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Private Waters Program
Management Assistance for Lakes, Ponds, Pits & Streams

HABITAT MODIFICATIONS

The natural foods of fish are either produced in the pond, washed in by rain, or fall into the pond. A pond has a series of food chains, or more accurately a food web, that starts with nutrients in the watershed and ultimately ends with big fish. Small fish concentrate the energy they get from their food and, in return, become high-energy food for larger fish. Since bluegills are lower on the food chain, a pond will support 5 to 10 times as many pounds of bluegills as it does largemouth bass.

The total biomass (weight) of fish that a pond can support is called the carrying capacity. This is much like a pasture being able to only support so many cattle, or a garden that can only grow so many vegetables. Without supplemental feeding, an average pond in Nebraska supports about 250 pounds of fish per acre – about 190 pounds of bluegill, 35 pounds of bass, and 25 pounds of catfish and/or other species. Once carrying capacity is reached (about 3 to 4 years after initial fish stockings), fish growth rates decline. Individual populations can be comprised of many small fish, a few large ones, or a combination of small, intermediate, and large, but the total weight will be the same and equal what the pond can support.

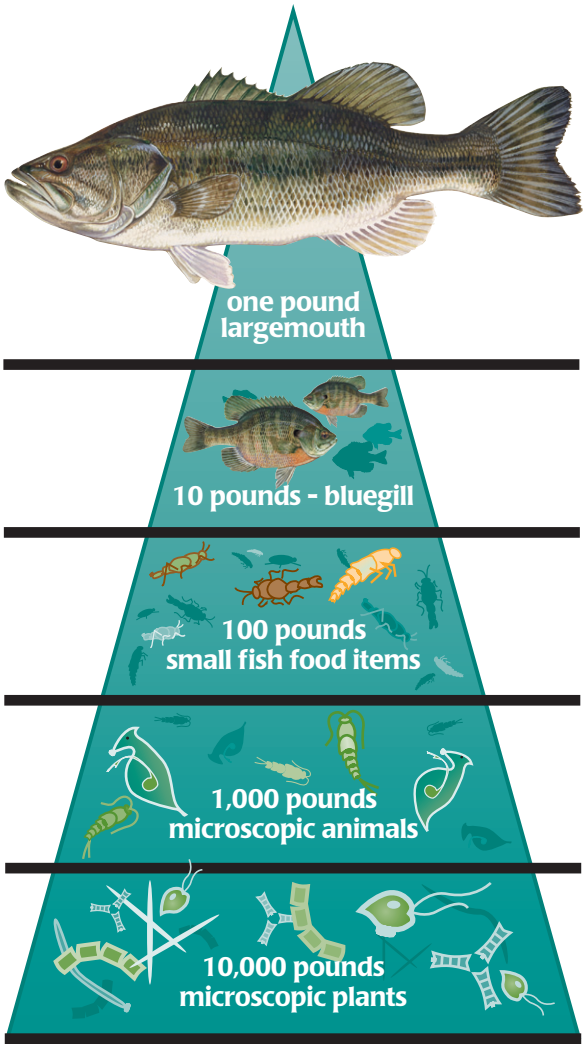
Depending on management goals, the productivity of a pond and the immediate surrounding land can be increased by modifying and/or supplementing aquatic and terrestrial environments. Changes will then benefit associated wildlife, whether it is a rabbit, a small catfish, or even a dragonfly.

AQUATIC HABITAT

Trees and brush removed during construction can be returned to the pond basin before the pond fills. Upon filling, the flooded trees, brush, grass, and weeds then become underwater structures and create an excellent, nutrient-rich environment. These underwater structures then:

- provide shade and cover for fish

AQUATIC FOOD CHAIN



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- are substrate on which aquatic organisms, such as aquatic insects, can grow and feed
- concentrate fish – small fish eat the aquatic insects and in return are eaten by bigger fish.

