Great Sacandaga Lake

Artificial Fish Habitat Construction Initiative

Broadalbin-Perth Science Research

Strategic Plan: Fall 2024 through Spring 2029

Contents:

Broadalbin-Perth Jr/Sr High School
100 Bridge Street, Broadalbin, NY 12025

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This proposal has been produced as part of an ongoing Great Sacandaga Lake walleye study conducted by members of the Broadalbin-Perth Science Research Course at Broadalbin-Perth High School.

INTRODUCTION

This document is designed to serve as a proposal for the construction and placement of artificial fish habitats in the Great Sacandaga Lake. The suggested habitats (Pennsylvania Porcupine Cribs) are aimed at providing long-term and long-lasting structures that contribute to improved angling opportunities while creating suitable structures to protect and enhance fish populations.

Natural lakes and man-made reservoirs differ in many ways, but differences in structure are often the most striking. Natural lakes are old, most originated with the retreat of the last glaciers 12,000 to 14,000 years ago, and water levels are relatively stable. Time and stability, along with the slow accumulation of sediments and nutrients, have led to the establishment of rooted aquatic plants in shallow waters where light is sufficient for their growth. Thus, many lakes are structure-rich (Schramm 2021).

Conversely, reservoirs are young, have a bottom composition not favorable for the growth of aquatic plants, and many lack the stable water conditions necessary for aquatic vegetation. Although some shallow reservoirs have developed aquatic plants, which unfortunately often are non-native plants that can grow to nuisance levels, the primary structure in reservoirs is pre-existing geologic features like rocks, trees, stumps, and brush. Much of the wood structure has decayed or been buried in sediment resulting in a substantial loss of substrate for aquatic food web production (Schramm 2021).

The Great Sacandaga Lake is 29.2 miles long and encompasses parts of Fulton and Saratoga County, New York. It was created as a reservoir in 1930 following the completion of the Conklingville Dam. The lake is managed by the Hudson River-Black River Regulating District with shorelines of private and public access including residential homes, boat launches, restaurants, marinas, campgrounds, and beaches. It is classified as a meso-oligotrophic lake which means it is a water body that has relatively intermediate productivity due to the low/moderate nutrient content in the lake. The Great Sacandaga Lake is home to over a dozen fish species including largemouth bass, smallmouth bass, yellow perch, brown bullhead, northern pike, chain pickerel, redbreast sunfish, rock bass, brown trout, rainbow trout, channel catfish, common carp, black crappie, and walleye.

FISHERIES HABITAT REQUIREMENTS

Most fish living in a lake or reservoir have similar habitat requirements. Depending on the species, most gamefish require certain physical elements to be present, in order to accomplish daily and seasonal survival tasks (as individuals or species). To naturally propagate, fish must accomplish all of these required tasks using various habitat types existing in the lake or reservoir (Houser 2007).

1. **Spawning**: Adult fish must successfully spawn if natural propagation of the species is to occur. Appropriate and abundant spawning habitats for individual species must be present for spawning to be successful (Houser 2007).

2. **Nesting**: Many fish species nest as part of their spawning requirements. Nesting requires appropriate substrate and, in many cases, overhead cover. The better the substrate is for nesting, the more successful a fish species can be at natural reproduction and propagation (Houser 2007).

3. **Nursery**: After spawning occurs, fingerlings of different species require a variety of specific habitats to successfully survive from juvenile to adult life stages. When nursery habitats are nonexistent or not sufficiently abundant, fingerling survival to the juvenile stage can be limited by increased predator success (Houser 2007).

4. **Refuge**: Refuge habitat primarily applies to juveniles who have survived their first year. As with fingerling survival, juvenile survival can be greatly enhanced, if appropriate and abundant habitats exist for that particular species or year class (Houser 2007).

5. **Foraging**: Foraging habitats enable predators to feed on native forage. The same habitat used by predators to forage may be necessary for the native forage to propagate naturally. For instance, burrowing mayflies may utilize a particular substrate until emergence. The same substrate or habitat may be used by walleye (or another species) to forage on the mayflies after emergence (Houser 2007).

6. **Ambush**: Some fish species require concealment cover to effectively ambush their natural prey. Both adults and juveniles of a variety of species may use ambush cover when foraging. Where appropriate and abundant ambush habitats exist, fish such as largemouth bass (and other species) can be more efficient at foraging for native prey species (Houser 2007).

