

DRAFT

STATE OF WASHINGTON

July 2016

Periodic Status Review for the American White Pelican



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*Washington Department of
FISH AND WILDLIFE
Wildlife Program*



The Washington Department of Fish and Wildlife maintains a list of endangered, threatened, and sensitive species (Washington Administrative Codes 232-12-014 and 232-12-011). In 1990, the Washington Wildlife Commission adopted listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 232-12-297). The procedures include how species listings will be initiated, criteria for listing and delisting, a requirement for public review, the development of recovery or management plans, and the periodic review of listed species.

The Washington Department of Fish and Wildlife is directed to conduct reviews of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing by the Washington Fish and Wildlife Commission. The periodic status reviews are designed to include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification. The agency notifies the general public and specific parties who have expressed their interest to the Department of the periodic status review at least one year prior to the five-year period so that they may submit new scientific data to be included in the review. The agency notifies the public of its recommendation at least 30 days prior to presenting the findings to the Fish and Wildlife Commission. In addition, if the agency determines that new information suggests that the classification of a species should be changed from its present state, the agency prepares documents to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act.

This document is a Draft Periodic Status Review for the American White Pelican. It contains an update of information pertaining to the status of the white pelican in Washington. The Department intends to present the results of this periodic status review to the Fish and Wildlife Commission at a meeting in November 2016.

Submit written comments by e-mail on this report by 10 October 2016 to:
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On the cover: photo of pelican by Joe Higbee; background of pelicans at Badger Island by Mike Livingston.



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Washington

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EXECUTIVE SUMMARY

The American White Pelican (*Pelecanus erythrorhynchos*) is a large colonial nesting bird that eats mostly non-game fish, such as carp, suckers, sticklebacks, as well as amphibians and crayfish. The species was listed as a state endangered species in Washington in 1981. They are not listed under the federal Endangered Species Act, but are protected under the Migratory Bird Treaty Act.

American White Pelican (or ‘white pelican’) numbers and range were reduced throughout the 19th and early 20th century due to habitat loss, persecution, and pesticide contaminants, especially DDT. In more recent decades, populations have recovered from pre-1970 declines; a conservative estimate for the species in 1998-2001, yielded a total of ~157,000 adults. Despite overall improved status, the white pelican remains a species of moderate conservation concern, primarily because of the concentration of birds on relatively few breeding colonies, and their vulnerability to disturbance, water level fluctuations, disease, and history of ‘boom and bust’ productivity.

Concurrent with range-wide increases, the numbers of American White Pelicans observed in Washington have increased substantially in the last 30 years. Historically, white pelicans likely bred in eastern Washington on inland waters such as Sprague and Moses Lakes, but there are no certain records of nesting after 1926. In 1994, a breeding colony was established in the Columbia River north of the mouth of the Walla Walla River. Since that time, the colony has grown steadily, and 3,267 breeding white pelicans were counted in aerial photos in May 2015. In 2010, another colony formed on Miller Sands just inside Oregon waters in the Columbia River estuary; a survey in April 2015, counted 261 adults and 144 nests. Inland waters of eastern Washington also support significant numbers of non-breeding white pelicans, especially along the Columbia River from The Dalles to Chief Joseph Pool. During summer, up to 2,000 birds are observed in the Potholes region; smaller numbers remain in winter.

Although white pelicans eat mostly carp and suckers, they sometimes consume fish resources that are of conservation concern or have recreational value. White pelicans are large conspicuous birds that have increased in number and many observers assume they are impacting salmonid runs. However, based on smolt PIT tag detections, the pelicans nesting at Badger Island and Miller Sands, do not seem to be an important source of mortality for out-migrating juvenile salmonids in the Columbia and Snake rivers. There is some circumstantial evidence that impacts on salmonids may be more significant at certain times and places in tributaries such as the Yakima River.

Although white pelicans have recovered substantially, populations remain somewhat vulnerable and Washington still only hosts a single colony. White pelicans are highly sensitive if disturbed by humans or predators on breeding colonies and prone to desert or leave eggs and young exposed to predation. Other factors affecting white pelican populations include loss of breeding and foraging habitats due to water level changes, diseases, and severe weather.

Given the increase in numbers and the new colony in the Columbia River estuary, the white pelican may no longer fit the definition of endangered in Washington, as defined in WAC 232-12- 297: Endangered species are, “*seriously threatened with extinction throughout all or a significant portion of its range within the state.*” It is recommended that the American White Pelican be down-listed to state threatened in Washington. A threatened species is, “*likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.*”

INTRODUCTION

The American White Pelican (*Pelecanus erythrorhynchos*) is a large (8–9.5 ft wingspan; 12–20 lbs) white bird with black outer wing feathers, and a large orange-yellow bill and distensible gular pouch (Fig. 1). They are colonial-nesting and prey on fish, amphibians and crayfish. White pelicans are known for their habit of flying in formations and cooperative foraging in coordinated swimming groups that encircle fish.



Figure 1. American White Pelicans (photo by Joe Higbee).

The species has been listed as a state endangered species in Washington since 1981. They are not listed under the federal Endangered Species Act, but are protected under the Migratory Bird Treaty Act.

DISTRIBUTION

The American White Pelican (*Pelecanus erythrorhynchos*) is widespread in much of western and southeastern North America (Fig. 2). It is frequently encountered at lakes, reservoirs, and rivers; it breeds at widely scattered island colonies that are relatively undisturbed by humans and mammalian predators. Pelicans that breed at colonies east of the Continental Divide migrate southeast toward the Gulf Coast and Mexico to winter (Evans and Knopf 1993). Birds from colonies west of the Divide generally winter along the Pacific coast from central California to Central America, and interior locations of southern California and southwestern Arizona (Yates 1999, Knopf and Evans 2004). In Washington, small numbers of white pelicans are seen in winter along major rivers in the Columbia Basin (Wahl 2005, eBird 2015).

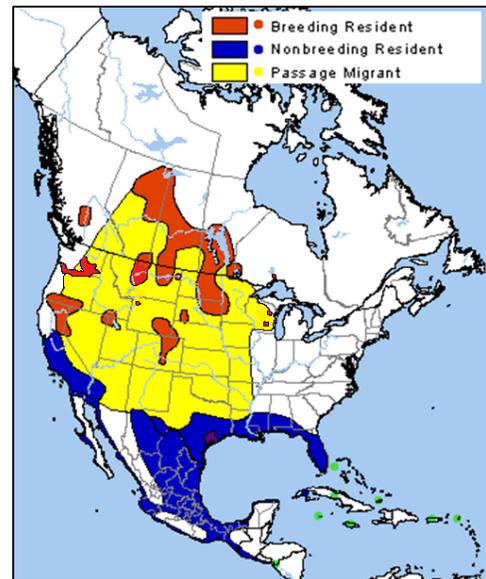


Figure 2. Range of American White Pelican (modified from: Ridgely et al. 2003).

NATURAL HISTORY

Habitat requirements. American White Pelicans breed primarily on isolated islands in freshwater lakes and rivers, and forage in shallow areas. White pelicans are limited by the availability of remote nesting sites and rich foraging habitats. Although white pelicans are somewhat adapted to changes in nesting and foraging sites as a result of droughts and flooding, the largest colonies exist where these resources have been consistent and disturbance by humans or mammalian predators has been rare (Evans and Knopf 1993). Primary winter habitats are shallow coastal bays, inlets, and estuaries with exposed loafing and

roosting sites (i.e., sand bars) near foraging areas. Some white pelicans, including some in Washington, will winter inland on large rivers, reservoirs, and areas below dams that remain ice-free.