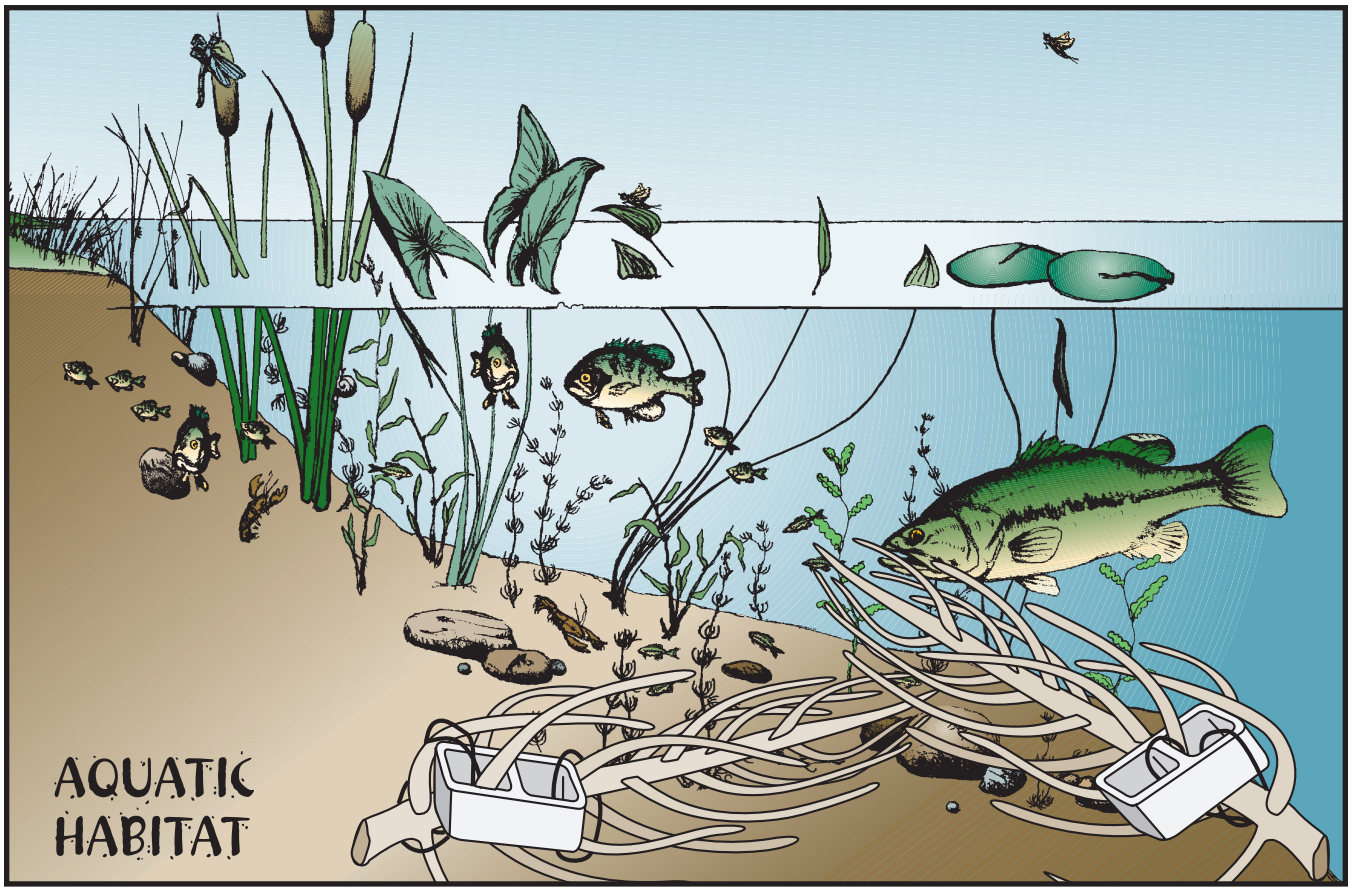
However, as the pond ages, underwater structures decay and disappear, reducing the amount of fish a pond can support. The subsequent habitat loss can be counteracted by development of natural habitat and/or addition of artificial habitat.

NATURAL HABITAT

Aquatic vegetation is also considered structure and will become established in most ponds. It is often considered a nuisance and removed by pond owners. It is, however, a natural and necessary component of a healthy pond. A good fishing pond usually will be about 40% covered with emergent and submergent vegetation. These types of aquatic plants:

- provide cover, food, and nesting sites for fish and other organisms
- help to oxygenate the water and reduce nutrient levels
- improve water clarity by decreasing wave strength and minimizing shoreline erosion
- tie up/utilize nutrients which reduces the likelihood of algal blooms that can cause fish kills.

