

Monroe Lake Aquatic Habitat Enhancement Plan  
Monroe County

Sandra Clark-Kolaks  
Southern Fisheries Research Biologist



Fisheries Section  
Indiana Department of Natural Resources  
Division of Fish and Wildlife  
I.G.C.-South, Room W273  
402 W. Washington Street  
Indianapolis, Indiana 46204

2017

Monroe Lake is a 10,750-acre flood control reservoir located in Brown and Monroe Counties southeast of Bloomington, Indiana. It is the largest lake in Indiana, and recreational activities such as boating and fishing are very important. There are nine publicly-owned boat ramps located around the lake. Access is also available at several privately-owned recreational facilities such as boat rentals, sports shops, marinas, and campgrounds. Monroe Lake serves as the primary water supply for the City of Bloomington. Stocked predators, Hybrid Striped Bass and Walleye, were introduced in the mid-1980s to utilize the overabundant forage base at Monroe Lake.

The lake and adjacent land is co-managed by the Army Corp of Engineers (COE) and Department of Natural Resources (DNR) Division of Parks and Reservoirs. Aquatic vegetation, shoreline vegetation (trees and shrubs) and woody debris are very limited in many parts of the lake due to greatly fluctuating water levels, land management prior to construction, and rocky shorelines. Many states already have established aquatic habitat enhancement programs and our recommendations are based on their work (Houser 2007, Wagner 2013, Kansas Department of Wildlife 2015). Habitat structures that will be used for this project include but are not limited to: 40 Pennsylvania Porcupine Crib Juniors, 30 Georgia Cubes and 160 Indiana pallet structures. Descriptions and building specifications of proposed structures can be found in the Appendix.

This project will focus on an area of the lake east of the State Highway 446 causeway. This area is idle and is very popular with anglers. Previous structures have been placed around the lake in small quantities through a permitting process administered by the DNR Monroe Lake property. Structures have been of various construction materials and designs. Many have been some form of stake beds, Christmas trees, PVC trees, and pallet cribs. Structures have been placed all across the lake but tend to be concentrated in certain areas (Figure 1). Many structures have been placed in the area designated by this project.

The average depth of the lake is 25 ft, however this side of the lake is shallower than the side west of the State Highway 446 causeway. Dissolved oxygen levels typically are adequate during summer months down to 16 ft. Because of these factors, the Habitat Enhancement Zone is designated as the area between the 8 ft and 11 ft contour and is about 172 acres (Figure 2). The target is to enhance 10% of this area which will require 17 acres of habitat enhancement (Clark-Kolaks 2015).

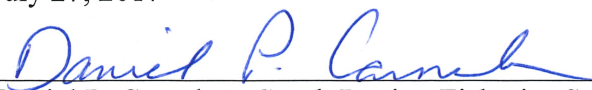
Construction of structures will be conducted in the summer 2018 with anticipated placement as conditions allow during the summer and fall 2018. The construction and placement of all artificial structures in this plan must be coordinated with the Indiana Division of Fish and Wildlife. Representatives of the Fisheries Section (or a designated representative) will be on hand to supervise and assist in construction and placement of all artificial habitats designed for this project. Volunteers from Indiana Bass Federation, Bass Unlimited and other volunteers will assist with construction of cribs. Local businesses will be solicited for the donation of materials including: cinder blocks, rock, and lumber. Indiana DNR Fisheries Biologists will coordinate structure placement. All artificial habitats must be constructed to the specification shown in the standard drawings attached to this document.

The Division of Fish and Wildlife will obtain a two-year (2018-2020) Individual Section 401 Water Quality Certification from the COE. This plan will be reviewed and approved by the Division of Water and Division of Law Enforcement before any structures are placed.