Diet and foraging. White pelicans feed largely on nongame or "rough" fish, mostly small schooling fishes (<1/2 bill length), but also larger sluggish bottom feeders (Knopf and Evans 2004). These include carp (*Cyprinus carpio*), suckers (*Catostomus* spp.), sticklebacks (*Gasterosteus aculeatus*), chub (*Couesius* spp.), bullheads (*Ameiurus* spp.), and minnows (*Cyprinidae*); they also prey on Tiger Salamanders (*Ambystoma tigrinum*), and crayfish (*Cambaridae*) (Evans and Knopf 1993, Pacific Flyway Council 2012). American White Pelicans will feed on game fishes, such as trout and juvenile salmonids, particularly when they are concentrated and vulnerable such as spawning runs (Stapp and Hayward 2002, Knopf and Evans 2004). White pelicans can be a problem at aquaculture facilities on their winter range, and where stocked hatchery trout are concentrated (IDFG 2009, Pacific Flyway Council 2012).

Unlike Brown Pelicans (*Pelecanus occidentalis*), American White Pelicans do not dive, but forage by 'bill dipping'; they scoop prey into their pouch and tip their bill up to swallow (McMahon and Evans 1992a). They are opportunistic foragers and often feed in groups, forming lines to either drive fish into shallow water or surrounding them in more open areas (Anderson 1991, McMahon and Evans 1992a). Foraging for small fish occurs in shallow (less than 8 ft) marshes, rivers, and lake margins in summer, and shallow coastal marine waters in winter. However, they will feed in deep water if prey species are at or near the surface (Anderson 1991). Nocturnal foraging is common during the breeding season (McMahon and Evans 1992b). White pelicans will also pirate fish from other species, such as Double-crested Cormorants (*Phalacrocorax auritus*) (Anderson 1991).

White pelicans are a mobile species. While they often forage within 50 km of the colony, they will make use of thermals to travel much longer distances to forage when necessary (Evans and Knopf 1993). Telemetry indicated that birds took advantage of air currents and thermals, occasionally flying ~70 mph (112 kph) and at heights >10,000 ft (>3.2 km) above the ground; round trips exceeding 200 mi (322 km) were a "common occurrence;" birds made occasional foraging trips from Nevada colonies over the Sierra Nevada to foraging sites in California's Central Valley (Yates 1999). Satellite telemetry studies indicate that white pelicans in Montana regularly commuted round-trips of >200 mi (322 km) to forage throughout eastern Montana, North Dakota, and Saskatchewan (Madden and Restani 2005). Birds from the Stum Lake colony in British Columbia foraged at ~40 lakes across an 11,580 mi² (30,000 km²) area (B.C.M.E. 2009).

Reproduction and life history. White pelicans lay one clutch of 2 eggs per year; adults share duty during the 30 day incubation period, and then brood the altricial young for about 25 days (Evans and Knopf 1993). Generally only one chick survives; at 3 weeks chicks are somewhat mobile and form into crèches with other chicks, while the parents stay at foraging areas and only return to feed them. Chicks make their first flights at 9–10 weeks, and depart the colony to join adults at foraging areas at about 10–11 weeks. White pelicans first breed at 3 years of age (Evans and Knopf 1993). Banded pelicans in Montana generally returned to their natal colony, and movements between Montana colonies were rare (Hendricks and Johnson 2002). Chick survival was 59% from fledging through the first year, 84% in the second year, with a mean of ~82% for year 3–20, (correcting for bands that wear out and begin to drop off at 10.7 years; Ryder 1981). Band returns indicate they can live to >26 years of age (Clapp et al. 1982).

Sources of mortality. Adult white pelicans are rarely killed by natural predators. Shooting was historically a significant source of mortality, based on band returns, but may no longer be a major factor in the United States (Strait and Sloan 1975, Hendricks and Johnson 2002). Severe weather, diseases (e.g. botulism and West Nile Virus), collisions with wires or objects, and contaminants can occasionally be important causes of mortality. Prolonged cold, wet, and windy conditions, especially during the critical

transition period between brooding and crèche formation, can have devastating effects on chick survival (Sovada et al. 2013). Severe hailstorms have also killed substantial numbers (Rocke et al. 2005). Cold weather and hailstorms resulted in >50% mortality of the chicks in the Medicine Lake NWR in Montana in 1940, 1954, and 1993 (Madden and Restani 2005).

Disturbance and associated predation at breeding sites are a major mortality factor for white pelican eggs and chicks, particularly hatchlings <3 weeks of age (Evans and Knopf 1993). Gulls (*Larus* spp.) and Common Ravens (*Corvus corax*) take eggs; Great Horned Owls (*Bubo virginianus*), Bald Eagles (*Haliaeetus leucocephalus*), and Black-crowned Night-Herons (*Nycticorax nycticorax*) take young. Gull predation can be high if the colony is disturbed by humans or a mammalian predator. Mammals, particularly Coyotes (*Canis latrans*) and Red Foxes (*Vulpes vulpes*) are not usually a problem at the island colonies except when low water levels expose a land bridge. Bald Eagles and River Otters (*Lontra canadensis*) have disturbed the Miller Sands colony, and an otter or Raccoon (*Procyon lotor*) killed chicks at Badger Island in 2010 (D. Lyons, pers. comm.). In addition to facilitating egg and chick predation by gulls, human disturbance (e.g., by foot, boat, or plane) can cause pelicans to abandon nests or entire colonies for the season (Evans and Knopf 1993).

POPULATION AND HABITAT STATUS

Range-wide population trends. The population and range of American White Pelicans were reduced throughout the 19th and early 20th century due to habitat loss resulting from water projects, persecution, and contaminants. Thompson (1933) reported the permanent destruction of historically critical foraging and nesting habitat. For example, a loss of ~90% of wetland habitat in California, led to the reduction from 11 known colonies in the 19th century to only one colony in 1932 (Shuford 2005). Historically, and to a lesser extent now, white pelicans were shot for ‘sport’, feathers, or to alleviate suspected impacts to fisheries. Even though studies clearly showed that they seldom preyed on the same fish sought by people, people shot pelicans, clubbed young, and broke eggs; during the 1920s, pelicans were shot and eggs destroyed, even in Yellowstone National Park (Schaller 1964).

Thompson (1933) tallied a total population of breeding adult white pelicans of 30,000, but he noted that data for Canada were incomplete. Lies and Behle (1966) estimated the continental population at ~45,000 in 1964. The species was placed on the National Audubon Society Blue List in 1972, due to the vulnerability of colonies (Tate and Tate 1981), and Sloan (1982) suggested they be listed as threatened under the Federal Endangered Species Act.

In more recent decades, populations have recovered from pre-1970 declines; Breeding Bird Survey data for the U.S. suggests average annual increase ~12% from 2003–2013 (Fig. 3; Sauer et al. 2014). The number of known breeding colonies increased from 43 in the 1960s, to 55 in 1980, while total breeding adults

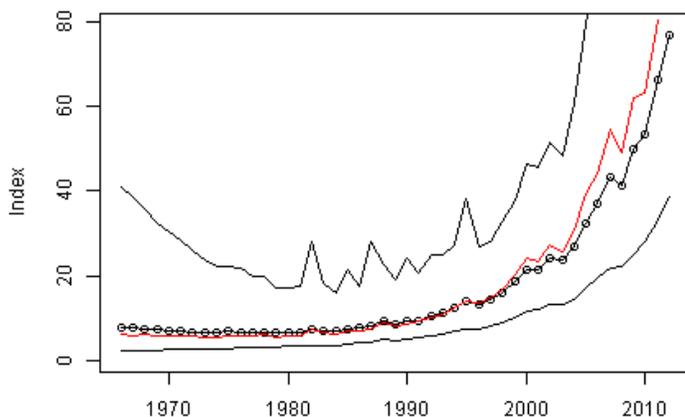


Figure 3. Survey-wide Breeding Bird Survey trend index estimated from a hierarchical model for white pelicans, 1966–2012; solid lines are median of the posterior distribution of yearly indexes and the lower (2.5%) and upper (97.5% CIs (Sauer et al. 2014).

appeared to increase from 63,000 to 109,000 (Sidle et al.1985, Keith 2005), although the apparent increase was likely partly an artifact of more complete surveys. The total number of nests in 20 breeding colonies that were surveyed during 1979–1981 and again in 1998–2001 doubled (King and Anderson 2005); their estimate for 1998–2001 was 134,000 breeding adults, and a total of ~157,000 birds, and they considered this a conservative estimate because several colonies lacked current data.