Emergents (rigid, shoreline plants with the bulk of plant above the water surface) can become established naturally or transplanted to speed colonization. Or, top soil from a nearby wetland (when permitted) can be transported to the new



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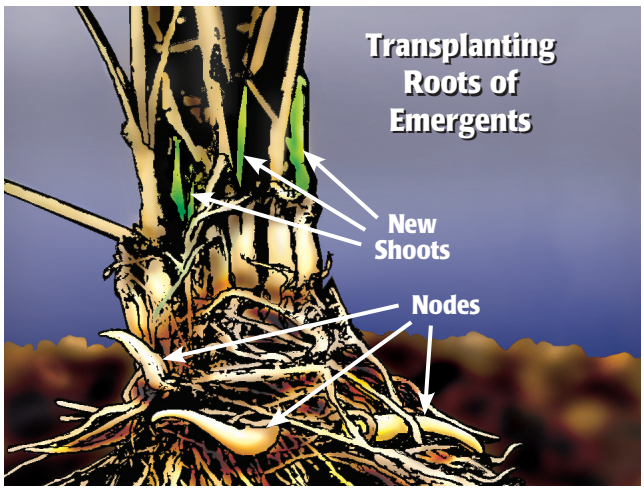
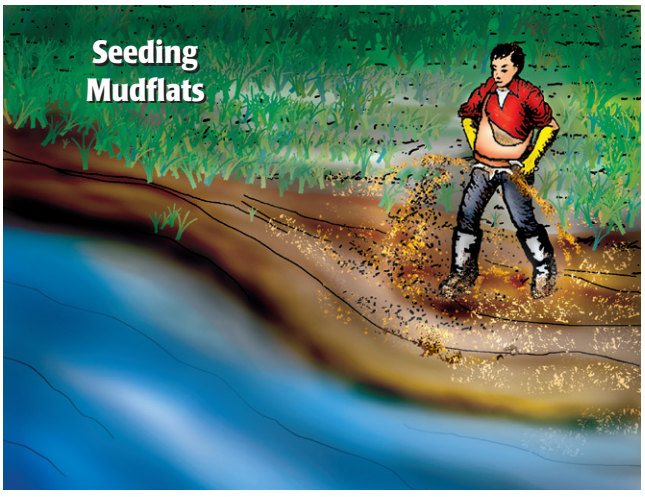


pond site and spread out so that the seed present in it can establish wetland plants. Most emergents (especially cattail, bulrush, and arrowhead) transplant easily. Transplanting should be done in the spring when new growth starts. Rootstock can be dug up, cut or pulled apart with at least two new shoots/nodes per section (especially for cattails), and planted along the shoreline. Some of the sections should be planted at and immediately above the water line, with others planted in water less than 10 inches deep. Emergents can also be planted on the tops of pond basin fish habitats (underwater terraces, humps, and land projections) that are within 2 to 3 feet of the water surface. They will become a vegetative breakwater and create slack water that should lessen the severity of shoreline erosion and provide additional habitat for a multitude of organisms. Keep in mind cattails are very aggressive and can spread extensively. They may need to be eliminated with chemical or mechanical means in wading, swimming, and some fishing areas.

Even though submergents (non-rigid plants, typically completely submerged and attached to the bottom) can also be transplanted, they usually become naturally established by waterfowl transporting seeds and/or incoming water transporting seeds and plant fragments. Ideally there should be a band of aquatic vegetation around the majority of the pond – starting with emergents immediately along the shoreline and transitioning into submergents that extend a short distance out into the pond. Submergents will likely also colonize the shallower portions of underwater terraces and humps installed in deep areas of the pond. Some submergent types (curlyleaf pondweed, Eurasian watermilfoil, and coontail) can extensively colonize shallow-water areas if adequate depths aren't present to restrict their growth. See **PG13-1** regarding pond depth, capacity, and slopes.

Although it is best to transplant locally acquired plants, contact your area Commission fisheries personnel for a listing of aquatic vegetation dealers. See **PG13-9** for additional information on identification, benefits, potential problems, and control of aquatic vegetation.

