American White Pelican

Figure 1. American white pelican (*Pelecanus erythrorhynchos*).

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Overview of Damage Prevention and Control Methods

Habitat Modification

- Drain water from flooded fields and other loafing sites

Exclusion

- Install overhead grid wires and perimeter electric fencing over ponds and raceways.

Frightening Devices

- Pyrotechnics can enhance other techniques to keep pelicans off ponds and loafing sites
- Use or encourage pedestrian traffic, ATVs, boats, and other vehicles to haze pelicans at sensitive locations
- Harassment patrols, electronic noise devices, human effigies, and propane cannons

Repellents

- None registered

Reproductive Control

- Nest destruction, egg addling, and egg oiling

Toxicants

- None available

Trapping

- Modified padded-jaw foothold trap
- Rocket nets

Shooting

- Centerfire rifles and 12-gauge shotguns using non-toxic T shot or BBs

Species Profile

Identification

The American white pelican (*Pelecanus erythrorhynchos,* Figure 1) is 1 of 2 pelican species native to North America. The brown pelican (*P. occidentalis*) forages in coastal aquaculture settings but has not been reported foraging at inland aquaculture facilities. This chapter focuses on the American white pelican.

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Physical Description

American white pelicans are mostly white with black primary and secondary feathers. Their bills and legs vary in color with age. Young pelicans have pale, gray-pink bills and legs while adults have yellow to orange-red bills and legs (Figure 2).

Figure 2. Immature American white pelicans.

During the breeding season, adult pelicans develop a horny knob on the bill and pale yellowish feathers on the chest and upper wing. When sleeping or standing (loafing), pelicans appear to have squat bodies with long necks. The American white pelican has a large throat pouch to capture and manipulate prey, a long bill with sharp edges and a small nail at the tip. It also has webbed feet and is a strong swimmer. American white pelicans have the widest wing span of any bird in North America (96 to 114 inches).In flight, pelicans soar gracefully (Figure 3).

Figure 3. American white pelicans in flight.

Males typically are heavier than females, averaging 14.3 and 11.2 pounds, respectively. The weight range for males is 11 to 18 pounds, and for females is 9.3 to 13.7 pounds.

Range

The continental divide separates American white pelicans into 2 geographically distinct populations. The eastern population migrates primarily through the Great Plains and along the Mississippi River and winters in the lower Mississippi River Valley and along the Gulf Coast (Figure 4). The western population migrates along the Pacific coast and winters along the coast of southern California and western Mexico.

The breeding range of the American white pelican extends from south-central British Columbia across to southwestern Ontario and southward to the northern Plains states and Pacific Northwest. One viable American white pelican colony of approximately 400 exists near Corpus Christi, Texas in the Laguna Madre.

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Figure 4. Breeding and wintering ranges of the American white pelican.

Voice and Sounds

Adults are silent except for low, short grunts typically given in agonistic or sexual contexts at a breeding colony. Young pelicans at the colony are more vocal with loud squawks and food-begging calls. Non-vocal sounds include wings splashing water during bathing and when herding prey, and popping of the bill during agonistic encounters.

Tracks and Signs

Pelicans have large webbed feet, 6½ to 7½ inches long and 4¼ to 5⅜ inches wide that trample vegetation in heavy traffic areas. Loafing sites have large quantities of white-colored excrement and large feathers. The size of a loafing site depends on the number of birds using the area.

General Biology

Reproduction

Pelicans are believed to breed at 3 years of age. The breeding period typically is mid-April through mid-September. Nest building takes 3 to 5 days after the onset of courting. Egg laying begins about 4 to 5 days after nest site selection, with an interval of 2 days between eggs. They have 1 clutch of 2 eggs per year. Smaller clutches often are due to egg loss to predation. Due to asynchronous hatching and siblicide, only 1 young typically survives to fledging. Average documented nest success ranges from 0.34 to 0.89 young fledged per nest. It is not known if pelicans renest following the loss of a clutch early in the season.

Eggs hatch about 30 days after being laid and the chicks fledge about 10 weeks later. Both sexes attend the nest and young.

