureus kincaidii*) and Fender's blue butterfly (*Icaricia icarioides fenderi*).

The Service concurs that the proposed action may affect, but is not likely to adversely affect, Bradshaw's lomatium, Kincaid's lupine, and Fender's blue butterfly. Our determination was made based on the conservation measures included as part of the proposed actions at the site including: (1) fenced exclusion areas will be established and occupied habitat will be flagged prior to proposed construction and maintenance activities, and subsequently monitored during these activities; (2) construction, maintenance and monitoring activities will be restricted to Royal Avenue and the lake; and, (3) no interactions between Bradshaw's lomatium, Kincaid's lupine or Fender's blue butterfly and Caspian terns are anticipated.

Oregon chub (*Oregonichthys crameri*)

The Service concurs that the proposed action may affect, but is not likely to adversely affect, Oregon chub for the following reasons: The cryptic features, small size of the Oregon chub, habitat conditions that are not conducive to tern foraging, and significant distance (5 miles) from the tern colony site, make successful foraging of chub by Caspian terns extremely unlikely to occur, and is therefore discountable.

California brown pelican (*Pelecanus occidentalis californicus*)

The proposed action may effect, but will not likely adversely affect California brown pelicans at East Sand Island for the following reasons: (1) construction, maintenance, and monitoring activities will not significantly affect any significant brown pelican roost sites or foraging behavior; (2) Caspian terns are not likely to out compete California brown pelicans for foraging space or foraging resources; and, (3) since pelicans do not nest in the Columbia River estuary, there will be no competition for nest sites.

BIOLOGICAL OPINION

It is the biological opinion of the Fish and Wildlife Service that the proposed Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary in Oregon is not likely to jeopardize the continued existence of the threatened Warner sucker. Critical habitat has been designated, however, this action does not affect that area, and no destruction or adverse modification of that critical habitat is anticipated.

DESCRIPTION OF THE PROPOSED ACTION

The objectives of the proposed project are to improve nesting habitat conditions at Crump Lake and attempt to attract nesting Caspian terns (S*terna caspia*) to the area to accommodate anticipated displaced nesting Caspian terns from East Sand Island and Rice Island in the Columbia River. Recent increases in the number of Caspian terns nesting in the Columbia River estuary has led to concerns over their potential impact on the recovery of threatened and endangered Columbia River salmonids.

In 1999, National Marine Fisheries Service (NOAA Fisheries) requested the U.S. Army Corps of Engineers (Corps) to eliminate Caspian tern nesting from Rice Island (located in the upper Columbia River estuary) in an attempt to decrease the number of juvenile salmonids consumed by terns nesting on the island. In 1999, the Corps initiated a pilot project to relocate the Rice Island tern colony to East Sand Island, near the mouth of the estuary, where marine fish (i.e., non-salmon) were abundantly available to foraging terns. In 2000, the Corps proposed to complete a project to prevent Caspian tern nesting on Rice Island, in the Columbia River Estuary, while attracting terns to nest on East Sand Island, near the mouth of the river. As a result of the proposed actions in 2000, Seattle Audubon, National Audubon, American Bird Conservancy, and Defenders of Wildlife filed a lawsuit against the Corps alleging that compliance with the National Environmental Policy Act for the proposed action of attracting the large colony of Caspian terns from Rice Island to East Sand Island was insufficient, and also against the Service in objection to the potential take of eggs as a means to prevent nesting on Rice Island. In 2002, all parties reached a settlement agreement. The settlement agreement stipulates that the Service, Corps, and NOAA Fisheries prepare an Environmental Impact Statement (EIS) to address Caspian tern management in the Columbia River estuary.

The purpose of the proposed action is to comply with the 2002 settlement agreement by identifying a management plan for Caspian terns in the Columbia River estuary that reduces resource management conflicts with Endangered Species Act-listed salmonids while ensuring the conservation of Caspian terns in the Pacific coast/western region.

Alternative C, the preferred alternative of the draft EIS (DEIS) (USDI 2004), would reduce tern predation on juvenile salmonids in the Columbia River estuary by managing habitat to redistribute the tern colony on East Sand Island throughout the Pacific Coast/Western region. This redistribution would be achieved by creating new or enhanced tern nesting habitat throughout the region and reducing the tern nesting site on East Sand Island to 1 to 1.5 acres. To ensure a suitable network of sites is available for terns on a regional scale, the Action Agencies propose to manage nesting habitat for terns in the region to replace twice the amount of occupied nesting habitat that would be lost on East Sand Island.

Approximately 8 acres of managed habitat would be enhanced in Washington, Oregon, and California. The proposed habitat creation or enhancement projects are proposed in eight locations in Washington, Oregon, and California: Dungeness National Wildlife Refuge (NWR) in Washington; Fern Ridge Lake, Summer Lake Wildlife Management Area, and Crump Lake in southern Oregon; and Brooks Island, Hayward Regional Shoreline, and Don Edwards NWR, in San Francisco Bay, California.

Habitat reduction on East Sand Island would be attained by allowing vegetation to grow in the current nesting area. This proposed habitat acreage on East Sand Island (1 to 1.5 acres) was selected for this alternative to reduce tern predation in the estuary on juvenile salmonids to a level that would increase salmonids population growth rates (lambda). In determining an acceptable predation level by terns, NOAA Fisheries conducted an analysis using a life cycle model and tern predation rates to estimate the impact of tern predation on the population growth rate of various Evolutionary Significant Units (ESUs) of Columbia River Basin steelhead. Steelhead were the focus of this analysis because they are the ESUs most affected by tern predation in the Columbia River estuary. Thus, estimates of the potential benefits to reducing tern predation are the greatest for steelhead but other Columbia River salmonid ESUs subject to tern predation would also benefit.

The NOAA Fisheries analysis estimated that a reduction in the tern colony to approximately 3,125 nesting pairs would result in the one percent or greater increase in population growth rate for all Columbia River Basin steelhead ESUs. Because of uncertainties in the model, the Action Agencies propose to manage for a more conservative range of nesting pairs (approximately 2,500 to 3,125) on East Sand Island to ensure an increase in population growth rate for all Columbia River Basin steelhead ESUs. Based on average nesting densities observed on East Sand (0.55 nesting pairs per square meter) and Rice islands (0.78 nesting pairs per square meter), this proposed range of nesting terns would be able to nest on the proposed habitat acreage (approximately one acre). Based upon the average number of nesting pairs (approximately 9,070) in the Columbia River estuary for 2000 through 2003, approximately 5,945 to 6,570 breeding pairs of Caspian terns would be displaced from nesting on East Sand Island with implementation of this alternative.

Breeding Caspian terns eat almost exclusively fish, catching a diverse array of species with shallow plunge dives, usually completely submerging themselves underwater. In the Columbia River estuary, diet studies of the Caspian tern colonies on Rice and East Sand islands documented that terns nesting on Rice Island (1999 to 2000) had an average of 83 (77 to 90) percent juvenile salmonids in their diet, while on East Sand Island (1999 to 2003), terns had an average of 36 (24 to 47) percent juvenile salmonids in their diet. From 1999 to 2003, the tern diet on East Sand Island, closer to the mouth of the Columbia River than Rice Island, was primarily non-salmonids, including northern anchovy, herring, shiner perch, sand lance, sculpins, smelt, and flatfish

Historically, in Oregon, breeding terns were restricted to shallow lakes and reservoirs of the Klamath Basin and Great Basin. In 1940, less than 1,000 pairs nested throughout Oregon. In recent years, tern numbers in Oregon averaged around 9,000 pairs. Currently, what has been considered the world's largest colony is found near the mouth of the Columbia River on East Sand Island, and small colonies still occur in interior Oregon. Nesting activity in the Columbia River estuary was first documented in 1984. Terns used habitat created by deposition of dredged material on the eastern tip of East Sand Island. By 1985, terns moved to nest on Rice Island. The number of terns peaked on Rice Island at 8,700 pairs in 1998. In 1999, a pilot study was implemented to attract the breeding colony of Caspian terns on Rice Island to East Sand Island. This effort included the removal of vegetation to create bare sand nesting habitat and social attraction techniques (i.e., decoys and audio playback systems) on East Sand Island. The project was successful and since 2001, all terns nesting in the estuary occur on East Sand Island. In 2002 and 2003, an average of 9,143 breeding pairs nested on East Sand Island.

Caspian terns also nest in interior sites in Oregon (e.g., Summer, Crump, and Malheur lakes). The number of terns nesting at each site varies dependent on water levels and prey availability. Nesting activity in recent years have been absent because of drought conditions. In 2003, 71 pairs of terns nested at Crump Lake, while only 5 pairs nested at Summer Lake. Two observations of nesting colony size have been made at Crump Lake in the recent past. One estimate in 2000 indicated 155 pairs and another count in 2003 of 71 pairs (USDI 2004). Use of these two observations does not provide a statistically robust estimate of the current nesting colony size. Caspian terns are a casual visitor at Fern Ridge Lake during spring migration and in late summer during the post-breeding season dispersal and/or migration. Fern Ridge Lake does not contain a suitable nesting site for this species at present.

