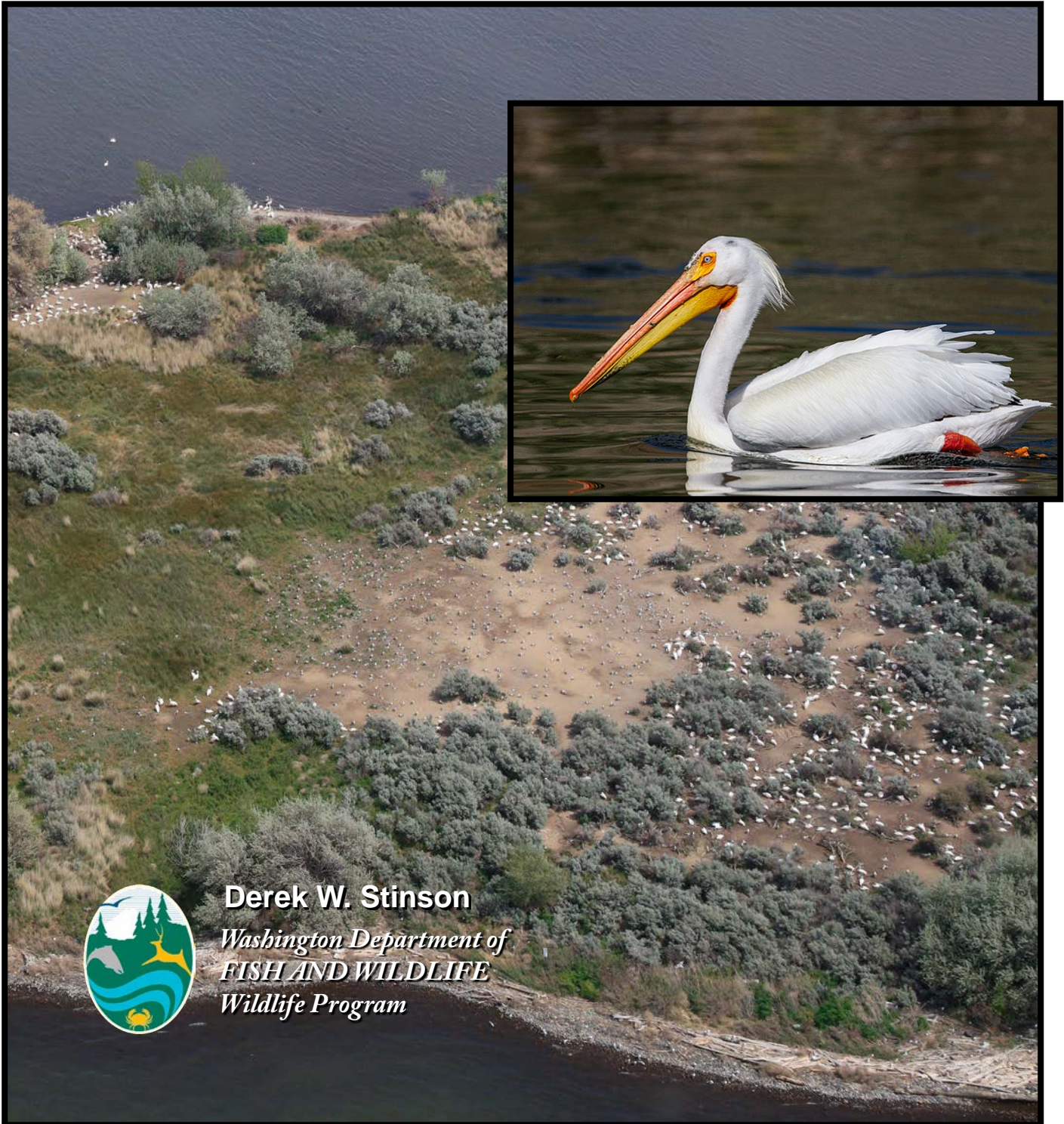


# Periodic Status Review for the American White Pelican



**Derek W. Stinson**  
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The Washington Department of Fish and Wildlife maintains a list of endangered, threatened, and sensitive species (Washington Administrative Codes 220-610-010 and 220-200-100). 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 220-610-110). 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 is a periodic status review for the American White Pelican in Washington. The draft periodic status review was reviewed by species experts and biologists from state, tribal, and federal agencies. It was available for a 90-day public comment period from 3 February–4 May 2022. Comments received were considered during the preparation of this final periodic status review. The Fish and Wildlife Commission voted on 23 September 2022 to downlist the American White Pelican to sensitive in Washington.

**This report should be cited as:**

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*On the cover: photo of pelican in Grant County by Joe Higbee; aerial background of Badger Island by Joe Evenson.*



*This work was supported in part by personalized and endangered species license plates*



# Periodic Status Review for the American White Pelican in Washington



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## EXECUTIVE SUMMARY

The American White Pelican (*Pelecanus erythrorhynchos*) is a large, colonial nesting bird that eats mostly nongame fish, such as carp, suckers, and sticklebacks, as well as amphibians and crayfish, but sometimes feeds on salmonids. The breeding population and range of the American White Pelican (or ‘white pelican’) were reduced throughout the 19<sup>th</sup> and early 20<sup>th</sup> century due to habitat loss, persecution, and pesticide contaminants, especially DDT. The species was listed as state endangered in Washington in 1981, but populations have since recovered from pre-1970 declines. Western colonies of white pelicans contained an estimated 50,400 breeding adults in 2018 and the species was down-listed to state threatened in Washington in 2017. Despite overall improved status, the species remains of some conservation concern, primarily because of the concentration of birds on relatively few breeding colonies, and their vulnerability to disturbance and water level fluctuations. At the federal level, white pelicans are not listed under the Endangered Species Act but are a protected species under the Migratory Bird Treaty Act.

In 1994, after an absence of breeding for ~50 years in Washington, a breeding colony established on an island in the Columbia River north of the mouth of the Walla Walla River. Since that time, the number of white pelicans nesting in that section of the Columbia River has grown steadily, with an estimated 5,594 breeding adults present in 2018, and 3,655 estimated from oblique aerial photos in 2019. In 2010, another colony formed on Miller Sands Spit in Oregon waters of the Columbia River estuary that has hosted up to several hundred nesting birds, but has been abandoned due to disturbance in recent years, with some shifting to re-nest on Rice Island. Inland waters of eastern Washington also seasonally host significant numbers of non-breeding (1–2 year-old) 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, though many are likely adults from Badger Island; smaller numbers remain in winter, but most winter in southern California.

Although the diet of white pelicans often consists mostly of carp and suckers, they can be a significant source of mortality on gamefish and do consume some fish of conservation concern. White pelicans are large conspicuous birds, and many observers assume they are impacting salmonid runs, but the pelicans nesting at Badger Island and Miller Sand Spit colonies do not appear to be an important source of mortality for most ESA-listed juvenile salmonids. However, a recent analysis of Upriver Bright Fall Chinook indicated that pelicans from the Badger Island colony can have a significant impact on that run, and other observations suggest that impacts on other runs are significant at certain times and places in tributaries (e.g., hatchery outflows during low water).

The western population of white pelicans has recovered substantially, and given the size of the Badger Island colony and number of non-breeding white pelicans in Washington during the past several years, a change in listing could be considered. The species remains somewhat vulnerable, however, as only the single colony regularly forms in Washington, and white pelican colonies are highly sensitive to disturbances; adults will desert and/or leave eggs and young exposed to predation following disturbances. We recommend the species be down-listed to Sensitive. A Sensitive species is, “vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats” (WAC 220-610-110).

## INTRODUCTION

This document is an update of the 2016 periodic status review, with recent data from colony counts and a brief discussion of recent management activities and issues surrounding conflicts with Columbia River fisheries. The document concludes with a recommendation to revise the species classification.



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

## DESCRIPTION AND LEGAL STATUS

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 sometimes foraging cooperatively in coordinated swimming groups to encircle fish.

The species was down-listed from state endangered to threatened in Washington in 2017. They are not listed under the federal Endangered Species Act, but are protected under the Migratory Bird Treaty Act. The species is ‘red’-listed in British Columbia (B.C. Conservation Data Center 2008).

## DISTRIBUTION

The American White Pelican is widespread in much of western and southeastern North America (Fig. 2). It is frequently encountered at lakes, reservoirs, and rivers and breeds at widely scattered island colonies. Pelicans that breed at colonies east of the Continental Divide migrate southeast toward the gulf coast and Mexico to winter (Evans & 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 & Evans 2004). In Washington, small numbers of white pelicans are seen in winter along major rivers in the Columbia basin (Wahl 2005; eBird 2021).

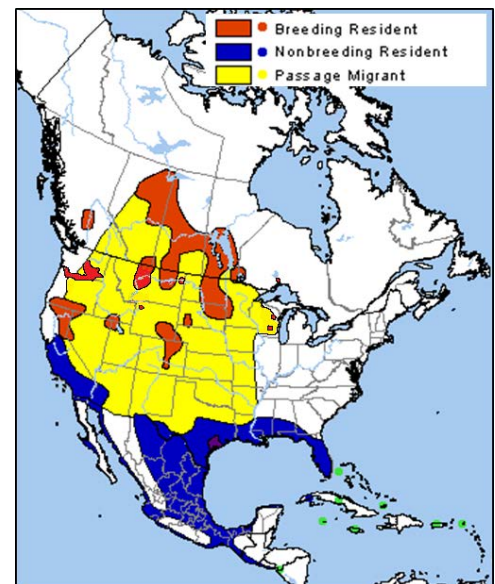


Figure 2. Range of American White Pelican (modified from: Ridgely and others 2003).

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 and others 2011; Reudink and others 2011). The population east of the Continental Divide is about three times larger than the western population (King & Anderson 2005).

## 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 & 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, winter inland on large rivers, reservoirs, and areas below dams that remain ice-free.

**Diet and foraging.** There have been no diet studies in Washington, but American White Pelicans generally feed largely on nongame or "rough" fish, mostly small schooling fishes (<1/2 bill length), but also larger bottom feeding species (Harper and others 2004, Knopf & Evans 2020). Common prey items include carp (*Cyprinus carpio*), suckers (*Catostomus* spp.), Three-spined Sticklebacks (*Gasterosteus aculeatus*), bullheads (*Ameiurus* spp.), chub (*Couesius* spp.), and other minnows (*Cyprinidae*). They also prey on Tiger Salamanders (*Ambystoma tigrinum*), and crayfish (*Cambaridae*) (Evans & Knopf 1993; Pacific Flyway Council 2012). The few data from Washington are consistent with studies elsewhere; two pelican carcasses picked up on the lower Yakima River contained a sucker and a chiselmouth (*Acrocheilus alutaceus*) (Stephenson and Fast 2005), and two pelicans captured at McNary Dam regurgitated a steelhead (*Onchorynchos mykiss*), a carp, and 2 suckers that were all headless, likely casualties of the dam turbines, and pelicans were observed swallowing American Shad (*Alosa sapidissima*) and suckers (Tiller and others 2004).