Nesting Cover

American white pelicans are ground nesters and prefer remote, isolated islands for colony sites. These breeding sites vary from nearly barren to densely vegetated, but are usually near water. Nests are typically shallow depressions on the ground with a small raised edge made from the adult raking gravel, soil, or vegetation with its bill (Figure 5).

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Figure 5. American white pelicans on nests.

Mortality

About 41% of fledged American pelicans die in their first year, 16% during their second year, and 21% thereafter. Main causes of mortality of pre-fledged young are starvation, severe weather (hail, lightning, extended periods of cold and wet conditions), and disease. Pelicans greater than 20 years old have been documented by banding recoveries. Adult mortality is mainly due to shooting, pesticides and other environmental contaminants, and habitat degradation.

Population Status

About 100,000 nests were counted at more than 55 colonies in the US and Canada in 2013. Therefore, a conservative estimate of the number of adult American white pelicans is 200,000 birds. The number of adults and colonies appears to be increasing. They can be common to unusual throughout their range. They occur in large numbers (200 to 30,000 individuals) in or near their breeding colonies and at loafing sites in their wintering areas (50 to 3,500 individuals, Figure 6).

Figure 6. American white pelicans loaf on fish pond levee.

Habitat

Pelicans breed and spend the summer months on remote islands in freshwater lakes and forage in lakes, rivers, marshes, and aquaculture facilities year round. Pelican mean home ranges vary from 110 to 2,927 square miles in the summer and from 115 to 569 square miles in the winter.

During migration, pelicans typically fly along river corridors and valleys but they have been known to cross deserts and mountains. Pelicans often stop over at lakes and reservoirs that provide forage and loafing sites. Pelicans readily take advantage of aquaculture facilities during migration and on their wintering grounds. Pelicans use sand bars, mud flats, flooded agriculture fields, and abandoned fish ponds as loafing sites.

Behavior

American white pelicans forage during the day and night although many, especially in south Louisiana and northwest Mississippi, forage primarily during the morning and afternoon. Pelicans feed singly, in small groups, or in large groups of more than 25 birds. When foraging singly or in small groups, pelicans usually dip their bills to search for food as they swim. When cooperatively foraging, pelicans herd their prey toward shallow water by swimming side by side and synchronously dipping their bills. Pelicans have been known to fly up to 190 miles from a breeding colony to a feeding site

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and prefer to forage in shallow water. Catfish ponds provide a nearly perfect foraging environment for pelicans, due to the relatively shallow pond depth (approximately 5 feet) and high fish stocking densities.

In a study conducted in south Louisiana and northwest Mississippi, researchers found that pelicans at catfish ponds spent about 4% of their day foraging and 96% loafing, whereas pelicans foraging in other habitats (crawfish ponds, rivers, lakes, and bayous) spent about 28% of their day foraging and 72% loafing.

American White Pelicans often forage cooperatively in large groups (Figure 7) using synchronized movements to herd and capture prey. They often swim in a line and synchronously dip their bills.

Figure 7. American white pelicans foraging.

Pelicans use air temperature thermals during flight to reduce their energy expenditure (Figure 8). They flap and circle to gain altitude and then release from the thermal and glide long distances, repeating the process until they arrive at their destination.

Figure 8. American white pelicans soaring.

Pelicans generally arrive at their breeding colonies during April to May and remain through early to mid-September. Fall migration usually takes place from mid-September through mid-November. Pelicans occupy their wintering areas from mid-November through the end of February. Spring migration typically takes place in March to April.

Food Habits

Pelicans prefer to forage in shallow water (1 to 10 feet) in open areas of marshes, lakes, rivers, and ponds, but also are known to forage in deeper water to take advantage of prey driven to shallower depths by diving birds such as cormorants. Pelicans are tip-up foragers; they do not submerge or dive. A pelican cannot forage deeper than it can extend its neck, head, and bill. A typical pelican can reach 3.3 feet below the surface of the water.

Pelicans typically feed on fish, crawfish, and amphibians, ranging in size from 2 to 25 inches. To forage, a pelican dips its bill into the water, scoops prey into its throat pouch, raises its bill above its head, and swallows. Pelicans prefer to forage for schooling prey but will forage for

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dispersed prey. Pelicans forage twice a day, consuming an average of 1.2 pounds per foraging trip. A pelican, however, has been reported consuming nearly 7 pounds in a single foraging event.