#### LITERATURE CITED

- Bassett, C. E. 1994. Use and evaluation of fish habitat structures in lakes of the eastern United States by the USDA Forest Service. *Bulletin of Marine Science*, 55(2-3): 1137-1148.
- Bolding, B., S. Bonar, and M. Divens. 2004. Use of artificial structures to enhance angler benefits in lakes, ponds, and reservoirs: a literature review. *Reviews in Fisheries Science* 12:75-96.
- Clark-Kolaks, S.J. 2015. Aquatic habitat enhancement plan for the placement of natural and artificial habitats in Indiana's reservoirs. Indiana Department of Natural Resources, Indiana. 20pp.
- Houser, D.F. 2007. Fish habitat management for Pennsylvania impoundments. Pennsylvania Fish and Boat Commission.  
[http://titifishandboat.com/tiwatertihabitattilake\\_fish\\_hab.pdf](http://titifishandboat.com/tiwatertihabitattilake_fish_hab.pdf).
- Kansas Department of Wildlife, Parks and Tourism. 2015. New fish attractors for Kansas Lakes [Press release]. <http://kdwpt.state.ks.us/KDWPT-Info/News/Weekly-News/1-29-15/NEW-FISH-ATTRACTORS-FOR-KANSAS-LAKES>.
- Wagner, E. 2013. Review of fish habitat improvement methods for freshwater reservoirs. Utah Division of Wildlife Resources.  
[http://titiwildlife.utah.gov/tifestipdf/tifish\\_habitat\\_improvement.pdf](http://titiwildlife.utah.gov/tifestipdf/tifish_habitat_improvement.pdf).

Submitted by: Sandra Clark-Kolaks, Southern Fisheries Research Biologist  
Date: July 27, 2017

Approved by:   
Daniel P. Carnahan, South Region Fisheries Supervisor  
Date: August 1, 2017