White pelicans are opportunists, however, and will feed on game fishes, such as trout and juvenile salmon, particularly when they are concentrated and vulnerable such as spawning runs or during juvenile outmigration (Stapp & Hayward 2002; Knopf & Evans 2020). This is confirmed by PIT tags from salmon detected on Badger Island and at a pelican loafing site below John Day Dam (Roby and others 2017; Collis and others 2020; Cramer and others 2021; E. Grosvenor 2020, pers. comm.; see discussion under *Fisheries conflicts and piscivorous bird management*). White pelicans can also be a problem at aquaculture facilities on their winter range, and where stocked hatchery trout are concentrated (IDFG 2009, 2016; 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 & 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 & 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 & Evans 1992b). White pelicans will also pirate fish from other species, such as Double-crested Cormorants (*Phalacrocorax auritus*) (Anderson 1991).

White pelicans often forage within 50 km of the colony during the nesting season, but are capable of making long-distance foraging flights in order to find prey fish; they will make use of thermals to travel much longer distances to forage when necessary (Evans & Knopf 1993). For example, Payton and others (2020) recovered PIT tags on the Badger Island pelican colony that were from subyearling Chinook salmon (*Oncorhynchus tshawytscha*) known to have survived migration to John Day Dam, over 150 km downstream of Badger Island. Telemetry indicated that birds from a Nevada colony took advantage of air currents and thermals, occasionally flying over the Sierra Nevada to foraging sites in California's Central Valley from Nevada colonies; round trips exceeding 200 mi (322 km) were a "common occurrence" (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 lakes up to 103 mi (165 km) away, across an 11,580 mi<sup>2</sup> (30,000 km<sup>2</sup>) area (Harper and others 2004).

**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 & Knopf 1993). Generally, only one of the chicks survives. White pelican chicks are somewhat mobile by 3 weeks of age and begin forming into crèches while their parents are away. Once chicks are old enough to join the crèches, parent birds may begin staying at foraging areas for extended periods of time before returning to the colony to feed their chicks. Chicks make their first flights at 9–10 weeks of age and depart the colony to join adults at foraging areas when they are about 10–11 weeks old. White pelicans are capable of breeding for the first time at 3 years of age (Evans & Knopf 1993). Banded pelicans in Montana generally returned to their natal colony, and movements between Montana colonies were rare (Hendricks & 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 white pelicans can live to >26 years of age (Clapp and others 1982).

**Sources of mortality.** Severe weather, disease (e.g., botulism and West Nile Virus), collision with wires or objects, and exposure to contaminants can occasionally be major causes of mortality for adult white pelicans, but predation as a source of adult mortality is rare. Shooting was a historically significant source of adult mortality, but may no longer be a major factor in the United States (Strait & Sloan 1975; Hendricks & Johnson 2002). Prolonged cold, wet, and windy conditions, especially during the critical transition period between brooding and crèche formation, can dramatically affect chick survival (Rocke and others 2005; Sovada and others 2013). Cold weather and hailstorms resulted in >50% mortality of the chicks in the Medicine Lake National Wildlife Refuge (NWR) in Montana in 1940, 1954, and 1993 (Madden & Restani 2005).

Predation associated with disturbances at breeding sites can be a major mortality factor for white pelican eggs and chicks, particularly hatchlings <3 weeks of age (Evans & Knopf 1993). Gulls (*Larus* spp.) and Common Ravens (*Corvus corax*) can take eggs, whereas, Great Horned Owls (*Bubo virginianus*), Bald Eagles



(*Haliaeetus leucocephalus*), and Black-crowned Night-Herons (*Nycticorax nycticorax*) may prey on the hatched young. Egg predation by gulls can be substantial if the colony is disturbed by human activity or a mammalian predator. Mammals, particularly Coyotes (*Canis latrans*) and Red Foxes (*Vulpes vulpes*) are not usually a problem at island colonies except when low water levels expose a land bridge. Bald Eagles, River Otters (*Lontra canadensis*), and humans have been responsible for disturbances at the Miller Sand Spit 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., on foot, boat, or plane) can cause pelicans to abandon nests or entire colonies for the breeding season (Evans & Knopf 1993).

## POPULATION AND HABITAT STATUS

**Range-wide population trends.** The population and range of American White Pelicans were reduced throughout the 19<sup>th</sup> and early 20<sup>th</sup> century due to habitat loss resulting from water projects, persecution, and contaminants, such as DDT. For example, a loss of ~90% of wetland habitat in California, led to the reduction from 11 known colonies in the 19<sup>th</sup> century to only one colony in 1932 (Shuford 2005). Historically, and to a lesser extent now, white pelicans have been shot for ‘sport’, feathers, or to alleviate suspected impacts to fisheries. Studies have clearly shown that white pelicans seldom prey on the same fish sought by people (Knopf & Evans 2020), but adult pelicans have still been shot, young pelicans clubbed, and pelican eggs broken in an attempt to ‘protect’ fisheries. During the 1920s, pelicans were even shot and eggs destroyed 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 & 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, and recent survey-wide Breeding Bird Survey data suggested an average annual increase ~5% (CI: 3.08-7.64) from 1993–2013 (Sauer and others 2020). The number of known breeding colonies increased from 43 in the 1960s, to 55 in 1980, while total breeding adults appeared to increase from 63,000 to 109,000 (Sidle and others 1985; Keith 2005). The total number of nests at 20 breeding colonies that were surveyed during 1979–1981 and again in 1998–2001 doubled (King & Anderson 2005); the estimate for 1998–2001 was 134,000 breeding adults, and a total of ~157,000 birds.

Despite their increasing population size, the American White Pelican retains some conservation concern. They have a history of ‘boom and bust’ productivity, are concentrated on relatively few breeding colonies, and are vulnerable to disturbance, water level fluctuations, and disease. 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 & Anderson 2005); only 4 large breeding colonies in the northern Great Plains account for 84,000 adults (Sovada and others 2013).

**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 and Arod lakes, 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 and others 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 was only about 16,000 birds at 5–8 colonies (Paullin and others 1988; IDFG 2009; Pacific Flyway Council 2012). Since the 1980s, the western population has increased substantially, and several new colonies have formed (Fig. 3); Moulton and others (2018) suggested that the increasing trend from the late 1970s to 2001 reported by King & Anderson (2005), likely continued through at least 2007. The 2018 western population estimate is 50,402 breeding adults at 17 colonies (Table 1; Pacific Flyway Council 2021). However, approximately 58.9% of the population occurs at only two colonies, and one of these (Gunnison Island) is at great risk of falling water levels of Great Salt Lake due to excess diversions (Wurtsbaugh and others 2017). The eight largest colonies comprise 90% of the western population (Pacific Flyway Council 2021). Moulton and others (2018) assessed abundance and trends for 10 colonies with adequate data; these colonies increased from 13,614 in 1981, to 40,864 in 2014, an increase of 200%; most of the increase occurred prior to 2000. Average production of

Figure 3. White Pelican colony locations and sizes in the western population, 2018 (Pacific Flyway Council 2021).

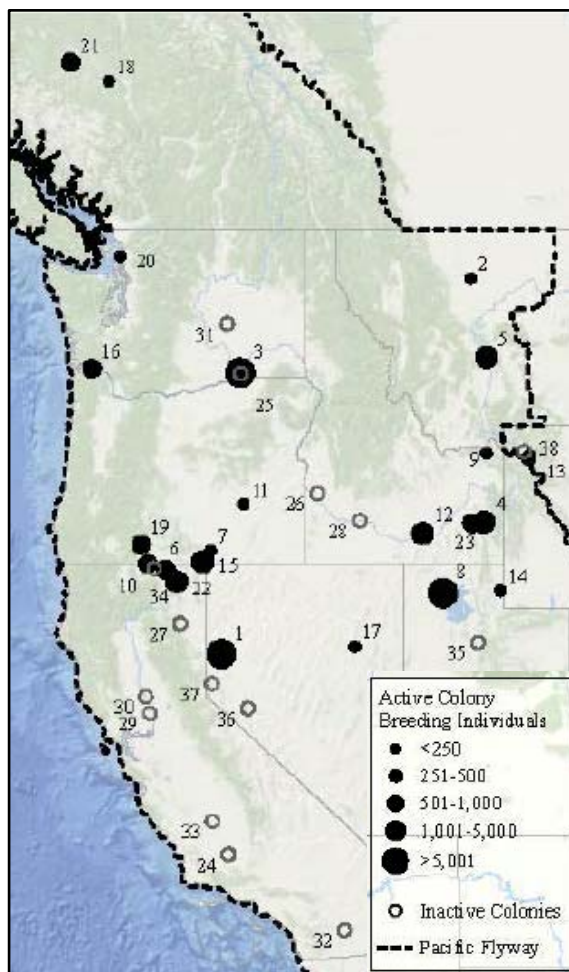


Table 1. Estimated number of breeding American White Pelicans at western colonies in 2018 (Pacific Flyway Council 2021).

Colony Name/map number	State	Number
1 Anaho Island NWR	NV	19,000
2 Arod Lake	MT	-
3 Badger Island, McNary NWR	WA	5,616
4 Blackfoot Reservoir	ID	1,416
5 Canyon Ferry Lake	MT	3,286
6 Clear Lake NWR	CA	830
7 Crump Lake	OR	0
8 Gunnison Island WMA	UT	10,664
9 Island Park Reservoir	ID	0
10 Lower Klamath NWR	CA	778
11 Malheur NWR	OR	144
12 Minidoka NWR	ID	3,676
13 Molly Lake, Yellowstone NP	WY	394
14 Neponsit Reservoir	UT	50
15 Pelican Lake	OR	1,174
16 Miller Sand Spit/Rice Island	OR	796
17 Ruby Lakes NWR	NV	-
18 Stum Lake	BC	88
19 Upper Klamath NWR	OR	770
20 Padilla Bay <sup>1</sup>	WA	0
21 Puntzi Lake	BC	592
22 Fairchild Swamp	CA	1,128
23 Chesterfield Reservoir	ID	-
<b>Total</b>		<b>50,402</b>

<sup>1</sup>Padilla Bay colony abruptly abandoned in 2018; inactive 2019-2020; active with ~40 nests in June 2021.

fledglings/nest declined 3.9%/year from 1981 to 2013. Moulton and others (2018) suggested white pelican populations in the west are approaching carrying capacity.

