

**U.S. FISH AND WILDLIFE SERVICE**

**DRAFT POST-DELISTING  
MONITORING PLAN FOR THE  
BROWN PELICAN**  
*(Pelecanus occidentalis)*



*Photo courtesy of Michael McCrary, U.S. Fish and Wildlife Service*

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**August 2009**

**Recommended Citation**

U.S. Fish and Wildlife Service. 2009. Draft post-delisting monitoring plan for the brown pelican. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California. 19 pp.

## Table of Contents

<b>ACKNOWLEDGEMENTS .....</b>	<b>ii</b>
<b>INTRODUCTION.....</b>	<b>1</b>
<b>BACKGROUND .....</b>	<b>1</b>
<b>REASON FOR BROWN PELICAN DECLINE AND LISTING .....</b>	<b>2</b>
<b>PURPOSE AND OBJECTIVES.....</b>	<b>4</b>
<b>MONITORING DURATION .....</b>	<b>6</b>
<b>IMPLEMENTATION .....</b>	<b>6</b>
<b>METHODS .....</b>	<b>8</b>
<b>MONITORING OF THREATS .....</b>	<b>13</b>
<b>FACTORS INDICATING POTENTIAL NEED FOR ACTION BY THE SERVICE AND ITS PARTNERS.....</b>	<b>15</b>
<b>MEETINGS AND REPORTS .....</b>	<b>16</b>
<b>FUNDING .....</b>	<b>17</b>
<b>ANTI-DEFICIENCY ACT DISCLAIMER .....</b>	<b>17</b>
<b>LITERATURE CITED .....</b>	<b>18</b>

## **ACKNOWLEDGEMENTS**

The primary authors of this draft post-delisting monitoring plan for the brown pelican are Robert McMorran and Michael D. McCrary of the U.S. Fish and Wildlife Service (Service), Ventura Fish and Wildlife Office. The following Service personnel provided assistance and valuable comments: Amedee Brickey of the Pacific Southwest Region, Steve Chambers of the Southwest Region, and Kelly Bibb, Deborah Fuller and Dr. Jorge Saliva of the Southeast Region. We especially thank Dr. Dan Anderson and Dr. Frank Gress for their information and advice regarding brown pelican populations in California and Mexico. We also thank Dr. Deborah Jaques for providing valuable information on roosting locations within the states of Washington, Oregon, and California.

## INTRODUCTION

On February 20, 2008, the Service published a proposed rule (73 FR 9408) to remove brown pelicans in the remaining portion of the species' range from the protections under the Endangered Species Act (Act) (50 CFR 17.11 and 17.22) based on the recovery of the species. The proposed rule included a brief description of the post-delisting monitoring that would occur if the species was delisted. Post-delisting monitoring refers to activities undertaken to verify that a species delisted due to recovery remains secure from risk of extinction after the protections of the Act no longer apply. Section 4(g), added to the Act in the 1988 reauthorization, requires the Service to implement a system in cooperation with the States to monitor for not less than 5 years the status of all species that have recovered and been removed from the List of Threatened and Endangered Plants and Animals (50 CFR 17.11, 17.12, 224.101, and 227.4). This draft post-delisting monitoring plan provides information on the goals, duration, implementation, methods, and reporting schedule for monitoring the brown pelican.

## BACKGROUND

The brown pelican was originally federally listed as endangered throughout its entire range (see below for details on the range of the brown pelican). The brown pelican was first listed under the Endangered Species Conservation Act of 1969; it was included in the United States List of Endangered Foreign Fish and Wildlife published in the Federal Register (FR) on June 2, 1970 (35 FR 84960), and in the United States List of Endangered Native Fish and Wildlife on October 13, 1970 (35 FR 16047). These lists were republished on January 4, 1974 (39 FR 1171), after the passage of the Endangered Species Act of 1973 (Act). On February 4, 1985, the Service delisted the brown pelican in Alabama, Florida, Georgia, South Carolina, North Carolina, and points northward along the Atlantic Coast (50 FR 4938). Brown pelican populations currently listed under the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 *et seq.*) occur in primarily coastal marine and estuarine (where fresh and salt water intermingle) environments along the coast of the Gulf of Mexico from Mississippi to Texas; along the Pacific Coast from British Columbia, Canada, south through Mexico into Central and South America; and in the West Indies.

The information on the biology, distribution, and nesting behavior of the brown pelican presented in this draft plan draws heavily from “Birds of North America” (Shields 2002) and the proposed delisting rule for the brown pelican (73 FR 9408).

The brown pelican occurs in coastal marine and estuarine habitats in parts of North, Central, and South America (see Shields 2002 for details). In the United States, brown pelican nesting colonies occur along the Atlantic Coast from Maryland to Florida, along the Gulf of Mexico from Florida to Texas, and along the Pacific Coast of southern California. Brown pelicans nest on several islands in the West Indies, including the Commonwealth of Puerto Rico and the U.S. and British Virgin Islands. In Mexico, brown pelican nesting colonies occur along the Pacific coast of Baja California, the Gulf of California, the States of Sinaloa and Nayarit along the west coast, and Veracruz and Yucatán along the east coast. In Central America, nesting colonies occur along the west coast of Honduras, Costa Rica, and Panama. In South America, nesting colonies occur along the coasts of Colombia, Venezuela, Peru, and Chile.