Some of the natural effects of aging and subsequent habitat loss can also be counteracted with water level manipulation. Ponds with gated draw-down valves can be lowered 2 to 3 feet (commence in late spring) and maintained at the lower level for an extended period of time. Make sure adequate depth remains to prevent a summer fish kill. Grasses and broadleaf plants will sprout



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naturally on the exposed bottom. Or, mud flats can be hand seeded with Japanese millet or grain sorghum when they are initially exposed and still moist. The pond should be refilled to flood the established vegetation, either in the fall if a winter fish kill is possible or the following spring. Although pumps can be used to partially drain or refill ponds for water level manipulation, pumping costs could be considerable.

Water level manipulation can also be used to:

- enhance emergents with dewatering starting about mid-May and a slow, refilling process starting in September
- crowd fish, which makes small bluegill more susceptible to predators.

Water level manipulations should ideally be done every 4 to 5 years.

ARTIFICIAL HABITAT

Pond owners can install underwater structures, commonly referred to as artificial habitat. Structures made of brush and trees are the most economical and effective types; however, rocks, wooden pallets, drain tiles, and piles of bricks can also be used. Before adding any structure into any surface waters of the state, a Section 404 Permit must first be obtained from the Army Corps of Engineers (Omaha Office 402-896-0723).


Pallets Used For Artificial Habitat


Cedars and Blocks Used For Artificial Habitat

As a pond is being built, structures can be quickly built by:

- pushing downed trees together and anchoring them in place
- leaving standing timber intact whenever possible.

Hardwoods, osage orange, red cedar, or any large tree work best and will last for decades once they are inundated. Christmas trees shouldn't be used because they decompose rapidly, nor should large pines because of their acidity.

Trees can either be tied together, anchored separately, or attached to stumps. They can be anchored with concrete blocks or attached to steel posts driven into the bottom, as long as there is no concern about the posts causing the pond to leak or becoming a boating hazard. Plastic banding, polypropylene rope, cable, or heavy, non-corrosive wire can be used to facilitate anchoring. Or, a tree can be placed upright in a hole that has been made in the bottom and subsequently held in place with poured concrete. Structures can also be installed on top of deep water humps and terraces or near the

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notches of underwater terraces. See **PG13-1** for more information regarding pond bottom design concepts.

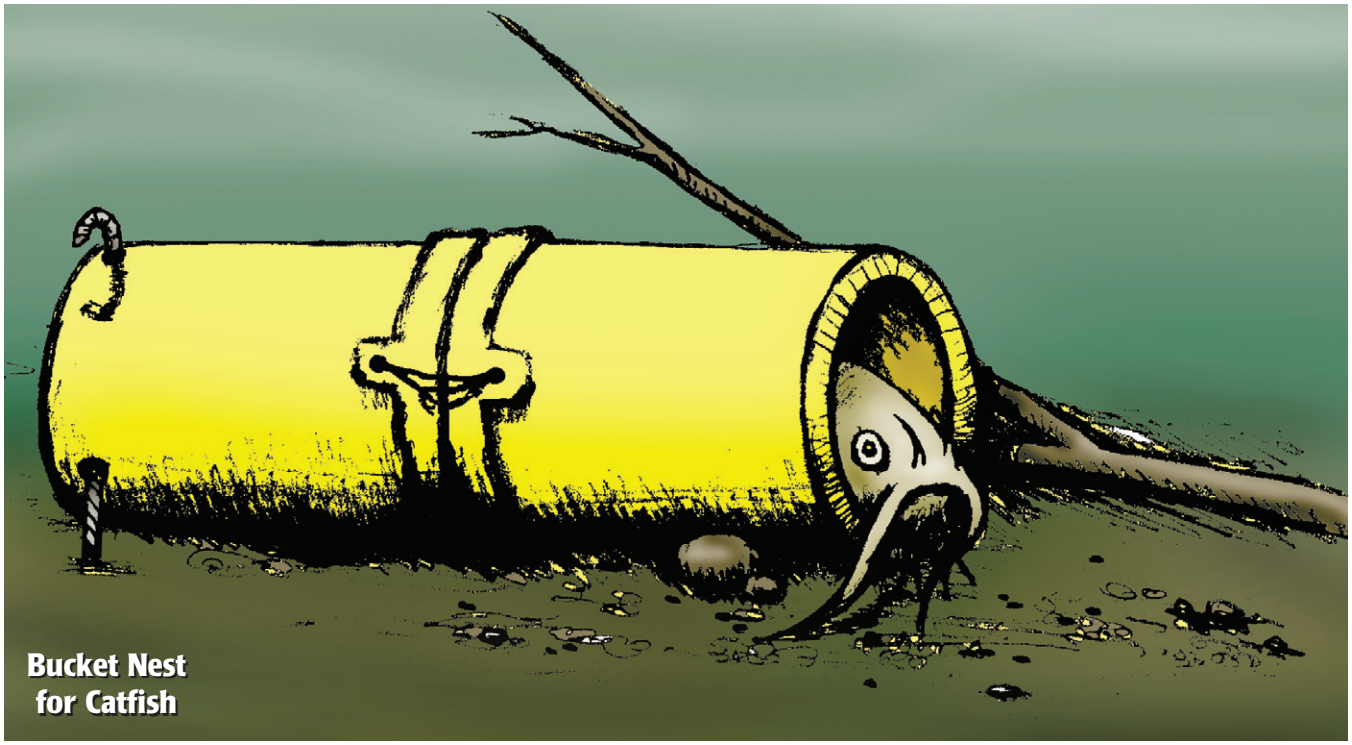
Shoreline structure can be made by felling trees along the edge of the pond into the pond. These trees can be kept in place by cabling them to the stumps, or half cut them, leaving a portion of the top connected to the stump.