Legal Status

In the US and Canada, American white pelicans are protected by the Migratory Bird Treaty Act (MBTA). The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations.

As authorized by the MBTA, the US Fish and Wildlife Service (USFWS) issues permits to qualified applicants for the take of depredating birds. The Department of Interior, USFWS, Division of Migratory Bird Management develops migratory bird permit policy, and the permits themselves are issued by the Regional Bird Permit Offices of the USFWS.

The USDA-APHIS Wildlife Services (WS) recommends that managers of aquaculture facilities take the following steps to resolve damage by migratory birds.

(1) Contact the appropriate wildlife damage control biologist employed by WS in your region of the state. The state office of the WS program may provide assistance.

(2) The wildlife damage control biologist will evaluate your complaint and, if necessary, conduct a site inspection to identify the migratory species of concern, estimate the number of migratory birds, estimate damage, and document other information.

(3) The wildlife damage control biologist will recommend nonlethal bird control techniques.

If existing hazing devices are not effective, wildlife damage control biologists may make recommendations on the damage report for lethal control of the species and the maximum number of birds that may be killed. The biologist will attach the report to a completed USFWS Federal Fish and Wildlife License/Permit Application or Depredation Permit (Form 3-200) and mail it to the Special Agent in Charge in the appropriate USFWS Regional Office. The client pays a fee (currently $100) to cover administrative costs. The wildlife damage control biologist will provide details, including the appropriate addresses.

(4) A turnaround time for the issuance or rejection of depredation (kill) permits by the USFWS is approximately 1 week, providing the permit application is complete and no unusual legal or environmental issues are involved.

All recommendations include becoming familiar with federal and state laws related to bird depredation, knowledge of bird identification, and good communication with involved agencies. Actions that may be taken against a depredating bird species to protect a crop may vary from state to state and region to region. In recent years, as the number of aquaculture-related bird depredation complaints have risen, USFWS has increased legal action against individuals violating the MBTA. Due to the severe legal consequences of violating the MBTA, individuals should be aware of all these factors and follow the proper permit process before taking action against depredating species.

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Human Wildlife Conflicts

Landscapes and Crops

American white pelicans can damage recently planted crops such as rice by trampling and depositing guano, although the extent of these losses is not known.

Pelicans can be perceived as nuisance wildlife by anglers when they consume sport fish.

Livestock and Pets

American white pelicans threaten aquaculture producers by direct predation and disease transfer. The impact of direct predation can be substantial. For example, assuming that pelicans foraging in a catfish pond consumed exclusively catfish averaging 10.2 inches, each bird would require 11 of these catfish to meet its energetic requirement of 2 pounds per day. This consumption rate would translate into 2,750 catfish consumed per day by an average-sized flock of 250 pelicans. If these fish reached harvestable size of 1.5 pounds and were valued at $0.70 per pound, catfish farmers could potentially lose approximately $2,900 from a single day of pelican foraging. Actual depredation losses would depend on pelican abundance at ponds, the size and number of catfish consumed, and the duration of pelican foraging at catfish ponds. American white pelicans also kill vegetation on pond levees by trampling and guano deposition.

Pelicans are hosts of commercial catfish parasites, especially the digenetic trematode *Bolbophorus damnificus*. This trematode has caused substantial economic losses to several aquaculture producers in Louisiana, northwest Mississippi, and southeast Arkansas.

Although the economic impact of pelican foraging can be significant, the potential for pelicans to transmit trematode infections to catfish ponds can be more devastating. Whole ponds of catfish have died from trematode infections, and little can be done to treat these infections. Even mild infections of *B. damnificus* can result in a more than 60% reduction of net returns. The economic impact of trematode infections to commercially raised catfish in Mississippi was estimated at $27.1 million per year in 2004.

Human Health and Safety

Pelicans are not known to transmit any significant diseases to humans. Aircraft collisions have been documented.