Brown pelicans nest mainly on offshore islands where they are generally free from predation by terrestrial mammals and free of human disturbance. Stable, undisturbed colonies tend to be occupied year after year, some for several decades or longer. Pairs build nests directly on the ground on islands with few or no trees (e.g., southern California) or in mangroves and other trees (e.g., Florida) when available. The number of nesting attempts and rate of nesting success vary widely from year to year and from colony to colony in response to factors such as changes in prey availability associated with climatic and oceanographic fluctuations (see Shields 2002 for details) and weather events (e.g., major storms during the breeding season). For example, along the Pacific Coast, prey species availability tends to decline during El Niño-Southern Oscillation (ENSO) events, which can result in major reductions in the number of nesting attempts and young fledged. Data collected from 1987 through 2003 show the number of nesting attempts on West Anacapa Island off southern California varied from a low of 1,490 to 6,440, and the number of young fledged varied from 372 to 5,530 (Gress and Harvey 2004; Figure 1). Changes in the number of nesting attempts can be steep and abrupt. For example, the number of nesting attempts declined by about 75 percent in a single year from 1991 to 1992. The lowest numbers of nesting attempts and young fledged during this period occurred during a series of ENSO events in the early 1990s. These historical data indicate that these fluctuations do not appear to significantly affect long-term population growth.

The diet of the brown pelican mainly consists of small, surface-schooling fish including menhaden (*Brevoortia* spp.), anchovies (*Anchoa* spp. and *Engraulis mordax*), and sardines (*Sardinella* and *Harengula* spp. and *Sardinops sagax*) (Shields 2002).

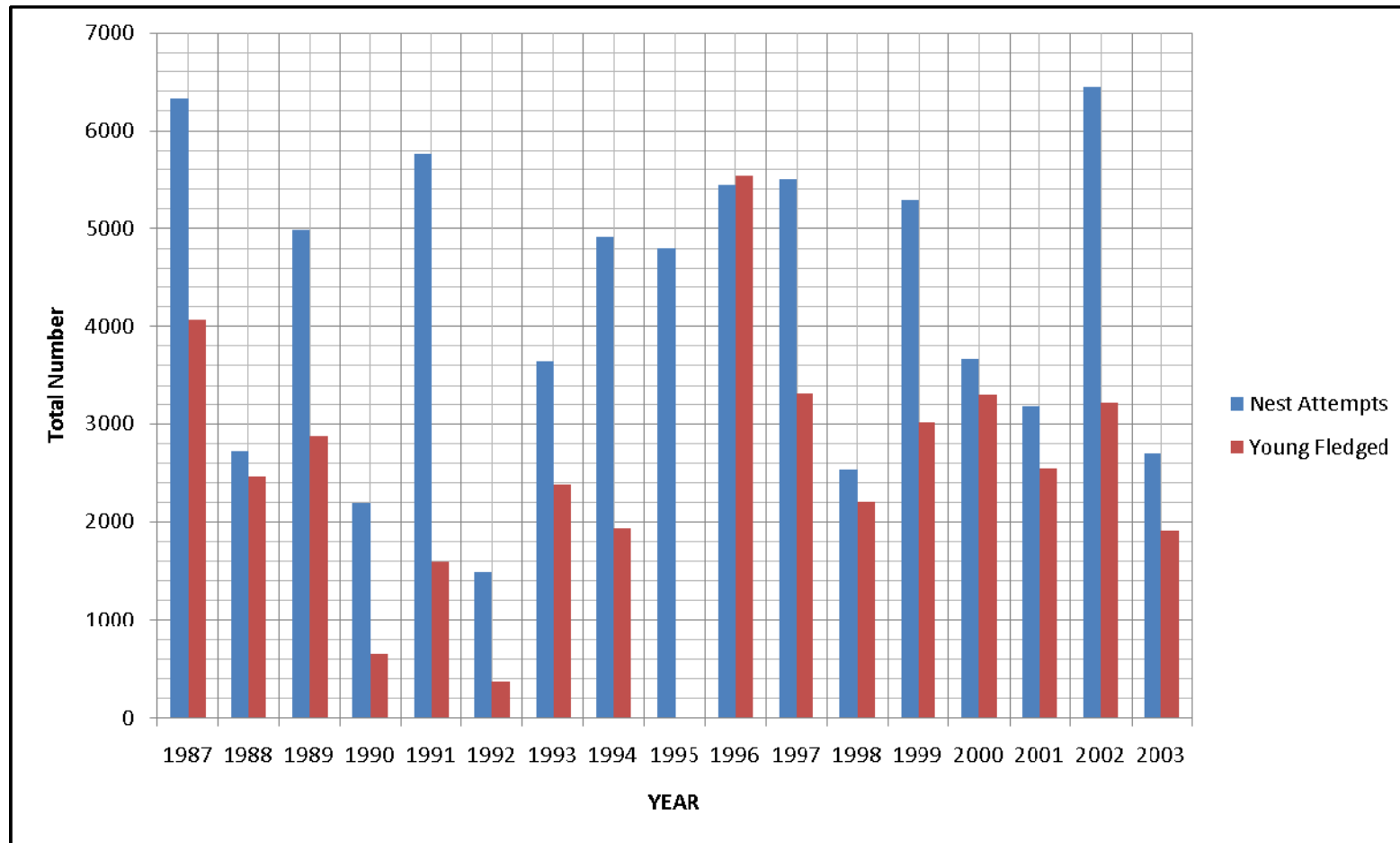
Pelicans do not reach sexual maturity until 3 to 5 years of age. The brown pelican is known to be a long-lived species; although no specific measures of longevity are available, one pelican lived to 43 years of age (Shields 2002).

