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American White Pelicans

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American White Pelicans

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Figure 1. American White Pelican (*Pelecanus erythrorhynchos*)

Human-Wildlife Conflicts

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American white pelicans (*Pelecanus erythrorhynchos*, Figure 1) threaten aquaculture producers by direct predation and the spread of disease. They are also considered competition and a nuisance by some sports fishermen. Pelicans can also damage pond levees and crops, such as rice, by trampling the vegetation and depositing guano. A combination of wildlife damage management techniques is often necessary to reduce pelican damage to these resources.

Aquaculture

Prior to the winter of 1992, American white pelican depredations at catfish facilities in the Delta regions of Arkansas and

Mississippi were limited, 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. Their increased persistence requires an equally persistent response to limit their damage. Around-the-clock harassment patrols may be necessary especially where pelicans forage at night. The most effective technique involves harassing the birds at their loafing sites near catfish farms. This often causes them to abandon the site, thus reducing or eliminating predation at nearby facilities.

The impact of direct pelican predation on catfish farms can be substantial. For



Figure 2. Pelicans on catfish farm.

example, assuming that pelicans foraging in a catfish pond ate only catfish averaging 10.2 inches, each bird would require 11 catfish to meet its energetic requirement of 2 pounds per day. This consumption rate translates into 2,750 catfish consumed per day by an average-sized flock of 250 pelicans. If these fish reached a harvestable size of 1.5 pounds and were valued at \$0.70 per pound, catfish farmers could lose approximately \$2,900 per day from pelican foraging. Actual depredation losses depend on pelican abundance at ponds, the size and number of catfish eaten, and the duration of foraging at catfish ponds.

Pelicans are also a host of commercial catfish parasites, especially the digenetic trematode *Bolbophorus damnificus*. This trematode causes substantial economic losses to aquaculture producers in Louisiana, northwest Mississippi, and southeast Arkansas. 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 60 percent or more reduction in profits. A 2004 analysis of the economic impact of trematode infections to commercially-raised catfish in Mississippi estimated economic losses of \$27.1 million per year.

Landscapes and Crops

American white pelicans can damage pond levees and recently planted crops, such as rice, by trampling the

vegetation and depositing guano, although the extent of these losses is not known.

Nuisance

Pelicans are perceived as nuisance wildlife by aquaculturists and sports fishermen because of their predation of farmed fish or sport fish prized by anglers.

Human Health and Safety

Pelicans are not known to transmit any significant diseases to people. However, they can threaten human safety when they collide with aircraft.

Damage Identification

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

Other signs of pelican presence include trampled vegetation and crops, large webbed tracks, and guano-stained (whitewashed) landscapes.

Management Methods

No single management method to prevent pelican conflicts works all the time or in all settings. Methods should be integrated so that one enhances the effect of another. For example, frightening devices often are more effective when done in conjunction with habitat modification (e.g., removal of loafing habitat) to make a site less attractive to pelicans.

American white pelicans typically migrate northward to their breeding grounds during spring and return to the

southeast U.S. during late fall. However, in recent years flocks of about 500 pelicans frequently have been seen in southeast aquaculture areas throughout the summer. These birds may represent non-breeding pelicans. Most wintering pelicans remain in the southeastern U.S. from late fall through mid-spring. Pelicans foraging on 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

Pelicans can be encouraged to abandon a loafing site if water is removed (e.g., drain flooded fields). Other habitat modifications may include eliminating open wetland sites by planting perennial woody vegetation.

Exclusion

Exclusion involves physically blocking a bird's access to a site and is an important part of pelican damage management. Exclusion may prevent pelican predation on fish and the spread of disease. Selection of a barrier system depends on the size of the facility and whether the barrier interferes with other operations. Also consider whether it can be easily damaged in severe weather or if it impacts the aesthetics of the area.

Take care to construct barriers so they do not become a hazard to non-target birds, especially threatened and endangered species. The barrier material should be visible to birds to minimize accidental entrapment and/or injury. Avoid using loosely hung, small mesh netting, such as mist netting, as it will cause excessive bird losses.

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

In general, enclosing ponds and raceways to exclude all fish-eating birds requires 1- to 2-inch mesh netting secured to frames or supported by overhead wires. In addition, gates and other openings must be covered. In areas with harsh winter conditions, nets must have an adequate framework or support cables to prevent ice or snow accumulation 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 distribute food through mesh-covered raceways. Since panels may interfere with feeding, cleaning, or harvesting operations, 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. Non-rigid exclusion structures, such as suspended netting, may need lines, pulleys, and counterweights to facilitate lifting and lowering during adverse conditions or maintenance.

