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Managing Common Fish-Eating Birds in the North Central U.S.

Fish-eating birds are common visitors to aquaculture facilities throughout the North Central Region (NCR) of the United States, where 82% of farms reported raising aquatic livestock in ponds, according to the 2023 Census of Aquaculture. Unfortunately, these productive expanses of open water, totaling nearly 65,000 acres, often attract fish-eating birds looking for an easy meal. Birds are known to consume and injure aquatic animals, foul water and threaten fish health through the introduction of parasites and diseases. Economic losses can be substantial.

Managing risk and understanding economic losses associated with fish-eating birds is frustrating and difficult to stay on top of. Proper identification and observation of problem bird species that frequent a site, along with accurate stocking and harvest records, is often useful for developing an integrated farm management plan. This publication includes information about common fish-eating birds observed at fish production facilities in the NCR and basic pest management information.

Background

Common fish-eating birds included in this fact sheet were selected based on a 2025 producer survey conducted by Purdue University (Carlton and Shambach, 2026). A total of 76 responses from NCR states were received. This represents roughly 20% of the farms in the NCR that reported raising fish in ponds for the 2023 Census of Aquaculture. All birds mentioned in this publication were reported to be “eating or injuring” aquatic livestock and were selected as birds that producers were “most concerned about.” Bird groupings appear in order of most to least common based on the number of times they were mentioned in response to the question, “What kind of birds are eating or injuring your aquatic livestock?”

This publication includes general information on:

- Legal status of fish-eating birds
- Species overview of common fish-eating birds
- Top four birds of concern in the NCR

- Other birds of concern
- Bird identification tips
- Nonlethal control methods
- Information on integrated bird management

Legal Status

Fish production facilities present challenges to both the humans using the water to raise fish and wildlife that want to eat the fish. The challenge comes with how to manage fish-eating birds in a way that reduces or attempts to eliminate predation, while adhering to the laws and regulations put in place to protect them. Nearly all birds common to fish production facilities are protected. Federally protected species may not be taken by killing, capturing, selling, trading or transporting without prior authorization from the U.S. Fish and Wildlife Service (USFWS). Regulatory authority was established by the Migratory Bird Treaty Act of 1918. Fish-eating birds may be protected by:

- Migratory Bird Treaty Act of 1918
- U.S. Endangered Species Act
- State regulations

For information on regulations specific to your facility, contact the following agencies:

- U.S. Fish and Wildlife Services (USFWS)
- U.S. Department of Agriculture Wildlife Services (USDA-WS)
- State natural resources agency

Although fish-eating migratory birds are protected, provisions have been made for situations where they have proven to cause harm to humans, including economic harm. Depredation permits can be obtained to protect fish from predation using nonlethal and lethal methods. You may not need a depredation permit to use nonlethal control methods for many of the birds known to frequent fish production facilities.

Common Fish-Eating Birds

Herons and Egrets

Herons, egrets and bitterns are long-legged, long-necked wading birds belonging to the Ardeidae family. They are found worldwide, including the United States. The Ardeidae family includes birds you might think of, such as great blue, green, and black-crowned night herons, and birds you might not think of, such as great

and snowy egrets. Egret is the common name given to the white, more slender members of this family, while heron is the common name given to more colorful members. Understanding physical and behavioral similarities can be helpful for managing this family.

Great Blue Heron

Scientific name: *Ardea herodias*

Habitat: Marshes

Food: Fish, amphibians, reptiles, mammals, and more

Nesting: Tree

Behavior: Stalking

Identifying Features

Relative size: 4 feet tall and slender

Color pattern: blue gray in color with a black stripe over the eye

Behavior: wade slowly or stand motionless in shallow water to stalk prey

Habitat: open coasts, marshes, swamps, riverbanks, lakes, grasslands, agricultural fields



Figure 1a. Great blue heron (*A. herodias*) feeding/standing at Ozark Fisheries in Stoutland, Missouri. Photo by Danny Lindahl, Kansas State University.

Range & Timing

Great blue herons are present year-round in all NCR states except the Dakotas and the northern portions of Michigan, Wisconsin and Minnesota. They will leave once water bodies freeze over. They visit the northwest portion of the region seasonally for breeding. Great blue herons gather in large numbers to breed. Breeding colonies, also known as rookeries, can consist of a couple hundred pairs and contain 500 nests or more. Breeding season is dependent on location.

Food & Feeding Behavior

Great blue herons eat nearly anything they can catch, including fish, amphibians, reptiles, mammals, insects and other birds. They eat pretty much anything that swims in the water and will fit down their throats. They are often found alone, wading slowly or standing motionless, looking for prey. Great blue herons are sight feeders. They snatch up and gulp down small prey. Their sharp, pointed bill skewers large prey; once impaled, spiny fish are often shaken to break or relax the spine. They are territorial and will defend their feeding area from other herons.