## **REASON FOR BROWN PELICAN DECLINE AND LISTING**

In the late 1950s and early 1960s, the brown pelican disappeared from the Louisiana coast and underwent major declines in many other areas, including Texas and California (73 FR 9408). As a result, the Service listed the brown pelican as endangered in 1970 (see Introduction section). The primary cause of this decline was determined to be organochlorine pesticides, including dichloro-diphenyl-trichloroethane (DDT) which was widely used from the 1950s through the early 1970s (37 FR 13369). Brown pelicans gradually accumulated these toxins by eating contaminated fish. These toxins resulted in nestling, juvenile, and adult mortality, or reproductive failure as a result of the production of thin-shelled eggs that are easily crushed during incubation. Please see the proposed delisting rule for additional details (73 FR 9408).

Other threats that may also have contributed to the decline of brown pelicans included: coastal development; disturbance of nesting colonies by fishermen, boaters, and other recreationists; loss and disturbance of roosts; hurricanes; declines in prey fish; and oil spills (see 73 FR 9408 for details).

Figure 1. Brown pelican nest attempts and young fledged on West Anacapa Island off southern California, 1987-2003.



## PURPOSE AND OBJECTIVES

The purpose of this draft plan is to track the status of the brown pelican over time (e.g., colony occupancy, number of nesting pairs), and to verify that the pelican remains secure from risk of extinction after it has been removed from the protections of the Act. The status of the brown pelican will be based on colony occupancy (e.g., the presence or absence of nesting birds) and number of nesting pairs over time. The loss of a large colony could be an indication of a serious problem as would a downward trend in nesting pairs. If a major colony is abandoned or the number of nesting pairs shows a downward trend (e.g., over 3 years or more, see Factors Indicating Potential Need For Action By The Service And Its Partners section) the potential cause(s) will be investigated. Post-delisting monitoring as described in this draft plan will fulfill the final process in the recovery of the brown pelican.

Although brown pelican colonies occur as far south as Peru, post-delisting monitoring will be limited to representative areas where data on population trends can be obtained and compared to previous survey results. This draft plan covers the following brown pelican populations: Gulf coast of Louisiana and Texas; the Commonwealth of Puerto Rico and the U.S. Virgin Islands in the West Indies; the Pacific coast of California and Baja California, Mexico; and the Gulf of California (Figure 2). Except for the Gulf of California, these populations suffered the greatest declines in productivity and abundance that led to the listing of the species. We are not aware of any serious declines in other areas except for those associated with natural occurrences such as ENSO events, and therefore, we have not included these areas. The Gulf of California population is included because it is believed to be a part of the Pacific coast of California and Baja California population, or is at least closely linked with that population. However, if information of a major decline in any population(s) not included in this draft plan becomes available, the Service and its partners will determine the best course of action, such as including the population in post-delisting monitoring or considering emergency listing of the population.

The primary goal of this draft plan will be accomplished through cooperation with the State resource agencies, the Commonwealth of Puerto Rico, U.S. Virgin Islands, Mexico, other U.S. Federal agencies, non-governmental organizations, and individuals. Colony occupancy can readily be determined, and methodologies for determining the number of nesting pairs have been developed for each population included in this draft plan. One of the factors that complicate the development of a post-delisting monitoring plan for brown pelicans is the substantial inter-annual variability in the number of pairs that attempt to nest (Figure 1), which does not necessarily indicate either a corresponding die off of breeding birds or a long-term change in the status of the species. However, other measures for determining status, such as productivity and total abundance, are particularly difficult to determine for brown pelicans. For example, it would not be feasible to determine the total abundance of adult and juvenile pelicans in southern California and Mexico because non-breeding birds disperse over a vast area that extends as far north as British Columbia, Canada.



We believe that colony occupancy and numbers of nesting pairs reflect the overall status of the brown pelican and that tracking these parameters for the duration of this plan is sufficient to ensure that the brown pelican does not decrease to the point of again meeting the definition of endangered or threatened without an appropriate and timely response.

Figure 2. Brown pelican breeding range and post-delisting monitoring populations.



Because contaminants were a major factor in the listing of the brown pelican, contaminants will also be monitored periodically. If a downward trend in one of the populations included in this draft plan is detected, potential causes of the decline will be investigated, including consideration of natural population cycles, weather, productivity, contaminants, and prey availability. A simultaneous decline in multiple populations would be a major concern and would require more intense scrutiny and possibly revisions to the post-delisting monitoring plan. The goal of such investigations will be to determine if changes in monitoring, additional research, and/or a range-wide status review of the species is warranted.

As discussed above, brown pelicans undergo occasional steep but short-term declines in the number of pairs that attempt to nest. However, these periodic declines do not necessarily reflect the overall status of the species if the changes are within or similar to the natural variation observed in the species based on the results of previous monitoring. Therefore, it is critical to the success of this draft plan that the results of future monitoring are comparable to those from the past. It is also important to note that the natural variation observed in each population may differ. For example, an ENSO event may have a major effect on pelicans along the Pacific Coast, but little or no effect on pelicans along the coast of Louisiana. Similarly, a hurricane in Louisiana will not affect brown pelican populations along the Pacific Coast.

## **MONITORING DURATION**

The Service believes that the brown pelican should be monitored for 10 years, although the Act has a minimum requirement of 5 years. As discussed in the Background section of this PDM, the brown pelican is a long-lived species, and some individuals do not begin breeding until 5 years of age. Also, the brown pelican may undergo major changes in the number of nesting pairs and productivity from year to year in response to changes in prey availability and environmental conditions. The 10-year monitoring period is necessary so that more than one generation is included and to provide sufficient time to determine if an observed decline in nesting pairs is within the range of natural variation or indicates a serious concern for the status of the species. However, if any indication of a population decline that falls outside observed natural variation or a substantial new threat is observed, the PDM may be extended.