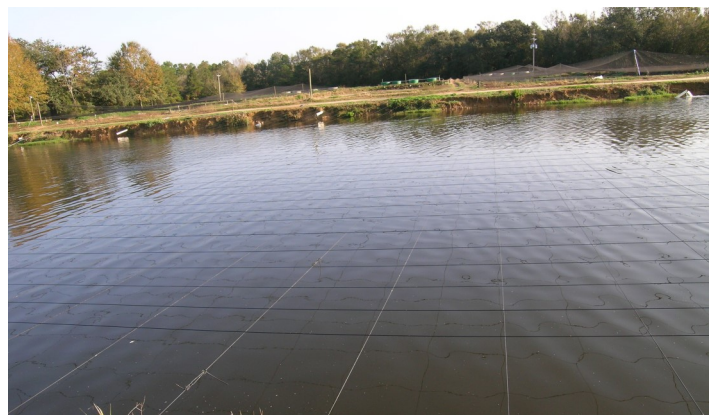


Figure 3. Example of grid wires at a fish farm.

Since complete exclusion may not always be practical, other barrier techniques may help to limit pelican access to ponds with tradeoffs. For instance, nets suspended over catfish farm levees can prevent pelican depredation, but may be impractical as most catfish farm levees are not wide enough to accommodate both the support structures for nets and vehicle access. Plastic and wire grids over catfish ponds can deter pelican flocks from landing and taking off, but often do not exclude individual birds. Some success with simple 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. Pelicans forage mainly during early morning and late afternoon and loaf during mid-day. However, pelicans quickly adapt to standardized harassment schedules. American white pelicans are typically diurnal foragers, but have been known to forage at night, especially in areas with daytime harassment. For instance, pelicans have been seen leaving a loafing site to time their arrival and departure when harassment personnel are on lunch breaks. Alternating harassment timing and methods typically is most effective.

Visual

In south Louisiana, bright spotlights have been used successfully to disperse foraging pelicans from catfish ponds at night.

Audio-visual

Pyrotechnics can be effective in dispersing pelicans from foraging and loafing sites (Figure 4). Possession and use of pyrotechnics may require a permit from the local, county, and/or state fire marshal. Harassment by personnel on foot, all-terrain vehicles (ATV), boats, or other vehicles combined with pyrotechnics can be effective. Lethal reinforcement is often necessary when pelicans become habituated to other techniques, such as pyrotechnics and propane canons. As pelicans begin to ignore harassment

techniques, shooting one or two pelicans often will cause the entire flock to leave the area.

Egg Oiling/Addling and Nest Destruction

Pelicans are protected by the Migratory Bird Treaty Act (MBTA). Removal of nests, egg oiling or addling, and any human activity in nesting colonies during the breeding season are regulated by the U.S. Fish and Wildlife Service (USFWS) and state/provincial agencies.

Repellents

No repellents are currently registered for use with pelicans.

Shooting

In the U.S. and Canada, American white pelicans are protected by the MBTA. As authorized by the MBTA, the USFWS issues permits to qualified applicants for the take of depredating birds. Local, state and federal regulations in regards to firearms and the take of pelicans must be reviewed and followed. See the section on Legal Status.

As with all firearms, make sure it is safe to discharge a firearm in a particular area. Because American white pelicans are large birds, accuracy is essential to ensure immediate death. Dispatch wounded birds quickly. Use a shotgun, 12-gauge or larger, with T-shot or larger



Figure 4. Pyrotechnics are used to disperse foraging pelicans.

ammunition. Use a centerfire rifle of .22-cal 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 predators, may be illegal, and generally is viewed as poor management.

Toxicants

No toxicants are currently registered for use with pelicans.

Trapping

Foothold Traps

Modified padded foothold traps, such as the Victor No. 3 Softcatch, are effective in capturing pelicans and other wading birds (Figure 5). 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 swiveling system.

Set these modified foothold traps in areas of high bird densities—typically flooded fields, pond levees, or loafing sites near colonies. Traps set in the water should be completely submerged, but in water shallow (3-6 inches) enough that birds could step into them. Slowly approach potential capture sites, flush the birds, and set traps 10 to 13 feet apart along transects. 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.

Each modified trap currently costs about USD \$30.



Figure 5. A modified padded foothold trap for use with pelicans.