Some of these displaced terns could be attracted to nest at Crump Lakes as a result of the management actions proposed for these sites described in the preferred Alternative. At Crump Lake, the newly created 1-acre island could support between 5 to 300 breeding pairs of terns. Prey base may be limiting at the site, and thus, the actual number of terns that can successfully nest at Crump Lake may not be as high as the nesting habitat could accommodate.

Crump Island, in Crump Lake, was formerly a natural island located approximately mid-lake and north of the peninsula that nearly bisects the lake. Surface elevation of Crump Lake is 4,475 feet. Previous human disturbance led to erosion of the island to lakebed level, eliminating its use by colonial nesting birds. An effort led by Oregon Department of Fish and Wildlife (ODFW) in the 1990's was partially successful in restoring the island. Working when the lake had dried up due to drought, ODFW pushed material up with dozers to reform the island. Unfortunately, the island height did not exceed high water levels and thus is inundated or nearly so during higher water periods. Erosion of soil placed to form the island was also an issue. Crump Island is approximately 1.25 miles offshore and is situated in waters 2-10 feet in depth.

The island is too far offshore for construction of a causeway to haul materials into place. Potentially the island could be reconstructed during a future drought but there is no certainty when such a situation will occur or if it will last long enough for the lakebed to support heavy equipment and dump trucks. There is also the issue of stabilizing or armoring the island shoreline to prevent future erosion. The action agencies propose to use a small hydraulic dredge that places material to form the island and would allow for construction to occur most years. Retention of material pumped to the location over the short- and long-term remains an issue. The Corps has preliminarily explored means to contain dredged material at the location and provide erosion protection. These include conventional stone revetment, an interlocking, plastic sheet pile wall, terracells stacked upon one another and filled with rock, and geotubes consisting of geotextile tubes filled with dredged material.

No specific design has been selected. The Action Agencies believe that the use of geotubes to form the island's perimeter and to retain dredged material placed interior to them is the most likely scenario for construction of Crump Island. A wall comprised of 40-sheet pile would be used to form a 20 feet x 20 feet cell to serve as a settling pond. A 2-4 feet space in the perimeter wall at the settling pond location will be installed one foot lower than the balance of the perimeter wall in order to decant water to the outside from the settling pond. The width of this opening can be increased by the contractor to ensure that outflow is sufficient to prevent overtopping of the perimeter wall by water during construction of the island via hydraulic dredge.

Construction of the island would occur in June when water levels should be at their highest. The hydraulic dredge would excavate material for placement within the island perimeter. Dredging activities will occur 200 feet or greater from the island site to be constructed. For construction purposes, we are assuming that the water depth at the island location is 10 feet, although remnant parts of the former island are present. Thus, an estimated 19,400 cubic yards of material are required to form an island that rises uniformly two feet above full pool level. This should leave two feet of freeboard on the perimeter walls. Dredged material will be pumped to the point furthest from the settling pond location and then moved closer as material accumulates.

To stabilize the surface of the constructed island and to reduce the risk of dense vegetation encroachment, the dredged material would be capped with gravel and fines. Gravel graded as ¾-inch minus to 1.5-inch minus would be placed atop the island in an approximately 6-inch lift (820 cubic yards). It is assumed that the material will have to be placed on site via helicopter. A quarry is located on private lands approximately 1.5 miles west of Crump Island. The 820 cubic yards would have to be purchased and crushed/graded to attain the proper size. Estimated weight of the material is 1,230 tons at 1.5 tons per cubic yard. The material from the private quarry would not be tested for contaminants prior to deposition at the construction site. Quarry waste is large in size, principally rock of various sizes with a minimum amount of fines, which are principally rock dust, and is excavated from a pit on the side of a sagebrush covered hill not subjected to agricultural or urban wastes. Thus, the likelihood of the presence of contaminants is absent.

Future operation and maintenance requirements to maintain Caspian tern nesting habitat at Crump Island are anticipated to be minimal. Shoreline revetment/protection would be installed to prevent erosion from wave action and is expected to have a greater than 50-year project life. A sand surface material may require periodic replenishment due to wind erosion; use of pea gravel would negate wind-erosion of surface material. Replacement material would be placed as needed in fall or winter after nesting birds have left the area. It is anticipated that weeds would have to be removed from the site annually, either by hand pulling or spot application of herbicide.

Conservation Measures

A conservation measure requiring survey for contaminants in the lake substrate material to be used for construction of the island is included in the proposed action:

> The following analysis will be conducted for fill materials obtained from an area with prior history of agriculture and possible releases from mining sites (upstream sources that drain into the lake or reservoir): (1) an organochlorine scan with total PCB or Aroclor PCB value; (2) a metal scan, with mercury prepared for (and determined by) cold vapor atomic absorption spectroscopy; and (3) grain size analysis could be determined as well as total organic carbon and percent moisture for sediments. Sediment samples would consist of surface grabs (composite samples are recommended) and cored samples to estimate concentrations at depth (represented concentrations that will remain on the surface after dredging or moving the sediment). These efforts will be conducted by the Action Agencies in coordination with the Service" (USDI 2005).

Caspian Tern Biology

Species Range. Caspian terns breed at widely scattered sites across North America. Wires and Cuthbert (2000) described five disjunct breeding regions in North America. Caspian terns breeding in the Columbia River estuary are in the Pacific Coast/Western Pacific Coast region. This region includes coastal Alaska, southwestern British Columbia, Washington, Oregon, California, Baja California, and Sinaloa, Mexico; and interior Washington, Oregon, California, southern Idaho, Montana, Wyoming, western Nevada, and northern Utah.

Pacific Coast Region Overview. Since the beginning of the 20th Century, the Pacific Coast regional population has shifted from nesting in numerous small colonies associated with freshwater marshes in interior California and southern Oregon, to primarily larger colonies along the coast extending into the State of Washington (Gill and Mewaldt 1983). Caspian terns adapt to spatial and temporal variability of breeding habitat and prey, leading to highly variable colony locations and sizes within the region. In recent years, terns were documented to have nested on about 60 sites scattered throughout the Pacific Coast region, including Alaska. This habitat base serves as a network of sites, which individually may vary in suitability from one year to the next but collectively provide a suite of locations for terns on a regional scale. Colonies in the interior are characteristically small in size and are subject to substantial shifts in location, and size of colony corresponding to cycles of flood and drought. Interior sites may also be subject to intensive management such as the control of reservoir and irrigation water.

Larger colonies (e.g., many hundreds to thousands of terns) have been documented primarily along the Pacific Coast. Coastal nesting habitat can be managed or natural and is typically subject to erosion and vegetation changes over time. Although ocean conditions may affect prey availability, coastal prey resources are typically more diverse, abundant, and stable in comparison to prey resources at interior sites which are highly variable from year to year. For a detailed review of current, historic, and potential tern nesting habitat throughout the Pacific Region see: *A Review of Caspian Tern Nesting Habitat: A Feasibility Assessment of Management Opportunities in the U.S. Fish and Wildlife Service Pacific Region* (Seto *et al.* 2003).

Habitat Requirements. Caspian terns nest in single-species colonies or in multi-species assemblages with other ground nesting waterbirds (gulls, skimmers, other terns, and cormorants). Caspian terns breed in a variety of habitats ranging from coastal estuarine, salt marsh, and islands. Terns typically nest in open, barren to sparsely vegetated areas, but also among or adjacent to driftwood, partly buried logs, rocks, or tall annual weeds. Nest substrates vary from sand, gravel, spongy marshy soil, or dead or decaying vegetation to hard soil, shell banks, limestone, or bedrock. Nests range from simple depressions in a bare substrate to nests lined with debris, such as shells, crayfish chelipeds, dried grasses and weed stems, wood, or pebbles.

The most apparent factor limiting colony size and nesting success of Caspian terns at Crump Lake is the availability of suitable nesting habitat. Despite the submergence of all tern nesting habitat on Crump Island by late May, no Caspian tern nesting colonies were initiated elsewhere in the Warner Valley in 2003. Also, the rapid colonization and onset of nesting on the artificial nest platform constructed at the site, plus the high nesting density on the platform, supports the hypothesis that suitable tern nesting habitat is severely limiting in this area of interior Oregon. There were 22 Caspian tern nests on Crump Island observed by Roby (2003).

Diet. Breeding terns eat almost exclusively fish, catching a diverse array of species with shallow plunge dives, usually completely submerging themselves underwater (Cuthbert and Wires 1999). The sizes of fish caught and diet composition are largely determined by geography and annual and seasonal prey availability, but most fish are 5 to 25 centimeters in length and occur near the surface of the water.