Despite their increasing population size, the American White Pelican remains a species of moderate conservation concern. They are concentrated on relatively few breeding colonies and are vulnerable to disturbance, water level fluctuations, disease, and have a history of ‘boom and bust’ productivity. For example, 28,000 birds abruptly abandoned the largest colony (Chase Lake, ND) during the 2004 nesting season for unknown reasons (Murphy 2005). In total, fewer than 50 colonies may be active in any year, and fewer than 20 have more than 500 nests (King and Anderson, 2005); and only 4 large breeding colonies in the northern Great Plains account for 84,000 adults (Sovada et al. 2013).

Murphy (2005) suggested that the eastern and western white pelican populations be evaluated for subspecific status because banding and telemetry data indicated a high degree of separation of migration and wintering areas. Though this separation is still used for management purposes (e.g. flyway plans), genetic studies indicate that the species is panmictic, exhibiting evidence of high historical and contemporary gene flow with no genetic structuring across the Continental Divide (Oomen et al. 2011, Reudink et al. 2011). The population east of the Continental Divide is about three times larger than the western population (King and Anderson 2005).

Western population. The western population includes all white pelicans known to breed west of the Continental Divide, plus the colonies at Yellowstone Lake, Wyoming and Canyon Ferry Lake and Arod Lake, Montana. In the late 19th century, there may have been upwards of 60,000 breeding birds at 23–24 colonies in the western states (Paullin et al. 1988, IDFG 2009, Pacific Flyway Council 2012); California alone may have hosted over 20,000 pairs (Shuford 2005). But by the late 1970s, the western population

Table 1. Estimated number of breeding adult American White Pelicans at western colonies in 2014 (Pacific Flyway Council 2015).

Colony Name	State	2014 estimate	Percent of western population
Anaho Island NWR	NV	16,224	38.0
Gunnison Island WMA	UT	9,428	22.1
Minidoka NWR	ID	4,264	10.0
Badger Island, McNary NWR	WA	3,670	8.6
Canyon Ferry Lake	MT	3,432	8.0
Blackfoot Reservoir	ID	2,096	4.9
Malheur NWR	OR	656	1.5
Molly Lake, Yellowstone NP	WY	614	1.4
Stum Lake	BC	590	1.4
Clear Lake NWR	CA	444	1.0
Miller Sand Spit	OR	366	0.9
Upper Klamath NWR	OR	348	0.8
Island Park Reservoir	ID	326	0.8
Arod Lake	MT	234	0.5
Lower Klamath NWR	CA	0	0.0
Crump Lake	OR	0	0.0
Pelican Lake	OR	0	0.0
Ruby Lakes NWR	NV	0	0.0
Total		42,692	100

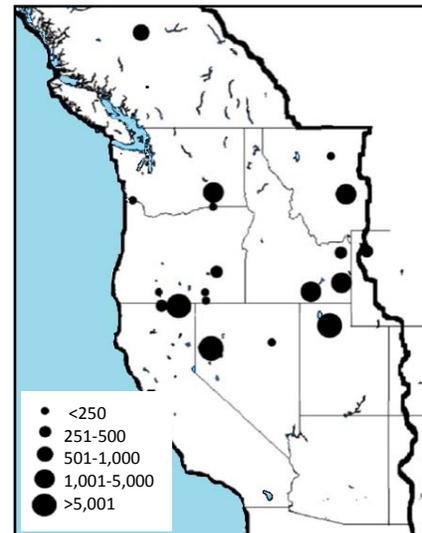


Figure 4. White pelican colony locations and sizes in the western population based on 2002-2012 data (Pacific Flyway Council 2012).

was only about 16,000 birds at 5–8 colonies (Paullin et al. 1988, IDFG 2009, Pacific Flyway Council 2012). Since the 1980s, the western population has increased substantially, and several new colonies have formed (Fig. 4); the 2014 western population estimate is 42,690 breeding adults at 14 colonies (Table 1; Pacific Flyway Council 2015). The two largest colonies contained >60% of the population.

Washington population status. In Washington, John K. Townsend noted American White Pelicans in the Columbia River estuary in the 1830s (Jobanek and Marshall 1992). White pelicans occurred and likely bred in eastern Washington historically on inland waters such as Sprague and Moses Lakes (Dawson and Bowles 1909, Jewett et al. 1953). The first published record of nesting is from 1926 at Moses Lake, Grant County (Brown 1926); that colony may have persisted into the 1930s. Kitchin (1934) states, “breeds in eastern Washington (commonly at Moses lake),” but there are otherwise no definite records (Motschenbacher 1984). Motschenbacher (1984) listed 4 additional sites where pelicans may have once nested (Sprague Lake, Coffee Pot Lake, Kahlotus Lake, and the Pasco/mouth of the Snake River area).

In 1994, a breeding colony was established on Crescent Island, part of McNary National Wildlife Refuge (NWR) which was constructed for nesting birds in the Columbia River, Walla Walla County in 1985 (Ackerman 1994, 1997). In 1997, pelicans began nesting on nearby Badger Island, also in McNary NWR, and ceased nesting on Crescent Island after 1998. Since that time, the colony has grown to over 1,600 breeding pairs and there is little use of Crescent Island. About 50 pelicans attempted to nest on Crescent Island in 2010, but all nests failed (Adkins et al. 2014). A mean of 3,267 breeding white pelicans were counted in aerial photos from May 2015, the highest count since the colony formed (Figure 5; D. Lyons, per. comm.). The increase from 2,447 counted in 2014 may reflect an influx of birds from Malheur Lake, where no nesting occurred in 2015, apparently due to low water conditions.

The first nesting record of white pelicans in the Columbia River estuary occurred at Miller Sands Spit, Oregon, in 2010. In July 2011, an on-colony survey on Miller Sands indicated a colony size of about 97 breeding pairs (Bird Research Northwest 2012). In July 2012, an aerial survey counted 427 adults and 79 chicks, and 71 were later banded with alpha-numeric leg bands (<http://www.birdresearchnw.org>). A boat-

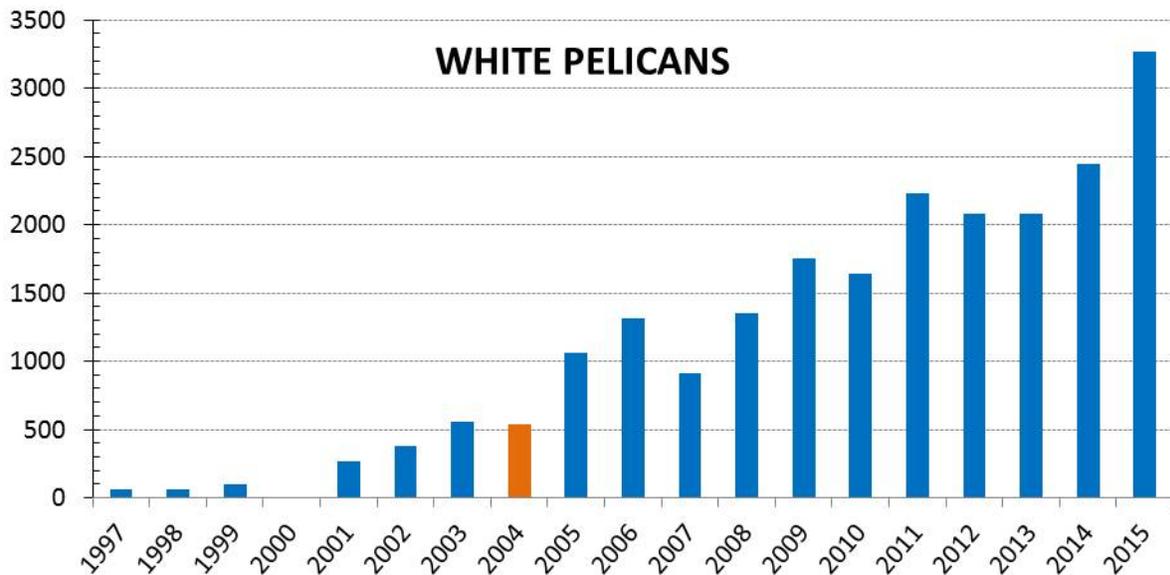


Figure 5. Numbers of American White Pelicans counted during the nesting season at Badger Island, 1997–2015 (Based on high resolution aerial photos; a few birds <10% may be obscured by vegetation; ■ = only low-resolution oblique photos were taken in 2004 and more birds may have been obscured by vegetation; from Bird Research Northwest).