Rocket Nets

A portable rocket net can be modified by building a box out of 0.12-inch aircraft aluminum (Figure 6). The box, net, and rockets can be set in water 0.8 to 1.6 inches deep with the opened end of the box angled out of the water. This system can be used on an exposed mud flat, pond levee, or other loafing site. Fold the net into the box prior to placing it at the capture site. Large nets (60 x 40 feet or 50 x 30 feet) with 2 to 4 rockets can be used depending on the box design. The net, stakes, and rockets can be stored in the box and the entire device easily transported by two people or by an ATV. The box, rockets, charges, and net currently cost about \$2,250.

As with other fish-eating birds, American white pelicans are attracted to bodies of water containing sick or dying prey. However, pelicans wintering in the southeast U.S. are wary of people; thus, developing and maintaining a bait site to attract birds to traps has proven very difficult.

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



Figure 6. Portable rocket net system.

Handling

Be careful when approaching live pelicans. Pelicans are large birds and have sharp edges along their upper bill. One of the pelican's defense mechanisms is to snap or bite. The edges of the bill can cause knife-like cuts. Grab a live pelican first by its bill (both upper and lower) using one hand and do not allow the bill to move in your hand.

Relocation

Relocation is the movement of an animal from one location in its home range to another location within the same home range for the purpose of resolving a human-wildlife conflict. Only two known attempts have been made to relocate pelicans from a damage site. Both attempts had good short-term success, but their long-term usefulness is not known. Pelicans captured and relocated 12 miles from one 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 and chemicals (i.e., carbon dioxide gas, lethal

injections) are approved methods of euthanasia for large birds, such as pelicans.

Disposal

Take of migratory birds is regulated by the Migratory Bird Treaty Act, and instructions for disposition of carcasses are usually provided under USFWS permit conditions.

Economics

Pelicans have the potential to cause extensive economic losses at catfish ponds. If allowed to land on catfish ponds, they immediately begin to forage. Therefore, make every (legal) effort to prevent flocks from landing. Lack of vigilance and harassment during a mid-day break or at night may allow substantial damage to take place despite other management efforts.

Although the costs of pelican damage management have not been thoroughly assessed, during November 1994 to April 1995, one catfish farmer in southern Louisiana estimated 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 lost about \$31,000 in fish to American white pelican predation. Without persistent harassment efforts, those losses 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.

Species Overview

Identification

The American white pelican (*Pelecanus erythrorhynchos*) is one of two pelican species native to North America. The other, known as the brown pelican (*P. occidentalis*, Figure 7) forages in coastal aquaculture settings, but has not been reported foraging at inland aquaculture facilities. This publication focuses on the American white pelican and damage management associated with inland aquaculture resources.

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 8). During the breeding season, adult pelicans develop a horny knob on the culmen (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 gular (throat) pouch to capture and manipulate prey, a long bill with sharp edges and a small hook (or 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 appear graceful and soaring. Males are typically heavier than females, averaging 14.3 and 11.2 pounds, respectively. The weight range for males is 11 to 18 pounds. The weight range for females is 9.3 to 13.7 pounds.

Range

The continental divide separates American white pelicans into two 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. 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, Alberta, Saskatchewan, Manitoba, and southwestern Ontario southward to Wisconsin, Minnesota, North Dakota, South Dakota, Montana, Wyoming, Colorado, Utah, Nevada, California, and Oregon (Figure 9). One viable American white pelican colony of approximately 400 exists near Corpus Christi, Texas in the Laguna Madre.



Figure 7. Brown pelican (*Pelecanus occidentalis*)



Figure 8. Young (left) and adult (breeding) American white pelicans

Voice and Sounds

Adults are silent except for low, short grunts typically given during aggressive, defensive or sexual interactions with other pelicans. Young pelicans (prior to fledging and at the colony) are more vocal with loud squawks and food-begging calls. Non-vocal sounds include wings splashing water when bathing or herding prey, and popping of the bill during combative encounters.

Tracks and Signs

Pelicans have large webbed feet, 6½ to 7½ inches long and 4¼ to 5¾ inches wide that trample vegetation down to the soil in heavily trafficked areas. Loafing sites have large quantities of white-colored excrement and large feathers. Loafing sites vary in size depending on the number of birds present.