7. **Resting**: Although this requirement is not always recognized, fish do need to rest. Resting often comes in the form of not foraging, migrating, spawning, or accomplishing other necessary survival tasks. In many cases, fish rest in or around habitats that are not used for any task but resting (Houser 2007).

8. **Migration**: All fish travel and most fish migrate. Many fish migrations occur because of spawning or foraging needs. Fish migrations do not need a specific habitat type, although fish do utilize habitats when they migrate. Bass, in particular, may use habitats to navigate, employing specific habitat features as landmarks to map travel routes (Houser 2007).

ARTIFICIAL FISH HABITATS

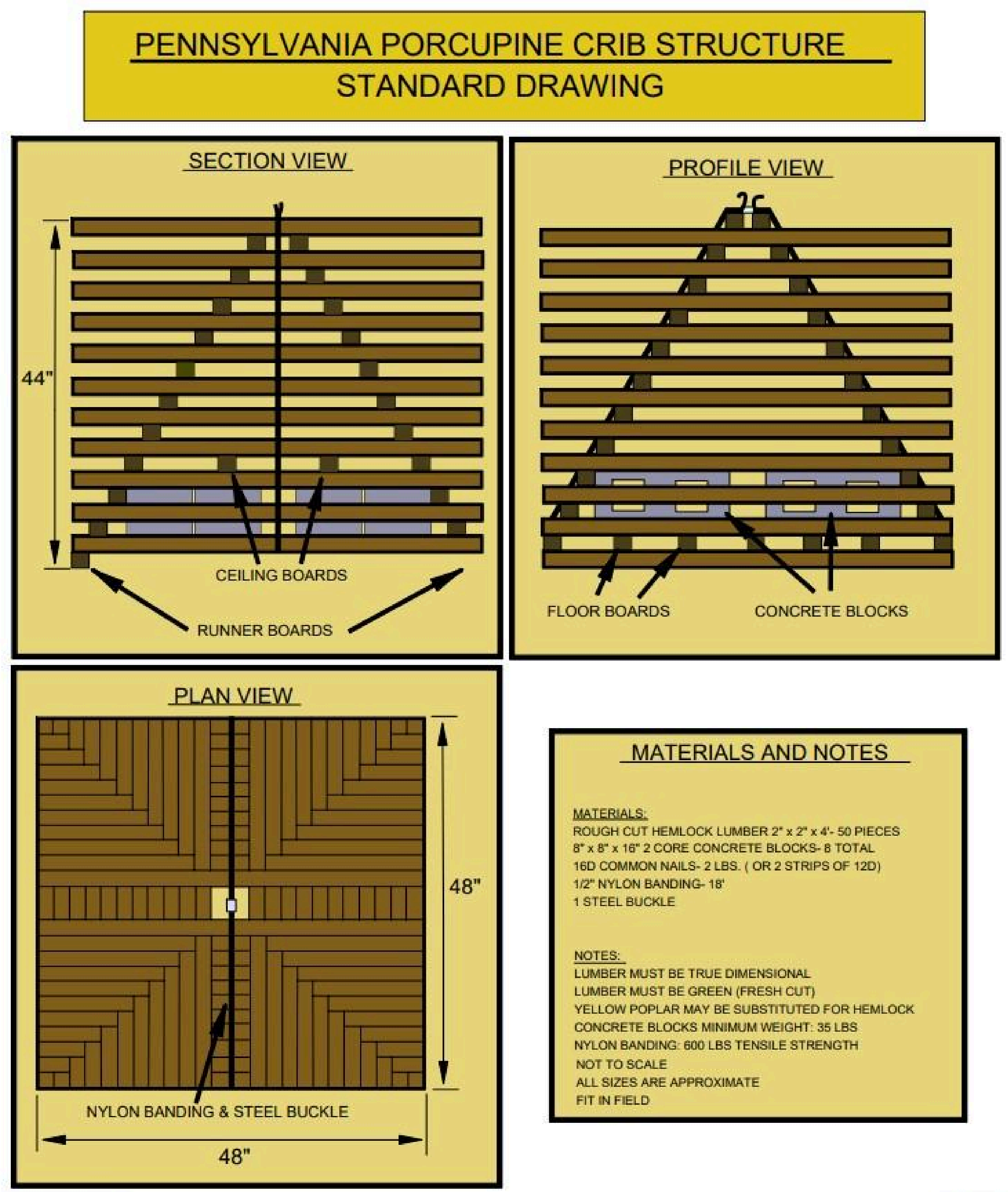
Artificial fish habitats are designed to be effective, long-lasting structures, providing habitats that allow fish to accomplish their daily and seasonal tasks with greater efficiency. There are several reasons to create artificial fish habitat in lakes and reservoirs. Structures can be placed next to spawning areas to provide protective cover for juvenile fish. These structures also attract larger fish, providing prime fishing opportunities for anglers. A common attribute of structure, in addition to providing cover for many species of fish, is that it provides the substrate for algae and other microorganisms to flourish. These organisms are important food sources for a variety of fishes. The more structure present, the more substrate, leads to a greater biomass of invertebrates and greater food available to fish. It is not surprising that fish are attracted to structures that provide both cover and abundant food resources (Schramm 2021).