Figure 6. Badger Island and Crescent Island (blue arrow; from *Bird Research Northwest*) in the Columbia River, McNary National Wildlife Refuge (left); pelican nesting aggregations on Badger Island, 2005 (photo by M.Livingston).

based survey in April 2015, counted 261 adults and 144 nests.

Nonbreeding and wintering birds. An increasing number of non-breeders has been noted along the mid-Columbia, lower Snake, and Yakima rivers, where they are often observed foraging below dams (Bird Research Northwest 2013, G. King, pers. comm.). Numbers vary greatly during the summer, with peaks of up to 2,000 birds observed in the Potholes region during late summer. A smaller number of birds remain in Washington during winter, with concentrations ranging from 40-300 birds; most are found in the Columbia River, particularly from Priest Rapids Dam to the Walla Walla River delta (Wahl 2005). Parts of eastern Washington may be important in sustaining non-breeding summer residents and birds that have dispersed from breeding grounds in adjacent states and provinces. Small numbers are recorded elsewhere on the Columbia, Snake, and Yakima rivers and on marine waters west of the Cascades (eBird 2015).

Habitat status--nesting colonies. Badger Island, located on the Columbia River upstream of McNary Dam and near the town of Wallula, is a long, narrow island of about 15 acres and part of McNary NWR. The island is closed to the public in order to avoid human disturbance to nesting pelicans that might cause abandonment of the colony. Pelicans nest in several patches across the island, with a majority of nests located in the shade of trees and shrubs. Shallow waters surrounding the island provide isolation from the main river channel and most recreational boating during the breeding season. Crescent Island, also part of McNary NWR, consists of ~7.5 acres with a mix of dense shrubs and bare ground. It was created from dredged materials in 1985 (Bird Research Northwest; <http://www.birdresearchnw.org/>).

As part of a plan to reduce the predation of juvenile salmonids, the U.S. Army Corps of Engineers is planting willows to dissuade Caspian Terns (*Sterna caspia*) from nesting (ACOE, Walla Walla District 2014). The habitat change may preclude white pelicans from resuming nesting on Crescent in the future.

Miller Sands is in Clatsop County, Oregon, near the southwest corner of Wahkiakum County, Washington (Fig. 7). It is a 117 acre horseshoe-shaped spit island in the lower Columbia River estuary, from approximate river mile 22.2 to 24.6 (ACOE, Portland District 2014). Historically, the site was formed as a flow control structure. It is owned by the State of Oregon and leased by the Port of Portland for material placement by the Army Corps of Engineers. The site is continually eroded by river currents, and about 150,000 cubic yards were placed there in 2013 (ACOE, Portland District 2014). A central embayment is sheltered from the mainstem flows and has a network of mud flats, tidal marsh, and sub-tidal waters and provides habitat for pelicans, shorebirds, waterfowl, etc. Miller Sands is designated as critical habitat for Streaked Horned Larks (*Eremophila alpestris strigata*) (USFWS 2013). Pelicans nest on the north spit of the island, with their nests facing the central embayment. Pelicans have consistently nested so that vegetation (trees, shrubs) screen them from the heavy commercial shipping and recreational boating traffic that passes nearby the north shore of the spit. The shallow water of the embayment discourages most recreational boating within direct sightlines of the colony.



Figure 7. Location of Miller Sands, Clatsop County, Oregon, in the Columbia River.

In September 2012, after nesting activities were concluded and pelicans had departed the island, the 2010–2012 nesting area on Miller Sands was covered with dredged material by the Army Corps of Engineers, or their contractor. Pelicans returned to nest in 2013 (and subsequent years), shifting their nesting to an area on the island where vegetative cover (trees, large shrubs) remained.

FACTORS AFFECTING WHITE PELICANS IN WASHINGTON

Adequacy of Regulatory Mechanisms

Federal protection. The American White Pelican was added to protected species under the Migratory Bird Treaty Act in 1972 (Strait and Sloan 1975). White pelicans have increased dramatically in recent decades, suggesting this protection has been adequate. Badger Island is part of McNary NWR, so protected from development and is closed to the public during the nesting season.

State protections. The American White Pelican was listed as endangered in Washington in 1981, and is protected from ‘take’ as an endangered species in state law (RCW 77.12.020, RCW 77.15.130). Most shorelines of water bodies used by pelicans for foraging would be considered ‘shorelines of the state’ and regulated by the Department of Ecology under the Shoreline Management Act (RCW 90.58.020).

Though development of shorelines and filling of wetlands are carefully regulated, regulation of water rights and irrigation may not adequately consider the effect of water level changes on wildlife, such as white pelicans.

Factors Affecting Populations

Although white pelicans have recovered substantially since the mid-20th century, populations remain somewhat vulnerable. Important factors affecting white pelican populations include: (1) loss of breeding and foraging habitats, particularly due to water level changes; (2) disturbances of nesting colonies; (3) disease, particularly West Nile Virus and botulism; and (4) severe weather.

Habitat loss, water level fluctuations, and water quality. Tremendous loss and degradation of wetlands and coastal habitats have occurred throughout North America and the Pacific Flyway (Kushlan et al. 2002, Pacific Flyway Council 2012). Water diversion and draining of wetlands for agriculture, have destroyed or degraded many traditional feeding, breeding, and loafing areas. The site of the 1926 nesting colony at Moses Lake, and the four other possible colony sites have been flooded by dams or are otherwise no longer suitable (Motschenbacher 1984). One of the four sites, Lake Kahlotus, dried up in recent years. Unsustainable pumping of water from deep aquifers may affect surface water bodies if drought becomes more common, and may affect pelican foraging habitat. Low water is not an issue at Badger Island, but flooding has been an issue in years of high spring run-off (e.g. 1994, 1997, 1998; Ackerman 1997, S. Ackerman, notes on file).

The continued, competing demand for water for agricultural, urban, and fisheries uses may be the greatest long-term threat to white pelicans, and regional waterbird populations in general (Ivey and Herziger 2006). Allocation of water can be, and often is, a contentious issue in western states because water resources are limited, and droughts, which are predicted to increase in frequency and severity with climate change, intensify conflicts. Low water levels decrease success or even eliminate pelican nesting at colonies by exposing a land bridge that allows predator access; unpredictable water levels can cause flooding of nests, eggs, and hatchlings (Moreno-Matiella and Anderson 2005, Murphy and Tracy 2005, Pacific Flyway Council 2012).

The Salton Sea in southern California is an important stopover and wintering site, hosting 65-85% of the western population during migration (Pacific Flyway Council 2012). Water quality is affected by agricultural run-off, industrial pollution, sewage, rising salinity and selenium levels, and botulism (Patten et al. 2003, Shuford 2014).

Human disturbance. Although relatively tolerant of human observers on foraging and loafing areas, white pelicans are highly sensitive on breeding colonies and prone to desert or leave eggs and young exposed to predators if disturbed by humans or predators (Evans and Knopf 1993). Even boats and airplanes in the vicinity of a colony may cause pelicans to temporarily leave the colony or abandon it altogether. Protection of breeding colonies from human disturbance has been a primary management concern. In a recent case, the pelican colony on Miller Sands was disturbed in early July 2014 by campers, (in addition to chronic disturbance by River Otters and Bald Eagles); 17 flightless chicks found swimming after a disturbance were taken to a rehabilitation facility by researchers (Bird Research Northwest, weekly update for 7/7-7/13/14 [<http://www.birdresearchnw.org/project-info/weekly-update/columbia-river-estuary/2014-updates/>]).