Damage Identification

American white pelicans reveal their presence by their large webbed tracks and guano-stained (whitewashed) landscapes. Other than fish losses and the presence of *B. damnificus*, direct observation is the only way to determine if pelicans have been in an area.

Evaluation of predation

Fish losses at harvest, the presence of B. *damnificus*, and direct observation are the only ways to determine if pelicans have foraged on aquaculture ponds. Direct observation of pelican predation may not always be possible because pelicans will forage at night, especially on aquaculture facilities with active daytime harassment programs.

Trampling of vegetation is characteristic of pelican damage to agricultural crops (e.g., rice).

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Wildlife Damage Prevention and Control Methods

Prior to the winter of 1992, pelican depredation at catfish facilities in the delta regions of Arkansas and Mississippi was limited to infrequent visits, and birds were easily dispersed from the area. Since 1992, however, pelicans have become more persistent in their foraging efforts and more difficult to disperse from catfish farms. Their increased persistence requires an equally persistent response to limit their damage. Twenty-four-hour harassment patrols may be necessary where pelicans forage at night. The more recent fragmentation of some pelican flocks makes harassment and dispersal from ponds much more difficult. Thus, the most effective technique seems to be harassing the birds at their loafing sites near catfish farms, causing them to abandon the site and often reducing or eliminating predation at nearby facilities.

Integrated Wildlife Management

American white pelicans typically migrate northward to their breeding grounds during spring and return to the southeastern US during late fall. In recent years, however, flocks of up to 500 pelicans frequently have been observed in southeastern aquaculture areas throughout the summer. These birds may be non-breeding pelicans. Most wintering pelicans remain in the southeast from late fall through mid-spring. Pelicans that forage in aquaculture facilities during spring migration seem to be more tenacious foragers and more difficult to disperse from an area. Intensive, integrated management methods must be used.

Habitat Modification

Removal or elimination of water from loafing sites (e.g., flooded fields) can cause pelicans to abandon a site. Other modifications may include eliminating open wetland sites by planting perennial woody vegetation.

Exclusion

Exclusion may prevent pelican predation and disease transfer. Selection of a barrier system depends on the size of facility and whether the barrier will interfere with operations. Other considerations include possible damage from severe weather and the barrier's effect on site aesthetics in visually sensitive areas. Care must be taken to construct any physical barrier so that it does not become a threat to non-target birds, especially threatened and endangered species. The barrier material should be visible to birds to minimize accidental entrapment and injury. Avoid using loosely hung, small mesh netting such as mist netting, as it will cause excessive bird loss and draw public and regulatory attention.

Although often cost prohibitive, near total exclusion can eliminate up to 90% of pelican access to individual ponds. One aquaculturist in south Mississippi used a combination of overhead grid wires, perimeter electric fencing, and harassment to exclude about 90% of brown pelicans from landing or entering his fish ponds. The producer reported a cost of "nearly $3 million" to set up the exclusion devices at five 6-acre ponds.

Use 1- to 2-inch mesh netting secured to frames or supported by overhead wires to exclude all fish-eating birds from ponds and raceways. Cover all gates and other openings. In areas with harsh winter conditions, nets must have an

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adequate framework or support cables to prevent accumulating ice or snow from ripping the netting.

Some hatchery operators use mesh panels placed on the raceway walls above the water to effectively exclude birds. Secure small mesh wire or net less than 1 inch to wood or pipe frames to prevent feeding through the panel. Design panels to accommodate demand or automatic feeders and feed blowers that feed through mesh-covered raceways. Panels may interfere with feeding, cleaning, or harvesting operations, so they may be more appropriate for seasonal or temporary use.

All exclusion structures must be strong enough to prevent the weight of large birds and their activities from making the net sag to within feeding distance of the water. Construct all exclusion structures to allow use of fish maintenance equipment and, if necessary, to withstand wind and the accumulation of snow and ice. Nonrigid exclusion structures such as suspended netting may need lines, pulleys, and counterweights to facilitate lifting and lowering during adverse conditions or maintenance.