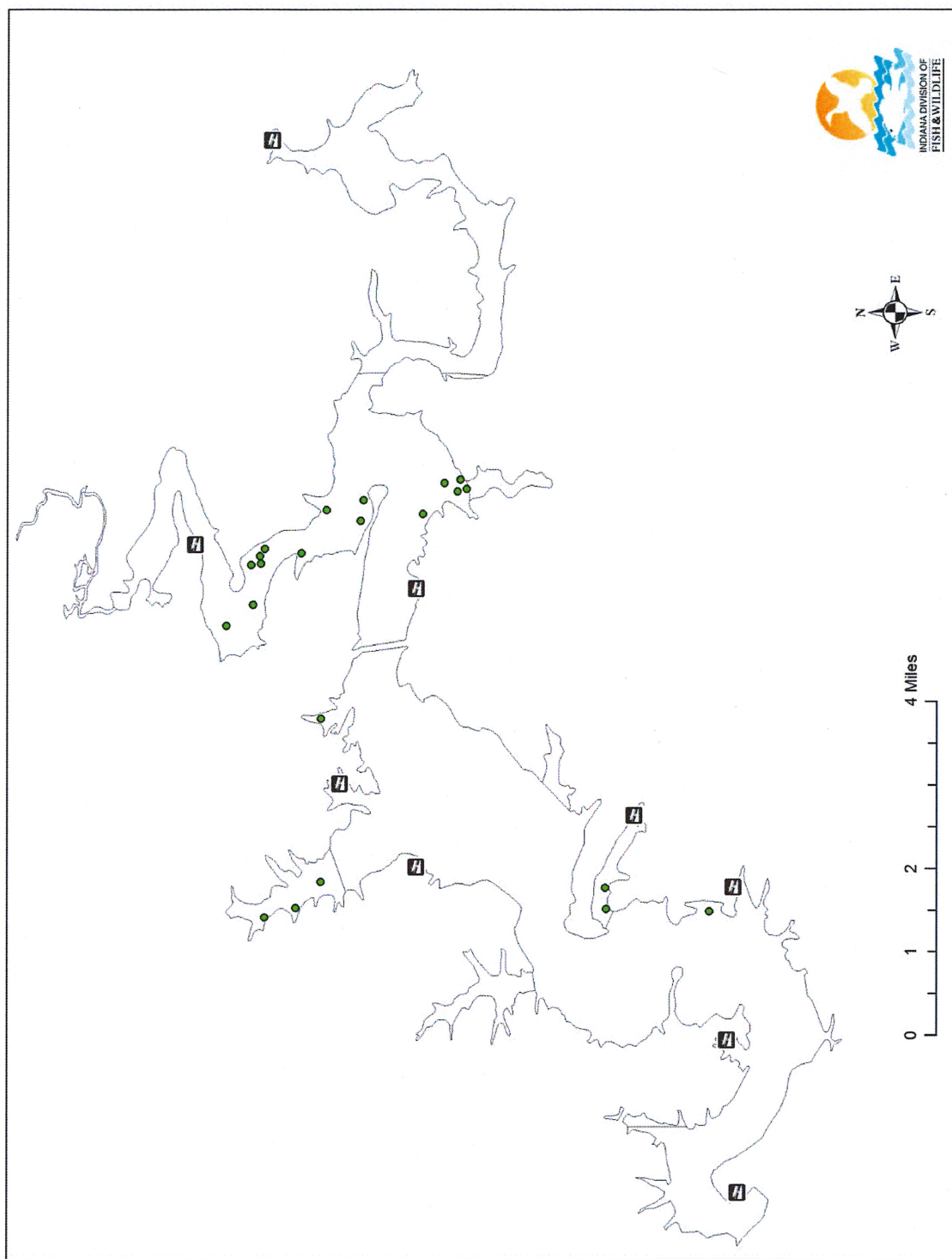


Figure 1. Locations of structures placed by anglers from 2000 to present (green dots).

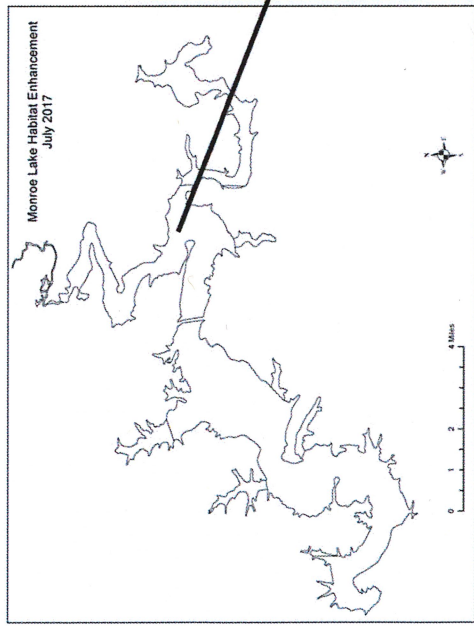


Figure 2. Proposed Fish Habitat Enhancement Plan for Monroe Lake.