Disease-botulism. Diseases are a significant source of mortality for white pelicans, and have caused substantial die-offs. White pelicans have died in numerous outbreaks of avian botulism caused by *C. botulinum* type C since 1980 (Madden and Restani 2005, Rocke et al. 2005).

Outbreaks of type C botulism are somewhat unpredictable, but are often associated with lower water levels, high summer surface temperatures, and mass production of filamentous algae (Espelund and Klaveness 2014). The disease spreads through necrophagous flies depositing eggs on dead and toxic animal carcasses. Climate change, that may involve higher summer temperatures, prolonged dry periods, and lower lake levels, may increase the frequency of outbreaks (Espelund and Klaveness 2014).

Disease-West Nile Virus. West Nile virus (WNV)–associated deaths of white pelican chicks have been reported at various nesting colonies in the United States since 2002 (Johnson et al. 2010). WNV was the presumed cause of >9,000 white pelican deaths in 7 states in 2002–2003 on the basis of testing of a sample of carcasses from various affected colonies (Rocke et al. 2005, Johnson et al. 2010). Prior to the arrival of WNV in the northern Great Plains region in 2002, chick mortality rates in the late breeding season were less than 5%, but in the years since were as high as 44% (Sovada et al. 2008).

Climate change and severe weather. Adult pelicans begin to terminate brooding when the chicks are about 2 weeks of age, enabling both parents to make extended foraging trips. Pelican chicks of 14–25 days of age are not able to fully thermoregulate, so chicks from many nests form crèches, crowding together to help them stay warm at night and during inclement weather. White pelicans in the northern plains may be experiencing population level effects attributable to climate change. For example, spring arrival by pelicans at Chase Lake National Wildlife Refuge in North Dakota has advanced approximately 16 days over a period of 44 years (1965–2008; Sovada et al 2014). The earlier timing of pelican arrival has resulted in more frequent and severe losses of pelican chicks because chicks are more frequently exposed to severe weather conditions than under the 1965-based phenology pattern. Cold and wet weather and severe storms resulted in the death of thousands of 2–4 week old chicks in 2005, 2006, 2007, and 2008 (Sovada et al. 2014). Similar impacts may occur in Washington, because most climate models predict an increase in precipitation in spring and an increase in days with >1 inch of precipitation (Dalton et al. 2013). A severe rain storm occurred in the area of the Badger Island colony in May 2015, and rain accompanied by unseasonal cold occurred in May 2013 (H. Newsome, pers. comm.); the effects, if any, on pelican productivity were not assessed. The median location of active white pelican colonies has shifted northward 2.57 degrees (285 km) in the last 53 years (Moulton and Wackenhut, *cited in* IDFG 2016)

If summer droughts increase in frequency and severity as climate models suggest (Mote and Salathé 2010), some breeding colonies will be affected. The increase on Badger Island from 2014 to 2015 may have been due to low water elsewhere (e.g. Malheur Lake). Droughts could negatively impact some foraging habitat, but new shallows would presumably be available, so it is not clear how this might affect the Badger Island colony.

Pesticides and contaminants. Many wetlands in the arid West are affected by insecticides, mercury, selenium, fertilizers and other agricultural pollutants. Bioaccumulation of contaminants, particularly DDT and its metabolites, likely contributed to population declines during the mid-20th century (Keith 2005), and may continue to pose threats to white pelicans in some locations (Kushlan et al. 2002, Ivey and Herziger 2006). Pesticides (e.g. endrin, dieldrin, and toxaphene) often caused deaths and episodic die-offs of white pelicans (Keith 2005, Rocke et al. 2005). Population increases since ~1980 have followed the slow decreases of persistent insecticide residues in the environment and in white pelican tissues. In Washington, organochlorine contaminants were generally low in 4 addled white pelican eggs collected on Crescent Island in 1994 (Blus et al. 1998). They were also below levels determined to affect reproduction in recent samples from colonies in Nevada and North Dakota (Wiemeyer et al. 2005, Pietz et al 2008).

Bio-accumulation of mercury and selenium can also be an issue for fish-eating birds. Wiemeyer et al. (2007) evaluated mercury and selenium in white pelicans breeding at Pyramid Lake, Nevada. Mercury and selenium concentrations in eggs were generally below known effect levels and did not appear to be affecting hatching success, but some adult pelicans had elevated mercury concentrations in their livers (Wiemeyer et al. 2007).

Fisheries conflicts. Although white pelicans eat mostly carp, suckers, and tiger salamanders, they do sometimes consume fish resources that are of conservation concern or have significant economic or recreational value and intervention is sometimes needed (Pacific Flyway Council 2012). White pelicans forage on concentrations of easily accessible fish, and fish reared at hatcheries are sometimes particularly vulnerable to depredation. Predation on game fish can result in economic effects due to loss of both the investment in hatchery production and the foregone economic contribution of angling to local economies. White pelicans are also large conspicuous birds that have recently increased in number in some locations (although recent increases represent recovery to levels prior to DDT associated population declines). Consequently, they may receive a larger share of the ‘blame’ for predation on fish runs of concern than they deserve.

In the Columbia River estuary, white pelicans nesting on Miller Sands Spit pose almost no risk to out-migrating juvenile salmonids (Bird Research Northwest 2012). More broadly, avian predation on the 13 federal ESA-listed salmonid (*Oncorhynchus* spp.) distinct population segments in the Columbia Basin has been an on-going concern. Since 1994, the number of white pelicans breeding at the Badger Island colony as well as the number of non-breeding pelicans along the Columbia, Snake, and Yakima rivers have increased dramatically (Wahl 2005, Adkins et al. 2014, Bird Research Northwest 2014). Based on smolt PIT tag detections on Badger Island, however, white pelicans from the colony do not appear to be a significant source of mortality for ESA-listed smolts. Predation rates by pelicans from the Badger Island colony on listed salmonid populations were the lowest observed among nine bird colonies investigated (Evans et al. 2012, 2016), with Caspian Terns (*Hydroprogne caspia*) and Double-crested Cormorants preying on salmon smolts much more often. However, the increasing number of non-breeding white pelicans in the Columbia Plateau region, and observations of pelicans foraging below dams when large numbers of salmonid outmigrants are known to be present, may indicate some predation on out-migrating juvenile salmonids. That localized predation and potential impact on salmonid populations is not yet well understood; diet and consumption studies, for example, have not been performed.

Yakama Nation Fisheries biologists believe American White Pelicans may in fact be a significant source of mortality for juvenile salmon of the Yakima River (M. Porter, pers. comm.). Data from 2008–2014 indicate that a total of 7,716 PIT tags (42–46% of 18,237) found on Badger Island belonged to salmon from the Yakima River Basin (Yakama Fisheries program data). Summer and Fall Chinook account for 63% (4,872 tags) of the recovered Yakima tags and preliminary analyses of minimum predation rates by Badger Island pelicans suggest that predation rates on these later migrating (non-ESA-listed) smolts were twice as great as those on (also non-ESA-listed) Yakima River



Figure 8. White pelicans at Horn Rapids (Wanawish) Dam, Yakima River (photo by M. Livingston).