Although complete exclusion may not be practical, various barrier techniques may limit access to ponds or to the fish in these ponds. Nets suspended over catfish farm levees can prevent pelican depredation. Use of these nets will be impractical if levees are not wide enough to accommodate support structures and still allow vehicle access. Plastic and wire grids over catfish ponds can deter pelican flocks from landing and taking off, but do not necessarily exclude individual birds. Some success with parallel overhead wires spaced on 26-foot centers has been reported, but in other studies, birds simply landed on the levees and walked under the wires into the ponds.

Frightening Devices

Frightening devices modify behavior and discourage birds from feeding, roosting, or gathering at a location. American white pelicans typically are diurnal foragers, but often forage at night, especially in areas where daytime harassment is effective. During daylight hours, pelicans forage mainly during early morning and late afternoon and loaf during mid-day. However, pelicans quickly adapt to standardized harassment schedules and have been observed leaving a loafing site to forage at a catfish farm less than 15 minutes after the harassment person left the facility. Use a variety of harassment methods to increase effectiveness. Harass pelicans at their loafing sites near catfish farms. This may cause abandonment of the site, which has reduced or eliminated predation at nearby facilities.

Visual Techniques

Bright spotlights have been successful in dispersing nocturnal foraging pelicans from catfish ponds.

Audio-visual Techniques

Pyrotechnics can be effective in dispersing pelicans from foraging and loafing sites (Figure 9). Possession and use of pyrotechnics may require a permit from the local, county, or state fire marshal. Use ATVs, boats, or other vehicles when using pyrotechnics to increase effectiveness. Lethal reinforcement often is necessary when pelicans become acclimated to pyrotechnics and propane canons. As pelicans begin to ignore harassment techniques,

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shooting 1 or 2 pelicans often will cause the entire flock to leave the area.

Figure 9. Examples of pyrotechnic devices and launcher.

Repellents

None registered.

Reproductive Control

Nest destruction

Pelicans are protected by the MBTA. Human activity in nesting colonies and removal or destruction of nests during the breeding season are regulated by the USFWS, provincial ministries, and state agencies.

Egg Oiling or Addling

Any egg oiling, or addling in nesting colonies is regulated by the USFWS, provincial ministries, and state agencies.

Toxicants

None registered.

Trapping

Foothold Traps

Modified padded foothold traps, such as the Victor No. 3 Softcatch, are effective in capturing pelicans and other wading birds (Figure 10).

Figure 10. Modified padded jaw foot-hold trap designed for pelicans.

Replace the factory springs with the springs of the weaker Victor No. 1.5 Softcatch to lessen the initial impact of the closing jaws on the pelican's leg. In addition, replace the factory chain with an 8-inch length of 0.15-inch aircraft cable and a 12-inch elastic shock-cord to minimize injury to captured birds. Attach additional box and stake swivels to increase the flexibility of the swivel system.

Set these modified foothold traps in areas of high bird densities, typically flooded fields, pond levees, or loafing sites near colonies. Slowly approach potential capture sites, flush the birds, and set traps 10 to 13 feet apart along transects in 3- to 6-inches of water. Drive trap stakes flush with the substrate, and conceal the elastic shock cords and swivels by pushing them into the mud or covering them with sediment. On land, set traps within 3 feet of the water's edge. Traps on levees can be set using a basic dirt-hole set similar to that used for coyotes. Once set, traps should be monitored constantly. Captured animals should be removed from traps immediately. When properly used, these modified traps are safe and humane for capturing pelicans. Modified traps currently cost about $30 each.

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Rocket nets

Rocket nets can be used to capture several pelicans at once on an exposed mud flat, pond levee, or other loafing site. Bait the site with bait fish. Modify a portable rocket-net system by building a box out of 0.12-inch aircraft aluminum (Figure 11). Set the box, net, and rockets in water 1 to 2 inches deep with the box opening angled out of the water. Fold the net into the box prior to placing it at the capture site. Use large nets (60 x 40 feet or 50 x 30 feet) with 2 to 4 rockets, depending on the box design. The net, stakes, and rockets can be stored in the box and the entire device can easily be transported by 2 people. The box, rockets, charges, and net currently cost about $2,000.

Figure 11. Modified portable rocket-net system.

As with other fish-eating birds, American white pelicans are attracted to bodies of water that contain sick or dying prey. Pelicans wintering in the southeastern US are wary of humans, so developing and maintaining a bait site to attract birds has proven very difficult.