In the Columbia River estuary, diet studies of the tern colonies on Rice and East Sand islands documented that terns nesting on Rice Island (1999 to 2000) had an average of 83 (77 to 90) percent juvenile salmonids in their diet (Roby et al. 2002), while on East Sand Island (1999 to 2004), terns had an average of 33 (17 to 47) percent juvenile salmonids in their diet (Collis et al. 2002a, 2002b, 2003a, 2003b). From 1999 to 2003, the tern diet on East Sand Island, closer to the mouth of the Columbia River than Rice Island, was primarily non-salmonids including northern anchovy, herring, shiner perch, sand lance, sculpins, smelt, and flatfish (Roby et al. 2002, Collis et al. 2002b, and 2003a).

Salmonid composition at other study sites were found to be variable. For example, in Grays Harbor, Washington, chum and Coho salmon were found in the tern diet in low numbers (14 to 21 percent) and primary prey taken were shiner perch and northern anchovy (Penland 1976). At Dungeness NWR, salmonid composition of the tern diet was observed to be the second most important prey species (31 percent of tern diet) in 2004 (Roby et al. 2004). Both of these sites in Washington differ from that observed in Commencement Bay, a location south of Dungeness NWR in Puget Sound, Washington. In 2000, terns in Commencement Bay were observed to have an average of 52 percent salmonids in their diet (Thompson et al. 2002). It is possible that these observed differences in diet composition is because Grays Harbor and Dungeness NWR contain a greater diversity and/or abundance of marine prey species than found in Commencement Bay due to the adjacent marine waters in these two locations. As ocean conditions improved, and thus, ocean productivity, the percentage of juvenile salmonids in the diet of terns in the estuary has continued to decline in recent years.

In San Francisco Bay, diet studies conducted in 2003 and 2004 found that the tern diet varied among the various nesting locations in the bay, but primary prey species included anchovy, surf perch, silversides, herring, sunfish, gobies, and toadfish (Roby et al. 2003a and 2004). In 2003, salmonids (not including trout from reservoirs) were found in the diets of four out of five nesting colonies, ranging from 0.1 (Agua Vista Park and Baumberg Pond) to 8.7 (Knight Island) percent of prey items (Roby et al. 2003a). In 2004, juvenile salmonids were more prevalent in the tern diets, ranging from 1.4 (Agua Vista Park) to 26.1 (Knight Island) percent, and consisted primarily of non-ESA-listed species (Roby et al. 2004). The higher prevalence of salmonids in the tern diet was apparently due to a lower availability of marine fish during that year (e.g., northern anchovy and surfperch, Roby et al. 2004).

In interior Oregon (Summer and Crump lakes), a study conducted in 2003 found tui chubs to be the primary prey of nesting terns (Roby et al. 2003a). In addition, Roby (2003) concludes that Warner sucker comprise 0.07 percent of the nesting tern's diet. In San Diego, food habits of terns were studied in 1995, 1997, and 1998. These studies consistently found terns to feed primarily on sardines, anchovies, and topsmelt (Horn et al. 1996, Horn and Dahdul 1998 and 1999).

Migration. Caspian terns migrate singly or in groups that can be as large as thousands (Shuford and Craig 2002). Most terns congregate for migration at traditional foraging locations along marine coasts and major rivers or freshwater lakes about a month after young have fledged (Shuford and Craig 2002). Timing of migration varies with region; fall movement typically occurs between mid-July and mid-September along the Pacific Coast (Shuford and Craig 2002).

A complete description of the proposed action is provided in the DEIS and the Biological Assessment

STATUS OF THE SPECIES

The following section provides information on the current status of the listed species addressed in this biological opinion and anticipated trends in habitat availability. Information presented in this section is the basis against which effects of the action are measured over the life of the action. The species account was developed primarily by personnel from the Service's Oregon Fish and Wildlife Office.

<u>Warner Sucker</u>

Species/critical habitat description. The Warner sucker (*Catostomus warnerensis*) is endemic to the Warner Valley in southeast Oregon, an endoreic (closed) sub-basin of the Great Basin area. The valley contains a dozen lakes and many potholes during wet years, but only the three southernmost lakes are semi-permanent. In addition, three permanent creeks drain into the valley (Honey Creek, Deep Creek, and Twentymile Creek).

Cope (1883) collected suckers he referred to as *Catostomus tahoensis* from the "third Warner lake" (presumably Hart Lake) although he noted differences in the size of scales between the Warner Lake suckers and *C. tahoensis* from Pyramid Lake, Nevada. The Warner sucker was recognized as distinct and described as a new species by Snyder (1908) based on specimens collected from the Warner Valley in 1897 and 1904. He reported the species from Warner Creek (now Deep Creek), sloughs south of Warner Creek, and Honey Creek. Relationships of the new sucker to existing species were not precisely defined, but Snyder (1908) noted affinities to *C. tahoensis* of the Lahontan Basin, and *C. catostomus* of wide distribution in northern North America. The distinctiveness of the Warner sucker as a species was confirmed by additional collections (Andreasen 1975, Bond and Coombs 1985). The Warner sucker is clearly within the subgenus *Catostomus* (Smith 1966), although identification of the closest relative has remained elusive.

The Warner sucker is a slender-bodied species that attains a maximum recorded fork length (the measurement on a fish from the tip of the nose to the middle of the tail where a V is formed) of

456 millimeters (17.9 inches). Pigmentation of sexually mature adults can be striking. The dorsal two-thirds of the head and body are blanketed with dark pigment, which borders creamy white lower sides and belly. During the spawning season, males have a brilliant red (or, rarely, bronze) lateral band along the midline of the body, female coloration is lighter. Breeding tubercles (small bumps usually found on the anal, caudal and pelvic fins during spawning season) are present along the anal and caudal fins of mature males and smaller tubercles occasionally occur on females (Coombs et al. 1979).

Sexes can be distinguished by fin shape, particularly the anal fin, among sexually mature adults (Coombs et al. 1979). The anal fin of males is broad and rounded distally, whereas the female anal fin is narrower in appearance and nearly pointed or angular. Bond and Coombs (1985) listed the following characteristics of the Warner sucker that differentiate it from other western species of *Catostomus*: dorsal fin base short, its length typically less than, or equal to, the depth of the head; dorsal fin and pelvic fins with 9 to 11 rays; lateral line (microscopic canal along the body, located roughly at midside) with 73-83 scales, and greater than 25 scales around the caudal peduncle (rear, usually slender part of the body between the base of the last anal fin ray and the caudal fin base); eye small, 0.035 millimeter (0.0013 inch) Standard Length (straight-line distance from the tip of the snout to the rear end of the vertebral column) or less in adults; dark pigmentation absent from lower 1/3 of body; in adults, pigmented area extends around snout above upper lip; the membrane-covered opening between bones of the skull (fontanelle) is unusually large, its width more than one half the eye diameter in adults.

The Service listed the Warner sucker as a threatened species and designated critical habitat on September 27, 1985 (Fish and Wildlife Service 1985). Warner sucker critical habitat includes the following areas: Twelvemile Creek from the confluence of Twelvemile and Twentymile Creeks upstream for about six stream kilometers (four stream miles); Twentymile Creek starting about 14 kilometers (nine miles) upstream of the junction of Twelvemile and Twentymile Creeks and extending downstream for about 14 kilometers (nine miles); Spillway Canal north of Hart Lake and continuing about three kilometers (two miles) downstream; Snyder Creek, from the confluence of Snyder and Honey Creeks upstream for about five kilometers (three miles); Honey Creek from the confluence of Hart Lake upstream for about 25 kilometers (16 miles). Warner sucker critical habitat includes 16 meters (50 feet) on either side of these waterways.

Warner sucker life history. Much of the information on the distribution and life history is taken from the Recovery Plan for the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin (Fish and Wildlife Service 1998). Information from research and observations since completion of the recovery plan has been added.

The distribution of Warner sucker is well known, but limited information is available on stream habitat requirements and spawning habits. Relatively little is known about feeding, fecundity, recruitment, age at sexual maturity, natural mortality, and interactions with introduced game fishes. In this account, "larvae" refers to the young from the time of hatching to transformation into juvenile (several weeks or months), and "juvenile" refers to young that are similar in appearance to adults. Young of year refers to members of age-group 0, including transformation into juvenile until January 1 of the following year.

A common phenomenon among fishes is phenotypic plasticity (the ability of different individuals of the same species to have different appearances despite identical genotypes) induced by changes in environmental factors (Wooton 1990, Barlow 1995). This is most easily seen by a difference in the size of the same species living in different but contiguous, and at times sympatric (occurring in the same area) habitats for a portion of their lives (Healey and Prince 1995, Wood 1995). The Warner Basin provides two generally continuous aquatic habitat types; a temporally more stable stream environment and a temporally less stable lake environment (e.g., lakes dried in 1992 and in the early 1930's).