Depredation Issues

Great blue herons often target fish, eating about one pound of prey per day. They are also known to injure fish, leaving them in the water or on pond banks and levees. Great blue herons are protected under the Migratory Bird Treaty Act. They are smart and adapt to farm management strategies. Farms reported observing great blue herons changing their feeding behavior to hunt when farm staff are off-site, including at night.

Management Options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Physical barriers used to exclude great blue herons include netting and fishing line or wire. Netting is used for small production units such as raceways and tanks. For larger production units, clear monofilament fishing line can be strung along the perimeter of the pond to prevent great blue herons from walking into ponds from banks or levees. Physical barriers are often impractical in larger grow-out ponds.



Figure 1b. Great blue heron standing in green grass next to a pond. Photo by Danny Lindahl, Kansas State University.

Programmable laser deterrent technologies have been tested on multiple sites, by authors Landsell and Gerken, throughout the NCR and have proven to alter great blue heron behavior. Birds were still observed at farms, but they often exhibited stress behaviors. Harassment, reinforced with lethal control, is one management option to consider.

Other Concerns

Great blue herons can also negatively impact hatchery ponds by targeting paternal fish guarding nests. For example, when a heron repeatedly targets male bluegill that are protecting eggs, the eggs can become unguarded and vulnerable to consumption by other fish, resulting in low fingerling production numbers.

Green Heron

Scientific name: *Butorides virescens*

Habitat: Marshes

Food: Fish, amphibians, crustaceans

Nesting: Tree

Behavior: Stalking

Identifying Features

Relative size: about the size of an American crow (*Corvus brachyrhynchos*)

Color pattern: deep green back, often appearing black when not in direct sunlight, with chestnut body and dark cap

Behavior: stand motionless on vegetation or solid ground when hunting

Range & Timing

Green herons are most likely to visit fish farms in the NCR in spring and summer. They migrate north in late winter through early spring. Usually travel in flocks at night. They are in the northern part of their range for breeding. They migrate south in late August through October to spend their winter in southern U.S. coastal areas, Mexico and Central America.

Food & Feeding Behavior

Green herons eat small fish such as minnows, sunfish, catfish, perch, goldfish and koi. They prefer fish but will feed on crustaceans, snails, amphibians and other animals. Their main hunting method is to wade among thick vegetation in shallow water that is less than 4 inches deep, but they will dive for deeper water prey. Green herons will use lures to attract prey, sometimes using a feather or other object to get fish to the surface. They hunt at all times of the day and night.

Depredation Issues

Green herons can eat up to 0.15 pounds of prey per day. They target small fish and crustaceans and are known for occasionally visiting ornamental fishponds. They can be a threat to sportfish, ornamental, baitfish



Figure 2. Male green heron standing on a dead tree branch. *Photo by Anne Jones.*

and freshwater shrimp facilities but are not considered as much of a threat as great blue herons due to their relatively small body and population size. Green herons are protected under the Migratory Bird Treaty Act.

Management Options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Physical barriers such as netting are effective at excluding green herons from small production systems. Lethal control requires a depredation permit.

Great Egret

Scientific name: *Ardea alba*

Habitat: Marshes

Food: Fish, amphibians, reptiles, crustaceans, and more

Nesting: Tree

Behavior: Stalking

Identifying Features

Relative size: similar to a great blue heron; slightly smaller

Color pattern: white in color with a yellowish-orange bill and black legs

Behavior: wade slowly or stand motionless in shallow water to stalk prey

Habitat: wetlands; breeding colonies are on lakes, ponds, marshes, estuaries, and islands; hunt in fish-rearing ponds

Range & Timing

Great egrets are seasonal visitors to fish production facilities in the NCR. They move north into the region for spring and summer breeding. They migrate by day in small flocks, making stopovers to rest and eat. You are most likely to have great egrets visit your facility in late spring, summer or fall.

Food & Feeding Behavior

Great egrets prefer eating small fish but will also feed on other aquatic organisms, including crayfish, prawns, shrimp and amphibians. They hunt from foot- to belly-deep water. Like great blue herons, they stalk prey and stand still to wait for prey to approach. They have been known to occasionally swim or hover and dip to capture fish.

Depredation Issues

Great egrets hunt alone or in groups along the pond's edges and at the surface of the water, consuming about 0.66 pounds of fish per day. They may cause substantial



Figure 3. A great egret flying over water

loss to small or shallow production systems commonly used for baitfish, ornamental fish and freshwater shrimp production. Great egrets are protected under the Migratory Bird Treaty Act.

Management Options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Physical barriers such as netting are effective at excluding great egrets from small production systems. Farm management practices that reduce the risk of fish coming to the surface may reduce predation. Great egrets looking for easy access to prey may take advantage of situations that bring fish to the surface, such as low dissolved oxygen and feeding. In general, great egrets are not known to cause significant economic losses. Lethal control requires a depredation permit.