Reproduction

Pelicans are believed to breed at three years of age. The breeding period typically is mid-April through mid-

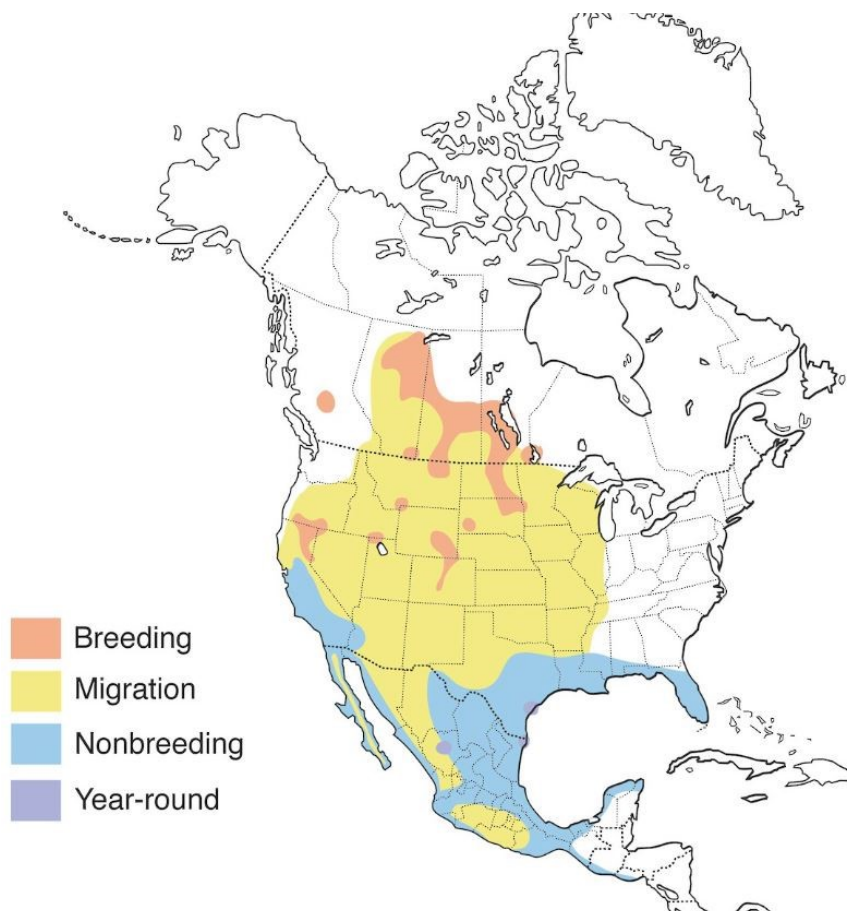


Figure 9. Range of American white pelicans.

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 one clutch of 2 eggs per year. Smaller clutches often are due to egg loss from predation. Only one young typically survives to fledging, due to asynchronous hatching and siblicide (i.e., one young bird kills the other). Average documented nest success ranges from 0.34 to 0.89 young fledged per nest. It is not known if pelicans re-nest following the loss of a clutch early in the season. Eggs hatch approximately 30 days after being laid and the chicks fledge approximately 10 weeks later. Both sexes attend the nest and young.

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 10).

Mortality

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

Population Status

A nest count in 2013 found approximately 100,000 nests at more than 55 colonies in the U.S. and Canada. Therefore, a conservative estimate of the number of adult (breeding age) American white pelicans is 200,000 birds. The numbers of both adults and colonies appear to be increasing. American white pelicans can be common to unusual throughout their range. They occur in large numbers in or near their breeding colonies (200 to 30,000



Figure 10. Typical shallow depression used by American white pelicans for nesting.

individuals) and at loafing sites in their wintering areas (50 to 3,500 individuals per loafing group).

Habitat

Pelicans breed and spend the summer months on remote islands of freshwater lakes and forage in lakes, rivers, marshes, and aquaculture facilities year round. Pelican mean home range sizes 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 do cross deserts and mountains. Pelicans often stop at water bodies that provide forage and loafing sites. Pelicans readily take advantage of aquaculture sites during migration and on their wintering grounds. While 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 both the day and the night. However, pelicans in southern Louisiana and northwest Mississippi forage primarily during the morning and afternoon. Pelicans feed singly, in small groups (2 to 25 birds), or in large groups of more than 25 birds. When foraging singly or in small groups, pelicans usually dip their



Figure 11. Foraging pelicans.



Figure 12. Pelicans riding thermals.

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

American White Pelicans are cooperative foragers (Figure 11). They often forage in large groups using synchronized movements to herd and capture prey (e.g., swim in a line and synchronously dip their bills). Pelicans use air temperature thermals during flight to reduce their energy expenditure. Birds flap and circle to gain altitude in a thermal (Figure 12). Then they release from the thermal and glide long distances, repeating the process until they arrive at their destination.

