

Goldfish and Koi Best Management Practices

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Purpose: To provide background, prevention strategies, and options for removal of goldfish and koi.

Introduction

What are goldfish and koi:

Goldfish and koi are examples of ornamental or aquarium fish. Goldfish (*Carassius auratus*) are described as a freshwater fish in the carp family *Cyprinidae* and are closely related to the Prussian carp (*Carassius gibelio*) and crucian carp (*Carassius carassius*). The typical length of a goldfish is between 5-8 inches, but they can reach close to 2 feet long. They can weigh up to 6 pounds (USGS). Goldfish are often found in groups of a dozen or more, up to several thousand fish. Lifespan is typically 6-7 years.

Koi (*Cyprinus rubrofuscus*) are considered a colorful, domesticated variety of common carp (*Cyprinus carpio*). Koi are used for decorative purposes in outdoor ponds and water gardens. The typical length of koi is between 1-2 feet long (Tomelleri and Eberle 1990). This taxa varies widely in color (bright orange, silver, white and black color patterns). They have prominent barbels on their lip, serrated dorsal spine and a deep body (Nelson 1984).

Native Range: Goldfish: Eastern Asia, parts of Europe. Koi: Eastern Asia, Russia.

Status in Minnesota: Goldfish and koi have been reported from Minnesota waters

Ecology: Goldfish are highly tolerant of turbid waters, temperature fluctuations and low levels of dissolved oxygen. Typical habitat includes streams and pools with submerged vegetation. Koi live in freshwater and brackish waters (Froese and Pauly 2018). Both species are omnivorous and forage for food on lake bottoms.

Impacts: Minnesota classifies goldfish and koi as regulated invasive species. They can cause harm to our waters if released, and in large numbers may compete with native fish for food and space (Moyle, 1976). Fish that are benthic (bottom) feeders increase turbidity by stirring up the sediments, resulting in a decline in aquatic vegetation.



Figure 1. Goldfish & Koi (Source: Wikipedia)

Regulations in Minnesota

Goldfish and koi are [regulated invasive species](#) in Minnesota, which means it is legal to possess, sell, buy, and transport, but they may not be introduced into a free-living state, such as being released or planted in public waters. You may not use goldfish as fishing bait in Minnesota.

Prevention

To prevent introduction and spread of goldfish, follow these rules and best practices:

- Never release aquarium pets or ornamental pond fish into Minnesota waters. Not only is release illegal, it is also inhumane. Like any other domesticated animal, your fish deserve proper care.
- Alternatives to release can be found on the [Responsible Buyers Webpage](#) and include:
 - Contacting a retailer for possible returns.
 - Rehoming your pet by giving it away, donating it to a school, or trading with other responsible hobbyists.
 - Bringing your pet to a humane society or [Habitattitude™](#) animal surrender event.
 - If the fish is sick, the best option is to contact a veterinarian or pet retailer for guidance on treatment or euthanasia of the pet.
- People that care for outdoor water gardens or ponds containing ornamental fish should build them away from natural water bodies, avoid areas prone to flooding, and maintain them properly to prevent escape.
- People interested in possessing or stocking a private lake or pond with ornamental or aquarium pets or plants should contact the Minnesota Department of Natural Resources (DNR) to ensure the correct protocols and permitting are followed.
- Report new occurrences of goldfish to the DNR immediately by logging in and submitting a report through [EDDMapS](#). The report will be verified by your [DNR Invasive Species Specialist](#).

Best Management Practices to Remove Goldfish and Koi

Like common carp, goldfish and koi populations are very difficult to eradicate. There are several options available to manage populations of goldfish and koi including: basin manipulation (e.g, dewatering or drawdown), predator stocking (e.g, northern pike or largemouth bass), physical removal (e.g., netting, seining, capturing), or pesticide use (e.g, rotenone). These options will require a permit from the DNR (see each option below for details).

Optimal removal methods vary depending on the type of basin (storm water retention basin, public water, or private pond). With any method, control is not a guarantee; therefore continuous monitoring may be needed to assess goldfish or koi presence or absence. For any management activity that is in a public water, please consult with DNR Fisheries on options to remove goldfish or koi.

Basin Manipulation

The most effective tool and preferred method of control is dewatering or drawdown of a water basin, where practical. Dewatering and drawdowns can have detrimental ecological effects to other wildlife [depending on size (lake vs. stormwater basin), species present, time of year, etc.].