Kingfishers

Kingfishers are small to medium-size birds in the Alcedinidae family. Of the 118 species in the family, only three are found in the United States, and one in the NCR region — the belted kingfisher. All kingfishers have

Belted Kingfisher

Scientific name: *Megaceryle alcyon*

Habitat: Lakes and ponds

Food: Fish

Nesting: Burrow

Behavior: Aerial dive

Identifying Features

Relative Size: robin-size

Color pattern: powder blue-gray color with a white breast; males have one blue-gray breast band; females have one blue-gray and one chestnut breast band

Behavior: perch near water and fly up and down shorelines

Habitat: ponds, lakes, streams, rivers and estuaries; live near water; burrow in earthen banks

Range & Timing

Belted kingfishers are present year-round in most of the NCR except in North Dakota, Michigan, Minnesota and Wisconsin in the winter months. They move south once water freezes over or even earlier. They return to the northern portion of the NCR to breed. Kingfishers need open water for hunting, so they do not stay year-round in locations with complete ice over. Some belted kingfishers migrate. Females tend to travel farther distances than males.

Food & Feeding Behavior

Belted kingfishers mainly eat small fish. They search for fish from a perch along the water's edge and in flight. They will use almost anything as a perch, including pipes. They hunt either by diving directly from their perch or by hovering over the water. They target prey near the surface of the water and dive with closed eyes. When successful, they return to a perch with their catch before swallowing it headfirst. Belted kingfishers also eat amphibians and crustaceans, such as crayfish. If feeding on fish, crayfish or other freshwater crustaceans, you may see fish scales or invertebrate shells in their disgorged pellet.

large heads, long pointed bills and short legs. The North American species have ragged crests. Most are brightly colored and live near water. Many but not all species eat fish.



Figure 4. A belted kingfisher with puffed-out features perched on a branch.

Depredation Issues

Belted kingfishers were hunted and trapped near fish hatcheries and along trout streams prior to the practice being outlawed. They mainly eat small fish, including young trout. Belted kingfishers may be of concern to production systems raising small or young fish. Even though kingfishers are small in size and few in number, 23.3% of respondents who reported belted kingfisher eating or injuring their aquatic livestock indicated that it was a bird they were most concerned about. Belted kingfishers are protected under the Migratory Bird Treaty Act.

Management Options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Physical barriers such as netting or tank covers can be used to exclude belted kingfishers from raceways or other small rearing systems. To see their prey, belted kingfishers require a clear line of sight from their perch to unclouded water. Anything you can do to obstruct their line of sight or prevent them from seeing their prey could discourage hunting or nesting. Like great egrets, belted kingfishers hunt prey in the surface waters, so minimizing situations that bring fish to the surface could decrease losses. Lethal control requires a depredation permit.

Eagle

Eagles are the largest member of the raptor family, Accipitridae. North America has two common types of eagles: bald and golden. Eagles are large birds of prey with powerful wings, sharp talons and large hooked beaks. The golden eagle is the only North American eagle that is genetically a "true eagle" from the Aquilinae subfamily. Golden eagles may be present year-round in the western portion of the region. Golden eagles also

Bald Eagle

Scientific name: *Haliaeetus leucocephalus*

Habitat: Forest

Food: Fish

Nesting: Tree

Behavior: Soaring

Identifying Features

Relative size: goose-size or larger; one of the largest birds in North America

Color pattern: brown body and wings; white head and tail at about age 5, prior to that all brown or mottled brown with white wings; yellow legs and beak

Behavior: soaring

Habitat: forest areas near water

Range & Timing

Bald eagles are present year-round throughout the NCR. Birds will migrate depending on their age, breeding location and food availability. Bald eagles may be NCR residents or visitors. Northern adults that breed in Canada begin migrating to open water in the fall. They return to their breeding grounds when weather permits. Immature bald eagles are nomadic, exploring vast areas, sometimes flying hundreds of miles per day.

Food & Feeding Behavior

Bald eagles eat a diet mainly of fish but are opportunistic and will eat a wide variety of other foods. They are powerful fliers, soaring, gliding and flapping over long distances in search of food. These birds often catch their prey live but may scavenge dead fish. They are known to take prey from other animals, including osprey, turkey vultures, other eagles and otters. They can survive many days, even weeks, without food.

Depredation issues

The bald eagle population was negatively impacted by hunting and bounties before the 1940s and then pesticides, such as DDT, until the 1960s. Even though the population rebounded enough by 2007 to be removed from the endangered species list, they remain protected

have a small eastern breeding population that breeds in Canada and winters in the NCR region (and is found there in early spring and late fall, too.) Golden eagles seen east of the Mississippi River are a distinct eastern population, rather than vagrant from outside its western range. Juvenile bald eagles may be mistaken for golden eagles. Bald eagles are common in the NCR.



Figure 5. Bald eagle standing on a branch near the surface of a river

by state law. Bald eagles are protected under the Migratory Bird Treaty Act as well as the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Harvest, harm or even possession of bald eagle feathers or parts can carry some of the harshest penalties of any North American bird. Lethal control is not allowed.