Observations indicate that Warner sucker grow larger in the lakes than they do in streams (White et al. 1990). The smaller stream morph (development form) and the larger lake morph are examples of phenotypic plasticity within metapopulations of the Warner sucker. Expressions of these two morphs in Warner sucker might be as simple as the species being opportunistic. When lake habitat is available, the stream morph migrates downstream and grows to become a lake morph. These lake morphs can migrate upstream to spawn or become resident populations while the lake habitat is available. Presumably, when the lake habitat dries up the lake morph is lost but the stream morph persists. When the lakes refill, the stream morph can reinvade the lakes to again become lake morphs. The lake habitat represents a less stable but more productive environment than the metapopulations of Warner sucker use on an opportunistic basis. The exact nature of the relationship between lake and stream morphs remains poorly understood and not well studied.

The lake and stream morphs of the Warner sucker probably evolved with frequent migration and gene exchange between them. The larger, presumably longer-lived, lake morphs are capable of surviving through several continuous years of isolation (e.g., drought or other factors) from stream spawning habitats. Similarly, stream morphs probably serve as sources for recolonization of lake habitats in wet years following droughts, such as the refilling of the Warner Lakes in 1993 following their desiccation in 1992. The loss of either lake or stream morphs to drought, winter kill, excessive flows and a flushing of the fish in a stream, in conjunction with the lack of safe migration routes and the presence of predaceous exotic fishes, may strain the ability of the species to rebound (White et al. 1990, Berg 1991).

Lake morph Warner sucker occupy the lakes and, possibly, deep areas in the low elevation creeks, reservoirs, sloughs and canals. Recently, only stream morph suckers have exhibited frequent recruitment, indicated by a high percentage of young of year and juveniles in Twelvemile and Honey Creeks (Tait and Mulkey 1993a,b). Lake morph suckers, on the other hand, were skewed towards larger, older adults (8-12 years old) with no juveniles and few younger adult fish (White et al. 1991) before the lakes dried up in 1992. Since the lakes refilled, the larger lake morph suckers have reappeared. Captured lake suckers averaged 267 millimeters (10.5 inches) SL in 1996 (Allen 1996), 244 millimeters (9.6 inches) SL in 1995 (Allen et al. 1995a) and 198 millimeters (7.8 inches) SL in 1994 (Allen et al. 1995b). Stream caught fish averaged 138 millimeters (5.4 inches) SL in 1993 (Tait and Mulkey 1993b).

Warner sucker recovered from an ice induced kill in Crump Lake were aged to 17 years old and had a maximum fork length of 456 millimeters (17.9 inches) (White et al. 1991). Lake resident suckers are generally much larger than stream residents, but growth rates for adults are not known for either form. Sexual maturity occurs at an age of three to four years (Coombs et al. 1979), although in 1993, captive fish at Summer Lake Wildlife Management Area, Oregon, successfully spawned at the age of two years (White et al. 1991).

Coombs et al. (1979) measured Warner sucker larval growth and found a growth rate of approximately 10 millimeters (0.39 inch) per month during the summer (i.e., when the larvae were 1-4 months old). Sucker larvae at Summer Lake Wildlife Management Area grew as large as 85 millimeters (3.3 inches) in three months during the summer of 1991, but this was in an artificial environment (earth ponds) and may not reflect natural growth patterns.

The feeding habits of the Warner sucker depend to a large degree on habitat and life history stage, with adult suckers becoming more generalized than juveniles and young of year. Larvae have terminal mouths and short digestive tracts, enabling them to feed selectively in midwater or on the surface. Invertebrates, particularly planktonic (having weak powers of locomotion) crustaceans, make up most of their diet. As the suckers grow, they develop subterminal mouths, longer digestive tracts, and gradually become generalized benthic (living on the bottom) feeders on diatoms (small, usually microscopic, plants), filamentous (having a fine string-like appearance) algae, and detritus (decomposed plant and animal remains). Adult stream morph suckers forage nocturnally over a wide variety of substrates such as boulders, gravel, and silt. Adult lake morph suckers are thought to have a similar diet, though caught over predominantly muddy substrates (Tait and Mulkey 1993a, b).

Spawning usually occurs in April and May in streams, although variations in water temperature and stream flows may result in either earlier or later spawning. Temperature and flow cues appear to trigger spawning, with most spawning taking place at 14-20 degrees Celsius (57-68 degrees Fahrenheit) when stream flows are relatively high. Warner sucker spawn in sand or gravel beds in slow pools (White et al. 1990, 1991, Kennedy and North 1993). Allen et al. (1996) surmise that spawning aggregations in Hart Lake are triggered more by rising stream temperatures than by peak discharge events in Honey Creek.

Tait and Mulkey (1993b) found young of year were abundant in the upper Honey Creek drainage, suggesting this area may be important spawning habitat and a source of recruitment for lake recolonization. The warm, constant temperatures of Source Springs at the headwaters of Snyder Creek (a tributary of Honey Creek) may provide an especially important rearing or spawning site for Warner sucker (Coombs and Bond 1980).

In years when access to stream spawning areas is limited by low flow or by physical in-stream blockages (such as beaver dams or irrigation diversion structures), Warner sucker may attempt to spawn on gravel beds along the lake shorelines. In 1990, Warner sucker were observed digging nests in 40+ centimeters (16+ inches) of water on the east shore of Hart Lake at a time when access to Honey Creek was blocked by extremely low flows (White et al. 1990).

Warner sucker larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes. Young of year Warner sucker are often found over deep, still water (from midwater to the surface) but also move into faster flowing areas near the heads of pools (Coombs et al. 1979).

Warner sucker larvae venture near higher velocities during the daytime to feed on planktonic organisms but avoid the mid-channel water current at night. This aversion to downstream drift may indicate that spawning habitats are also used as rearing grounds during the first few months of life (Kennedy and North 1993). None of the studies conducted thus far have succeeded in capturing Warner sucker younger than two years old in the Warner lakes, and it has been suggested that Warner sucker do not migrate down from the streams for two to three years (Coombs et al. 1979). The absence of young Warner sucker in the Warner lakes, even in years following spawning in the lakes, could be due to predation by introduced game fishes (White et al. 1991).

Juvenile suckers (one to two years old) are usually found at the bottom of deep pools or in other habitats that are relatively cool and permanent such as near springs. As with adults, juvenile Warner sucker prefer areas of the streams that are protected from the higher velocities of the main stream flow (Coombs et al. 1979). Larval and juvenile mortality over a two month period during the summer has been estimated at 98 percent and 89 percent, respectively, although accurate larval Warner sucker counts were hampered by dense macrophyte cover (Tait and Mulkey 1993b).

White et al. (1991) found in qualitative surveys that, in general, adult suckers used stretches of stream where the gradient was sufficiently low to allow the formation of long (50 meters [166.6 feet] or longer pools. These pools tended to have undercut banks, large beds of aquatic macrophytes (usually greater than 70 percent of substrate covered), root wads or boulders, a surface to bottom temperature differential of at least two degrees Celsius (at low flows), a maximum depth greater than 1.5 meters (5 feet), and overhanging vegetation (often Salix spp.). About 45 percent of these pools were beaver ponds, although there were many beaver ponds in which Warner sucker were not observed. Warner sucker were also found in smaller or shallower pools or pools without some of the above mentioned features. However, they were only found in such places when a larger pool was within approximately 0.4 kilometer (0.25 mile) upstream or downstream of the site.

Submersed and floating vascular macrophytes are often a major component of Warner sucker-inhabited pools, providing cover and harboring planktonic crustaceans which make up most of the young of year Warner sucker diet. Rock substrates such as large gravel and boulders are important in providing surfaces for epilithic (living on the surface of stones, rocks, or pebbles) organisms upon which adult stream resident Warner sucker feed, and finer gravels or sand are used for spawning. Siltation of Warner sucker stream habitat increases the area of soft stream bed necessary for macrophyte growth, but embeds the rock substrates utilized by adult Warner sucker for foraging and spawning. Embeddedness, or the degree to which hard substrates are covered with silt, has been negatively correlated with total Warner sucker density (Tait and Mulkey 1993).

Habitat use by lake resident Warner sucker appears to be similar to that of stream resident Warner sucker in that adult Warner sucker are generally found in the deepest available water where food is plentiful. Not surprisingly, this describes much of the habitat available in Hart, Crump, and Pelican Lakes, as well as the ephemeral lakes north of Hart Lake. Most of these lakes are shallow and of uniform depth (the deepest is Hart Lake at 3.4 meters (11.3 feet) maximum depth), and all have mud bottoms that provide the Warner sucker with abundant food in the form of invertebrates, algae, and organic matter.

Warner sucker population dynamics. A population estimate of Warner sucker in streams was conducted in 1993 on the Honey Creek and Twentymile Creek drainages (Tait and Mulkey 1993b). Approximately 20 percent of available stream habitat in the Honey Creek drainage was sampled. The population within the area sampled was estimated at 77 adults, 172 juveniles, and 4,616 young of year. Approximately 60 percent of the available stream habitat in the Twentymile Creek drainage was also sampled. The population estimates within this area sampled was 2,563 adults, 2,794 juveniles, and 4,435 young of year.