Spring Chinook, and greater than observed by pelicans on ESA-listed Chinook populations from the Upper Columbia River or Snake River (Bird Research NW unpublished data, Evans et al. 2012). Pelican predation on some small (3–4”) age 0 summer and fall Chinook smolts may be a consequence of attraction to abundant populations of Northern Pikeminnow (*Ptychocheilus oregonensis*), Bridge-lip and Largescale Suckers (*Catostomus columbianus*, *C. macrocheilus*), Chiselmouth (*Acrocheilus alutaceus*), Common Carp and other larger (6–12”+) prey in these locations. The Summer and Fall Chinook also migrate in the late spring when flows are dropping and water clarity improves, and are easy prey for terns and gulls, as well as for pelicans. Nonetheless, white pelicans are consistently found in significant numbers on the Yakima River, and during smolt outmigration there may be 150 along the Wapato Reach, and “large numbers” at Horn Rapids (Wanawish) Dam (Fig. 8), and at the outflow of the Prosser Tribal Hatchery (M. Porter, pers. comm.).

Elsewhere, there is concern about white pelican depredation of Yellowstone and Bonneville Cutthroat (*O. clarkii bouvieri*, *O. c. utah*) in Idaho. White pelicans may also prey on several federally threatened species, including Lahontan Cutthroat (*O. c. henshawi*) and suckers in Nevada (Cui-wei, *Chasmistis cujus*), and the Klamath Basin of northern California/southern Oregon (Lost River Sucker [*Deltistes luxatus*], and Short-nose Sucker [*Chasmistes brevirostris*]) (IDFG 2009 2016, Pacific Flyway Council 2012).

The Pacific Flyway Council (2012) developed a policy statement “intended to provide general guidance to member states of the Pacific Flyway when addressing migratory bird predation issues on fish resources in open waters.” It discusses non-lethal and lethal methods to reduce depredation, and permit requirements for lethal control. [A federal permit is not required to harass or scare birds (except eagles and threatened or endangered species), provided (a) birds are not killed or injured and (b) birds sitting on active nests (nests with eggs or chicks present) are not disturbed to the point that it causes the eggs to not hatch or the chicks to die or become injured. A depredation permit is required to destroy an active nest.] If all practicable non-lethal management actions have proved ineffective, managers may apply to the USFWS Regional Migratory Bird Permit Office to lethally take white pelicans through depredation permits. During 2005–2010 in the Pacific Flyway, depredation permits authorized the take of up to 432 pelicans at aquaculture facilities, but only 16 were lethally taken (in California, Colorado, and Wyoming; Pacific Flyway Council 2012). After limited success with non-lethal methods, Idaho Fish and Game has taken white pelicans annually at Blackfoot Reservoir to reduce predation on Yellowstone Cutthroat, with up to 500 nests and 69 adults taken per year since 2012; a revised draft plan has the goal to “maintain viable breeding populations of pelicans in Idaho while reducing impacts to native fish and recreational fisheries” (IDFG 2016).

Piscivorous bird management. The Army Corps of Engineers implemented dissuasion measures (fencing, ropes, and flagging along with human hazing) at Crescent Island in 2015 to get Caspian Terns to disperse from the site (ACOE, Walla Walla District 2014). They also are doing experimental planting of willows (*Salix* spp.) and other native trees in an attempt to make the island less suitable for tern nesting. Dissuasion activities are anticipated to occur each nesting season through 2018. As a result of the dissuasion activities, the large California Gull (*Larus californicus*) colony on Crescent Island also dispersed, with a sizable portion (>3,000 individuals) moving to Badger Island. However, this did not appear to impact pelican nesting activity (D. Lyons, pers. comm.), but California Gulls are known to take unattended eggs at pelican colonies, particularly when colonies are disturbed (Knopf and Evans 2004, Sovada et al. 2013).

MANAGEMENT ACTIVITIES

The Pacific Flyway Council developed a management framework (2012) and a monitoring strategy (2013) for American White Pelicans in the Pacific Flyway. Guidance was needed for agencies and

locations dealing with pelican predation on fish of conservation concern, such as Yellowstone Cutthroat in southern Idaho, Lahontan Cutthroat in Nevada, Eagle Lake Rainbows, and federally listed suckers in California.

Monitoring and research. The Pacific Flyway Council has made a commitment to the long-term coordinated monitoring of all 18 white pelican nesting colonies, with surveys conducted every three years. Monitoring of pelican nesting colonies in Washington and Oregon has generally been done by Bird Research Northwest (birdresearchnw.org), a collaborative project between Oregon State University (Don Lyons, Pete Loschl, Tim Lawes), Real Time Research Inc. (Bend, Oregon; Ken Collis, Allen Evans), and the USGS-Oregon Cooperative Fish and Wildlife Research Unit (Dan Roby). They have been investigating predation by birds on salmonids in the Columbia River system and elsewhere in the Northwest with funding from ACOE and the Bonneville Power Administration. During the nesting season, boat-based counts of the colony on Badger Island are conducted periodically, and high-resolution, vertical aerial photographs are taken of the colony each year during the incubation period as an index to colony size (Bird Research Northwest 2013). WDFW and Yakama Nation biologists conducted surveys of the colony and the Yakima River basin in 2005 and 2006. No other management or research is underway in Washington, but multiple projects have been conducted elsewhere to monitor major colonies, document movement patterns, and investigate genetics, and factors affecting white pelican populations (*see Literature Cited*).

CONCLUSIONS AND RECOMMENDATION

The numbers of American White Pelicans observed in Washington has increased substantially in the last 30 years. In May 2015, 3,267 breeding adults were counted in aerial photos from the Badger Island nesting colony; the large increase in 2015 was likely due to low water conditions elsewhere. In addition, a smaller nesting colony now exists on Miller Sands just inside Oregon waters in the Columbia River estuary. Though the situation for white pelicans has improved, Washington still hosts only a single colony, and white pelicans are notoriously sensitive to disturbance. A single major disturbance could lead to temporary abandonment of the Badger Island colony and failure of at least one nesting season, but such a setback would likely be temporary as long as regional numbers remain high, the nesting island is generally secure, and food resources remain relatively stable. Repeated disturbance during the nesting period, however, could lead to colony abandonment, and it is not clear they would find a secure alternate site in Washington.

Management to address Caspian Tern predation on salmon smolts resulted in a shift of a California Gull colony from Crescent Island to Badger Island; gulls are known to take unattended pelican eggs, but the effect on pelican nest success on Badger Island is unknown. American White Pelicans are also noted for ‘boom and bust’ productivity, and remain at risk to disease, toxins, and extreme weather.

Given the increase in numbers and the new colony in the Columbia River estuary, the white pelican may no longer fit the definition of endangered in Washington, as defined in WAC 232-12-297: Endangered species are, “*seriously threatened with extinction throughout all or a significant portion of its range within the state.*” It is recommended that the American White Pelican be down-listed to state threatened in Washington. A threatened species is, “*likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.*”