Management options

Exclusion: Yes

Harassment: No

Nonlethal remove: Yes, only with an eagle depredation permit

Lethal removal: No

Physical barriers to exclude bald eagles from fish-rearing areas are one of the few management options for these birds. If you have not yet purchased a fish farm site, selecting a site with limited or no suitable nesting habitat may prevent bald eagles from moving in. Bald eagles are protected by the Bald and Golden Eagle Protection Act. A federal Eagle Depredation permit (CFR 22.23) is required to "haze or trap bald eagles and/or golden eagles that are depredating or pose a risk to human or eagle health and safety. Depredation includes agricultural damage, private property damage, threats to human or eagle health and safety, and threats to recovery of protected wildlife." Lethal control is prohibited.

Cormorant

Cormorants are aquatic birds in the Phalacrocoracidae family. They are medium to large birds with long necks and long, thin, hooked bills. They nest in colonies in both coastal areas and inland waters. All cormorants are fish

Double-crested Cormorant

Scientific name: *Nannopterum auritum*

Habitat: Lakes and ponds

Food: Fish

Nesting: Ground

Behavior: Surface dive

Identifying Features

Relative size: between a crow and a goose

Color pattern: black head and body with brown-black wing features, yellow-orange skin at the base of a long, narrow and hooked bill; adults develop a small crest of black or white feathers in breeding season

Behavior: float low on surface water; stand with wings spread out to dry

Habitat: lakes and ponds; perching area

Range & Timing

Double-crested cormorants are present year-round or seasonally throughout the NCR. There are resident populations that do not migrate. In general, breeding populations will be present seasonally in the northern part of the region and in the central and southern portions of the region, where major river systems or large water bodies can be found. Seasonal visitors are common in the central and southern portions of the NCR during migration events. Nonbreeding populations may show up on farms in southeastern Kansas, southwestern Missouri and the southern tips of Illinois and Indiana.

Food & Feeding Behavior

Cormorants are fish eaters. Their diet mostly consists of fish but may include crustaceans, amphibians and insects. They are not picky when it comes to fish, eating more than 250 different species. They are skilled hunters, diving and chasing fish underwater using their webbed feet. They are also known for catching and eating crustaceans, such as crayfish.

Depredation issues

Double-crested cormorants are large birds, each one eating about 1 pound of prey per day. They typically eat fish 6 inches long or less but can eat fish over a foot in length. Often congregating in large numbers, their diet is wide ranging in both species and size of fish. Their

eaters and settle near water bodies large enough to support their populations. They are excellent divers and can propel themselves with their wings and feet once underwater, making them accomplished hunters.



Figure 6. A pair of double-crested cormorants, male in front, female behind, stand in the shallow water of a lake. Photo by Michael Warren.

presence could pose a threat to most fish production facilities in the NCR. Double-crested cormorants are protected under the Migratory Bird Treaty Act.

Management options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Physical barriers, such as overhead netting with edges extending to the ground, and overhead monofilament grid lines, 140 tensile strength baler twine stretched from levee to levee, or ropes with floats called bird balls, can be effective at preventing flocks from landing on small production systems. Other nonlethal deterrents include visual scarers, habitat modification and active harassment. Lethal control requires a depredation permit. In extreme cases where a colony is nesting or night roosting, nearby trees could be removed by agency staff.

Coming soon to an NCR state near you!

Neotropic cormorants have greatly expanded their range along the Mississippi River and have been seen as far north as Detroit. There has been a breeding pair near Detroit since about 2022 and breeding colonies up the Mississippi. Experts speculate that neotropic cormorants will be common in the NCR over the next 10 to 15 years. Click the link to see where all they have been seen: https://www.allaboutbirds.org/guide/Neotropic_Cormorant/maps-sightings

Pelican

Pelicans are large fish-eating waterbirds. Their distinguishing features are their large white body, black wing tips and large bills that expand when feeding. They are in the order Pelecaniformes, in the family

American White Pelican

Scientific name: *Pelecanus erythrorhynchos*

Habitat: Lakes and ponds

Food: Fish

Nesting: Ground

Behavior: Dabbler

Identifying Features

Relative size: goose-size or larger, smaller than a wild turkey, larger than a bald eagle

Color pattern: white with black flight feathers and yellow-orange legs and bill

Behavior: soar over water searching for food; dip or dabble to catch fish

Habitat: islands, wetlands, coastal waters, bays and estuaries

Range & Timing

American white pelicans are present seasonally in the western portion of the NCR region. Breeding populations are found in Minnesota, Wisconsin, North Dakota, South Dakota and Nebraska. Smaller breeding colonies are found in Michigan and Ohio along Lake Erie. Northern breeding populations pass through North Dakota, South Dakota, Minnesota, Wisconsin, Nebraska, Iowa, Missouri and Kansas on their way to overwintering grounds in the Gulf States, Mexico and Central America.