**Washington population status.** In Washington, American White Pelicans were recorded in the Columbia River estuary by Lewis and Clark in 1805, and in the 1830s by John K. Townsend who said that in spring, “they retire inland to breed” (Jobanek & Marshall 1992). White pelicans historically nested in eastern Washington at Moses Lake, possibly Sprague Lake, and perhaps a few other lakes (Dawson & Bowles 1909, Jewett and others 1953). The first published record of nesting in Washington was in 1926 at Moses Lake, Grant County (Brown 1926); that colony may have persisted through the 1930s. Motschenbacher (1984) noted that a long-time resident recalled that up to ~500 pelicans were present seasonally on Moses Lake from 1902 until the 1940s. 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 of white pelicans established on Crescent Island, Walla Walla County. The source of the pelicans that initiated the colony is not known, but 13 band recoveries or observations of patagial markers in Washington were birds marked at Stum Lake, British Columbia (VanSpall and others 2005); and single band recoveries were from eastern Montana and Klamath NWR (Stephenson and Fast 2005). The island is part of McNary NWR and was constructed in 1985 for nesting birds in the Columbia River (Ackerman 1994, 1997). In 1997, pelicans began nesting on nearby Badger Island, also in McNary NWR, and ceased nesting on Crescent Island after 1998 (Fig. 4). Since that time, the colony has grown to over 2,500 breeding pairs (Fig. 5). Increases after 2014 may reflect an influx of birds from Malheur Lake in Oregon



Figure 4. Badger Island (yellow arrow) and Crescent Island (blue arrow; from *Bird Research Northwest*) in the Columbia River, McNary National Wildlife Refuge (left); pelican nesting aggregation (right) on Badger Island, 2018 (photo by J. Evenson).

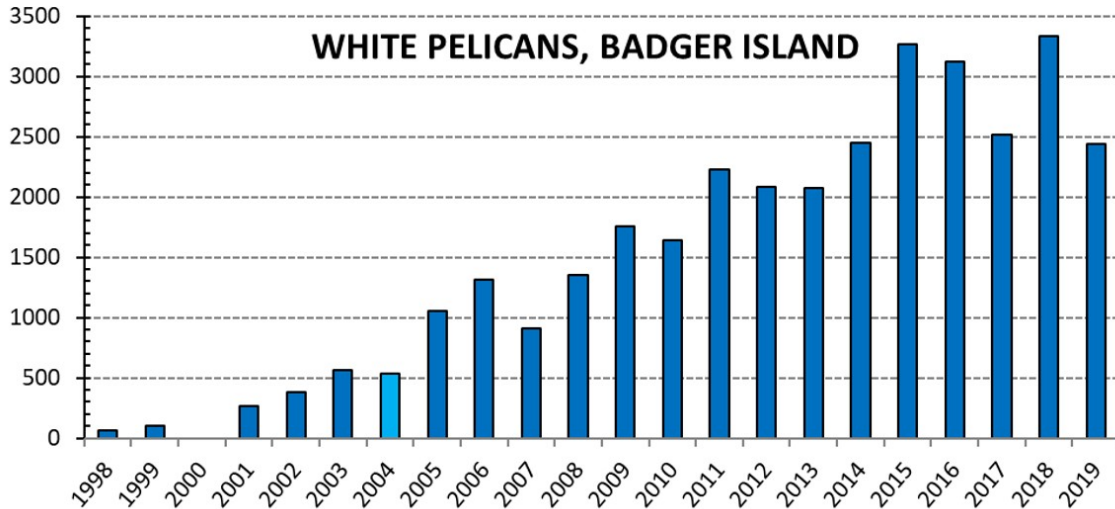


Figure 5. Number of American White Pelicans counted in aerial photos of the Badger Island colony, 1997–2019 (based on high resolution photos from fixed-wing or drone aircraft; some birds are obscured by vegetation; low-resolution oblique photos were taken in 2004 and more birds may have been obscured by vegetation; data from Bird Research Northwest, and WDFW; a 2018 nest count from high resolution drone photos revealed 2,797 nests, or ~5,500 breeders; see text for discussion of correction factor).

where no nesting occurred in 2015-2018 due to drought conditions. A mean of 3,330 white pelicans was counted in aerial photos (by drone) from May 2018. Raw counts of pelicans from aerial photos are often multiplied by 1.5 to account for birds off foraging to estimate the number of adults (Pacific Flyway Council 2018), which produced an estimate of 4,995. The photos taken by drone, however, were high enough resolution to provide a count of 2,797 ( $\pm 43$ ) nests; 2 adults per nest indicate the higher estimate of 5,594 breeding adults (T. Lawes 2021, pers. comm.). Our raw count from oblique aerials on 6 May 2019 was 2,437; if adjusted ( $\times 1.5$ ) there were 3,655 adults associated with the colony, but adults could not always be distinguished from large chicks in our photos (WDFW data; no photos were obtained in 2020 due to Covid-19 restrictions on activities). It is not clear if the somewhat lower count compared to 2018 is an artifact of the difference in methods (vertical drone, vs. oblique aerial), or represents a decline; some birds may have resumed breeding at Malheur NWR.

The first nesting record of white pelicans in the Columbia River estuary occurred at Miller Sands Spit, Clatsop County, Oregon, in 2010 (Fig. 6). In July 2011, an on-colony survey on the island indicated a colony size of about 97 breeding pairs (Bird Research Northwest 2012). A boat-based survey in April



Figure 6. Location of Miller Sands Spit, Clatsop County, Oregon, in the Columbia River.

2015, counted 261 adults and 144 nests (<http://www.birdresearchnw.org>). In 2016, 492 adults and 351 nests were present in May, but the colony was abandoned in June (P. Loschl, pers. comm.). In 2017 and 2018, the colony was again abandoned near the end of May, but many pelicans shifted to re-nest on nearby Rice Island by early June (T. Lawes 2021, pers. comm.). Counts from aerial photos of Rice Island indicated there were 102 breeding pairs in 2017, and 398 birds in 2018 following abandonment of Miller Sands Spit. In 2019, pelicans were present on Miller Sands Spit in early June, but no additional data are available (T. Lawes 2021, pers. comm.).

Another small colony was initiated on an island in Padilla Bay in Skagit County in 2017; it apparently produced about 18 chicks (S. Ehler 2018, pers. comm.). The colony formed again in 2018 and nesting activities began, but the colony was abruptly abandoned around July 4<sup>th</sup> for unknown reasons (R. Waddell 2021, pers. comm.). There was no nesting activity reported there, or anywhere in the Puget Sound region in 2019 or 2020. The colony formed again in 2021, with 40–50 nests as of 28 June, but had abandoned by 5 July, though up to 300 pelicans continued to forage in Padilla Bay, with 200 there on 14 September (S. Ehler, pers. comm., 2021). Up to 200 white pelicans have also been observed at Deer Lagoon off Useless Bay, Whidbey Island, each year since 2016; pelicans arrived in early April and the last departed in early October (eBird 2021); no nesting activity has been observed, and it isn't clear if the small islands there would provide a secure colony site.

**Nonbreeding and wintering birds.** Increasing numbers of non-breeding white pelicans have 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 2015, pers. comm.). Numbers vary greatly during the summer; a tally of the high count of eBird records at unique locations for the week of 23-31 May 2021 was 2,073 birds (eBird 2022), with a portion of these likely birds from the colony while others representing nonbreeding offspring of the previous two years. Peak numbers observed in late summer in the Potholes region are up to 2,000 birds. A smaller number of pelicans overwinter in Washington; most of these birds can be found on the Columbia River, particularly from Priest Rapids Dam to the Walla Walla River delta, in concentrations ranging from 40–300 birds (Wahl 2005), and smaller numbers elsewhere on the Columbia, Snake, and Yakima rivers and on marine waters west of the Cascades (eBird 2021). 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.

**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 to control human disturbances to nesting pelicans that might cause abandonment of the colony. Shallow waters surrounding the island provide isolation from the main river channel and most recreational boating during the breeding season. Further, the island and all waters within ¼ mile are designated as a state game reserve closed to hunting and trapping (WAC 220-411-020). 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 recently planted willows to dissuade Caspian Terns (*Hydroprogne caspia*) from nesting on Crescent Island (Collis and others 2019). The habitat change may or may not preclude white

pelicans from resuming nesting on Crescent in the future.

Miller Sands Spit is in Clatsop County, Oregon, near the southwest corner of Wahkiakum County, Washington (Fig. 7). It is a 117 acre horseshoe-shaped island in the lower Columbia River estuary, from approximate river mile 22.2 to 24.6 (ACOE, Portland District 2014). Historically, the site was created 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. Miller Sands Spit is designated as critical habitat for Streaked Horned Larks (*Eremophila alpestris strigata*; USFWS 2013). In September 2012, after nesting activities were concluded and pelicans had departed the island, the 2010–2012 nesting area on the island 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 became a protected species under the Migratory Bird Treaty Act in 1972 (Strait & Sloan 1975). White pelicans have increased dramatically in recent decades, suggesting that this protection has been adequate. The nesting colony on Badger Island is part of McNary NWR and is protected from other uses and is closed to the public during the nesting season.

**State protections.** The American White Pelican is listed as threatened in Washington and is protected from ‘take’ in state law (WAC 220-200-100, 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. The white pelican is listed as a ‘Sensitive’ species in the East Cascades and Blue Mountains ecoregions of Oregon (ODFW 2019).

### Factors Affecting Populations

Although white pelicans have recovered substantially since the mid-20<sup>th</sup> century, populations remain somewhat vulnerable. 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) increased severe weather due to climate change.

**Habitat loss, water level fluctuations, and water quality.** Water diversion and draining of wetlands for agriculture historically destroyed or degraded many traditional feeding, breeding, and loafing areas in the Pacific Flyway and throughout North America (Kushlan and others 2002; Pacific Flyway Council 2012). 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. Allocation of water continues to be a contentious issue in western states because water resources are limited, and droughts intensify conflicts. Unsustainable pumping of water from aquifers may affect surface water bodies used by pelicans for foraging if drought becomes more common. The continued, competing demand for water for agricultural, urban, and fisheries uses may be the greatest long-term threat to white pelicans (Ivey and Herziger 2006). Low water levels can affect or eliminate pelican nesting at colonies by exposing land bridges that allow predator access; unpredictable water levels can cause flooding of nests, eggs, and hatchlings (Moreno-Matiella & Anderson 2005; Murphy & Tracy 2005; Pacific Flyway Council 2012). 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 Salton Sea in southern California is an important stopover and wintering site, hosting 65–85% of the western population of white pelicans 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 and others 2003; Shuford 2014).