Large, complex wood structures in lakes and reservoirs can create positive fish habitat for a variety of species. Due to its excellent submerged capabilities, rough-cut hemlock lumber is used in the wood structure designs for the artificial fish habitat (Pennsylvania Porcupine Crib) described in this document. The artificial fish habitat design used in this plan has undergone a minimum one-year design phase and a two-year durability test. Materials and construction techniques used in the assembly of Pennsylvania Porcupine Crib structures provide the best balance of structure longevity, invertebrate and plankton colonization, and fish utilization. Lumber used in the construction of Pennsylvania Porcupine Crib structures should be green (newly cut), rough-cut, true-dimensional hemlock. Hemlock is an ideal wood because of its durability and resistance to rot. All other material types used will be noted in the plan, as a specific type of material required for the Pennsylvania Porcupine Crib (Houser 2007).

PENNSYLVANIA PORCUPINE CRIB DESCRIPTION

Porcupine Cribs (see Figure 1 and Figure 2) are long-lasting, deep-water, pyramid-shaped structures designed as a refuge-type habitat. This design should provide protection for juvenile fish and improve recruitment of game fish in lakes and reservoirs that lack abundant, deep-water, submerged aquatic vegetation. Construction materials consist of rough-cut, true-dimensional, hemlock (50 pieces of 2” x 2” x 4’ - 3 pounds each), eight two-core 8-inch concrete blocks (35 pounds each), and two pounds of 16d common bright nails, plus a 14-foot piece of 1⁄2" nylon security banding and one steel buckle. Each fully constructed crib will weigh approximately 430 pounds and stand four feet high and four feet wide. Placement is traditionally accomplished by specially-equipped watercraft, during open-water periods. Submerged structures are normally placed in a row or alternating row pattern, with four to eight-foot spaces between individual structures. Ten Porcupine Cribs typically are placed at one site (Houser 2007).

Figure 1. **Pennsylvania Porcupine Crib Construction Drawings**



** Numerous state environmental agencies, community outreach programs, and fishing clubs throughout the country use Pennsylvania Porcupine Cribs in their local lakes and reservoirs because of their durability and positive impact on the ecosystem.*

<u>Figure 2.</u> Photo Examples of Pennsylvania Porcupine Crib Construction

<u>Figure 3.</u> Great Sacandaga Lake Artificial Fish Habitat Placement Map (Proposed Areas)

**not drawn to scale*

- Construction and storage of all fish cribs will be occur at Broadalbin-Perth High School, located at 100 Bridge Street, Broadalbin, NY 12025.
- Transport of fully constructed fish cribs to the lake will occur via flatbed trailers *(approximately 5 miles to the lake from the school).*
- Placement of the fish cribs will be accomplished by using the Husdon River-Black River Regulating District cargo boat located at their Great Sacandaga Lake field office in Mayfield, NY 12117.