LITERATURE CITED

- Ackerman, S. M. 1994. American white pelicans nest successfully at Crescent Island, Washington. *Washington Birds* 3:44-49.
- Ackerman, S. M. 1997. Update: American white pelican colony. *WOS News* 51, October/November. Washington Ornithological Society.
- ACOE (U. S. Army Corps of Engineers), Portland District. 2014. Biological assessment for the continued operations and maintenance dredging program for the Columbia River Federal Navigation Channel. Portland District, U. S. Army Corps of Engineers. 212 pp.
- ACOE (U. S. Army Corps of Engineers), Walla Walla District. 2014. Inland Avian Predation Management Plan. Walla Walla District, U. S. Army Corps of Engineers. 44 pp.
- Adkins, J. Y., D. E. Lyons, P. J. Loschl, D. D. Roby, K. Collis, A. F. Evans, and N. J. Hostetter. 2014. Demographics of piscivorous colonial waterbirds and management implications for ESA-listed salmonids on the Columbia River. *Northwest Science* 88:344-359.
- Anderson, J. T. 1991. Foraging behavior of the American White Pelican (*Pelecanus erythrorhynchos*) in western Nevada. *Colonial Waterbirds* 14:166-172.
- Bird Research Northwest. 2012. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Final 2011 Annual Report, prepared for Bonneville Power Administration and the U.S. Army Corps of Engineers. 171 pp. Available at: <http://www.birdresearchnw.org/Project-Info/publications-reports/default.aspx>
- Bird Research Northwest. 2013. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Bird Research Northwest. Final 2013 Annual Report prepared for Bonneville Power Administration, U.S. Army Corps of Engineers, and the Grant County Public Utility District. 251 pp. Available at: <http://www.birdresearchnw.org/Project-Info/publications-reports/default.aspx>
- Bird Research Northwest. 2014. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Bird Research Northwest. 2014 Final Annual Report prepared for Bonneville Power Administration, U.S. Army Corps of Engineers, and the Grant County Public Utility District. 222 pp. Available at: <http://www.birdresearchnw.org/Project-Info/publications-reports/default.aspx>
- B.C.M.E. 2009. Species Summary: *Pelecanus erythrorhynchos*. B.C. Ministry of Environment. Available at: <http://a100.gov.bc.ca/pub/eswp/>
- Blus, L. J., M. J. Melancon, D. J. Hoffman and C. J. Henny. 1998. Contaminants in eggs of colonial waterbirds and hepatic cytochrome P450 enzyme levels in pipped tern embryos, Washington State. *Archives of Environmental Contamination and Toxicology* 35: 492-497.
- Brown, D. E. 1926. Birds observed at Moses lake, Grant County, Washington. *Murrelet* 7(3):48-51.
- Clapp, R. B., M. K. Klimkiewicz, and J. H. Kennard. 1982. Longevity records of North American birds: Gaviidae through Alcidae. *J. Field Ornithology* 53:81-124.
- Dalton, M. M., P. W. Mote, and A. K. Snover [eds.]. 2013. *Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities*. Washington, DC: Island Press.
- Dawson, W. L., and J. H. Bowles. 1909. *The birds of Washington*. Volume II. Occidental Publishing Company, Seattle, Washington.
- eBird. 2015. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: <http://www.ebird.org>. (Accessed: Date April 22, 2015).
- Espelund, M., and D. Klaveness. 2014. Botulism outbreaks in natural environments— an update. *Frontiers in Microbiology* 5:1-7 (article 287, June 2014).
- Evans, A. F., N. J. Hostetter, D. D. Roby, K. Collis, D.E. Lyons, B.P. Sandford, R. D. Ledgerwood, and S. Sebring. 2012. Systemwide evaluation of avian predation on juvenile salmonids from the Columbia River based on recoveries of passive integrated transponder tags. *Transactions of the American Fisheries Society* 141: 975–989.
- Evans, R. M., and F. L. Knopf. 1993. American White Pelican (*Pelecanus erythrorhynchos*). No. 57 in A. Poole and F. Gill, editors. *The Birds of North America*. Academy of National Science and American Ornithologists Union, Philadelphia, Pennsylvania.
- Evans, A. F., Q. Payton, A. Turecek, B. Cramer, K. Collis, D. D. Roby, P. J. Loschl, L. Sullivan, J. Skalski, M. Weiland, and C. Dotson. 2016. Avian

- Predation on Juvenile Salmonids: Spatial and Temporal Analysis Based on Acoustic and Passive Integrated Transponder Tags. *Transactions of the American Fisheries Society* 145:860–877.
- Hendricks, P., and R. F. Johnson. 2002. Movements and mortality of American White Pelicans fledged in three Montana colonies. Report to the U.S. Fish and Wildlife Service. Montana Natural Heritage Program, Helena. 17 pp.
- IDFG (Idaho Fish & Game) 2009. Management of American White Pelicans in Idaho: A five-year plan (2009–2013) to balance American white pelican and native cutthroat trout conservation needs and manage impacts to recreational fisheries in southeast Idaho. Aug 2009.
- IDFG (Idaho Fish & Game) 2016. Draft management plan for the conservation of American White Pelicans in Idaho, 2016–2025. Idaho Fish and Game, Boise, Idaho. 46 pp.
- Ivey, G. L. and C. P. Herziger. 2006. Intermountain West Waterbird Conservation Plan, Version 1.2. A plan associated with the Waterbird Conservation for the Americas Initiative. Portland, Oregon.
- Jewett, S. G., W. P. Taylor, W. T. Shaw, and J. W. Aldrich. 1953. *Birds of Washington State*. University of Washington Press, Seattle, Washington.
- Jobanek, G. A., and D. B. Marshall. John K. Townsend's 1836 report of the birds of the lower Columbia River region, Oregon and Washington. *Northwestern Naturalist* 73:1-14.
- Johnson, G., N. Nemeth, K. Hale, N. Lindsey, N. Panella, and N. Komar. 2010. Surveillance for West Nile Virus in American White Pelican, Montana, USA, 2006–2007. *Emerging Infectious Diseases* 16(3):406-410.
- Johnson, Jr., R. F. and N. F. Sloan. 1978. White Pelican production and survival of young at Chase Lake National Wildlife Refuge, North Dakota. *Wilson Bulletin* 90(3):346-352.
- Keith, J. O. 2005. An overview of the American White Pelican. *Waterbirds* 28 (Special Publication 1): 9-17.
- King, D. T., and D.W. Anderson. 2005. Recent Population Status of the American White Pelican: A Continental Perspective. *Waterbirds* 28 (Special Publication 1): 48-54.
- Kitchin, E. A. 1934. Distributional check-list of the birds of the state of Washington. *Northwest Fauna Series*. No. 1. Pacific Northwest Bird and Mammal Society. Seattle 28 pp.
- Knopf, F. L., and R. M. Evans. 2004. American White Pelican (*Pelecanus erythrorhynchos*). *The Birds of North America Online* (A. Poole, Ed.) Ithaca: Cornell Lab of Ornithology.
- Kushlan, J. A., M. Steinkamp, K. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R. M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J. E. Saliva, B. Syderman, J. Trapp, J. Wheeler, and K. Wohl. 2002. *Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1*. Waterbird Conservation for the Americas, Washington, DC, USA., 78 pp.
- Lies, M. F. and W. H. Behle. 1966. Status of the White Pelican in the United States and Canada through 1964. *Condor* 68:279-292.
- Madden, E. M. and M. Restani. 2005. History and breeding ecology of the American White Pelican at Medicine Lake National Wildlife Refuge, Montana. *Waterbirds* 28 (Special Publication 1):23-26.
- McMahon, B. F. and R. M. Evans. 1992a. Foraging strategies of American White Pelicans. *Behaviour* 120:69-89.
- McMahon, B. F. and R. M. Evans. 1992b. Nocturnal foraging in the American White Pelican. *Condor* 94:101-109.
- Moreno-Matiella, L. A. and Anderson D. W. 2005. Water level variation and its effects on nesting habitat configuration and availability for the American White Pelican at Clear Lake Reservoir, California. *Waterbirds* 28 (Special Publication 1): 73-82.
- Mote, P. W. and E. P. Salathé Jr. 2010. Future climate in the Pacific Northwest. *Climatic Change*. DOI 10.1007/s10584-010-9848-z
- Motschenbacher, M. D. 1984. The feasibility of restoring a breeding white pelican population in the state of Washington. M. S. Thesis. Washington State University, Pullman. 117 pp.
- Murphy, E. C. 2005. Biology and conservation of the American White Pelican: current status and future challenges. *Waterbirds* 28(Special Publication 1):107-112.
- Murphy, E. C. and J. C. Tracy. 2005. Century-long impacts of increasing human water use on numbers and production of the American White Pelican at Pyramid Lake, Nevada. *Waterbirds* 28(sp1):61-72. 2005.
- Oomen, R. A., M. W. Reudink, and J. J. Nocera. 2011. Mitochondrial evidence for panmixia despite perceived barriers to gene flow in a widely distributed waterbird. *Journal of Heredity* 102(5): 584-592.
- Pacific Flyway Council. 2012. *Pacific Flyway Plan: A Framework for the Management of American White Pelican Depredation on Fish Resources in*