## **IMPLEMENTATION**

Brown pelican post-delisting monitoring is a cooperative effort, and the Service will coordinate with other U.S. Federal agencies, State resource agencies, foreign governments, interested scientific organizations, and others as appropriate to implement an effective monitoring program to track the status of the brown pelican.

A Service team comprised of staff from Regions 2, 4, and 8 was established to develop the PDM and implement and coordinate monitoring. Region 8's Ventura Fish and Wildlife Office (VFWO) has the lead for this monitoring effort. The VFWO will be responsible, with the cooperation and assistance of the above, for ensuring that the

monitoring requirements outlined in this PDM are accomplished, including the completion of the final monitoring report.

The role of Region 8 is to:

- prepare a draft PDM in cooperation with Regions 2 and 4 and partners;
- publish the Notice of Availability for the draft PDM in the Federal Register and distribute the draft PDM within the Service, and to State resource agency directors, U.S. territories, Mexico, other cooperators, and the public for comment;
- incorporate peer review comments on the draft PDM from scientific experts and cooperators and consider all public comments on the draft PDM;
- publish the Notice of Availability for the final PDM in the Federal Register and distribute the final PDM within the Service, and to State resource agency directors, U.S. territories, Mexico, other cooperators and the public;
- work with partners in California and Mexico to facilitate monitoring and prepare reports on survey results;
- gather additional information for California and Mexico that may aid in assessing the status of the brown pelican, including information on roosts, prey species, productivity, and threats;
- gather any information from areas outside those included in this draft plan that may be important to assessing the overall status of the species. An example of a potential source of information outside the area covered by the PDM is the results of any future aerial surveys of non-breeding brown pelicans in Oregon and Washington that may be conducted by the Service;
- prepare a report on the status of the brown pelican for the first 5 years of monitoring and a final report at the end of the monitoring period;
- hold annual meetings via conference call with Regions 2 and 4 and partners to discuss monitoring results and information needs and to update the monitoring plan, as needed; and
- prepare a final report with the assistance of Regions 2 and 4 and partners.

The roles of Regions 2 and 4 of the Service are to:

- assist with the preparation of the draft and final PDM;
- coordinate with the States, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, organizations, and individuals within their jurisdiction that will be participating in brown pelican monitoring;
- gather additional information for their respective areas that may aid in assessing the status of the brown pelican, including information on roosts, prey species, productivity, and threats;
- prepare data reports after each survey is completed for their respective areas to be compiled into a status report for the first 5 years of monitoring.

## **METHODS**

At least some degree of monitoring of all the brown pelican populations included in this PDM had been conducted prior to the February 20, 2008, proposed delisting of the species (73 FR 9408), the results of which were critical to the decision to propose delisting. Different monitoring methods have been developed for each population, and it is not the intent of this PDM to replace or change existing brown pelican monitoring programs. The number of nesting pairs and population trends can be estimated with the existing methods. We believe it is important to the success of this PDM to continue using the same methods, in most areas, as have been used in the past to ensure that data are comparable to those collected before the protections of the Act had been removed. In addition to data comparability issues, we do not believe it is feasible to develop a single methodology that would apply to all populations because nest substrate, nesting phenology, and distribution and abundance vary among populations. The results and methods of existing monitoring strategies should be sufficient to track the status of each population and provide an adequate overview of the status of the species.

The exception to employing existing monitoring methodologies is southern California and the Pacific Coast of Baja California, Mexico. The existing methodology for these populations has been used for many years. However, this methodology is labor intensive and time consuming. The existing methodology was also developed during the early phase of recovery when the number of nesting pairs was far lower, and it has become increasingly difficult to use as the number of nesting pairs has increased. Therefore, a new methodology will need to be developed for this area. It is important that the new method be designed so that results are comparable with the original method (see California and Mexico section below).

As noted in the proposal to delist the brown pelican, brown pelicans will undergo occasional changes in the number of nesting pairs and productivity on a local scale. The species' broad distribution and multiple nesting colonies reduce the risk that any single event would affect the entire population of brown pelicans. The timing and cause of these fluctuations varies between populations. The occurrence of these fluctuations makes it difficult to specify a value (e.g., percent decline) that, if reached, would require new conservation measures or consideration for relisting. Therefore, a major component of this PDM is ongoing coordination between the Service and State resource agencies, Puerto Rico, U.S. Virgin Islands, Mexico, nonprofit groups, pelican experts, and other partners.

As part of the methodology for this PDM, annual conference calls between the Service and representatives from the above will be conducted. The goal of these meetings will be to discuss the general status of pelican populations over the previous year, any new survey results, and any additional research needs for the upcoming year(s). Any observed changes in nesting-pair abundance, the degree of change in comparison to previous estimates, and potential reasons for the change will be emphasized. The group may decide that an observed change is outside the range of natural variation and that additional information should be collected on the affected population(s). In preparation

for the meeting, the Service will ask Regions 2 and 4 to provide a report on the results of any new pelican surveys and identify any new threats or changes in existing threats.