Table 1. **Proposed Coordinates for Artificial Fish Habitat Placement in the Great Sacandaga Lake**

Name	GPS	Depth (feet)	Location to the nearest physical structure
Habitat 1	43°8.481'N · 74°8.771'W	30'	East Shore, North of Sand Island
Habitat 2	43°7.819'N · 74°9.154'W	30'	East Shore, North of Sand Island
Habitat 3	43°7.515'N · 74°9.368'W	31'	East Shore, North of Sand Island
Habitat 4	43°7.726'N · 74°9.516'W	30'	West of the D-5 buoy, North of Sand Island
Habitat 5	43°7.818'N · 74°10.118'W	31'	West of Habitat 4, North of Sand Island
Habitat 6	43°6.117'N · 74°11.287'W	34'	East Shore, West of the F-9 buoy
Habitat 7	43°9.318'N · 74°11.591'W	30'	North of Habitat 6, West of Sand Island
Habitat 8	43°7.312'N · 74°11.756'W	30'	West of G-buoys
Habitat 9	43°7.710'N · 74°11.421'W	38'	Northwest of G-buoys
Habitat 10	43°7.748'N · 74°11.888'W	35'	Northwest of G-buoys
Habitat 11	43°8.206'N · 74°12.248'W	33'	Northwest of Habitat 10
Habitat 12	43°7.768'N · 74°12.222'W	34'	West of Habitat 11
Habitat 13	43°7.795'N · 74°13.493'W	30'	Between Sunset Bay and Habitat 12
Habitat 14	43°7.239'N · 74°13.417'W	30'	West Shore, Southeast of Sunset Bay
Habitat 15	43°7.812'N · 74°13.769'W	30'	Between Sunset Bay and Habitat 13
Habitat 16	43°8.196'N · 74°12.660'W	32'	North of Habitat 13, East of Cranberry Cove Boat Ramp
Habitat 17	43°8.771'N · 74°13.086'W	30'	North of Habitat 16
Habitat 18	43°8.528'N · 74°12.003'W	34'	South of Deer Island, East of Habitat 17
Habitat 19	43°8.850'N · 74°11.226'W	30'	Southeast of Deer Island
Habitat 20	43°9.318'N · 74°11.591'W	31'	Northwest of Deer Island, West shore

** proposed habitat locations are in contour depths of 30 feet or more to account for seasonal drawdowns of the lake*

Table 2. **Great Sacandaga Lake Artificial Fish Habitat Construction Initiative Timeline**

Time	Project Events
Fall 2024	Start construction of artificial fish habitats
Spring 2025	Complete construction of 40 habitats and submerge in GSL @ 4 designated locations
Spring 2026	Complete construction of 40 habitats and submerge in GSL @ 4 designated locations
Spring 2027	Complete construction of 40 habitats and submerge in GSL @ 4 designated locations
Spring 2028	Complete construction of 40 habitats and submerge in GSL @ 4 designated locations
Spring 2029	Complete construction of 40 habitats and submerge in GSL @ 4 designated locations

Total number of locations - 20 (10 porcupine cribs at each location)
Total number of fish habitats constructed - 200

Table 3. Materials Needed for the Construction of 200 Pennsylvania Porcupine Cribs:

Materials	Amount	Unit Price	Approximate Cost
Rough Cut Hemlock (2”x2”x4’)	10,000 pieces	$3.00	$30,000.00
Concrete Blocks (8	1,600 pieces	$2.00	$3,200.00
16d Common Nails	200 lbs.	$65.00 / box	$455.00
Nylon Security Banding	2,800 ft.	$60.00 / roll	$480.00
TOTAL for 5-Year Project			**$34,135.00**

**5-year project (Fall 2024 - Spring 2029) = $6,827.00 per year for construction materials*
*** Cost estimates will be contingent upon donations from local businesses such as Home Depot and Lowes*

MONITORING

Once the artificial fish habitats are built and dropped into designated locations in the Great Sacandaga Lake, monitoring the habitats will be accomplished by using an underwater drone. Regular video monitoring using drone technology will determine if the artificial fish habitats are being utilized by fish and other aquatic species. Using an underwater drone for this project will play a crucial role in understanding the impact that the artificial structures are having on the fishery. The versatility and non-intrusive nature of drones make them valuable tools when studying fish populations, enabling researchers to collect data efficiently and safely with minimal disturbance to the fish’s daily and seasonal survival tasks.

WORK CITED

Houser, D.F. 2007. Fish habitat management for Pennsylvania impoundments. Pennsylvania Fish and Boat Commission.

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