Considerations:

- It is best to consult with the DNR Area Fisheries Office and the Area Hydrologist to reduce any potential impacts to wildlife. Timing is important to a successful drawdown, and the hydrologist will be able to advise.
- If the basin is being aerated over the winter, then the aerator should be disabled to encourage winterkill. It is important to note that *Carassius* species (carp and goldfish) can survive prolonged periods without oxygen, allowing them to overwinter in oxygen deprived, ice-covered ponds and shallow lakes (Fagernes et al. 2017).
- Consult with the Area Hydrologist regarding type of permit you will need:
https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html
- In general, any water that is being discharged cannot be directed into surface waters, drainage ditches or storm water catch basins. All water must be discharged onto the land surface at least 300 feet (or greater) from another surface water. Further consultation with your local unit of government and surrounding property owners is also recommended. For example, you might want to see if these waterbodies have a flowage easement or discuss options with landowners to obtain permission if pumping or discharge may occur on private or public property.
- If the waterbody is on the infested waters list (<https://www.dnr.state.mn.us/invasives/ais/infested.html>), you will need a permit to remove water from the waterbody. The DNR does not list a water body as infested based on the presence of goldfish or koi alone. Permit application:
https://files.dnr.state.mn.us/waters/forms/infested_waters_permit_application.pdf.

Predator Stocking

Stocking predatory fish, such as northern pike or largemouth bass, to a non-public water basin may be a good option for controlling goldfish and koi. Since goldfish and koi are brightly colored, they are very susceptible to predation. Stocking should be done in consultation with DNR Fisheries and with a transport permit from the DNR Area Fisheries Office.

Mechanical Harvest

Seining and trap netting are possible removal methods, but are not known to be very effective for goldfish and koi. The DNR does not conduct invasive fish management activities in non-public waters (private/neighborhood ponds, sediment basins, holding ponds, etc.). However, DNR Fisheries staff are available to provide technical guidance and support for the project. It is recommended a person or entity hire a commercial fisherman to remove unwanted invasive fish within a non-public water through a permit (contact Area Fisheries Supervisor). It is important to note that commercial fishermen have designated zones in Minnesota, so the applicant should work with the Area Fisheries Supervisor to determine who is available. If the person(s) removing goldfish/koi are not licensed commercial fishermen, they will need a scientific research permit similar to those issued for controlling common carp (another regulated invasive species) in order to allow the use of commercial fishing gear ([Permit application](#)).

Pesticide

Removing fish by pesticide (i.e., rotenone) is also possible, but not preferred or recommended by the DNR because it is costly, hard to find pesticide, difficult to apply the product (both from a safety and logistical standpoint) and not always effective. Rotenone is also considered moderately hazardous (World Health Organization) and extremely toxic to insects, aquatic organisms and fish. The use of a pesticide requires a permit to apply fish toxicants (rotenone) to waters of the state issued and approved by DNR (Area Fisheries Supervisor, Regional Fisheries Manager and Fisheries Director). By statute, all riparian (shoreline) owners must provide consent (in writing) for the permit to be issued. The permit covers private, municipal, county and public waters.

Minnesota Pollution Control Agency (MPCA) is also involved in permitting the use of aquatic pesticides. Depending on the size of the treatment area and whether the applicant is part of MNDNR's Aquatic Plant Management program, you may be required to submit an application for a National Pollutant Discharge Elimination System permit: <https://www.pca.state.mn.us/water/pesticide-npdes-permit-program>. The applicator is responsible to follow NPDES requirements in addition to any requirements listed in a MNDNR permit.

Review the [Aquatic Nuisance Animal Pest Control Pesticide General Permit requirements](#). It is also the applicant's responsibility to check with other local city and county requirements. A pesticide treatment needs to be performed by a licensed aquatic pesticide applicator (rotenone is a Restricted Use Pesticide). Any applicator with a Minnesota commercial category F pesticide license can conduct this

treatment, as long as the label does not contain mandatory training requirements. The applicator is required to be in full compliance with the product label. Read [here for further information on rotenone](#).

Additional considerations

Adaptive management might also be needed depending on the system you are managing. It is recommended to base management on the goldfish behavior, spawning locations and movement. These indicators may help to determine the correct gear and management option for your project.

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