Artificial habitat can also be added after the pond fills to intentionally attract and concentrate fish for anglers. The best locations for attractors are near natural gathering places for fish (off points, at the edges of drop-offs, or in the mouths of coves) and in areas accessible to shore anglers (near boat docks and fishing piers). The structures can be built on the ice during the winter over 4 to 10 feet of water or, if possible, the pond can be partially drained and the structures placed on the exposed bottom. Structures can also be built on the bank and pulled out into the water or hauled in a boat to the ideal fishing spot.

As mentioned earlier, a good fish pond will have aquatic vegetation associated with about 40% of its surface area – subsurface artificial habitat can be a portion of this percentage. Structures placed in 5 to 10 feet of water can be used by fish year-round; whereas, those placed in water deeper than 10 feet may not be used during summer months if insufficient oxygen is present. Good attractors will be about 10 by 15 feet, or larger. Trees are more effective if grouped together in several large piles instead of spreading individual trees across the entire bottom. A good rule of thumb for ponds larger than 5 acres is to build one large brush pile for every 2 to 3 acres of water. For safety's sake, do not place any structures in swimming or wading areas or within 100 feet of spillways or overflow pipes.

SPAWNING HABITAT

Bass and bluegill are typically generalists, thereby eliminating the need to add spawning substrate such



Bucket Nest for Catfish

as sand or gravel. But, some studies have shown bass prefer to spawn near a downed log, or similar structure, when available. There is the likelihood that excessive amounts of sediment in older ponds can smother eggs in a nest if it is stirred up and then resettles. Partially draining older ponds will cause the exposed bottom to dry out and become somewhat firm, making it better for nest builders. Or, heavy equipment can be used to remove the sediment in several areas. Its usage will also compact the bottom.

Channel catfish usually nest in a bank cavity that they can lay in and defend. They can also use a hollow log, trash barrel on its side, a large piece of PVC pipe with one end plugged, or other similar structures. Plastic 5-gallon buckets (page 5) can also be used. Wire the open ends of two buckets together. Cut an opening in the bottom of one bucket – leave about a one-inch lip that will prevent the egg mass from sliding out. Drill one hole at the top and one on the underside near the bottom of the other bucket. A piece of rebar can then be driven through the two holes and into the pond bottom to anchor the structure (install it in about 4 feet of water). Coarse gravel can be put inside to help stabilize the structure. Catfish will also nest alongside protective structure if no cavity is available. There will be limited survival of their young if the water is clear and bass are present.

SHALLOW-WATER HABITAT

If desired, shallow-water habitat can be further diversified/increased by constructing:

- a small wetland below the dam
- a small pond above the main pond to provide additional habitat as well as sediment detention
- some additional shallow-water areas in upper reaches of the pond.

All of these areas will eventually become vegetated and provide habitat for waterfowl, bullfrogs, and other wildlife. Pond owners who want to manage a pond specifically for waterfowl must decide to do so before the pond is built because there are some different guidelines that need to be considered. See **PG13-7** for detailed information on waterfowl production.