**Human disturbance.** Although relatively tolerant of humans at 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 human activities (Evans & Knopf 1993). Even boats and airplanes in the vicinity of a colony may cause pelicans to temporarily leave the colony or abandon it altogether. In a recent case, the pelican colony on Miller Sands Spit 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 the disturbance were taken to a rehabilitation facility by researchers (Bird Research Northwest, weekly update 7/7-7/13/14 [<http://www.birdresearchnw.org/project-info/weekly-update/columbia-river-estuary/2014-updates/>]). The Miller Sands Spit colony was again abandoned in 2016, 2017, 2018, and 2020, likely due to human disturbances. In 2018 and 2020, following the abandonment at Miller Sands Spit, some portion of the displaced pelicans shifted to Rice Island to re-nest (T. Lawes 2021, pers. comm.).

**Disease-botulism and West Nile Virus.** Outbreaks of botulism and West Nile Virus can be a significant source of mortality for white pelicans. Since 1980, numerous outbreaks of avian botulism caused by *Clostridium botulinum* type C (Madden & Restani 2005; Rocke and others 2005) have resulted in large-scale white pelican mortality events or die-offs. Outbreaks of type C botulism are somewhat unpredictable, but are often associated with low water levels, high summer surface temperatures, and abundant filamentous algae (Espelund & Klaveness 2014). Type C botulism spreads through necrophagous flies depositing eggs on dead 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). West Nile Virus (WNV) associated deaths of white pelican chicks were reported at various nesting colonies after 2002 (Johnson and others 2010). In Washington, WNV was diagnosed in a pelican from Potholes Reservoir in the fall of 2010 (Cramer and others 2021). WNV was the presumed cause of >9,000 white pelican deaths in 7 states in 2002–2003 (Rocke and others 2005; Johnson and others 2010). Prior to the arrival of WNV in the northern Great Plains, chick mortality rates in late breeding season were <5%, but in subsequent years were as high as 44% (Sovada and others 2008).

**Climate change and severe weather.** White pelican colonies in the northern Great Plains may be experiencing population level effects attributable to impacts from climate change. Moulton and others (2018) noted that the median latitude of colonies active since 2010 has shifted northward 114 km compared to colonies active up through the 1960s. The median latitude of the six newest colonies is 360 km north of the rest of the currently active colonies (Moulton and others 2018). This shift may be related to more frequent droughts and earlier spring weather predicted for the western states (Wehner and others 2017). Spring arrival of pelicans at Chase Lake NWR 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 chicks due to severe weather events than occurred under the 1965-based phenology pattern. Cold and wet weather and severe storms resulted in the death of thousands of chicks in 2005–2008 at colonies on the northern Plains (Sovada and others 2014).

In the future, negative impacts from cold and wet weather may occur with increasing frequency in Washington; most climate models predict an increase in precipitation in spring and more days with >1 inch of precipitation (Dalton and others 2013). A severe rainstorm occurred in the area of Badger Island in May 2015, and rain accompanied by unseasonal cold occurred in May 2013 (H. Newsome 2015, pers. comm.); the effects on pelican productivity were not assessed. Some breeding colonies will probably also be affected by droughts, if droughts increase in frequency and severity as climate models suggest (Mote & Salathé 2010). The increase in pelican numbers 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 drought cycles might affect the Badger Island colony.

**Pesticides and contaminants.** Bio-accumulation of mercury and selenium can be an issue of concern for fish-eating birds. Many wetlands in the arid West are affected by mercury or selenium and insecticides, fertilizers and other agricultural pollutants. Population increases for white pelicans 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 added pelican eggs collected on Crescent Island in 1994 (Blus and others 1998). Recent samples from colonies in Nevada and North Dakota were also below levels determined to affect reproduction (Wiemeyer and others 2005, Pietz et al 2008). Wiemeyer and others (2007) evaluated mercury and selenium in white pelicans breeding at Pyramid Lake, Nevada and found that concentrations in eggs were generally low, but some adult pelicans had elevated mercury concentrations in their livers.

**Fisheries conflicts and piscivorous bird management.** Although white pelicans typically forage on species that do not bring them into conflict with fishery resources (i.e., carp, suckers, minnows, Tiger Salamanders), and also prey on piscivorous fish (e.g. pike minnows; Harper and others 1999), they do consume some fish species of conservation concern or that have economic and/or recreational value (Pacific Flyway Council 2012). Avian predation on the 13 federal ESA-listed salmonid (*Oncorhynchus* spp.) distinct population segments in the Columbia River basin has been an on-going concern in the recovery of those fish stocks. The numbers of pelicans breeding at the Badger Island colony and non-breeding pelicans along the Columbia, Snake, and Yakima rivers have increased substantially during the past two decades (Wahl 2005; Adkins and others 2014; Bird Research Northwest 2014), and predation by pelicans appears to be non-trivial for certain salmon runs and species of conservation concern (Payton and others 2020, Evans and others 2022). Foraging



white pelicans often exploit vulnerable concentrations of easily accessible fish, which likely includes smolts concentrated during passage through hydropower dams on the Columbia River. Observations of pelicans foraging below dams (Figs. 7, 8), and the recovery of PIT tags from smolts deposited on the Badger Island colony (Bird Research Northwest 2012; Evans and others 2019; Collis and others 2020), and on a small island at Preacher’s Eddy below John Day Dam (E. Grosvenor 2020, pers. comm.) have confirmed that some predation is occurring.

Although other bird species (Caspian Terns, *Hydroprogne caspia*; Double-crested Cormorants; gulls, *Larus californicus* and *L. delawarensis*) seem to be the principal avian predators of the juvenile outmigrants of most ESA-listed salmon runs (Collis and others 2001; Evans and others 2012, 2016, 2019, 2022; Hostetter and others 2015), predation by pelicans seems to be significant for some species and runs. For example, the pelicans and gulls from Badger Island (as well as the cormorant colony on Foundation Island) often consumed a larger proportion of available Upriver Bright Fall Chinook smolts than Caspian Terns and Double-crested Cormorants (Payton and others 2020). White pelicans are also suspected of inflicting wounds on adult sockeye in the Yakima River during predation attempts (Kock et al. 2020). Avian predation varied year-to-year and research is needed to estimate what proportion of PIT tags consumed by pelicans are subsequently deposited on breeding colonies.



Figure 7, 8. White pelicans at Horn Rapids (Wanawish) Dam, Yakima River (left; photo by M. Livingston) and at a fish bypass return pipe (right; photo by D. Isaac, Yakama Nation Fisheries).

As a result of dissuasion measures to disperse Caspian Terns implemented by the Army Corps of Engineers on Crescent Island in 2015-2018, a sizable portion (>3,000 individuals) of the California Gull colony moved to Badger Island (Collis and others 2019). This did not appear to impact pelican nesting activity (D. Lyons 2021, pers. comm.), but gulls are known to take unattended eggs, particularly when colonies are disturbed (Knopf & Evans 2020; Sovada and others 2013). The gulls may now be more difficult to manage, however, without disturbing the pelican colony. Dissuasion activities for gulls and terns on other islands in the Columbia Basin also may reduce pelican use of other potential nesting colony sites.

Avian monitoring and deterrence actions have also been implemented at U.S. Army Corps of Engineers (ACOE) hydropower projects on the lower Columbia and Snake rivers (ACOE-NW Division 2020). The program objective is to reduce piscivorous bird predation on juvenile salmonids and lamprey by passive

deterrence and hazing in a manner that impedes their ability to forage on fish and/or forces them to leave the area. Hazing activities are implemented by the U.S. Department of Agriculture’s Animal & Plant Health Inspection Service (USDA APHIS). Passive deterrence includes perch deterrents that eliminate perching sites and wires and sprinklers that prevent or inhibit flight in areas where fish are vulnerable. Hazing activities include pyrotechnics, sound, propane cannon, lasers, (and lethal take of gulls, terns, and cormorants, as necessary). Avian hazing is done primarily near dams where predation risk is high (e.g., tailrace areas where fish may be disoriented after passing the project and/or forebay areas where fish may be delayed). The ACOE was recently experimenting with the use of green lasers to deter birds, including pelicans, at the juvenile fish outfall at McNary Dam (Peery and others 2019). Increasing pelican numbers required additional non-lethal harassment near hatchery outfalls during smolt releases in 2022.

Conflicts between white pelican populations and fisheries is not unique to Washington, and the Pacific Flyway Council developed a management framework (2012) and a monitoring strategy (2018) for American White Pelicans in the Pacific Flyway. Guidance was needed for agencies and locations dealing with pelican predation on fish of conservation concern.

## **MANAGEMENT ACTIVITIES**

***Monitoring and research.*** The Pacific Flyway Council has made a commitment to coordinated monitoring of white pelican nesting colonies, with surveys conducted at least two consecutive years, repeating these after a two-year hiatus until 2026 (Pacific Flyway Council 2018). It is also recommended that productivity be monitored (Nur and others 2018), but this generally has not been done previously in Washington. Monitoring of pelican nesting colonies in Washington and Oregon has generally been done by Bird Research Northwest ([birdresearchnw.org](http://birdresearchnw.org)), a collaborative project between Oregon State University, Real Time Research Inc., and the USGS-Oregon Cooperative Fish and Wildlife Research Unit. 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 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 in 2005 and 2006, and WDFW made counts from oblique aerial photos in 2018 and 2019. 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 number of American White Pelicans observed in Washington has increased substantially in the last 30 years. In 2018, high resolution drone photos provided a count of 2,797 ( $\pm$  43) nests, indicating approximately 5,594 breeding adults were associated with the Badger Island nesting colony in that year. Our raw count from oblique aerals in 2019 was 2,437; if adjusted for adults off foraging (x 1.5), then there were ~3,655 adults. This somewhat lower number from 2018 may reflect the difference in methods rather than a decline, but earlier increases are partly due to low water conditions elsewhere and birds may have returned to other colonies when water levels increased there. In addition, a smaller nesting colony now exists on Miller Sands Spit in Oregon waters of the Columbia River estuary, although it was often abandoned due to disturbance. And the number of nonbreeders, such as the ~200 pelicans seasonally present on Whidbey Island, seems to have increased. Washington still hosts only a single colony, however, and white pelicans are notoriously sensitive to disturbance. Fortunately, the Badger Island colony enjoys the relative protection of McNary NWR.

Although most studies have reported that white pelicans were not an important predator of ESA-listed salmonids in the Columbia basin, a recent analysis of URB Fall Chinook indicated that the Badger Island pelicans take more smolts than the other bird species. Efforts are made to address pelican conflicts with fisheries at the large dams, but predation by increased numbers of pelicans at other locations and certain times when fish are vulnerable such as hatchery outflows may be a significant and growing problem.

Given the substantial number of white pelicans in Washington, and the ongoing protections at their primary nesting colony, we recommend the species be down-listed to Sensitive. A Sensitive species is, *“vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats”* (WAC 220-610-110).