The following are descriptions of on-going brown pelican monitoring protocols that collectively, along with a new methodology for the Pacific Coast population, would be the base of the brown pelican post-delisting monitoring plan. As stated previously, population data are available for these areas for comparison with data collected during post-delisting monitoring, and with the exception the Pacific Coast, survey methodologies have already been developed and implemented in these areas. Also, these populations were among the largest outside of those in Peru prior to listing (73 FR 9408), and these populations also suffered the greatest declines in productivity and abundance that led to the listing of the species. For example, in the early 1960s, brown pelicans had completely disappeared from Louisiana (73 FR 9408). Therefore, the continued health of these populations should be indicative of the health of the species as a whole. However, if information of a major decline in any population(s) not included in this draft plan becomes available, the Service and its partners will determine the best course of action, such as including the population in post-delisting monitoring or considering emergency listing of the population.

#### *California and Mexico*

In 2006, surveys using a combination of observation techniques (e.g., boats, airplanes, observers on the ground) were conducted to determine the population size of the California brown pelican subspecies (*Pelecanus occidentalis californicus*) during a non-El Niño year. Survey results relevant to this PDM included: 1) nesting colony occupancy; 2) number of nesting pairs; 3) documentation of disturbance to coastal and offshore rocks/islands, and the impacts of aquaculture activities, all of which may result in substantial loss of nesting habitat; and 4) number of juvenile and sub-adult pelicans (Anderson et al. 2007).

During the 2006 survey, different methods were used for the Gulf of California colonies compared to the Pacific Coast colonies. Because the Gulf of California has many more colonies that are spread over a much larger area than the Pacific Coast, these colonies were mainly surveyed by airplane in 2006, with boats and observers on the ground used only minimally. In contrast, the Pacific Coast colonies were mainly surveyed from the ground and from boats, similar to the methods used in most previous surveys of these populations. However, we believe that the goals of this PDM will best be achieved by applying the methods used for the Gulf of California, namely aerial surveys, to the entire range of the California brown pelican, including the Pacific Coast. We believe aerial surveys are more efficient than boat and ground surveys, especially in those areas with large concentrations of nests, such as Anacapa Island, or a large number of nesting islands. In addition to aerial surveys, the methods used for the Pacific Coast will likely include some level of observation from the ground and boats to verify that the data collected through aerial surveys are comparable to older data or to determine correction factors if needed. We are working with brown pelican experts on the details for the

Pacific Coast methodology and will provide a complete description in the final post-delisting monitoring plan.

In addition to estimating nesting pelican abundance each year, we propose that other areas used as the largest (several thousand birds in some cases) pelican roosts along the California coast be surveyed at least every other year throughout the duration of this PDM to determine numbers of pelicans using these sites. Along the Pacific Coast, undisturbed roost sites have been identified as an important requirement of pelicans because in this area brown pelicans use roost sites that are different from nest sites (Jaques and Anderson 1987, Briggs et al. 1981). In other areas, brown pelicans generally also use their nesting grounds as roosting grounds year round (Saliva 2003, Hess and Durham 2002, Hess and Linscombe 2001, King et al. 1985). Methodologies for surveying brown pelican roosts have been developed for California, and previous roost data are available. Aerial surveys at pelican roost sites in California have been spotty and associated with a variety of projects. The most recent California statewide aerial surveys were conducted in 1998, 1999, and 2000, with about 40,000 pelicans counted during the 2000 survey. A methodology for monitoring pelican roosts based on aerial survey techniques has been developed (Strong and Jaques 2003). Aerial surveys are performed at an altitude of approximately 500 feet (ft) (152 meters (m)) above sea level immediately offshore from the shoreline or roost habitat. Photographs of pelican roost locations are taken out an open window at an oblique angle. Pelicans are counted individually later from projected transparencies. Numbers of pelicans at small roosts (generally less than 20 birds) and active birds flying or feeding within 1 kilometer (0.62 miles) of shore are tallied.

### *Louisiana*

Louisiana Department of Wildlife and Fisheries (LDWF) conducts brown pelican surveys each year during the breeding season. In coastal Louisiana, usually 10 to 15 active nesting colonies are present each year. The majority of colonies occur from Last Island south of Houma, Louisiana, to North Island at the northern tip of the Chandeleur Islands east of the Mississippi River.

The goal of LDWF is to track trends in the number of nests, and although not required for this monitoring plan, reproductive success. Pelican data collected by LDWF include: 1) number of nests producing young; 2) number of fledglings per nest; and 3) number of fledglings per colony. The original methodology developed by LDWF for studying brown pelicans consisted of a combination of aerial surveys, aerial photography, and boat surveys (McNease et al. 1992); this methodology was used by LDWF from 1980 to 2001. In 2002, aerial photography was discontinued when the plane with those capabilities was sold. Data are now collected by direct observation from helicopters and boats. LDWF believes this methodology is as accurate as aerial photography and more efficient.

LDWF conducts an average of five to six surveys throughout the nesting season, which extends from March through August. LDWF conducts additional surveys when needed to monitor the impact of extreme weather and environmental events such as hurricanes

and oil spills. Survey timing is variable but generally begins in March or April to determine nest initiation dates.

Aerial Surveys: Most colonies are surveyed from the air. Surveys are conducted with a Jet Ranger 206B helicopter, with two trained observers looking out the same side of the aircraft opposite of the pilot. The aircraft flies parallel to the shoreline for barrier island colonies at an altitude of approximately 100 to 150 ft (approximately 30 to 45 m) at low flight speeds to ensure accurate results. Marsh and inland nest sites are surveyed by circling and hovering. The observers compare notes after surveying each colony to assure accurate results. Aerial surveys start at 8:00 AM and end at 4:00 PM and occur on clear, sunny days.