OTHER AQUATIC CONSIDERATIONS

Water fertility determines a pond's productivity – a more productive pond will support more fish and larger harvest than a less productive pond. Good fish production should occur if you can see your fingers when an arm is extended 18 inches downward into the water while in direct sunlight, or when a secchi disc is impossible to see at 18 to 24 inches below the pond surface. The level of visibility should be due to the density of existing fish food organisms (such as zooplankton, phytoplankton, and aquatic insects), not suspended soil particles.

In general, the addition of more nutrients is not needed in Nebraska ponds because most soils and water supplies are nutrient-rich. Exceptions could be newly created ponds that may need a nutrient boost to facilitate initial establishment and expansion of fish food items. See the Vegetation Establishment, Habitat Enhancement, and Shoreline Stabilization section of **PG13-1** for details.

The addition of an agricultural fertilizer to increase fertility is actually prohibited since it would


Checking Water Turbidity By Hand

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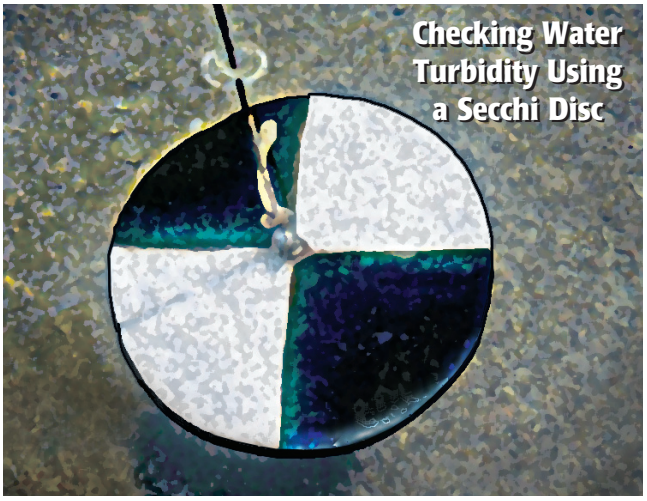
Checking Water Turbidity Using a Secchi Disc

violate Title 117 Water Quality Standards set by the Nebraska Department of Environmental Quality. If nutrients become excessive, there is the likelihood of excessive aquatic vegetation growth, especially algae, that could negatively impact fish populations.

Nebraska ponds are usually productive enough that fish feeding is not necessary. But, feeding may be considered if the owner is willing to spend the time and money necessary to produce rapidly-growing, large-bodied fish. See **PG13-6** for details on fish feeding.

TERRESTRIAL HABITAT

A pond is a community of many living organisms, with most of them depending on each other for survival. It is also a connecting link between the aquatic and terrestrial worlds. The vegetative cover near the pond greatly influences the types of wildlife that will regularly use the pond – ranging from aquatic insects to upland wildlife.

The basic needs of most upland wildlife species are simple: food and cover. Buffer strips adjacent to ponds become important habitat that provide both. Cover is needed for nesting or denning, escape from predators, and shelter from harsh weather. The lack of any of these may limit populations.

Cover can also improve water quality and lengthen the life expectancy of a pond by entrapping sediment from erosion on land surrounding the pond. It will also "retain" the excessive amounts of nutrients that can come from livestock facilities, over-grazed pastures, and cropland following storm runoff, thus preventing excessive growth of aquatic vegetation – particularly algae.

In open rangeland and small pastures, fencing should be used to protect at least a 100-foot wide grassed buffer around the entire pond. A small watering gap can be constructed for livestock if this is the only water source. A buffer strip of this width provides excellent habitat, particularly for small mammals and ground-nesting birds, and makes it more difficult for predators to locate prey. If the pond is to be located in or near cropland or over-grazed pasture, a mixture of native grass and legumes,


Fenced Buffer Around Pond

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such as alfalfa and clover, should be planted within the fenced buffer. Depending on the amount of land available, trees and shrubs can also be considered. Establishing windbreaks near the south and west sides of the pond will provide cover for a variety of wildlife and help to reduce wave action and turbidity. These various plantings will provide additional winter and escape cover, food production, and nesting areas for wildlife. Keep in mind trees should not be planted along the northwest corner of ponds. Prevailing northwest winter winds are needed to prevent excessive snow accumulation on the ice, thus lessening the chance of a winter fish kill.