Food & Feeding Behavior

American white pelicans mainly eat fish found in shallow water or near the surface of deeper water bodies. Even though they seem to prefer smaller schooling fish, they will feed on bottom-feeding fish, tadpoles and crayfish. They are opportunistic feeders, so their diet changes based on what species are available. They catch fish by dipping their beak into the water and scooping up water and fish, or by tipping forward and submerging most of their body underwater. They raise their bill to drain water and swallow prey. They often forage in large groups during both day and night. During migration, they will visit catfish production facilities to feast. They are also known to take game fish such as trout. During breeding season, they travel up to 30 miles from their nest to find food. Chicks are provided roughly 150 pounds of food before they can forage on their own.

Pelecanidae. Like geese, they often fly in a V-shaped formation and are most likely to be seen in the Midwest in the spring or fall as they pass through on their way to breeding or winter grounds.



Figure 7. American white pelican resting on dark blue rippling water. Paul Crook on Unsplash.

Depredation issues

American white pelicans migrate through the western and central portions of the NCR, where they may stop at catfish farms or other aquaculture facilities to rest and eat. These birds travel in flocks and often forage in large groups. They mostly feed on small schooling fish near or close to the surface of the water. Groups of pelicans sometimes hunt cooperatively, herding fish to concentrate them for easier capture. American white pelicans are large birds that eat more than 2 pounds of fish per day.

Management options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Nonlethal control, such as scare methods, can be used to chase pelicans off aquaculture production ponds. Pelicans feed day and night, so around-the-clock patrols may be required. Habitat modification to remove loafing sites, such as unvegetated shorelines, may encourage pelicans to abandon a site. Physical barriers can include wire grids for larger ponds and 1- to 2-inch netting supported by a frame for small production units to exclude birds. Pelicans are large birds, so any physical barrier must be able to withstand their weight. American white pelicans are protected under the Federal Migratory Bird Treaty Act, and lethal control requires a federal depredation permit.

Osprey

Ospreys are the only North American raptor that eats a diet almost exclusively of fish. They have barbed pads on the soles of their feet to help them hold onto their prey. They are commonly seen soaring overhead and standing

in their large stick nests. Ospreys are typically solitary birds and tend to roost alone or in small groups of six to 10.

Osprey

Scientific name: *Pandion haliaetus*

Habitat: Shorelines

Food: Fish

Nesting: Tree

Behavior: Aerial dive

Identifying Features

Relative size: goose-size or larger, smaller than a bald eagle, larger than a red-tailed hawk

Color pattern: brown backs and white below; the head is white with a brown band through the eye

Behavior: fly over or circle high above shallow water; hover briefly before diving. Their flight profile is similar to a seagull's but once viewed closely you can tell they are much larger.

Habitat: ponds, reservoirs, rivers, lagoons, swamps, marsh; often nesting over or near water

Range & Timing

Ospreys are present seasonally in the NCR for breeding or migration. Aquaculture facilities in Minnesota, Wisconsin and Michigan are most likely to encounter breeding pairs. Most osprey in North America will migrate south to overwinter in Central or South America. Some will winter in the deep south of the United States.

Food & Feeding Behavior

Osprey hunt from the air, diving into the water to capture fish swimming up to 3 feet deep. They tend to target 6- to 13-inch fish in the upper portion of the water column. They are not good divers and can capture fish in only the top 3 feet or so of the water column. They can catch fish weighing as much as 2.5 pounds. Ospreys are not picky eaters. Records account for them eating more than 80 species of fresh and saltwater fish. They primarily capture and eat live fish but will occasionally feed on fish carcasses, salamanders, small mammals, snakes or other birds.

Depredation issues

Even though ospreys are considered a conservation success story, they still may be listed as endangered, threatened or a species of concern in your state. It is



Figure 8. Osprey in flight on approach to nest, clutching fish in its talons. *Photo by Richard Lee.*



Figure 9. Osprey perched on a branch of a tree. *Photo by Joshua J. Cotten on Unsplash.*

recommended to contact your local wildlife agency and the USFWS before any management actions are considered or taken.

Management options

Exclusion: Yes

Harassment: No

Lethal removal: Unlikely

Management options for osprey are limited and may be different from state to state. Osprey and their nests are protected by state and federal law. Exclusion may be your only option. Running heavy monofilament lines across small ponds has been effective at keeping ospreys out. Ospreys are protected under the federal Migratory Bird Treaty Act. It is possible, but not likely, to obtain a depredation permit for osprey.

Fish-Eating Ducks

Mergansers are ducks that primarily eat fish, capturing prey with their long, serrated bills. Species reported to visit aquaculture facilities in the NCR include common, hooded and red-breasted mergansers. Other species

Common Merganser

Scientific name: *Mergus merganser*

Habitat: Lakes and ponds

Food: Fish

Nesting: Cavity

Behavior: Surface dive

Identifying Features

Relative size: between a crow and a goose, smaller than a Canada goose, slightly larger than a mallard

Color pattern: most white with dark, iridescent green head, black back, and red bill (males); gray body with white breast, and rusty cinnamon heads (females and juveniles)

Behavior: surface diver; dip head under water; afloat

Habitat: freshwater lakes and rivers, nest in cavities of large trees or nesting boxes

Range & Timing

Common mergansers are present seasonally throughout the NCR for breeding, nonbreeding and migration. All North American populations migrate. Most populations migrate north to Canada for breeding. Common mergansers can be found year-round in western South Dakota and Michigan where open water remains in the winter months. Seasonal visits to aquaculture facilities in the NCR are most likely to occur in late fall to early spring. Some populations overwinter in the southern portion of the region.