The use of foothold traps or rocket-nets requires permits from the Migratory Bird Office, USFWS, and state wildlife agencies. The use and storage of rocket net charges may be controlled by the US Occupational Safety and Health Administration, US Department of Transportation, and US Bureau of Alcohol, Tobacco, Firearms, and Explosives.

Shooting

Handle all firearms safely and ensure that it is safe to discharge firearms in all target areas. American white pelicans are large birds, so accuracy is essential to ensure immediate death. Dispatch wounded birds quickly. Use a shotgun, 12-gauge or larger, with T-shot or larger. Use a centerfire rifle of .22-caliber or larger (e.g. .223, .22-250) for shooting individual birds. Shot birds should be disposed of as soon as possible in accordance with permit instructions. Leaving bird carcasses on a facility can attract other predators, can be illegal, and generally is viewed as poor management by the public.

The use of shooting requires permits from the Migratory Bird Office, USFWS and state wildlife agencies.

Handling

Pelicans are large birds; be careful when approaching them. One of the pelican's defense mechanisms is to snap or bite. The edges of the bill are sharp and can cause knife-like cuts. Always first grab a live pelican by its bill (both upper and lower) using one hand and do not allow the bill to move in your hand. Reach around with your other arm to hold and support the bird.

Relocation

Only 2 known attempts have been made to relocate pelicans from a damage site. Both had good short-term success but long-term usefulness is not known. Pelicans captured and

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relocated 12 miles from an aquaculture facility did not return to the facility for at least 3 weeks.

Euthanasia

Euthanasia recommendations are intended to serve as guidelines, and they require the use of professional judgment for specific situations. Ultimately, it is the responsibility of those carrying out euthanasia to assure that it is done in the most humane manner possible. Shooting, decapitation, exsanguination, chemicals (carbon dioxide, lethal injections), and blunt force trauma (stunning) to the base of the skull, followed by cervical dislocation are approved methods of euthanasia for large birds, such as pelicans.

Disposal

Check your local, state, and federal regulations regarding carcass disposal.

Economics of Wildlife Damage Prevention and Control

Considering the potential for extensive losses at catfish ponds, deterring pelicans from foraging on ponds clearly is warranted. If allowed to land on catfish ponds, pelicans immediately begin to forage. Therefore, make every legal effort to prevent flocks from landing. Prompt and persistent action are needed to preclude large losses from occurring. Lack of vigilance of harassment patrols during a mid-day break or at night may allow substantial damage to occur, despite control efforts.

Although the costs of control have not been thoroughly assessed, one catfish farmer in southern Louisiana in 1994 documented his costs for pyrotechnics, ammunition, and labor for pelican harassment to be $129,000 with an additional $13,000 spent for extra road and vehicle maintenance. Despite these expenditures, this farmer estimated losing $31,000 in fish to American white pelicans. Without persistent harassment efforts, those losses most likely would have been much higher. Losses due to disease transmission can be much more devastating to producers. Losses from *B. damnificus* to Mississippi catfish producers have been estimated at $45 million per year.

Acknowledgments

Figure 1, 3, 5-11. Photos by T. King.

Figure 2. Photo by T. Ferguson.

Figure 4. Map from Knopf, F. L. and R. M. Evans. 2004. The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology.

Production of “Prevention and Control of Wildlife Damage” was supported by the USDA-APHIS-Wildlife Services and Nebraska Extension.

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Glossary

Culmen: the upper ridge of a bird's bill.

Gular: throat; an area of featherless skin on a bird that joins the lower mandible of the bill to the bird's neck.

Key Words

American white pelican, aquaculture, control, depredation, disease, exclusion, harassment, *Pelecanus erythrorhynchos*, pelican

Disclaimer

Implementation of wildlife damage management involves risks. Readers are advised to implement the safety information contained in the Manual of the National Wildlife Control Training Program. Some control methods mentioned in this document may not be legal in your location. Always use repellents and toxicants in accordance with EPA-approved labels and your local regulations. Wildlife control operators must consult relevant authorities before instituting any wildlife control action.

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