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**Table A. Key to 34.05.271 RCW Categories:**

<b>34.05.271(1)(c) RCW</b>	<b>Category Code</b>
(i) Independent peer review: review is overseen by an independent third party.	i
(ii) Internal peer review: review by staff internal to the department of fish and wildlife.	ii
(iii) External peer review: review by persons that are external to and selected by the department of fish and wildlife.	iii
(iv) Open review: documented open public review process that is not limited to invited organizations or individuals.	iv
(v) Legal and policy document: documents related to the legal framework for the significant agency action including but not limited to: (A) federal and state statutes; (B) court and hearings board decisions; (C) federal and state administrative rules and regulations; and (D) policy and regulatory documents adopted by local governments.	v
(vi) Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under the processes described in (c)(i), (ii), (iii), and (iv) of this subsection.	vi
(vii) Records of the best professional judgment of department of fish and wildlife employees or other individuals.	vii
(viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).	viii

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# Periodic Status Review for the American White Pelican in Washington



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## EXECUTIVE SUMMARY

The American White Pelican (*Pelecanus erythrorhynchos*) is a large, colonial nesting bird that eats mostly nongame fish, such as carp, suckers, and sticklebacks, as well as amphibians and crayfish, but sometimes feeds on salmonids. The breeding population and range of the American White Pelican (or ‘white pelican’) were reduced throughout the 19<sup>th</sup> and early 20<sup>th</sup> century due to habitat loss, persecution, and pesticide contaminants, especially DDT. The species was listed as state endangered in Washington in 1981, but populations have since recovered from pre-1970 declines. Western colonies of white pelicans contained an estimated 50,400 breeding adults in 2018 and the species was down-listed to state threatened in Washington in 2017. Despite overall improved status, the species remains of some conservation concern, primarily because of the concentration of birds on relatively few breeding colonies, and their vulnerability to disturbance and water level fluctuations. At the federal level, white pelicans are not listed under the Endangered Species Act but are a protected species under the Migratory Bird Treaty Act.

In 1994, after an absence of breeding for ~50 years in Washington, a breeding colony established on an island in the Columbia River north of the mouth of the Walla Walla River. Since that time, the number of white pelicans nesting in that section of the Columbia River has grown steadily, with an estimated 5,594 breeding adults present in 2018, and 3,655 estimated from oblique aerial photos in 2019. In 2010, another colony formed on Miller Sands Spit in Oregon waters of the Columbia River estuary that has hosted up to several hundred nesting birds, but has been abandoned due to disturbance in recent years, with some shifting to re-nest on Rice Island. Inland waters of eastern Washington also seasonally host significant numbers of non-breeding (1–2 year-old) 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, though many are likely adults from Badger Island; smaller numbers remain in winter, but most winter in southern California.

Although the diet of white pelicans often consists mostly of carp and suckers, they can be a significant source of mortality on gamefish and do consume some fish of conservation concern. White pelicans are large conspicuous birds, and many observers assume they are impacting salmonid runs, but the pelicans nesting at Badger Island and Miller Sand Spit colonies do not appear to be an important source of mortality for most ESA-listed juvenile salmonids. However, a recent analysis of Upriver Bright Fall Chinook indicated that pelicans from the Badger Island colony can have a significant impact on that run, and other observations suggest that impacts on other runs are significant at certain times and places in tributaries (e.g., hatchery outflows during low water).

The western population of white pelicans has recovered substantially, and given the size of the Badger Island colony and number of non-breeding white pelicans in Washington during the past several years, a change in listing could be considered. The species remains somewhat vulnerable, however, as only the single colony regularly forms in Washington, and white pelican colonies are highly sensitive to disturbances; adults will desert and/or leave eggs and young exposed to predation following disturbances. We recommend the species be down-listed to Sensitive. A Sensitive species is, “vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats” (WAC 220-610-110).

## INTRODUCTION

This document is an update of the 2016 periodic status review, with recent data from colony counts and a brief discussion of recent management activities and issues surrounding conflicts with Columbia River fisheries. The document concludes with a recommendation to revise the species classification.



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

## DESCRIPTION AND LEGAL STATUS

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 sometimes foraging cooperatively in coordinated swimming groups to encircle fish.

The species was down-listed from state endangered to threatened in Washington in 2017. They are not listed under the federal Endangered Species Act, but are protected under the Migratory Bird Treaty Act. The species is ‘red’-listed in British Columbia (B.C. Conservation Data Center 2008).

## DISTRIBUTION

The American White Pelican is widespread in much of western and southeastern North America (Fig. 2). It is frequently encountered at lakes, reservoirs, and rivers and breeds at widely scattered island colonies. Pelicans that breed at colonies east of the Continental Divide migrate southeast toward the gulf coast and Mexico to winter (Evans & 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 & Evans 2004). In Washington, small numbers of white pelicans are seen in winter along major rivers in the Columbia basin (Wahl 2005; eBird 2021).

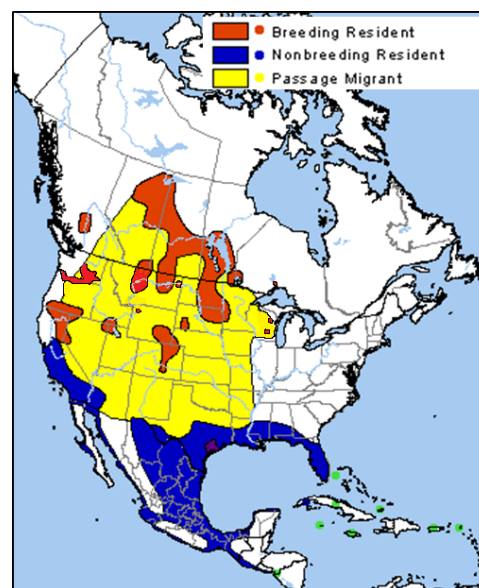


Figure 2. Range of American White Pelican (modified from: Ridgely and others 2003).

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 and others 2011; Reudink and others 2011). The population east of the Continental Divide is about three times larger than the western population (King & Anderson 2005).

## 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 & 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, winter inland on large rivers, reservoirs, and areas below dams that remain ice-free.

**Diet and foraging.** There have been no diet studies in Washington, but American White Pelicans generally feed largely on nongame or "rough" fish, mostly small schooling fishes (<1/2 bill length), but also larger bottom feeding species (Harper and others 2004, Knopf & Evans 2020). Common prey items include carp (*Cyprinus carpio*), suckers (*Catostomus* spp.), Three-spined Sticklebacks (*Gasterosteus aculeatus*), bullheads (*Ameiurus* spp.), chub (*Couesius* spp.), and other minnows (*Cyprinidae*). They also prey on Tiger Salamanders (*Ambystoma tigrinum*), and crayfish (*Cambaridae*) (Evans & Knopf 1993; Pacific Flyway Council 2012). The few data from Washington are consistent with studies elsewhere; two pelican carcasses picked up on the lower Yakima River contained a sucker and a chiselmouth (*Acrocheilus alutaceus*) (Stephenson and Fast 2005), and two pelicans captured at McNary Dam regurgitated a steelhead (*Onchorynchos mykiss*), a carp, and 2 suckers that were all headless, likely casualties of the dam turbines, and pelicans were observed swallowing American Shad (*Alosa sapidissima*) and suckers (Tiller and others 2004).

White pelicans are opportunists, however, and will feed on game fishes, such as trout and juvenile salmon, particularly when they are concentrated and vulnerable such as spawning runs or during juvenile outmigration (Stapp & Hayward 2002; Knopf & Evans 2020). This is confirmed by PIT tags from salmon detected on Badger Island and at a pelican loafing site below John Day Dam (Roby and others 2017; Collis and others 2020; Cramer and others 2021; E. Grosvenor 2020, pers. comm.; see discussion under *Fisheries conflicts and piscivorous bird management*). White pelicans can also be a problem at aquaculture facilities on their winter range, and where stocked hatchery trout are concentrated (IDFG 2009, 2016; 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 & 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 & 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 & Evans 1992b). White pelicans will also pirate fish from other species, such as Double-crested Cormorants (*Phalacrocorax auritus*) (Anderson 1991).

White pelicans often forage within 50 km of the colony during the nesting season, but are capable of making long-distance foraging flights in order to find prey fish; they will make use of thermals to travel much longer distances to forage when necessary (Evans & Knopf 1993). For example, Payton and others (2020) recovered PIT tags on the Badger Island pelican colony that were from subyearling Chinook salmon (*Oncorhynchus tshawytscha*) known to have survived migration to John Day Dam, over 150 km downstream of Badger Island. Telemetry indicated that birds from a Nevada colony took advantage of air currents and thermals, occasionally flying over the Sierra Nevada to foraging sites in California's Central Valley from Nevada colonies; round trips exceeding 200 mi (322 km) were a "common occurrence" (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 lakes up to 103 mi (165 km) away, across an 11,580 mi<sup>2</sup> (30,000 km<sup>2</sup>) area (Harper and others 2004).

**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 & Knopf 1993). Generally, only one of the chicks survives. White pelican chicks are somewhat mobile by 3 weeks of age and begin forming into crèches while their parents are away. Once chicks are old enough to join the crèches, parent birds may begin staying at foraging areas for extended periods of time before returning to the colony to feed their chicks. Chicks make their first flights at 9–10 weeks of age and depart the colony to join adults at foraging areas when they are about 10–11 weeks old. White pelicans are capable of breeding for the first time at 3 years of age (Evans & Knopf 1993). Banded pelicans in Montana generally returned to their natal colony, and movements between Montana colonies were rare (Hendricks & 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 white pelicans can live to >26 years of age (Clapp and others 1982).

**Sources of mortality.** Severe weather, disease (e.g., botulism and West Nile Virus), collision with wires or objects, and exposure to contaminants can occasionally be major causes of mortality for adult white pelicans, but predation as a source of adult mortality is rare. Shooting was a historically significant source of adult mortality, but may no longer be a major factor in the United States (Strait & Sloan 1975; Hendricks & Johnson 2002). Prolonged cold, wet, and windy conditions, especially during the critical transition period between brooding and crèche formation, can dramatically affect chick survival (Rocke and others 2005; Sovada and others 2013). Cold weather and hailstorms resulted in >50% mortality of the chicks in the Medicine Lake National Wildlife Refuge (NWR) in Montana in 1940, 1954, and 1993 (Madden & Restani 2005).