Food & Feeding Behavior

Common mergansers primarily eat fish, but they will also eat crustaceans and frogs. They hunt in clear water, less than 13 feet deep. In winter, they sometimes dive deeper to find schools of fish. They tend to target 4- to 14-inch fish in the upper portion of the water column. The size of fish consumed appears to be restricted by fish girth not length. The upper girth limit, maximum circumference of a fish's body, is 6.5 to 7.8 inches. They are sight feeders and will use their bills to forage in the sediments and under rocks. In the wild, their diet includes salmon, trout, sunfish, minnows and more.

of ducks, such as the mallard, eat fish but are not considered fish-eating ducks because the bulk of their diet does not consist of fish.



Figure 10. Pair of common mergansers on a log in a river. A black and white male is in front, with a gray and cinnamon female behind.
Photo by Robert Winkler.

Depredation issues

Common mergansers congregate in areas with high fish density, such as commercial fish farms.

Management Options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with a hunting license or a depredation permit

Common mergansers can be taken during the legal hunting season. Generally, this runs from fall through late January but varies by state and flyway. Contact your state's wildlife agency for exact dates and zone regulations. The federal frameworks for hunting seasons are set annually by the USFWS. Common mergansers are protected under the Federal Migratory Bird Treaty Act and should be taken only during the open hunting season or with a depredation permit.

Hooded Merganser

Scientific name: *Lophodytes cucullatus*

Habitat: Ponds and lakes

Food: Fish

Nesting: Tree cavity

Behavior: Surface dive

Identifying Features

Relative size: crow-size, smaller than a red-breasted merganser, larger than a bufflehead

Color pattern: black above with white breast and chestnut sides, black head has a large white patch, crest can be raised and lowered, black bill (males); gray and brown body with cinnamon tinge on head and a brown bill with orange accents (female and juvenile)

Behavior: swim low in the water and dive from the surface; males raise crest when courting females

Habitat: freshwater lakes and rivers, nest in cavities of large trees or nesting boxes

Range & Timing

Hooded mergansers are present year-round or seasonal in the NCR. Populations can be present year-round in Michigan, Ohio, Indiana, Illinois and portions of Wisconsin, Minnesota, Iowa and Missouri. In general, year-round populations are in the eastern portion of the NCR, breeding populations in the middle, nonbreeding populations in the south-central, and migration in the western portion of the region. Some populations migrate north to overwinter in the Great Lakes and southern Canada. During migration, they stop over in a wide range of habitats, including the open water of large ponds and lakes.

Food & Feeding Behavior

Hooded mergansers have a broader diet than most mergansers. They eat small fish, crustaceans, amphibians, mollusks, aquatic insects, vegetation and more. They hunt in clear water by diving and swimming through the water with their eyes open. They locate prey by sight using eyes adapted for seeing underwater. They also feed by swimming with their head just under the surface of the water.

Depredation issues

Hooded mergansers are usually seen in pairs or small groups of up to 40 birds. They feed on small fish and crustaceans such as crayfish. They select relatively secluded locations for breeding and large open



Figure 11. Pair of hooded mergansers perched on a partially submerged log in a pond. The male is on the left, and the female is on the right.

Photo by gjohnstonphoto.

bodies of water to overwinter. Hooded mergansers are not typically considered a bird of major concern for aquaculture facilities.

Management options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with a hunting license or depredation permit

Hooded mergansers can be legally hunted. Open season for these birds varies by state and flyway. Hunting dates are set by USFWS in cooperation with state agencies. Contact your state's wildlife agency for exact dates and zone regulations.

Hooded mergansers are protected under the federal Migratory Bird Treaty Act and should be taken only during the open hunting season or with a depredation permit. Removal of standing dead trees can prevent pairs from selecting a site for breeding. Physical barriers can be used to protect small production units.

Top 4 Birds of Concern at NCR Aquaculture Facilities

- Great blue herons
- Double-crested cormorants
- Osprey
- Belted kingfishers

Others include bald eagles, American white pelicans, cranes (sandhill, whooping), egrets (great, snowy), crows, common mergansers, hooded mergansers and ring-billed gulls.

Other Birds of Concern

Canada Goose

Scientific name: *Branta canadensis*

Habitat: Marshes

Food: Seeds

Nesting: Ground

Behavior: Ground forage

Concerns

Canada geese are often seen as a nuisance to aquaculture producers. Their feces can carry pathogens, including parasites (e.g., *Giardia* and *Cryptosporidium*) and bacteria (e.g., *E. Coli*, *Salmonella*, *Campylobacter*, *Listeria*) that cause human illnesses. Canada geese can also cause economic loss to fish production facilities by feeding on the fish food intended for the fish. For example, when utilizing automatic feeders, geese can consume a large portion of the feed that is intended for the fish. One aquaculture producer reported Canada geese being a major nuisance.