As of 1996, the Hart Lake Warner sucker population was estimated at 493 spawning individuals (95 percent confidence intervals of 439-563) (Allen et al. 1996). Although this is the only quantified population estimate of Warner sucker ever made for Hart Lake, it is likely well below the abundances found in Hart Lake prior to the drought.

In 1997, Bosse et al. (1997) documented the continued existence, but reduced numbers, of Warner sucker in the Warner Lakes. The number of Warner sucker, as measured by catch per unit effort, had declined 75 percent over the 1996 results. The reduction in sucker numbers was offset by a sharp increase in the percentage composition of introduced game fish, especially white crappie and brown bullhead.

Hartzell and Popper (2002) indicated a continued reduction of Warner sucker numbers and an increase of introduced fish in Warner Lakes. The greatest number of Warner sucker captured was in Hart Lake (96% of total Warner sucker catch) with only a few Warner sucker captured in the other Warner Lakes, including Crump Lake. Suckers represented a greater percentage of the catch in relation to introduced and other native fish compared to the efforts of 1997, although a smaller total number of sucker were captured than in 1997. This was the first year since 1991 that native fish made up a smaller percentage of the catch than introduced fish.

Distribution. The probable historic 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 Warner Valley. Warner sucker historic distribution in tributaries includes Deep Creek (up to the falls west of Adel), the Honey Creek drainage, and the Twentymile Creek drainage. In Twelvemile Creek, a tributary to Twentymile Creek, the historic range of Warner sucker extended through Nevada and back into Oregon.

Early collection records document the occurrence of Warner sucker from Deep Creek up to the falls about 5 kilometers (3.1 miles) 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 area.

Between 1977 and 1991, eight studies examined the range and distribution of the Warner sucker throughout the Warner Valley (Kobetich 1977, Swenson 1978, Coombs et al. 1979, Coombs and Bond 1980, Hayes 1980, White et al. 1990, Williams et al. 1990, White et al. 1991). These surveys have shown that when adequate water is present, Warner sucker may inhabit all 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 1980's, and again in the 1990's (Allen et al. 1996). The Warner sucker population of Hart Lake was intensively sampled to salvage individuals before the lake went dry in 1992.

Stream resident populations of Warner sucker 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 Warner sucker 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 habitat 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 Warner sucker 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).

While investigating the distribution of Cowhead Lake tui chub, Scoppettone and Rissler (2001) discovered a single juvenile Warner sucker in West Barrel Creek. West Barrel Creek is a tributary to Cow Head Slough that eventually enters Twelvemile Creek at the known upper extension of suckers in the Twelvemile drainage. This discovery of a Warner sucker in the Cowhead Lake drainage is a significant range extension for Warner sucker.

Kennedy (1997) made observations of the success of survivorship of sucker larvae during 1992 and 1993. In 1992, all lakes were dry by July and refilled in 1993 due to higher spring run-off. Estimated survivorship of sucker larvae were not significantly different and showed low recruitment to the juvenile size class both years (<10% in 1992 and <3% in 1993). Evidence of similar survivorship despite lake level, may indicate that the sucker's survivorship is independent of its ability to occupy and use lake type habitat.

Threats that currently occur to Warner sucker. Warner sucker were listed due to reductions in the range and numbers, reduced survival due to predation by introduced game fishes in lake habitats, and habitat fragmentation and migration corridor blockage due to stream diversion structures and agricultural practices. Since the time of listing, it has been recognized that habitat modification, due to both stream channel degradation and overall reduced watershed function has worsened and the status and viability of the Warner sucker has declined. Signs of stream channel and watershed degradation are common in the Warner Valley, and include fences hanging in mid-air because stream banks have collapsed beneath them, high cut banks on streams, damaged riparian zones, bare banks, and large sagebrush flats where there were once wet meadows (White et al. 1991).

With few exceptions, designated Warner sucker critical habitat is excluded from grazing and other land use authorizations by the BLM. The one exception is on the Deppy Creek/ Honey Creek confluence where a water gap allows stock access. The other exception is in the 0207 allotment on Twentymile Creek. This area is not occupied by Warner sucker and is an intermittent, rock-armored channel.

The first large scale human impact to migration of the Warner sucker within the Warner Basin was the construction of irrigation diversion structures in the late 1930s (Hunt 1964). These structures hamper or block both upstream and downstream migrations of various life stages of Warner sucker. Few irrigation diversions have upstream fish passage. Adult suckers that have spawned and are moving downstream can be diverted from the main channel to become lethally trapped in unscreened irrigation canals. Larval, post larval, young of year, and juvenile suckers are probably also lethally diverted into unscreened irrigation canals.

In high water years, the amount of water diverted from Warner Valley streams may be only a small 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. Over a series of drought years, reduced flows can cause drops in lake levels and sometimes, especially in conjunction with lake pumping for irrigation, cause complete dry-ups, as was the case with Hart Lake in 1992.

Although the native species composition in the Warner basin included some piscivorus fishes, like the Warner Valley redband trout (*Oncorhynchus mykiss sp.*), the introduction of exotic game fish disrupted this balance and the native ichthyofauna has suffered. In the early 1970s, ODFW stocked white crappie (*Pomoxis annularis*), black crappie (*P. nigromaculatus)*, and largemouth bass (*Micropterus salmoides*), in Crump and Hart Lakes. Prior to this, brown bullhead (*Ameiurus nebulosus*) and non-native rainbow trout were introduced into the Warner Valley. The adults of all five piscivorous fish species feed on Warner sucker to varying degrees.

The presence of the introduced game fishes may also threaten Warner sucker through competitive interactions. Brown bullhead are bottom oriented omnivores (Moyle 1976) that may compete directly with Warner sucker for the same food sources. Bullhead may also prey on sucker eggs in the lower creek or lake spawning areas, as well as on sucker larvae and juveniles. Young crappie probably eat many of the same zooplankton and other small invertebrates that young suckers depend on. Habitat use by young Warner sucker remains poorly understood, but there may be competition between suckers and other fishes for what scarce cover resources are available.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

The action area is defined at 50 CFR §402 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action". Because Warner sucker inhabit streams outside of the Caspian tern foraging area (approximately 12 to 14 mile radius), and these streams contribute to the population of Warner suckers in the lakes and streams which Caspian terns forage, the area to be considered for this consultation includes all the waters inhabited by Warner sucker which connect in some way to Crump Lake. For the purposes of this consultation, the Service recognizes the action area to include the area affected by Caspian tern predation on Warner sucker which includes the main waterbodies of the Warner basin. Primary forage areas would be expected in Crump Lake and Hart Lake. Affected stream populations associated with these two Lakes would be Honey Creek, Deep Creek, Twentymile Creek, and Twelvemile Creek.

Warner sucker inhabit lakes, sloughs, and potholes in the Warner Valley, including the canal north of Hart Lake, Hart Lake, Crump Lake, Anderson Lake, Swamp Lake, Mugwump Lake, Greaser Reservoir, Honey Creek, Snyder Creek, Twentymile Creek and Twelvemile Creek.

Fish passage improvements. In 1991, BLM installed a modified steep-pass Denial fish passage facility on the Dyke diversion on lower Twentymile Creek. The fishway is intended to re-establish a migration corridor, and allow access to high quality spawning and rearing habitats. The Dyke diversion structure is a 1.2 meter (4 feet) high irrigation diversion that was impassable to Warner sucker and redband trout before the fishway was installed. It blocked all migration of fishes from the lower Twentymile Creek, Twentymile Slough and Greaser Reservoir populations from moving upstream to spawning or other habitats above the structure. To date, no suckers have been observed or captured passing the structure, but redband trout have been observed and captured in upstream migrant traps.

An evaluation of fish passage alternatives has been done for diversions on Honey Creek which identifies the eight dams and diversions on the lower part of the creek that are barriers to fish migration (Campbell-Craven Environmental Consultants 1994). In May 1994, a fish passage structure was tested on Honey Creek. It consisted of a removable fishway and screen. The ladder immediately provided passage for a small redband trout. These structures were removed by ODFW shortly after their installation due to design flaws that did not pass allocated water.

Warner sucker research. Research through 1989 summarized in Williams *et al.* (1990) consisted of small scale surveys of known populations. Williams *et al.* (1990) primarily tried to document spawning and recruitment of the Hart Lake population, define the distributional limits of the Warner sucker in the streams, and lay the groundwork for further studies. White *et al.* (1990) conducted trap net surveys of the Anderson Lake, Hart Lake, Crump Lake, Pelican Lake, Greaser Reservoir, and Twentymile Slough populations. A population estimate was attempted for the Hart Lake population, but was not successful. Lake spawning activity was observed in Hart Lake, though no evidence of successful recruitment was found.