Boat Surveys: The Rabbit Island Colony in Calcasieu Lake is usually surveyed by boat. In 2007 and 2008 the Last Island, Wine Island, and Whiskey Island colonies were also surveyed by boat in conjunction with a brown pelican translocation/life history research project. Boat surveys are conducted by two observers surveying the island by running the boat along its perimeter. The surveyors estimate the number of birds on nests and number of young observed. The distance of the boat from the island varies depending on the tolerance of nesting birds to their presence (i.e., the boat approaches the island close enough to count, but not so close to cause the birds to leave the nest). Boat surveys start at 8:00 AM and end at 4:00 PM and occur on clear, sunny days.

### *Texas*

Monitoring of brown pelicans along the Texas coast of the Gulf of Mexico consists of yearly nest site counts and monitoring of islands for erosion. Nesting areas are all islands and are owned or managed by the National Audubon Society, Texas General Land Office, Port of Corpus Christi, The Nature Conservancy, and the Service's National Wildlife Refuge System. Some publicly-owned areas are under lease to the National Audubon Society. Employees of these agencies and organizations, as well as private volunteers, carry out monitoring activities.

Nest site monitoring consists of annual 1-day counts, usually conducted in May or June, of nesting pairs at all known nesting colonies. Annual counts for each nesting area are compiled by the Texas Colonial Waterbird Census and are posted on their website. The Texas Colonial Waterbird Count is organized by the Service, Texas Parks and Wildlife Department, Texas Audubon Society, and academic institutions. The Texas Colonial Waterbird Count has been conducted every year since 1973.

Monitoring for storm and erosion impacts to nesting islands occurs irregularly and is conducted by employees of landowner agencies or lessees during the course of their regular duties. Damage is noted and reported to landowners but is not formally compiled and reported for the entire area.

## *West Indies*

Puerto Rico: The Service conducted one to two aerial surveys of brown pelicans per year (depending on the availability of funds and aircraft) between 1991 and 2003, using both fixed-wing aircrafts and helicopters. Surveys were initially conducted with a Jet Ranger 206B helicopter or Cessna 172 airplane flown by contract pilots; later surveys were conducted with a Service-owned Partenavia airplane flown by a Service pilot. Surveys are conducted by three trained observers; two observers are stationed on the same side of the aircraft opposite of the pilot (the observer in the front seat also records data and directs the pilot), and one observer behind the pilot. Observers on both sides of the aircraft are used to ensure that both inshore and offshore pelican activity is recorded. The aircraft flies parallel to the shoreline at an altitude of 500 to 600 ft (150 to 180 m) and at low flight speeds to ensure accurate results. Observers maintain constant communication to ensure that no pelicans are counted more than once. Inland foraging and roosting sites are surveyed by circling and hovering (no brown pelican nesting activity has ever been recorded inland). Aerial surveys are conducted on clear, sunny days from 8:00 a.m. to 4:00 p.m. Boat surveys are not conducted because the density of the tree canopy and the location of pelican nests high in the canopy prevent accurate counts of active nests.

The goals of these aerial surveys were to: 1) count all juvenile and adult brown pelicans; 2) determine the distribution of pelicans throughout the islands; 3) record nesting activity (including colony location and number of nests); and 4) record behavior (e.g., foraging, roosting) and important foraging and roosting areas. Although pelican nesting activity has been recorded at seven areas in Puerto Rico (Aguadilla Cliffs (Aguadilla), Cayo Conejo (Vieques Island), Cayo Don Luis (Lajas), Cayo Fríos (Santa Isabel), Cayo Fríos (Lajas), Cayo Morrillos (Ponce), and Cayo Ratones (Cabo Rojo), only Cayo Conejo, Cayo Don Luis, and Aguadilla Cliffs are regularly active each year. Brown pelican nesting activity may occur twice in some years, which presumably is a result of increased prey availability. When this occurs, the first nesting period is from May to August, and the second nesting period is from December to March.

Since 2004, the Puerto Rico Department of Natural and Environmental Resources (DNER), Fisheries Research Laboratory, and the Service have limited surveys and research on brown pelican breeding activities to two colonies, Cayo Don Luis and Cayo Fríos (Lajas). The DNER uses a ground-based methodology for surveying brown pelicans that was developed in 2001 jointly by the Service and N. Jiménez of the DNER (J. Saliva, Service, personal communication 2009). Pelican data collected by DNER include: 1) number of active and inactive nests, 2) number of eggs and young per nest, 3) number of fledglings per nest, and 4) number of fledglings per colony. DNER visits the two pelican colonies once per week after the pelicans begin laying and incubating eggs. Each nest tree is individually tagged and the location of each nest is diagramed. After this initial process, each nest is monitored for hatching success and nestling survival. Because nests are usually in the upper canopy of mangrove trees at a height of 30 to 45 ft (10 to 15 m), hatching success is monitored using a surveillance camera mounted on a pole and connected to a monitor on the ground. Individual nestlings are not tracked because they are highly mobile. Therefore, to estimate total fledging success of the



colony, the total number of nestlings in the colony is recorded on each trip until they have all fledged.

By using the same methodology each year, DNER is able to track the number of nests and total colony fledgling success at the two colonies. Depending on funding availability, DNER will continue using the same survey methodology at the same two colonies as have previously been monitored. DNER may also initiate monitoring of other colonies in Puerto Rico, such as Cayo Conejo, depending on funding availability.