Adult Canada goose standing in grass.

Photo by Merih Tasli on Unsplash

Management options

Exclusion: Yes

Harassment: Yes

Lethal Removal: Yes, with a hunting license or a depredation permit

Nonlethal control methods include scare tactics and habitat modification. Removal of nests or destruction of eggs requires permission from the USFWS. Canada geese are protected under the Federal Migratory Bird Treaty Act and may be protected by state laws. Lethal control requires a federal depredation permit. Hunting licenses can be obtained. Hunting season for these birds varies by state, and dates are set by USFWS in cooperation with state agencies. Contact your state's wildlife agency for exact dates and zone information.

Gull

Gulls are “seabirds” in the family Laridae and subfamily Larinae. They are most closely related to terns and skimmers. They are usually grey or white with black head or wing markings. Gulls are fish-eaters (piscivores)

American Herring Gull

Scientific name: *Larus smithsonianus*

Habitat: Shorelines

Food: Omnivore

Nesting: Ground

Behavior: Ground forager

Identifying Features

Relative size: between crow and goose-size, larger than a ring-billed gull

Color pattern: adults light-gray back with white body, wings, and tail, black wing tips spotted with white; pink legs and yellow-orange bill with red spot; nonbreeding adults with white and gray speckled heads and necks; birds years 1-3 are mottled grey, brown, white and black with pink to grey legs and grey to pink to yellow bills

Behavior: fly overhead, water search for food; loud and competitive scavengers; perch near food sources

Habitat: shorelines and near large reservoirs, lakes, rivers, open water, mudflats, plowed fields and landfills

Range & Timing

American herring gulls are present year-round or seasonally throughout the NCR. Year-round, they are found in the Great Lake states, including Wisconsin, Michigan and Ohio. Birds that breed inland in Canada migrate south, seeking warmer locations during winter. Nonbreeding populations can be found in the corridors of major rivers, such as the Mississippi, and the southern portion of the region.

Food & Feeding Behavior

The American herring gull is an omnivore. Their prey includes fish, invertebrates, insects, small birds, mussels, crabs, crayfish and worms. They also scavenge for carrion and trash. Individual gulls often target specific food types. Groups of American herring gulls may frequent areas where there is abundant food, such as fish-processing plants and commercial fishing boats. Even though live fish are rich in calories, protein and fat, American herring gulls do not always prefer fresh-

and prey on live fish or scavenge for dead fish. Gulls have jaws that can unhinge, allowing them to catch large prey. There are coastal and inland species.



Figure 12. American herring gull standing on wood post with a blurry blue and white background.

caught fish. They capture fish by plunging from near the surface to take prey. They will drop shellfish onto rocks to break them open.

Depredation issues

Little is known about the impacts of American herring gulls on aquaculture facilities in NCR.

Management options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit

Management of American herring gulls is similar to control methods used for ring-billed gulls. American herring gulls are protected under the Federal Migratory Bird Treaty Act. Lethal control requires a federal depredation permit and, in many cases, an additional state permit.

Ring-billed Gull

Scientific name: *Larus delawarensis*

Habitat: Lakes and ponds

Food: Omnivore

Nesting: Ground

Behavior: Ground forage

Identifying Features

Relative Size: crow-size, about pigeon-size body, smaller than a herring gull

Color pattern: adults are gray above with white head, breast, and tail; black wing tips spotted with white; yellow legs and yellow bill with black ring; juveniles and first-year birds are mottled grey and white with gray to yellow beaks and legs

Behavior: fly overhead or feed on the ground in large groups

Habitat: beaches, parking lots, landfills, reservoirs, lakes, ponds, streams and freshly plowed fields

Range & Timing

Ring-billed gulls are present year-round or seasonal in the NCR. Generally, they are found throughout the region year-round, but portions of the population migrate south in the winter, making them less common in their northern ranges in winter months.

Food & Feeding Behavior

Ring-billed gulls eat almost anything, but mostly fish, insects, earthworms, small rodents, grain and garbage. Small fish targeted by ring-billed gulls include yellow perch, salmonids, smelt and alewife. Ring-billed gulls mostly forage for fish and other aquatic animals by stomping their feet or skimming shallow waters. Most food items fed to chicks are whole fish, fish pieces and insects. There is evidence that suggests ring-bill gulls can learn when and where young fish are released for stocking and then will target those events. They feed mostly in the early morning hours and at night.

Depredation issues

Ring-billed gulls congregate in large numbers and often return to the same breeding location year after year, consuming dead and ill fish, small fish and other aquatic organisms in shallow water. Ring-billed gulls can be a problem, but the extent of their impact on aquaculture facilities is not well understood.



Figure 13. Ring-billed gull standing on a rock in the shallow waters of a riverbank.