White *et al.* (1991) documented the presence of suckers in the Nevada reach of Twelvemile Creek. This area had been described as apparently suitable habitat by Williams *et al.* (1990), but suckers had not previously been recorded there. Kennedy and North (1993) and Kennedy and Olsen (1994) studied sucker larvae drift behavior and distribution in streams in an attempt to understand why recruitment had been low or nonexistent for the lake morphs in previous years. They found that larvae did not show a tendency to drift downstream and theorized that rearing habitat in the creeks may be vital to later recruitment.

Tait and Mulkey (1993a,b) investigated factors limiting the distribution and abundance of Warner sucker in streams above the man-made stream barriers. A population estimate of Warner sucker in streams was conducted in 1993 on the Honey Creek and Twentymile Creek drainages (Tait and Mulkey 1993b). Approximately 20 percent of available stream habitat in the Honey Creek drainage was sampled. The population within the area sampled was estimated at 77 adults, 172 juveniles, and 4,616 young of year. Approximately 60 percent of the available stream habitat in the Twentymile Creek drainage was also sampled. The population estimates within this area sampled was 2,563 adults, 2,794 juveniles, and 4,435 young of year. The detrimental effects of these barriers are well-known, but there may be other less obvious factors that are also affecting the suckers in streams. These studies found that general summertime stream conditions, particularly water temperature and flows, were poor for most fish species. Recent studies have concentrated on population estimates, marking fish from Hart Lake and monitoring the recolonization of the lakes by native and non-native fishes (Allen *et al.* 1995a,b, Allen *et al.* 1996).

Federal land management. The Federal agencies responsible for management of the habitat in the Warner Basin have consulted on activities that might impact the Warner sucker. On May 21, 1995, the BLM, USFS, NOAA-Fisheries and the Service signed the Streamlining/Consultation Guidelines to improve communication and efficiency between agencies. In the Warner Basin, the outcome of streamlining has been regular meetings between the Federal agencies conducting and reviewing land management actions that may affect Warner sucker. These meetings have greatly improved the communication among agencies and have afforded all involved a much better understanding of issues throughout the entire watershed. As a result of close coordination, the Forest Service and BLM have modified many land management practices, thus reducing negative impacts, and in many cases bringing about habitat improvements to Warner sucker and Warner Valley redband trout.

Since the listing of Warner sucker as threatened in 1985, the Lakeview Resource Area has completed numerous consultations on BLM actions affecting Warner sucker. The following lists the subject and year the consultation was completed: Habitat Management Plan for the Warner Sucker 1985; Fort Bidwell-Adel County road realignment 1987; Warner Wetlands Habitat Management Plan 1990; relocation of Twentymile stream gauge 1993; Lakeview BLM grazing program 1994; reinitiation of consultation on grazing program 1995; Noxious Weed Control Program 1996; reinitiation of consultation on grazing program 1996; informal consultation on guided fishing activities 1997; reinitiation of consultation on grazing program and consultation on a number of small non-grazing projects 1997; reinitiation of consultation on grazing program 1999; informal consultation on Long Canyon Prescribed Fire 1999; grazing permit renewal concurrence 1999; consultation on the Resource Management Plan for BLM activities 2003; and reinitiation of consultation on grazing program 2000 through 2004.

In 1994, Lakeview Resource Area determined that ongoing site-specific livestock grazing actions were likely to adversely affect Warner sucker in the Warner Valley Watersheds and has, to date, consulted under recurring biological opinions with the Service. Present grazing prescriptions and monitoring protocols are in accordance with biological opinions issued by the Service, and results of grazing monitoring appear annually in reports to the Service. Consultation for Lakeview Resource Area's grazing activities has been reinitiated due to changes in the action, changes due to new information, and for failure to comply with terms and conditions of the biological opinions.

EFFECTS OF THE ACTION

Potential affects of the action on Warner sucker include: (1) direct loss of lake habitat due to placement of fill material to form the island; (2) turbidity and water quality impacts resulting from dredging and placement of fill material to construct the island; (3) potential entrainment of Warner sucker from the dredging operation; (4) increased predation on Warner sucker by foraging Caspian terns; and (5) potential increased predation by other piscivorous colony nesting birds that may use the constructed nesting island.

1) Direct loss of lake habitat due to placement of fill material

It is not known whether Warner sucker use habitat in the vicinity of the lake where the island will be constructed. If Warner suckers use the area around the island, construction of the island could impact Warner suckers by displacing them from the area during high water periods. Because the area to be impacted is small (approximately six acres out of approximately 8,120 acres), and the area which will be constructed is already an island at lower water levels, the amount of habitat impacted would be insignificant. Approximately 0.02 percent of the area of the lake would be impacted, and then only when the water levels are higher than normal.

2) Turbidity

Increases in turbidity are known to disrupt behavior of fish including feeding and hiding. Island construction activities would occur for approximately 30 to 60 days and in a limited area (six acres). Background turbidity levels are relatively high in Crump Lake. Use of geotubes is planned in order to reduce the amount of suspended sediment returned to the lake waters. A slurry of lake substrate would be pumped into the geotubes which are porous and allow water to flow out while retaining the solid material. Because the dredge area is localized and construction techniques would use geotube technology to limit and filter material that would otherwise be suspended, it is not likely that turbidity from the dredging operation will impact Warner sucker. Increases in turbidity due to the dredging will be minimal and not expected to be persistent.

The Biological Assessment for this project (USDI 2005) includes a conservation measure requirement to analyze fill materials obtained from areas with prior history of agriculture and possible releases from mining sites for various contaminants. The use of lake bed sediment as fill material is included in this conservation measure. As stated in the Biological Assessment "...(1) an organochlorine scan with total PCB or Aroclor PCB value; (2) a metal scan, with mercury prepared for (and determined by) cold vapor atomic absorption spectroscopy; and (3) grain size analysis could be determined as well as total organic carbon and percent moisture for sediments. Sediment samples would consist of surface grabs (composite samples are recommended) and cored samples to estimate concentrations at depth (represented concentrations that will remain on the surface after dredging or moving the sediment). These efforts will be conducted by the Action Agencies in coordination with the Service."

3) Entrainment from Dredging

Construction activities will include the use of a hydraulic dredge in the lake to remove substrate from the lake bottom to be used to raise the base area of the constructed island. The dredge will operate more than 200 meters from the island under construction. An estimated 19,400 cubic yards of material will be dredged from the lake bottom. The area of impact is approximately 3-6 acres of lake-bottom, ranging from approximately 2 to 4 feet deep assuming water levels remain similar to current conditions. It is possible for the dredge equipment to encounter fishes or other aquatic organisms including Warner sucker. Impact to fish from hydraulic dredge operation is not well understood or documented.

Entrainment is defined as the direct uptake of aquatic organisms by the suction field generated at the hydraulic intake or cutterhead. In their review of potential impacts due to entrainment by hydraulic dredges (Reine and Clarke 1998), found that several investigators have sought to determine if entrainment and resultant mortalities are meaningful from either broad ecological or fishery population dynamics perspectives. The results of these limited studies have been inconclusive. Reine and Clarke (1998), indicate instances ranging from no entrainment to high entrainment rates. High entrainment was determined for both pipeline and hopper dredges use. Impacts were highest in situations where salmon occupied the entire water column in narrow, constricted channels. Warner sucker typically orient to the bottom of the water column in an open water body (in the case of this activity being considered), and would readily be flushed away from the equipment operation area, reducing the likelihood of entrainment.

Other studies to date illustrate the difficulties in determining precise estimates of absolute entrainment rates and have seldom been able to determine population-level consequences with any degree of confidence. Much of the available evidence suggests that entrainment is not a significant problem for many species of fish in many bodies of water.

One particular factor contributing to higher entrainment rates was hypothesized to be the inability of salmon fry and smolts to actively avoid the suction force of hydraulic dredges. We expect the Warner sucker encountered in the Lake to be adult size fish (> 195 mm.) which would be able to avoid the dredging equipment.

Warner sucker density estimates for Crump Lake are not available, making any quantification of potential entrainment difficult. Crump Lake is expected to hold far fewer Warner sucker than Hart Lake, and density estimates conducted at Hart Lake indicate up to 500 suckers may be present (Allen et al 1996). The area of Crump Lake is approximately 8,120 acres (USGS 1971). Assuming there would be approximately 500 suckers evenly distributed throughout the lake, there would be approximately 0.07 fish per acre, and 0.4 fish per 6 acres. Assuming such a situation, and assuming all Warner suckers within the estimated 6 acres of lake-bottom would be injured or killed if they entrained through the dredge, less than one Warner sucker would be susceptible to injury or mortality (USDI 2005). Warner sucker are not likely to be evenly distributed throughout Crump Lake, therefore it is not likely any one fish would be entrained in the dredge. Additionally, Warner Sucker are likely able to avoid construction equipment.