Predation associated with disturbances at breeding sites can be a major mortality factor for white pelican eggs and chicks, particularly hatchlings <3 weeks of age (Evans & Knopf 1993). Gulls (*Larus* spp.) and Common Ravens (*Corvus corax*) can take eggs, whereas, Great Horned Owls (*Bubo virginianus*), Bald Eagles

(*Haliaeetus leucocephalus*), and Black-crowned Night-Herons (*Nycticorax nycticorax*) may prey on the hatched young. Egg predation by gulls can be substantial if the colony is disturbed by human activity or a mammalian predator. Mammals, particularly Coyotes (*Canis latrans*) and Red Foxes (*Vulpes vulpes*) are not usually a problem at island colonies except when low water levels expose a land bridge. Bald Eagles, River Otters (*Lontra canadensis*), and humans have been responsible for disturbances at the Miller Sand Spit 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., on foot, boat, or plane) can cause pelicans to abandon nests or entire colonies for the breeding season (Evans & Knopf 1993).

## POPULATION AND HABITAT STATUS

**Range-wide population trends.** The population and range of American White Pelicans were reduced throughout the 19<sup>th</sup> and early 20<sup>th</sup> century due to habitat loss resulting from water projects, persecution, and contaminants, such as DDT. For example, a loss of ~90% of wetland habitat in California, led to the reduction from 11 known colonies in the 19<sup>th</sup> century to only one colony in 1932 (Shuford 2005). Historically, and to a lesser extent now, white pelicans have been shot for ‘sport’, feathers, or to alleviate suspected impacts to fisheries. Studies have clearly shown that white pelicans seldom prey on the same fish sought by people (Knopf & Evans 2020), but adult pelicans have still been shot, young pelicans clubbed, and pelican eggs broken in an attempt to ‘protect’ fisheries. During the 1920s, pelicans were even shot and eggs destroyed 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 & 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, and recent survey-wide Breeding Bird Survey data suggested an average annual increase ~5% (CI: 3.08-7.64) from 1993–2013 (Sauer and others 2020). The number of known breeding colonies increased from 43 in the 1960s, to 55 in 1980, while total breeding adults appeared to increase from 63,000 to 109,000 (Sidle and others 1985; Keith 2005). The total number of nests at 20 breeding colonies that were surveyed during 1979–1981 and again in 1998–2001 doubled (King & Anderson 2005); the estimate for 1998–2001 was 134,000 breeding adults, and a total of ~157,000 birds.

Despite their increasing population size, the American White Pelican retains some conservation concern. They have a history of ‘boom and bust’ productivity, are concentrated on relatively few breeding colonies, and are vulnerable to disturbance, water level fluctuations, and disease. 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 & Anderson 2005); only 4 large breeding colonies in the northern Great Plains account for 84,000 adults (Sovada and others 2013).

**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 and Arod lakes, 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 and others 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 was only about 16,000 birds at 5–8 colonies (Paullin and others 1988; IDFG 2009; Pacific Flyway Council 2012). Since the 1980s, the western population has increased substantially, and several new colonies have formed (Fig. 3); Moulton and others (2018) suggested that the increasing trend from the late 1970s to 2001 reported by King & Anderson (2005), likely continued through at least 2007. The 2018 western population estimate is 50,402 breeding adults at 17 colonies (Table 1; Pacific Flyway Council 2021). However, approximately 58.9% of the population occurs at only two colonies, and one of these (Gunnison Island) is at great risk of falling water levels of Great Salt Lake due to excess diversions (Wurtsbaugh and others 2017). The eight largest colonies comprise 90% of the western population (Pacific Flyway Council 2021). Moulton and others (2018) assessed abundance and trends for 10 colonies with adequate data; these colonies increased from 13,614 in 1981, to 40,864 in 2014, an increase of 200%; most of the increase occurred prior to 2000. Average production of

Figure 3. White Pelican colony locations and sizes in the western population, 2018 (Pacific Flyway Council 2021).

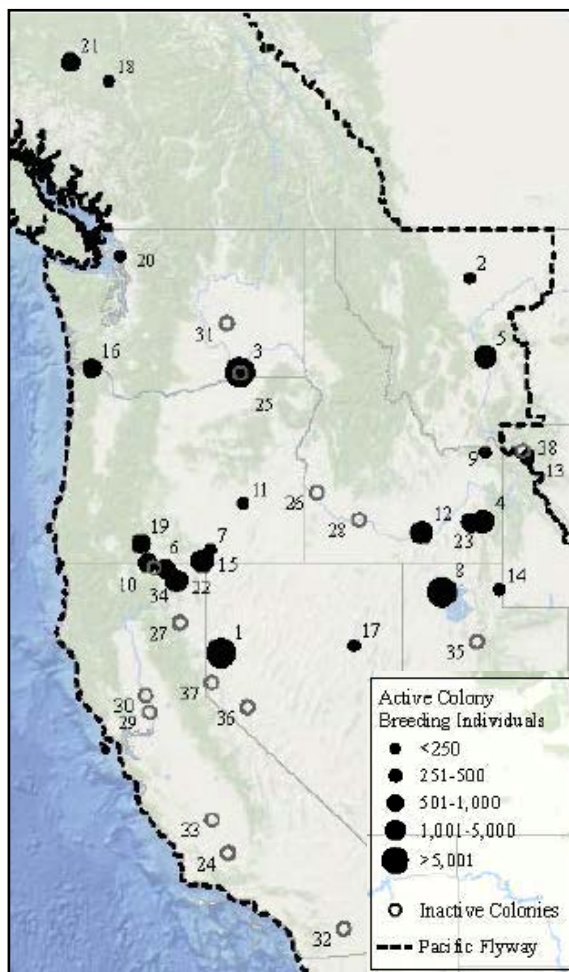


Table 1. Estimated number of breeding American White Pelicans at western colonies in 2018 (Pacific Flyway Council 2021).

Colony Name/map number	State	Number
1 Anaho Island NWR	NV	19,000
2 Arod Lake	MT	-
3 Badger Island, McNary NWR	WA	5,616
4 Blackfoot Reservoir	ID	1,416
5 Canyon Ferry Lake	MT	3,286
6 Clear Lake NWR	CA	830
7 Crump Lake	OR	0
8 Gunnison Island WMA	UT	10,664
9 Island Park Reservoir	ID	0
10 Lower Klamath NWR	CA	778
11 Malheur NWR	OR	144
12 Minidoka NWR	ID	3,676
13 Molly Lake, Yellowstone NP	WY	394
14 Neponsit Reservoir	UT	50
15 Pelican Lake	OR	1,174
16 Miller Sand Spit/Rice Island	OR	796
17 Ruby Lakes NWR	NV	-
18 Stum Lake	BC	88
19 Upper Klamath NWR	OR	770
20 Padilla Bay <sup>1</sup>	WA	0
21 Puntzi Lake	BC	592
22 Fairchild Swamp	CA	1,128
23 Chesterfield Reservoir	ID	-
<b>Total</b>		<b>50,402</b>

<sup>1</sup>Padilla Bay colony abruptly abandoned in 2018; inactive 2019-2020; active with ~40 nests in June 2021.

fledglings/nest declined 3.9%/year from 1981 to 2013. Moulton and others (2018) suggested white pelican populations in the west are approaching carrying capacity.

**Washington population status.** In Washington, American White Pelicans were recorded in the Columbia River estuary by Lewis and Clark in 1805, and in the 1830s by John K. Townsend who said that in spring, “they retire inland to breed” (Jobanek & Marshall 1992). White pelicans historically nested in eastern Washington at Moses Lake, possibly Sprague Lake, and perhaps a few other lakes (Dawson & Bowles 1909, Jewett and others 1953). The first published record of nesting in Washington was in 1926 at Moses Lake, Grant County (Brown 1926); that colony may have persisted through the 1930s. Motschenbacher (1984) noted that a long-time resident recalled that up to ~500 pelicans were present seasonally on Moses Lake from 1902 until the 1940s. 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 of white pelicans established on Crescent Island, Walla Walla County. The source of the pelicans that initiated the colony is not known, but 13 band recoveries or observations of patagial markers in Washington were birds marked at Stum Lake, British Columbia (VanSpall and others 2005); and single band recoveries were from eastern Montana and Klamath NWR (Stephenson and Fast 2005). The island is part of McNary NWR and was constructed in 1985 for nesting birds in the Columbia River (Ackerman 1994, 1997). In 1997, pelicans began nesting on nearby Badger Island, also in McNary NWR, and ceased nesting on Crescent Island after 1998 (Fig. 4). Since that time, the colony has grown to over 2,500 breeding pairs (Fig. 5). Increases after 2014 may reflect an influx of birds from Malheur Lake in Oregon



Figure 4. Badger Island (yellow arrow) and Crescent Island (blue arrow; from *Bird Research Northwest*) in the Columbia River, McNary National Wildlife Refuge (left); pelican nesting aggregation (right) on Badger Island, 2018 (photo by J. Evenson).

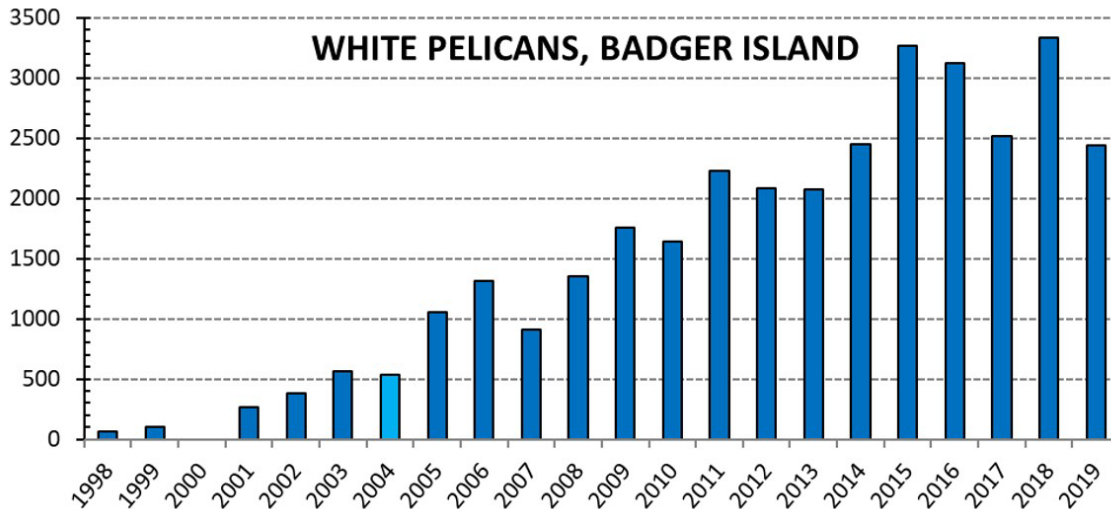


Figure 5. Number of American White Pelicans counted in aerial photos of the Badger Island colony, 1997–2019 (based on high resolution photos from fixed-wing or drone aircraft; some birds are obscured by vegetation; low-resolution oblique photos were taken in 2004 and more birds may have been obscured by vegetation; data from Bird Research Northwest, and WDFW; a 2018 nest count from high resolution drone photos revealed 2,797 nests, or ~5,500 breeders; see text for discussion of correction factor).

where no nesting occurred in 2015-2018 due to drought conditions. A mean of 3,330 white pelicans was counted in aerial photos (by drone) from May 2018. Raw counts of pelicans from aerial photos are often multiplied by 1.5 to account for birds off foraging to estimate the number of adults (Pacific Flyway Council 2018), which produced an estimate of 4,995. The photos taken by drone, however, were high enough resolution to provide a count of 2,797 ( $\pm 43$ ) nests; 2 adults per nest indicate the higher estimate of 5,594 breeding adults (T. Lawes 2021, pers. comm.). Our raw count from oblique aerials on 6 May 2019 was 2,437; if adjusted ( $\times 1.5$ ) there were 3,655 adults associated with the colony, but adults could not always be distinguished from large chicks in our photos (WDFW data; no photos were obtained in 2020 due to Covid-19 restrictions on activities). It is not clear if the somewhat lower count compared to 2018 is an artifact of the difference in methods (vertical drone, vs. oblique aerial), or represents a decline; some birds may have resumed breeding at Malheur NWR.