The grassed buffer areas need to be periodically manipulated to produce a wide diversity of grasses and broadleaf plants, also known as forbs, that can be utilized as food and cover for the various kinds of wildlife desired. Wildlife utilization of a habitat can then be increased by maintaining a stage of plant succession. Since vegetation cannot be held at a particular stage for any great length of time, it becomes necessary to set back succession and allow the process to start over; thus recycling the most beneficial successional stages. This can be accomplished by controlled burning, mowing, lightly disking and interseeding with legumes or forbs, grazing, or even careful use of chemicals. These practices, when done correctly, do not destroy the grass, but improve plant diversity and maintain vigorous growth within the stand, yielding greater wildlife benefits and diversity. Other wildlife requirements can also be met if there is a need to plant additional trees and shrubs. Contact your area Commission wildlife biologist or county Natural Resources Conservation Service personnel about habitat planning and periodic manipulation.

Contacts: Jeff Blaser, Private Waters Specialist
Nebraska Game and Parks Commission
2200 North 33rd Street, Lincoln, NE 68503
402-471-5435
or area Commission fisheries biologist.

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TECHNICAL ASSISTANCE CONTACTS

Nebraska Game and Parks Commission (Commission)
2200 N 33rd Street PO Box 30370
Lincoln, NE 68503
Private Waters Specialist 402-471-5435
Natural Heritage Program 402-471-5419

Northwest (NW) District - Alliance
Game and Parks Commission
299 Husker Road PO Box 725
Alliance, NE 69301
308-763-2940
Fisheries Division or
Wildlife Habitat Partners Section

Northwest (NW) Field Office - Valentine
Valentine State Fish Hatchery
90164 Hatchery Road
Valentine, NE 69201
402-376-8080 or 402-376-2244

Southeast (SE) District - Lincoln
Game and Parks Commission
2200 N 33rd Street PO Box 30370
Lincoln, NE 68503
402-471-7651 or 402-471-5561
Fisheries Division or
Wildlife Habitat Partners Section

Northeast (NE) District - Norfolk
Game and Parks Commission
2201 N 13th Street
Norfolk, NE 68701
402-370-3374
Fisheries Division or
Wildlife Habitat Partners Section

Northeast (NE) Field Office - Bassett
Game and Parks Commission
524 Panzer Street PO Box 508
Bassett, NE 68714
402-684-2921
Fisheries Division or
Wildlife Habitat Partners Section

Southwest (SW) District - Kearney
Game and Parks Commission
1617 First Avenue
Kearney, NE 68847
308-865-5310
Fisheries Division or
Wildlife Habitat Partners Section

Southwest (SW) Field Office - North Platte
Game and Parks Commission
301 East State Farm Road
North Platte, NE 69101
308-535-8025
Fisheries Division or
Wildlife Habitat Partners Section

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United States Department of Agriculture - Natural Resources Conservation Service (NRCS)

Federal Building, Room 152
100 Centennial Mall North
Lincoln, NE 68508
Statewide Wildlife Biologist
402-437-4100
or contact Local County Office

University of Nebraska - Lincoln, Cooperative Extension

211 Agricultural Hall - UNL East Campus
Lincoln, NE 68583
Main Office 402-472-2966
or contact Local County Office;
Water Quality Questions 402-643-2981, ext. 115

Nebraska Department of Natural Resources (DNR)

301 Centennial Mall South, PO Box 94676
Lincoln, NE 68509
Water Storage Permits 402-471-2363 or
Dam Safety Guidelines 402-471-1222

U.S. Army Corps of Engineers (ACOE)

8901 S. 154th Street, Suite 1
Omaha, NE 68138 402-896-0723
or contact the Kearney office at:
1430 Central Avenue
Kearney, NE 68847
308-234-1403

Nebraska Department of Environmental Quality (NDEQ)

1200 N Street, PO Box 98922
The Atrium, Suite 400
Lincoln, NE 68509
402-471-0096

Nebraska Association of Resources Districts (NARD)

601 S. 12th Street, Suite 201
Lincoln, NE 68508
402-471-7670
or contact your local Natural Resources District (NRD)
listed in White Pages of the phone book