4) Increase in Predation of Warner Sucker by Foraging Caspian Tern

Forage surveys for the Crump Lake Caspian tern colony have indicated that Warner sucker is likely an occasional if not rare prey for Caspian terns (Roby *et al.* 2003). Warner suckers are known to exhibit several behaviors that likely reduce this exposure risk to predation. Warner sucker are typically benthic oriented fish and tend to seek out and use deeper waters as the season progresses and water temperatures increase. White et al. (1990) and Coombs et al. (1979) observed that Warner suckers were most abundant in large deep pools. Deep pools also allow suckers to thermo-regulate vertically in the water column and to mitigate temperature extremes (Tait and Mulkey 1993b. Early season, larval suckers tend to forage on nekton at the water surface (Kennedy and Vinyard 1997). As they mature they switch to forage on benthic material, and reside in the deeper waters to avoid higher water temperatures encountered at the water surface.

Warner suckers tend to prefer deeper cooler waters during the time of season when daytime water temperatures elevate. The switch in behavior of Warner sucker may aid in their ability to avoid predation from Caspian terns. Deep water provides refuge from predators both through the cover of water and the presence of undercut banks in stream habitats. The nocturnal, shallow water foraging activity of Warner suckers suggests that avoidance of some visual predator, most likely piscivorous birds, may cause Warner suckers to rely on cover of deep water during daylight.

During the study one out of 1,378 observations of fish in bill loads of Caspian terns was a Warner sucker representing 0.3 percent of their diet. This observation was made during the week ending June 1, 2003 (Roby et. al. 2003). No additional Warner suckers were observed during the 2003 observational study. The reason for the lack of additional observations may be due to the natural tendency for suckers to orient to the bottom of the waterbody which they inhabit.

Caspian Tern nesting begins approximately mid May, with first eggs hatching approximately mid June. Fledging occurs approximately the end of July. During the period of time from hatchling to fledging, the rate of predation on fish appears to double to triple (Roby et. al. 2003). Therefore the timing of Warner sucker seeking deeper water due to water temperature may coincide with the increased predation by Caspian terns to feed chicks.

The Biological Assessment suggests that this rate of capture success could be multiplied out over the total time period which Caspian terns are nesting and foraging, and also be multiplied by the expected increase in the population of terns, resulting in a maximum expected take of 42 individual Warner suckers during any nesting season (USDI 2005). Although this multiplication may not be as accurate a prediction as a bioenergetics model may represent, the results may be similar. NOAA fisheries concludes in a study of juvenile fish predation by Caspian terns (NOAA 2004), that results of bioenergetics modeling is similar to results of observations of prey taken based on PIT tag recoveries in the nesting areas on East Sand Island.

Additional information provided by the action agencies (email February 11, 2005), suggests the actual predation rates on Warner sucker may be less. The prediction in the Biological Assessment assumes the probability of capture of Warner sucker per observation of bill loads returned to the nest relates directly to the number of birds nesting rather than attempts at capture. It is more reasonable to compare the number of successful captures of Warner sucker directly to the total number of nesting Caspian terns observed in the study by Roby et al. (2003). Considering 71 nesting pairs Caspian terns were observed in 2003, results of the observational study may be useful in predicting an annual take of Warner sucker. The foraging study identified one Warner sucker captured by 71 pairs or 142 terns of the nesting colony during the sampling period (Roby et al. 2003). Using this ratio of 1 sucker to 142 terns, an estimate of 4.2 suckers would be consumed by 600 terns (the maximum predicted colony size for Crump Lake). Additionally, the diet composition sampling period consisted of three hours of observation per day. Multiplying the prediction of 4.2 suckers per three hours of observation by five hours per day, in order to estimate a 15 hour daylight period, results in an estimate of 21 Warner suckers that could be consumed by the estimated 600 Caspian terns expected during an annual breeding season at Crump Lake.

Additionally, alternative prey (e.g. tui chub and centrarchids) are more abundant and available to nesting terns, reducing the potential for terns to prey on Warner suckers. Observations made by Collis et al. (2002), indicated that relocating Caspian terns to habitat closer to the mouth of the Columbia River from East Sand Island to Rice Island significantly reduced predation impact on juvenile salmon as the Caspian terns switched to prey primarily on more abundant marine fish species. Caspian terns appear to be opportunistic feeders and select the most abundant prey (Roby et. al..2003). With the predominant forage fish in Crump Lake being tui chub and crappie, the opportunity for Caspian terns to feed on fish other than Warner sucker in Crump Lake is great.

Although Caspian terns forage on other prey species, in situations where they are more abundant, Caspian terns still select other sucker (*Catostomus*) species as a relatively small proportion of catch (0.4 to 1.9 percent of diet) (Collis et. al.2002). The number of Warner suckers expected to be taken by Caspian terns would be expected to be relatively few, because the number of suckers available in relation to the total abundance of fish in Crump Lake. Surveys attempting to detect Warner sucker in Crump Lake conducted in the early to mid 1990s indicate Warner sucker constitute a small portion of the overall fish inhabiting Crump Lake relative to overall abundance of fish sampled (Allen et. al. 1996).

Current nesting conditions for Caspian terns depend upon the water level of the lake. The most apparent factor limiting colony size and nesting success of Caspian terns in the Crump Lake area is the availability of nesting habitat on Crump Island (Roby et al 2003). Habitat availability on Crump Island is limited by the elevation of the lake. During the observational study conducted in 2003, an artificial nesting platform was constructed when lake water elevation threatened to inundate the natural island. Forty nine of the seventy one active nests monitored were on the artificial platform (Roby et al. 2003). In drier years there is a greater amount of habitat available, and in wetter years the island size is smaller and therefore nesting habitat is limited, or completely eliminated on years when the island is inundated. The created island would result in a more stable nesting habitat that would persist despite lake water elevations which occur under current conditions. Therefore an increase in stable Caspian tern nesting habitat would be realized directly upon completing of the island construction. An estimate of Caspian tern colony size was made in 2000 at 155 pairs. In 2003, seventy one Caspian terns were observed nesting either on the island, or the constructed artificial nesting platform (Roby et al. 2003). Information on current use of the nesting habitat is limited, and use of an average of the observations made in 2000 and 2003 would not be statistically robust. It would be reasonable and conservative to expect at least the 71 nesting pairs observed in 2003 to use the artificial island immediately after construction.

Density of Caspian tern nests in other studies indicates an average of 0.55 to 0.78 nests per square meter. The island design size is approximately one acre, which theoretically could support approximately 3,338 to 4,735 nesting pairs of Caspian terns. At Crump Lake, the newly created island could support between 5 to 300 breeding pairs of terns based on estimates of historic numbers of terns nesting at inland Oregon sites (USDI 2004). Prey base may be limiting at the site, and thus, the actual number of terns that can successfully nest at Crump Lake may not be as high as the nesting habitat could accommodate. Based on this limited information, the Action Agencies estimate a proposed colony size of 300 pairs may be expected on the newly constructed island (USDI 2004). Commensurate increase or decrease in capture of Warner sucker will occur relative to the number of Caspian terns, and other colony nesting birds, present in any year in the action area.

5) Other Piscivorous Colony Nesting Birds

Other piscivorous birds are present at Crump Lake and may also increase due to the creation of additional nesting habitat. Estimates of predation from double crested cormorants and other piscivorous birds was shown to be substantial for salmonids when compared to Caspian tern predation rates in the Columbia River estuary (NOAA 2004, Roby et al. 2003). Additional predation from other birds could also be expected at the Crump Lake site. Fish feeding birds at Crump may utilize the created island to nest including double crested cormorants, white pelicans and other feeding birds

Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Both interdependent and interrelated activities are assessed by applying the "but for" test, which asks whether any action and its associated impacts would occur "but for" the proposed action. No additional interrelated or interdependent activities were identified or analyzed.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act.

Privately held land parcels are located within the relocation area being consulted on. Predominant use of the adjacent lands are agriculture, and cattle grazing. Impacts to Warner sucker may occur due to stream habitat alteration and water withdrawals for irrigation.

Angling regulations allow angling for crappie in Crump Lake. The probability of Warner sucker being caught while angling for crappie is very low and impacts to Warner sucker are not expected from angling.

CONCLUSION

After reviewing the current status of Warner sucker, the environmental baseline for the action area, the effects of the proposed action and cumulative effects, it is the Ecological Services' biological opinion that the proposed Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary in Crump Lake Oregon, as proposed, is not likely to jeopardize the continued existence of the threatened Warner sucker. Critical habitat has been designated for this species, however none has been designated within Crump Lake where the island is proposed to be constructed. Thus, no critical habitat is expected to be affected by the proposed project.

This determination is based on: 1) the expectation that only a small portion of the total population will be preyed upon by Caspian terns; 2) effects due to construction of nesting habitat will be minimized; 3) Warner sucker preyed upon are expected to be younger age class fish between 0+ and 1+ years of age; 4) due to the natural expected high rate of mortality in young fish, the additional mortality of a maximum of 21 Warner sucker each nesting season will not be significant.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Service's Migratory Birds and State Programs and the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in 7(o) (2) to apply. Migratory Birds and State Programs and the Corps has a continuing duty to regulate the activity covered by this incidental take statement. If Migratory Birds and State Programs and the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse.