The first nesting record of white pelicans in the Columbia River estuary occurred at Miller Sands Spit, Clatsop County, Oregon, in 2010 (Fig. 6). In July 2011, an on-colony survey on the island indicated a colony size of about 97 breeding pairs (Bird Research Northwest 2012). A boat-based survey in April



Figure 6. Location of Miller Sands Spit, Clatsop County, Oregon, in the Columbia River.

2015, counted 261 adults and 144 nests (<http://www.birdresearchnw.org>). In 2016, 492 adults and 351 nests were present in May, but the colony was abandoned in June (P. Loschl, pers. comm.). In 2017 and 2018, the colony was again abandoned near the end of May, but many pelicans shifted to re-nest on nearby Rice Island by early June (T. Lawes 2021, pers. comm.). Counts from aerial photos of Rice Island indicated there were 102 breeding pairs in 2017, and 398 birds in 2018 following abandonment of Miller Sands Spit. In 2019, pelicans were present on Miller Sands Spit in early June, but no additional data are available (T. Lawes 2021, pers. comm.).

Another small colony was initiated on an island in Padilla Bay in Skagit County in 2017; it apparently produced about 18 chicks (S. Ehler 2018, pers. comm.). The colony formed again in 2018 and nesting activities began, but the colony was abruptly abandoned around July 4<sup>th</sup> for unknown reasons (R. Waddell 2021, pers. comm.). There was no nesting activity reported there, or anywhere in the Puget Sound region in 2019 or 2020. The colony formed again in 2021, with 40–50 nests as of 28 June, but had abandoned by 5 July, though up to 300 pelicans continued to forage in Padilla Bay, with 200 there on 14 September (S. Ehler, pers. comm., 2021). Up to 200 white pelicans have also been observed at Deer Lagoon off Useless Bay, Whidbey Island, each year since 2016; pelicans arrived in early April and the last departed in early October (eBird 2021); no nesting activity has been observed, and it isn't clear if the small islands there would provide a secure colony site.

**Nonbreeding and wintering birds.** Increasing numbers of non-breeding white pelicans have 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 2015, pers. comm.). Numbers vary greatly during the summer; a tally of the high count of eBird records at unique locations for the week of 23-31 May 2021 was 2,073 birds (eBird 2022), with a portion of these likely birds from the colony while others representing nonbreeding offspring of the previous two years. Peak numbers observed in late summer in the Potholes region are up to 2,000 birds. A smaller number of pelicans overwinter in Washington; most of these birds can be found on the Columbia River, particularly from Priest Rapids Dam to the Walla Walla River delta, in concentrations ranging from 40–300 birds (Wahl 2005), and smaller numbers elsewhere on the Columbia, Snake, and Yakima rivers and on marine waters west of the Cascades (eBird 2021). 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.

**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 to control human disturbances to nesting pelicans that might cause abandonment of the colony. Shallow waters surrounding the island provide isolation from the main river channel and most recreational boating during the breeding season. Further, the island and all waters within ¼ mile are designated as a state game reserve closed to hunting and trapping (WAC 220-411-020). 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 recently planted willows to dissuade Caspian Terns (*Hydroprogne caspia*) from nesting on Crescent Island (Collis and others 2019). The habitat change may or may not preclude white

pelicans from resuming nesting on Crescent in the future.

Miller Sands Spit is in Clatsop County, Oregon, near the southwest corner of Wahkiakum County, Washington (Fig. 7). It is a 117 acre horseshoe-shaped island in the lower Columbia River estuary, from approximate river mile 22.2 to 24.6 (ACOE, Portland District 2014). Historically, the site was created 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. Miller Sands Spit is designated as critical habitat for Streaked Horned Larks (*Eremophila alpestris strigata*; USFWS 2013). In September 2012, after nesting activities were concluded and pelicans had departed the island, the 2010–2012 nesting area on the island 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 became a protected species under the Migratory Bird Treaty Act in 1972 (Strait & Sloan 1975). White pelicans have increased dramatically in recent decades, suggesting that this protection has been adequate. The nesting colony on Badger Island is part of McNary NWR and is protected from other uses and is closed to the public during the nesting season.

**State protections.** The American White Pelican is listed as threatened in Washington and is protected from ‘take’ in state law (WAC 220-200-100, 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. The white pelican is listed as a ‘Sensitive’ species in the East Cascades and Blue Mountains ecoregions of Oregon (ODFW 2019).

### Factors Affecting Populations

Although white pelicans have recovered substantially since the mid-20<sup>th</sup> century, populations remain somewhat vulnerable. 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) increased severe weather due to climate change.

**Habitat loss, water level fluctuations, and water quality.** Water diversion and draining of wetlands for agriculture historically destroyed or degraded many traditional feeding, breeding, and loafing areas in the Pacific Flyway and throughout North America (Kushlan and others 2002; Pacific Flyway Council 2012). 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. Allocation of water continues to be a contentious issue in western states because water resources are limited, and droughts intensify conflicts. Unsustainable pumping of water from aquifers may affect surface water bodies used by pelicans for foraging if drought becomes more common. The continued, competing demand for water for agricultural, urban, and fisheries uses may be the greatest long-term threat to white pelicans (Ivey and Herziger 2006). Low water levels can affect or eliminate pelican nesting at colonies by exposing land bridges that allow predator access; unpredictable water levels can cause flooding of nests, eggs, and hatchlings (Moreno-Matiella & Anderson 2005; Murphy & Tracy 2005; Pacific Flyway Council 2012). 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 Salton Sea in southern California is an important stopover and wintering site, hosting 65–85% of the western population of white pelicans 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 and others 2003; Shuford 2014).

**Human disturbance.** Although relatively tolerant of humans at 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 human activities (Evans & Knopf 1993). Even boats and airplanes in the vicinity of a colony may cause pelicans to temporarily leave the colony or abandon it altogether. In a recent case, the pelican colony on Miller Sands Spit 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 the disturbance were taken to a rehabilitation facility by researchers (Bird Research Northwest, weekly update 7/7-7/13/14 [<http://www.birdresearchnw.org/project-info/weekly-update/columbia-river-estuary/2014-updates/>]). The Miller Sands Spit colony was again abandoned in 2016, 2017, 2018, and 2020, likely due to human disturbances. In 2018 and 2020, following the abandonment at Miller Sands Spit, some portion of the displaced pelicans shifted to Rice Island to re-nest (T. Lawes 2021, pers. comm.).

**Disease-botulism and West Nile Virus.** Outbreaks of botulism and West Nile Virus can be a significant source of mortality for white pelicans. Since 1980, numerous outbreaks of avian botulism caused by *Clostridium botulinum* type C (Madden & Restani 2005; Rocke and others 2005) have resulted in large-scale white pelican mortality events or die-offs. Outbreaks of type C botulism are somewhat unpredictable, but are often associated with low water levels, high summer surface temperatures, and abundant filamentous algae (Espelund & Klaveness 2014). Type C botulism spreads through necrophagous flies depositing eggs on dead 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). West Nile Virus (WNV) associated deaths of white pelican chicks were reported at various nesting colonies after 2002 (Johnson and others 2010). In Washington, WNV was diagnosed in a pelican from Potholes Reservoir in the fall of 2010 (Cramer and others 2021). WNV was the presumed cause of >9,000 white pelican deaths in 7 states in 2002–2003 (Rocke and others 2005; Johnson and others 2010). Prior to the arrival of WNV in the northern Great Plains, chick mortality rates in late breeding season were <5%, but in subsequent years were as high as 44% (Sovada and others 2008).



**Climate change and severe weather.** White pelican colonies in the northern Great Plains may be experiencing population level effects attributable to impacts from climate change. Moulton and others (2018) noted that the median latitude of colonies active since 2010 has shifted northward 114 km compared to colonies active up through the 1960s. The median latitude of the six newest colonies is 360 km north of the rest of the currently active colonies (Moulton and others 2018). This shift may be related to more frequent droughts and earlier spring weather predicted for the western states (Wehner and others 2017). Spring arrival of pelicans at Chase Lake NWR 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 chicks due to severe weather events than occurred under the 1965-based phenology pattern. Cold and wet weather and severe storms resulted in the death of thousands of chicks in 2005–2008 at colonies on the northern Plains (Sovada and others 2014).

In the future, negative impacts from cold and wet weather may occur with increasing frequency in Washington; most climate models predict an increase in precipitation in spring and more days with >1 inch of precipitation (Dalton and others 2013). A severe rainstorm occurred in the area of Badger Island in May 2015, and rain accompanied by unseasonal cold occurred in May 2013 (H. Newsome 2015, pers. comm.); the effects on pelican productivity were not assessed. Some breeding colonies will probably also be affected by droughts, if droughts increase in frequency and severity as climate models suggest (Mote & Salathé 2010). The increase in pelican numbers 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 drought cycles might affect the Badger Island colony.

**Pesticides and contaminants.** Bio-accumulation of mercury and selenium can be an issue of concern for fish-eating birds. Many wetlands in the arid West are affected by mercury or selenium and insecticides, fertilizers and other agricultural pollutants. Population increases for white pelicans 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 pelican eggs collected on Crescent Island in 1994 (Blus and others 1998). Recent samples from colonies in Nevada and North Dakota were also below levels determined to affect reproduction (Wiemeyer and others 2005, Pietz et al 2008). Wiemeyer and others (2007) evaluated mercury and selenium in white pelicans breeding at Pyramid Lake, Nevada and found that concentrations in eggs were generally low, but some adult pelicans had elevated mercury concentrations in their livers.