Management options

Exclusion: Yes

Harassment: Yes

Lethal removal: Yes, with depredation permit.

A combination of habitat modification, physical barriers and scare tactics can be used to deter ring-billed gulls. Wires, netting and spikes can be used for small production units. Gulls can be live trapped. Depending on your state, it may be legal to remove nests. Gulls are smart and will adapt, so you will need to reevaluate what works and what does not. Ring-billed gulls are protected under the Federal Migratory Bird Treaty Act. Lethal control requires a federal depredation permit and, in many cases, an additional state permit.

Bird Identification Tips

Observation and proper identification of fish-eating birds that injure, infect or kill aquatic livestock is critical for on-farm management, and for reporting annual take connected to a depredation permit.

Bird enthusiasts use four features to identify birds:

- Size and shape
- Color pattern
- Behavior
- Habitat

Once you have identified the species, range maps can confirm that the bird you have identified is found in the place where you observed it. Range maps tell where and when birds are typically found. The Cornell Lab All About Birds website (allaboutbirds.org) is a helpful resource.

Nonlethal Control Methods and Behavior

Many birds that visit aquaculture production facilities can be categorized based on their predominant hunting behaviors. Species with similar hunting behaviors may often be controlled using the same management strategies. In the north central region, common hunting/foraging behaviors exhibited by fish-eating birds of the most concern include stalking, surface diving and aerial diving.

One characteristic that all these birds have in common, other than their appetite for fish, is that they use their keen sense of sight to locate their prey. As such, visual deterrents that make fish less visible or scare birds away may be an important component in your management plan. Thinking about how animals find and capture food can be a powerful tool in developing strategies to exclude or discourage them from selecting a production facility site as a feeding ground.

Stalking

Birds that hunt by stalking prey in shallow water use sight and stealth. These typically long-legged birds either stand very still, awaiting prey to approach them, or move very slowly to search out prey. They often enter the water on foot from land and primarily hunt and forage in shallow water. Physical barriers such as monofilament fishing line strung around the perimeter of a pond can be used to obstruct their approach. Considerations when using physical barriers for exclusion are cost and labor associated with installation, and how their presence will impact common farm activities, such as feeding, stocking and harvesting.

Physical barriers can be lethal. Birds can get entangled in lines or nets. If using physical barriers, lines or nets should be checked often to ensure birds are not being harmed. For large production units, harassment patrols reinforced with the use of scare devices can disrupt feeding and scare off problem birds. Examples of stalking birds include great blue herons, green herons and great egrets.

Surface Diver

Surface diving birds threaten fish throughout the pond and do not restrict their hunting to shallow waters like most stalking birds. Birds that use this strategy to hunt and capture prey will dive from the surface and chase fish underwater using their webbed feet to propel themselves through the water. Waterfowl often access ponds by flying in and landing on the water. Physical barriers in this case would be placed overhead. For large production units, harassment patrols reinforced with the use of scare devices can be effective. Other nonlethal deterrents include visual scarers, habitat modification and active harassment. Examples of surface divers are common mergansers, hooded mergansers and double-crested cormorants.

Aerial Diver

Aerial divers are birds that locate prey from far above the water's surface and then dive into the water to capture their prey. Some aerial divers utilize a high perch to look for prey, while others fly over or hover. Unfortunately, there are not many effective management strategies to deter aerial divers. Habitat modification and exclusion may be your only options to deter these stealthy predators. Examples of aerial divers are belted kingfishers and osprey.

Integrated Bird Management

Birds are highly adaptive, making management difficult. Even if a successful management strategy is found, it may not work for long, and it is highly unlikely that one piece of technology or control strategy will be effective at deterring avian predators. There are no silver bullets when it comes to deterring birds. The most effective approach to protecting aquatic livestock is to use an integrated bird management plan. This is a comprehensive program that utilizes many strategies to control birds and adapts management strategies over time.

For example, lethal control methods may be necessary to reinforce nonlethal control methods. If a bird or group of birds learn that the control method is harmless, they will no longer be deterred by that method. This process of acclimating to a control method is referred to as habituation. When a bird becomes habituated to your control methods, the method is no longer effective, but habituation can often be reduced by changing locations, presentations or timing of deterrents in your system. The bottom line is that because birds are highly adaptive,

you too will have to be highly adaptive to effectively manage fish-eating birds. Evaluate and modify your integrated management plan as needed to minimize economic losses caused by avian predators.

Technical Assistance

For assistance managing avian predators on your aquaculture facility, contact the USDA Wildlife Service by calling 866-487-3297 (866-4USDA-WS). You can also contact your state Extension specialist or local Extension office.

Suggested Readings

Bald and Golden Eagle Protection Act: <https://www.fws.gov/law/bald-and-golden-eagle-protection-act>

Birds of the World: <https://birdsoftheworld.org/bow/home>

Frequently Asked Questions about a Federal Eagle Predation Permit: <https://www.fws.gov/sites/default/files/documents/3-200-16FAQ.pdf>

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