In order to monitor the impact of incidental take, Migratory Birds and State Programs and the Corps must report the progress of the action and its impact on the species to Ecological Services as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Ecological Services expects that Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary is likely to result in incidental take of Warner sucker in the form of direct mortality, harm and harass or impairment of biological patterns. This take is due to detrimental effects from Caspian terns preying upon Warner sucker in Crump Lake. Up to 21 Warner sucker may be taken as prey due to the increase in nesting habitat.

This Biological Opinion provides a reasonable and prudent measure which is expected to reduce the likelihood of incidental take. The measure described below is non-discretionary, and must be undertaken by the agency or made a binding condition of any grant or permit issued to the applicant, as appropriate.

Based on stream habitat, fish population, and predations studies by the Service's Migratory Birds and State Programs, Ecological Services anticipates that the following take could occur as a result of the activities associated with the implementation of the proposed Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary.

1. Take of Warner sucker due to increased Caspian tern nesting habitat will occur in the form of harassment of an undetermined number of Warner sucker, and mortality of 21 Warner sucker annually. Based on the population estimates conducted in 1993 by Tait and Mulkey (1993) take of 21 sucker could represent 0.4 percent of the total estimated population of Warner sucker including stream habitat.

   The estimate of number of Warner sucker mortality is based on an analysis of an observational study which indicated one capture of an individual Warner sucker out of 1,378 observations of bill loads (Roby et. al. 2003). The estimate most likely represents a worst case situation, in which the single observation is used to predict that an increased population of nesting Caspian terns over a longer period of time. The study was conducted over a twelve week period, observing 71 nesting pairs of Caspian terns. The prediction assumes a direct relationship of the success of foraging terns would be commensurate with the increased number of nesting birds. Observations made of foraging Caspian terns in the Columbia River suggest that Caspian tern predation rate is not affected by prey availability, at least over the range of values experienced in that study (NOAA 2004). Such observations suggest that the increase in numbers of foraging Caspian terns may not necessarily result in an increase in Warner sucker predation. Additional observations of Caspian tern predation, diet and Warner sucker behavior to avoid predation necessary to determine actual affects to the Warner sucker population.

2. Probability of actual catch of Warner sucker by Caspian terns are not expected due to observation of low success (Roby et al. 2003). Minimization of take is expected due to implementation of the reasonable and prudent measure and terms and conditions. We expect the actual take resulting in mortality to be less than 21 individuals.

EFFECT OF THE TAKE

In the accompanying biological opinion, Ecological Services determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Ecological Services believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take of Warner sucker authorized by this biological opinion:

1. Monitor Caspian terns and other fish eating bird use of the constructed island.

2. Monitor predation by Caspian terns to determine whether take is exceeded due to predation on Warner sucker. Monitoring shall be started as soon as the tern colony reaches a size greater than current conditions support. Based on 2003 data, baseline conditions at Crump Lake will be considered to be 71 nesting pairs.

3. Minimize affects to Warner sucker from operation of dredging equipment while constructing or maintaining the nesting Island.

4. Assess Lake sediment to be used in creating the nesting island to ensure that contaminants will not adversely affect the Warner sucker.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, Migratory Birds and State Programs and the Corps must comply with the following terms and conditions which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary:

1. To implement reasonable and prudent measure number one, the following terms and conditions shall be implemented:

   1.1 Following completion of island construction monitor Caspian tern and other fish-eating bird use of the newly constructed island during the breeding season.

2. To implement reasonable and prudent measure number two, the following terms and conditions shall be implemented:

   2.1 Conduct a baseline population estimate of lake dwelling Warner sucker directly affected by Caspian tern predation; Monitor Warner sucker to determine the actual baseline population of Warner suckers in the project area that may be impacted by the proposed action in Hart and Crump Lakes, and stream-resident Warner Suckers in Honey, Deep, and Twentymile Creeks which are tributary to these lakes. Assess size (age) structure, especially evidence of recruitment to the lakes in recent years. PIT tag captured suckers to assess growth rates and movements over time.

2.2 Design an observational study that focuses on determining the portion of prey base Warner suckers comprise for Caspian terns; Based on 2003 data, baseline conditions will be considered to be a nesting colony of 71 nesting pairs. Monitoring of the nesting colony to determine increased predation by Caspian terns should be implemented once the colony of Caspian terns meets this baseline. Presence of other piscivorous birds utilizing the nesting island should be discussed with the Fish and Wildlife Service Bend Field Office to determine if unanticipated take is occurring that may affect baseline assumptions. Once the baseline of 71 nesting pairs is reached, the duration of monitoring will take place for a minimum of the first three years after construction of the artificial island. Additional monitoring needs will be considered in consultation with Ecological Services' Bend Field Office to determine if higher rates of foraging on Warner sucker may be occurring based on the preliminary results of the first three years monitoring, or due to increases in nesting bird colony size.

2.3 A complete report of monitoring and assessment results will be submitted to the Service's Oregon Fish and Wildlife Office with copies to the Bend Field Office following annual completion of monitoring.

3. To implement reasonable and prudent measure number three, the following terms and conditions shall be implemented:

   3.1 Before beginning operation of dredging equipment, disturb water to chase away or haze Warner sucker potentially holding in the area of operation.

   3.2 In order to reduce the probability of entraining Warner sucker into the dredge, install a "cow-catcher" or "tickler chains" or other types of deflector to push fish away from the operating head of the dredge before operation.

   3.3 The size of the area to be dredged should be kept to a minimum in order to minimize harm to fish habitat.

   3.4 A sediment or silt screen should be installed around the work area prior to starting. After the work is completed, the screen should be carefully removed after the sediment has settled on the lake bottom.

4. To implement reasonable and prudent measure number four, the following terms and conditions shall be implemented:

   4.1 The contaminant sampling plan for sediment used to form the nesting island will be provided to the Oregon Fish and Wildlife Office for review at least two weeks prior to initiation of sampling. Ecological Services is willing to work with the Action Agencies in designing the sampling plan prior to final review to insure that potential contaminant concerns are adequately addressed.

   4.2 Contaminant sampling results and an evaluation of the potential effects of any identified contaminants to the Warner sucker will be provided to the Oregon Fish and Wildlife Office for review at least one month prior to the initiation of island construction.

Reporting requirements

1. When implementing the construction, or conducting observations, if dead, injured, or sick Warner sucker are discovered, which are not included in the take exempted by this biological opinion, initial notification must be made to the Resident-Agent-in-Charge, U.S. Fish and Wildlife Service, Office of Law Enforcement, Wilsonville, Oregon, at telephone number (503) 682-6131. Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured fish to ensure effective treatment and care, and when handling dead specimens to preserve biological material in the best possible state. If a need for museum specimens is identified, special handling and preservation practices will be provided. In conjunction with the care of sick or injured Warner sucker, or the preservation of biological materials from a dead sucker, the Service's Migratory Birds and State Programs and the Corps have the responsibility to ensure that information relative to the date, time, and location of the fish when found, and possible cause of injury or death of each fish be recorded and provided to Ecological Services.

2. Results of monitoring, stream habitat surveys, and fish population monitoring conducted should be provided to the Service's Oregon Fish and Wildlife Office with copies to the Bend Field Office upon completion.

Ecological Services believes that take of Warner sucker will be limited to direct mortality, harm or harassment in streams and lakes within the Action Area of the project. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If during the course of the action, this level of incidental take is exceeded; such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Service's Migratory Birds and State Programs and the Corps must immediately provide an explanation of the causes of the taking and review with Ecological Services the need for possible modification of the reasonable and prudent measures.

If the Incidental Take authorized by this opinion is exceeded, Migratory Birds and State Programs and the Corps shall immediately cease the activity resulting in the take and shall reinitiate formal consultation.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's 7(a)(1) responsibilities.

1. The Migratory Birds and State Programs and the Corps should pursue cooperative agreements with other agencies and non-governmental organizations to complete population status assessments and contribute to further Warner sucker recovery goals.

2. The following additional information could be gathered to assess Caspian tern nesting affects on Warner sucker at Crump Lake:

a) In order to assess the extent of impact on Warner sucker, use PIT tags to estimate predation by nesting birds by recovery of tags detected at the nest sites.

b) Estimate abundance of other prey fishes in Hart and Crump Lakes. PIT tag a sample of various other fishes presumed to be preyed upon in order to estimate the proportion of various fish in the Caspian tern diets. Recovered PIT tags from piscivorous waterbird colonies would be used to assess the relative vulnerability of different species of fish to predation. PIT tags will also aid in estimating predation by nesting birds by recovery of tags detected at the nest sites.

c) Radio tag adult suckers in Lakes and track movements. Determine ability of suckers to pass water diversions to move upstream to spawn.

In order for Ecological Services to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Ecological Services requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the proposed actions described. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a matter or extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat not considered in this opinion; (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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