**Fisheries conflicts and piscivorous bird management.** Although white pelicans typically forage on species that do not bring them into conflict with fishery resources (i.e., carp, suckers, minnows, Tiger Salamanders), and also prey on piscivorous fish (e.g. pike minnows; Harper and others 1999), they do consume some fish species of conservation concern or that have economic and/or recreational value (Pacific Flyway Council 2012). Avian predation on the 13 federal ESA-listed salmonid (*Oncorhynchus* spp.) distinct population segments in the Columbia River basin has been an on-going concern in the recovery of those fish stocks. The numbers of pelicans breeding at the Badger Island colony and non-breeding pelicans along the Columbia, Snake, and Yakima rivers have increased substantially during the past two decades (Wahl 2005; Adkins and others 2014; Bird Research Northwest 2014), and predation by pelicans appears to be non-trivial for certain salmon runs and species of conservation concern (Payton and others 2020, Evans and others 2022). Foraging

white pelicans often exploit vulnerable concentrations of easily accessible fish, which likely includes smolts concentrated during passage through hydropower dams on the Columbia River. Observations of pelicans foraging below dams (Figs. 7, 8), and the recovery of PIT tags from smolts deposited on the Badger Island colony (Bird Research Northwest 2012; Evans and others 2019; Collis and others 2020), and on a small island at Preacher’s Eddy below John Day Dam (E. Grosvenor 2020, pers. comm.) have confirmed that some predation is occurring.

Although other bird species (Caspian Terns, *Hydroprogne caspia*; Double-crested Cormorants; gulls, *Larus californicus* and *L. delawarensis*) seem to be the principal avian predators of the juvenile outmigrants of most ESA-listed salmon runs (Collis and others 2001; Evans and others 2012, 2016, 2019, 2022; Hostetter and others 2015), predation by pelicans seems to be significant for some species and runs. For example, the pelicans and gulls from Badger Island (as well as the cormorant colony on Foundation Island) often consumed a larger proportion of available Upriver Bright Fall Chinook smolts than Caspian Terns and Double-crested Cormorants (Payton and others 2020). White pelicans are also suspected of inflicting wounds on adult sockeye in the Yakima River during predation attempts (Kock et al. 2020). Avian predation varied year-to-year and research is needed to estimate what proportion of PIT tags consumed by pelicans are subsequently deposited on breeding colonies.



Figure 7, 8. White pelicans at Horn Rapids (Wanawish) Dam, Yakima River (left; photo by M. Livingston) and at a fish bypass return pipe (right; photo by D. Isaac, Yakama Nation Fisheries).

As a result of dissuasion measures to disperse Caspian Terns implemented by the Army Corps of Engineers on Crescent Island in 2015-2018, a sizable portion (>3,000 individuals) of the California Gull colony moved to Badger Island (Collis and others 2019). This did not appear to impact pelican nesting activity (D. Lyons 2021, pers. comm.), but gulls are known to take unattended eggs, particularly when colonies are disturbed (Knopf & Evans 2020; Sovada and others 2013). The gulls may now be more difficult to manage, however, without disturbing the pelican colony. Dissuasion activities for gulls and terns on other islands in the Columbia Basin also may reduce pelican use of other potential nesting colony sites.

Avian monitoring and deterrence actions have also been implemented at U.S. Army Corps of Engineers (ACOE) hydropower projects on the lower Columbia and Snake rivers (ACOE-NW Division 2020). The program objective is to reduce piscivorous bird predation on juvenile salmonids and lamprey by passive

deterrence and hazing in a manner that impedes their ability to forage on fish and/or forces them to leave the area. Hazing activities are implemented by the U.S. Department of Agriculture's Animal & Plant Health Inspection Service (USDA APHIS). Passive deterrence includes perch deterrents that eliminate perching sites and wires and sprinklers that prevent or inhibit flight in areas where fish are vulnerable. Hazing activities include pyrotechnics, sound, propane cannon, lasers, (and lethal take of gulls, terns, and cormorants, as necessary). Avian hazing is done primarily near dams where predation risk is high (e.g., tailrace areas where fish may be disoriented after passing the project and/or forebay areas where fish may be delayed). The ACOE was recently experimenting with the use of green lasers to deter birds, including pelicans, at the juvenile fish outfall at McNary Dam (Peery and others 2019). Increasing pelican numbers required additional non-lethal harassment near hatchery outfalls during smolt releases in 2022.

Conflicts between white pelican populations and fisheries is not unique to Washington, and the Pacific Flyway Council developed a management framework (2012) and a monitoring strategy (2018) for American White Pelicans in the Pacific Flyway. Guidance was needed for agencies and locations dealing with pelican predation on fish of conservation concern.

## **MANAGEMENT ACTIVITIES**

***Monitoring and research.*** The Pacific Flyway Council has made a commitment to coordinated monitoring of white pelican nesting colonies, with surveys conducted at least two consecutive years, repeating these after a two-year hiatus until 2026 (Pacific Flyway Council 2018). It is also recommended that productivity be monitored (Nur and others 2018), but this generally has not been done previously in Washington. Monitoring of pelican nesting colonies in Washington and Oregon has generally been done by Bird Research Northwest ([birdresearchnw.org](http://birdresearchnw.org)), a collaborative project between Oregon State University, Real Time Research Inc., and the USGS-Oregon Cooperative Fish and Wildlife Research Unit. 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 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 in 2005 and 2006, and WDFW made counts from oblique aerial photos in 2018 and 2019. 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 number of American White Pelicans observed in Washington has increased substantially in the last 30 years. In 2018, high resolution drone photos provided a count of 2,797 ( $\pm$  43) nests, indicating approximately 5,594 breeding adults were associated with the Badger Island nesting colony in that year. Our raw count from oblique aerials in 2019 was 2,437; if adjusted for adults off foraging ( $\times$  1.5), then there were  $\sim$ 3,655 adults. This somewhat lower number from 2018 may reflect the difference in methods rather than a decline, but earlier increases are partly due to low water conditions elsewhere and birds may have returned to other colonies when water levels increased there. In addition, a smaller nesting colony now exists on Miller Sands Spit in Oregon waters of the Columbia River estuary, although it was often abandoned due to disturbance. And the number of nonbreeders, such as the  $\sim$ 200 pelicans seasonally present on Whidbey Island, seems to have increased. Washington still hosts only a single colony, however, and white pelicans are notoriously sensitive to disturbance. Fortunately, the Badger Island colony enjoys the relative protection of McNary NWR.

Although most studies have reported that white pelicans were not an important predator of ESA-listed salmonids in the Columbia basin, a recent analysis of URB Fall Chinook indicated that the Badger Island pelicans take more smolts than the other bird species. Efforts are made to address pelican conflicts with fisheries at the large dams, but predation by increased numbers of pelicans at other locations and certain times when fish are vulnerable such as hatchery outflows may be a significant and growing problem.

Given the substantial number of white pelicans in Washington, and the ongoing protections at their primary nesting colony, we recommend the species be down-listed to Sensitive. A Sensitive species is, *“vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats”* (WAC 220-610-110).

## LITERATURE CITED

The references cited in the *Periodic Status Review for the American White Pelican* are categorized for their level of peer review pursuant to section 34.05.271 RCW, which is the codification of Substitute House Bill 2661 that passed the Washington Legislature in 2014. A key to the review categories under section 34.05.271 RCW is provided in Table A. References were categorized by the author.

**Table A. Key to 34.05.271 RCW Categories:**

<b>34.05.271(1)(c) RCW</b>	<b>Category Code</b>
(i) Independent peer review: review is overseen by an independent third party.	i
(ii) Internal peer review: review by staff internal to the department of fish and wildlife.	ii
(iii) External peer review: review by persons that are external to and selected by the department of fish and wildlife.	iii
(iv) Open review: documented open public review process that is not limited to invited organizations or individuals.	iv
(v) Legal and policy document: documents related to the legal framework for the significant agency action including but not limited to: (A) federal and state statutes; (B) court and hearings board decisions; (C) federal and state administrative rules and regulations; and (D) policy and regulatory documents adopted by local governments.	v
(vi) Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under the processes described in (c)(i), (ii), (iii), and (iv) of this subsection.	vi
(vii) Records of the best professional judgment of department of fish and wildlife employees or other individuals.	vii
(viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).	viii

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## APPENDIX A. Public Comments

WDFW received 12 comments during the 90-day public comment period. Eight supported the recommendation to downlist the American White Pelican to sensitive status. None opposed. Three expressed fisheries concerns; one disapproved of hazing/dissuasion at dams.

## Washington State Status Reports, Periodic Status Reviews, Recovery Plans, and Conservation Plans

### Periodic Status Reviews

2022	Brown Pelican
2022	American White Pelican
2022	Cascade Red Fox
2022	Snowy Plover
2021	Gray Whale
2021	Humpback Whale
2021	Greater Sage-grouse
2020	Mazama Pocket Gopher
2019	Tufted Puffin
2019	Oregon Silverspot
2018	Grizzly Bear
2018	Sea Otter
2018	Pygmy Rabbit
2017	Fisher
2017	Blue, Fin, Sei, North Pacific Right, and Sperm Whales
2017	Woodland Caribou
2017	Sandhill Crane
2017	Western Pond Turtle
2017	Green and Loggerhead Sea Turtles
2017	Leatherback Sea Turtle
2016	American White Pelican
2016	Canada Lynx
2016	Marbled Murrelet
2016	Peregrine Falcon
2016	Bald Eagle
2016	Taylor's Checkerspot
2016	Columbian White-tailed Deer
2016	Streaked Horned Lark
2016	Killer Whale
2016	Western Gray Squirrel
2016	Northern Spotted Owl
2016	Greater Sage-grouse
2016	Snowy Plover
2015	Steller Sea Lion

### Conservation Plans

2013	Bats
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### Recent Status Reports

2019	Pinto Abalone
2017	Yellow-billed Cuckoo
2015	Tufted Puffin
2007	Bald Eagle
2005	Mazama Pocket Gopher, Streaked Horned Lark, and Taylor's Checkerspot
2005	Aleutian Canada Goose
1999	Northern Leopard Frog
1999	Mardon Skipper
1999	Olympic Mudminnow
1998	Margined Sculpin
1998	Pygmy Whitefish
1997	Gray Whale
1997	Olive Ridley Sea Turtle
1997	Oregon Spotted Frog

### Recovery Plans

2020	Mazama Pocket Gopher
2019	Tufted Puffin
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	Lynx
1999	Western Pond Turtle
1996	Ferruginous Hawk
1995	Pygmy Rabbit
1995	Snowy Plover

[Status reports and plans are available on the WDFW website at:](#)

<http://wdfw.wa.gov/publications/search.php>