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 March to April.

Food Habits

Pelicans prefer to forage in shallow water (1 to 9.8 feet) in open areas of marshes, lakes, rivers, ponds, but are also known to forage in deeper water to take advantage of prey driven to shallower depths by diving birds, such as double-crested 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 easily reach to 3.3 feet below the surface of the water.

Pelicans typically feed on fish, crawfish, and amphibians, ranging in size from 1.6 to 24.8 inches. To forage, a pelican dips its bill into the water and scoops prey into its gular pouch, then raises its bill above its head to swallow. Pelicans prefer to forage for schooling prey but will forage for dispersed prey. Pelicans forage twice a day, eating an average of 1.2 pounds per foraging trip. Researchers, however, have recorded a pelican eating as much as 6.8 pounds in a single foraging event.

Legal Status

In the U.S. 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 U.S. 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 USFWS' Regional Bird Permit Offices.

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

- (1) Contact the appropriate wildlife biologist employed by WS in your region of the state. The state office of the WS program may provide assistance.
- (2) The wildlife 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 biologist will recommend nonlethal wildlife damage management techniques. If existing nonlethal methods are not effective, the wildlife biologist may recommend lethal control and provide information on the maximum number of birds that may be killed. The biologist will attach this information 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 biologist will provide details, including the appropriate addresses.

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

Note: Actions taken against a depredating bird species to protect a crop 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.

Acknowledgements

Figure 1. Photo by Tommy King, USDA-Wildlife Services
Figure 2. Photo by Tommy King, USDA-Wildlife Services
Figure 3. Photo by Tommy King, USDA-Wildlife Services
Figure 4. Photo by Paul Gorenzel, University of California-Davis
Figure 5. Photo by Tommy King, USDA-Wildlife Services
Figure 6. Photo by Tommy King, USDA-Wildlife Services
Figure 7. Photo by David Pereksta, U.S. Fish and Wildlife Service
Figure 8. Photos by Tommy King, USDA-Wildlife Services
Figure 9. Map by The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology
Figure 10. Photo by Tommy King, USDA-Wildlife Services
Figure 11. Photo by Tom Koerner, U.S. Fish and Wildlife Service
Figure 12. Photo by Tommy King, USDA-Wildlife Services

Glossary

Asynchronous Hatching: When the eggs in a clutch hatch over several days instead of all at once.

Colonial Nesting: A large group of nesting birds that may be made up of one or two species all nesting within close proximity of one another.

Loafing Site: A place where birds rest, often preening themselves.

Pyrotechnics: Flares or cartridges fired from a gun or launcher that produce a loud blast or scream accompanied by smoke and a flash of light.

Roost: Location where birds rest or sleep either during the day or at night.

Keywords

American white pelican, Aquaculture, Control, Depredation, Disease, Exclusion, Harassment, Life history, *Pelecanus erythrorhynchos*

Disclaimer

Wildlife can threaten the health and safety of you and others in the area. Use of damage prevention and control methods also may pose risks to humans, pets, livestock, other non-target animals, and the environment. Be aware of the risks and take steps to reduce or eliminate those risks.

Some methods mentioned in this document may not be legal, permitted, or appropriate in your area. Read and follow all pesticide label recommendations and local requirements. Check with personnel from your state wildlife agency and local officials to determine if methods are acceptable and allowed.

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Appendix

Damage Management Methods for American White Pelicans

Type of Control	Available Management Options
Egg and Nest	<ul style="list-style-type: none"> • Oiling of eggs • Addling or puncturing eggs • Removing nests and eggs
Exclusion	<ul style="list-style-type: none"> • Overhead wires • Electric fencing • Netting
Frightening Devices	<ul style="list-style-type: none"> • Propane cannons, pyrotechnics, and other noise making devices • Bright spotlights • Harassment by people on foot, all-terrain vehicles, boats or other vehicles
Habitat Modification	<ul style="list-style-type: none"> • Drain water from flooded fields that serve as loafing sites • Plant perennial woody vegetation to eliminate open wetland sites
Repellents	None available
Shooting	Centerfire rifles or 12-gauge shotguns using non-toxic T-shot or BBs; Requires proper federal and state permits
Toxicants	None available
Trapping	Modified padded-jaw foot-hold traps and rocket nets; Requires proper federal and state permits