Virgin Islands: Little is known about the breeding success of brown pelicans in the Virgin Islands, primarily because of the difficulty accessing nesting colonies. The only in-depth brown pelican research on these islands was conducted from the mid-1980's through the early 1990's, when surveys were conducted at Dutchcap Cay (St. Thomas), Congo Cay (St. Thomas), Buck Island (St. Croix), and Tortola (British Virgin Islands). Since then, the U.S. Virgin Islands Department of Planning and Natural Resources (DPNR) has sporadically visited the brown pelican colonies as part of a rat eradication program on Congo Cay, and during censuses and research on other seabird species on Dutchcap Cay and Buck Island. The methodology used by DPNR to monitor seabirds including the brown pelican includes a combination of aerial observations and ground-based surveys similar to the methodology used in Puerto Rico. However, low-level flights over the Virgin Islands are restricted, which limits aerial surveys. Ground surveys and monitoring are also limited because the cays are difficult to access, and many of the nests are located on steep slopes and cliff faces. In the Virgin Islands, brown pelicans may breed twice a year depending on prey availability. Therefore, surveys should be conducted between February and May (first nesting period) and between August and December (second nesting period).

## **MONITORING OF THREATS**

Colony occupancy and number of nesting pairs will be monitored annually for 10 years to determine whether the species remains secure from the risk of extinction after the protections of the Act no longer apply. If a major colony is abandoned or downward trend in the number of nesting pairs is observed, especially one that the Service and its partners consider to be outside the bounds of natural variation, the Service will attempt to determine the reason(s) for the decline. A decline may be the result of human-related threats or natural events or a combination of the two. Information that may be important in determining the cause of a decline includes but is not limited to: 1) major weather events or changes in weather patterns; 2) changes in prey availability; 3) changes in habitat or habitat loss; and 4) contaminants. If a human-related threat is identified as a causative factor in a decline, the Service will work with its partners, land managers and landowners, other Federal and State agencies, and conservation organizations to address the threat and work to avoid the need to relist the brown pelican. Additional details on potential threats to brown pelicans are provided below.

### *Weather*

Although certain weather information, such as temperature and wind speed and direction, will not be reviewed routinely, major weather events will be closely monitored.

Hurricanes and other major storms cause erosion, destroy nests, and down nesting trees. ENSO events may result in declines in nesting pairs and nest failures. The Service will review ENSO forecasts and yearly reports, which are available through the National Oceanic and Atmospheric Administration's Climate Prediction Center (<http://www.cpc.ncep.noaa.gov>). These documents may be useful to the Service and its partners in understanding the reason(s) for an observed decline in nesting pairs.

### *Prey Availability*

Annual reproductive success of brown pelicans in southern California and the Pacific coast of northern Baja California, Mexico (Southern California Bight) is correlated with northern anchovy (*Engraulis mordax*) abundance (i.e., the rate of nest abandonment and nestling mortality is higher in years when anchovies are scarce) (Anderson et al. 1982). To determine if a decline in the number of nesting pairs is the result of reduced prey availability, in years when pelican monitoring data show a substantial decline the Service will review the Pacific Fishery Management Council's annual stock assessment and fishery evaluation reports. These reports detail any significant changes or trends in pelagic fish populations, fisheries, or marine ecosystems; document harvest levels; and assess the success of State and Federal fishery management programs. The Service will also review any reports from the Gulf Coast or Caribbean Fishery Management Councils and any fishery reports for areas where brown pelicans occur outside the U.S. that may provide insight on the status of the species.

A shift in diet of brown pelicans could also indicate a change in the distribution or abundance of prey species. The Service and its partners may encourage the collection of diet samples from brown pelicans when this information could help determine the cause(s) of an observed decline in the number of nesting pairs or other changes in the species status.

### *Contaminants*

The drastic adverse effect of organochlorines, especially DDT and endrin, on brown pelicans was the primary reason for listing the species. Although DDT has been banned and endrin use has been reduced, we believe it is important to monitor contaminant levels in brown pelicans as part of this PDM. In addition to the legacy organochlorines, such as DDT and polychlorinated biphenyls (PCBs), newer compounds, such as polybrominated diphenyl ethers (PBDEs) used in manufacturing as flame retardants, are becoming more widely-distributed in the environment. PBDEs at environmentally relevant levels have recently been associated with reproductive impairment in piscivorous (fish eating) raptors (Henny et al. 2009). Residual DDT contamination, eggshell thickness, and concentrations of other contaminants such as PCBs, PBDEs, and mercury in addled eggs will be analyzed to determine the current level of contaminant exposure. Contaminants

from the Pacific Coast, Gulf of California, Gulf of Mexico, and Caribbean will be assayed three times during post-delisting monitoring: at the beginning of post-delisting monitoring, during the fifth year, and at the end of the 10-year monitoring period. In addition, the Service will review any available information on contaminants in other seabirds, which may be an indication of contamination problems for brown pelicans.

We will also ask partners to alert us immediately in the case of any major events, such as an oil spill or unusual mortality event that may adversely affect pelicans

## **FACTORS INDICATING POTENTIAL NEED FOR ACTION BY THE SERVICE AND ITS PARTNERS**

Although often included in PDMs for other species, we do not believe it is feasible to specify in advance a list of explicit, quantitative triggers for the brown pelican that would require specific actions by the Service (e.g., extension of the PDM period, initiation of a formal status review, or publication of a relisting proposal). As noted previously, a decline in the number of nesting pairs of brown pelicans in a single year does not necessarily equate to the occurrence of adult mortality and does not necessarily indicate a change in the status of the species. Identifying range-wide quantitative triggers is further complicated because population size, population dynamics, and potential threats are often different for each of the populations included in this PDM. For example, over 70,000 nesting pairs may occur in California and Mexico, while less than 1,000 nesting pairs occur in Puerto Rico and the Virgin Islands (73 FR 9408), and thus, a decline in the latter would be much more significant at a local scale than a decline of similar magnitude occurring along the Pacific Coast. Additionally, an ENSO event may have a substantial effect on pelicans along the Pacific Coast, but little or no effect on Puerto Rico and Virgin Island pelicans. Therefore, any remedial or responsive actions will only be taken by the Service based on a more comprehensive review of the underlying cause(s) of an observed decline or other change rather than in response to a specific quantitative trigger.