- the Pacific Flyway. Pacific Flyway Council, U.S. Fish and Wildlife Service, Portland, Oregon. 49 pp.
- Pacific Flyway Council. 2013. A Monitoring Strategy for the Western Population of American White Pelicans within the Pacific Flyway. Pacific Flyway Council, U.S. Fish and Wildlife Service, Portland, Oregon. 22 pg.
- Pacific Flyway Council. 2015. American White Pelican. Nongame Migratory Bird Technical Committee, Pacific Flyway Council, U.S. Fish and Wildlife Service, Portland, Oregon. 2 pp.
- Patten, M. A., G. McCaskie, and P. Unitt. 2003. Birds of the Salton Sea: Status, Biogeography, and Ecology. Univ. California Press, Berkeley.
- Paullin, D. G., G. L. Ivey, and C. D. Littlefield. 1988. The re-establishment of American White Pelican nesting in the Malheur-Harney Lakes Basin, Oregon. *Murrelet* 69:61-64.
- Pietz, P. J., M. A. Sovada, C. M. Custer, T. W. Custer, and K. M. Johnson. 2008. Contaminant levels in eggs of American White Pelicans, *Pelecanus erythrorhynchos*, from Chase Lake, North Dakota. *Canadian Field-Naturalist* 122(4):312-315
- Reudink, M. W., C. J. Kyle, J. J. Nocera, R. A. Oomen, M. C. Green, and C. M. Somers. 2011. Panmixia on a continental scale in a widely distributed colonial waterbird. *Biological Journal of the Linnean Society* 102(3): 583–592.
- Ridgely, R. S., T. F. Allnutt, T. Brooks, D. K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.
- Rocke, T., K. Converse, C. Meteyer, and R. McLean. 2005. The impact of disease in American White Pelicans in North America. *Waterbirds* 28: 87–94.
- Ryder, R. A. 1981. Movements and mortality of White Pelicans fledged in Colorado. *Colonial Waterbirds* 4:72-76.
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2013. Version 01.30.2015* [USGS Patuxent Wildlife Research Center, Laurel, MD](http://www.usgs.gov/patuxent-wildlife-research-center)
- Schaller, G. B. 1964. Breeding behavior of the white pelican at Yellowstone Lake, Wyoming. *The Condor* 66:3–23.
- Shuford, W.D. 2005. Historic and current status of the American white pelican breeding in California. *Waterbirds* 28:35–47.
- Shuford, W. D. 2014. Patterns of distribution and abundance of breeding colonial waterbirds in the interior of California, 2009–2012. A report of Point Blue Conservation Science to California Department of Fish and Wildlife and U.S. Fish and Wildlife Service (Region 8). Available at www.fws.gov/mountainprairie/species/birds/western_colonial/.
- Sidle, J. G., W. H. Koonz, and K. Roney. 1985. Status of the American White Pelican: an update. *American Birds* 39:859-864.
- Sloan, N. F. 1982. Status of breeding colonies of White Pelicans in the United States through 1979. *American Birds* 36:250-254.
- Sovada M. A, L. D. Igl, P. J. Pietz, A. J. Bartos. 2014. Influence of Climate Change on Productivity of American White Pelicans, *Pelecanus erythrorhynchos*. *PLoS ONE* 9(1): e83430. doi:10.1371/journal.pone.0083430
- Sovada, M. A., P. J. Pietz, R. O. Woodward, A. J. Bartos, D. A. Buhl, and M. J. Assenmacher. 2013. American white pelicans breeding in the northern plains—Productivity, behavior, movements, and migration: U.S. Geological Survey Scientific Investigations Report 2013–5105, 117 p., <http://pubs.usgs.gov/sir/2013/5105/>.
- Sovada, M. A., P. J. Pietz, K. A. Converse, D. T. King, E. K. Hofmeister, P. Scherr, and H. S. Ip. 2008. Impact of West Nile virus and other mortality factors on American white pelicans at breeding colonies in the northern plains of North America. *Biological Conservation* 141:1021-1031.
- Strait, L. E. and N. F. Sloan. 1975. Movements and mortality of juvenile White Pelicans from North Dakota. *Wilson Bull.* 87:54-59.
- Stapp, P., and G. D. Hayward. 2002. Estimates of predator consumption of Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouvieri*) in Yellowstone Lake. *Journal of Freshwater Ecology* 17(2):319-329.
- Tate, Jr., J., D. J. Tate. 1982. The Blue List for 1982. *American Birds* 36(2):126-135
- Thompson, B. H. 1933. History and present status of the breeding colonies of the White Pelican (*Pelecanus erythrorhynchos*) in the United States. U.S. Dept. Interior, Contr. Wildl. Div. Occasional Paper No. 1.
- USFWS. 2013. Designation of Critical Habitat for Taylor’s Checkerspot Butterfly and Streaked Horned Lark: Final Rule. *Federal Register / Vol. 78, No. 192 (Thursday, October 3, 2013): 61506-61589.*
- Wahl, T.R. 2005. American White Pelican (*Pelecanus erythrorhynchos*). Pages 95-96 in Wahl, T.R., B. Tweit, and S.G. Mlodinow (Editors), *The Birds of Washington: status and distribution*. Oregon State University Press, Corvallis, Oregon.
- Wiemeyer, S. N., J. F. Miesner, P. L. Tuttle, and E. C. Murphy. 2005. Organochlorine contaminants in

the American White Pelican breeding at Pyramid Lake, Nevada. *Waterbirds* 28 (Special Publication 1): 95–101.

Wiemeyer, S. N., J. F. Miesner, P. L. Tuttle, E. C. Murphy, L. Sileo, and D. Withers. 2007. Mercury

and selenium in American White Pelicans breeding at Pyramid Lake, Nevada. *Waterbirds* 30: 284–295.

Yates, M. 1999. Satellite and conventional telemetry study of American White Pelicans in northern Nevada. *Great Basin Birds* 2:4-12.

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American White Pelicans (*photo by Joe Higbee*).

WASHINGTON STATE STATUS REPORTS, PERIODIC STATUS REVIEWS, RECOVERY PLANS, AND CONSERVATION PLANS

Status Reports

2015 Tufted Puffin
2007 Bald Eagle
2005 Mazama Pocket Gopher,
Streaked Horned Lark, and
Taylor's Checkerspot
2005 Aleutian Canada Goose
2004 Killer Whale
2002 Peregrine Falcon
2000 Common Loon
1999 Northern Leopard Frog
1999 Olympic Mudminnow
1999 Mardon Skipper
1999 Lynx Update
1998 Fisher
1998 Margined Sculpin
1998 Pygmy Whitefish
1998 Sharp-tailed Grouse
1998 Sage-grouse
1997 Aleutian Canada Goose
1997 Gray Whale
1997 Olive Ridley Sea Turtle
1997 Oregon Spotted Frog
1993 Larch Mountain Salamander
1993 Lynx
1993 Marbled Murrelet
1993 Oregon Silverspot Butterfly
1993 Pygmy Rabbit
1993 Steller Sea Lion
1993 Western Gray Squirrel
1993 Western Pond Turtle

Periodic Status Reviews

2016 Streaked Horned lark
2016 Killer Whale
2016 Greater Sage-grouse
2016 Northern Spotted Owl
2016 Snowy Plover
2016 Western Gray Squirrel
2015 Brown Pelican
2015 Steller Sea Lion

Recovery Plans

2012 Columbian Sharp-tailed Grouse
2011 Gray Wolf
2011 Pygmy Rabbit: Addendum
2007 Western Gray Squirrel
2006 Fisher
2004 Sea Otter
2004 Greater Sage-Grouse
2003 Pygmy Rabbit: Addendum
2002 Sandhill Crane
2001 Pygmy Rabbit: Addendum
2001 Lynx
1999 Western Pond Turtle
1996 Ferruginous Hawk
1995 Pygmy Rabbit
1995 Upland Sandpiper

Conservation Plans

2013 Bats

Status reports and plans are available on the WDFW website at:
<http://wdfw.wa.gov/publications/search.php>