In the absence of a quantitative trigger, the Service and its partners will further evaluate any population in which the number of nesting pairs declines from one year to the next for 3 consecutive years, regardless of the degree of decline. A decline for 3 consecutive years or more is generally outside the observed range of normal variation for brown pelicans and could indicate that a higher level of sustained breeding bird mortality is occurring. In the case of such a decline, the Service and its partners may decide that additional monitoring and research are needed to determine the cause of the decline. Depending on the causes, severity, and duration of the decline, the Service may determine that it is necessary to extend the term of the PDM beyond 10 years or that relisting the population as endangered or threatened is warranted.

The Service and its partners may also decide that other events in addition to a multi-year decline in nesting pairs, warrant further study. Examples of potential events and possible responses include:

- Event: A severe hurricane hits the coast of Louisiana or Texas in the vicinity of brown pelican colonies.
- Reponse: Additional surveys are conducted to assess the locations and degree of pelican nesting habitat loss, if any.
- Event: An unusually large number of dead or sick adult and juvenile brown pelicans are being reported along the coast of California, such as occurred along the coast of California and Mexico in 2008-2009 (Jessup, in litt. 2009).
- Response: Surveys of beaches to assess the number and age of dead or injured pelicans and necropsies of dead pelicans are conducted. The Service coordinates with State resource agencies to facilitate and direct research efforts and determine the cause or causes of the event.

Although we do not believe synchronized, range-wide population declines are likely to occur, the following are examples of changes that would likely require the Service to take action:

- a simultaneous multi-year decline in nesting pairs in multiple populations,
- nest abandonment and high fledgling mortality in multiple populations, or
- unusually high mortality of adults and juveniles in multiple populations.

In the event of a substantial range-wide decline, the Service may take one or more of the following actions as appropriate:

- hold a special meeting between the Service and its partners to discuss the causes and severity of the observed change and appropriate responses;
- add new components to the PDM;
- extend the PDM period;
- conduct a range-wide status review of the species, which would include a five-factor analysis of the threats to the species, to determine whether the species warrants listing under the Act; or
- emergency list the brown pelican.

## **MEETINGS AND REPORTS**

As stated previously, annual meetings via conference call will be held to share and discuss results from surveys, evaluate any observed change(s), determine information needs, consider additional research, and coordinate report preparation. As part of each annual meeting, the Service will also consider changes to the PDM; if such changes are necessary to meet the Service's responsibilities under Section 4(g) of the Act, they will be promptly implemented, subject to available funding needed for their implementation.

In addition to the annual meetings, the Service should be represented at scientific conferences and workshops, such as the Pacific Seabird Group and Waterbird Society annual meetings, that pertain to brown pelicans and other seabirds. Participation in such meetings provides an opportunity for the Service and its partners to present the results of

post-delisting monitoring, gather additional information on other seabirds and the marine environment that may apply to brown pelicans, and encourage or maintain interest in brown pelican monitoring within the scientific community.

A range-wide report on the status of the brown pelican will be prepared at the end of year 5 of post-delisting monitoring. This report will include: 1) a summary of the results of annual surveys for each population; 2) any other data that could be used to assess the status of the pelican; 3) a summary of the status of the pelican in each population and overall; 4) the status of threats to the species with respect to the five factors considered when a species is proposed for addition to the Federal List of Threatened and Endangered Wildlife and Plants [i.e., A) the present or threatened destruction, modification, or curtailment of habitat or range; B) overutilization for commercial, recreational, scientific, or educational purposes; C) disease or predation; D) inadequacy of existing regulatory mechanisms; and E) other natural or manmade factors affecting its continued existence], and 5) recommendations for any actions and plans for the next 5 years.

At the end of the PDM period, the Service will conduct a final internal review and prepare a final report summarizing the results of monitoring. A Notice of Availability of the final report will be published in the Federal Register. The final report will include a discussion of whether monitoring should continue beyond the 10-year period for any reason. If the results are inconclusive, monitoring should continue and the monitoring plan should be modified as appropriate. If there is no indication that the brown pelican meets the definition of endangered or threatened under the Act at the end of the 10-year monitoring period, then monitoring can be discontinued at that time. The Service may request reviews of drafts of the final report by species experts and other independent specialists, as appropriate. The final report will be posted on the Internet at:

<http://www.fws.gov/ventura>

## **FUNDING**

The Service is currently working on cost estimates for implementation of the PDM and will include these in the final PDM.

## **ANTI-DEFICIENCY ACT DISCLAIMER**

Post-delisting monitoring is a cooperative effort between the Service and State, Tribal, and foreign governments; other Federal agencies; and non-governmental partners. Funding of post-delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the brown pelican following removal of Endangered Species Act protections. To the extent feasible, the Service intends to provide funding for post-delisting monitoring efforts through the annual appropriations process. Nonetheless, nothing in this post-delisting monitoring plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation.

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