## Appendix

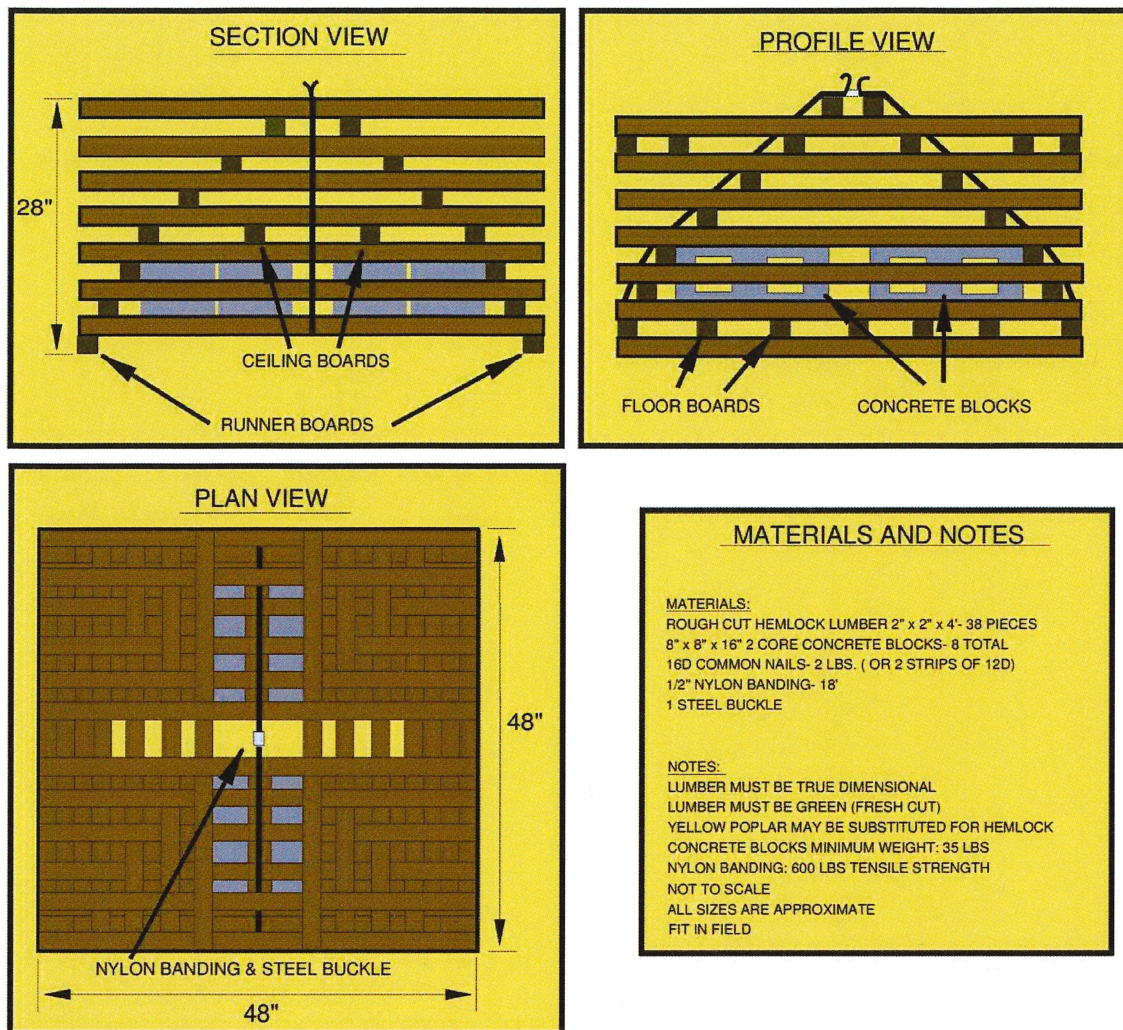
Pennsylvania Porcupine Crib Junior

Georgia Cube

Indiana Pallet Structure

Budget

# PENNSYLVANIA PORCUPINE CRIB JR. (Houser 2007)



\* \*Four 8 in or six 6 in concrete blocks per crib.

## GEORGIA CUBE (Kansas Department of Wildlife, Parks and Tourism 2015)



---

### Cube Fish Attractor Materials

Materials to build 1 attractor

8 – 1½“ dia. PVC deep fit\* elbows

8 – 1½“ dia. PVC deep fit\* “T”s”

40ft. - 1½“ dia. sch. 40 PVC pipe

100ft. – 4”dia. Corr. drain line

10 high tensile strength zip ties\*\*

80 – 1” **self-tapping** screws

1 - 8”x8”x16” concrete block

Heavy duty PVC cement

---

\* - deep fit has a larger lip on the fitting, allowing for a better fit compared to shallow fittings.

\*\* - lower tensile strength zip ties break under the stress of deploying the attractor.

### Construction:

- 1) The 1.5” white PVC pipe comes in 10ft. lengths. Cut 3, 3 ft. lengths from each 10ft. piece of PVC. The remaining 1ft. piece can be cut into 2-3 in. pieces, which will be used to connect some of the fittings.
- 2) Connect and glue the 3ft. white PVC pipe to the fittings to form a cube frame. Use the self-tapping screws to reinforce the glued fittings (see photo below).
- 3) Drill several 3/8in holes in various locations around the completed PVC frame. This will allow it to fill with water when deployed – making it easier to sink.
- 4) Once the PVC frame is complete use a heavy-duty zip tie (or aluminum wire) to attach one end of the 100 ft. piece (uncut) of black corrugated drain line to the PVC frame.

Once the end of the corrugated drain line is attached to the PVC frame, begin to push the corrugated drain line in and out of the PVC frame. Use additional zip ties to attach the corrugated drain line to various locations on the PVC frame. Use the entire 100 ft. length of corrugated drain line. It does not matter how the corrugated drain line is strung through the PVC frame. It is simply providing the cover for the fish to hide in.

## INDIANA PALLET STRUCTURE DESIGN

| Materials                                           | Number needed | Cost per structure |
|-----------------------------------------------------|---------------|--------------------|
| 2.5" Countersinking-Head Polymer-Coated Deck Screws | About 60      | \$3.31             |
| Non-treated hardwood pallets                        | 5             | free               |
| 8" Cinder blocks                                    | 8             | free               |

### Construction:

- 1) Only **untreated** pallets should be used. Reinforce exterior boards of pallets with screws, one screw per end. This will ensure that if the nails rust the boards will stay attached.
- 2) Form a triangle with three pallets (two leaning against each other **on top** of the base).
- 3) On one open end of the triangle place a pallet upright in a fashion where it covers the open end of the triangle.
- 4) Fasten the upright pallet to the two pallets leaning against each other with one screw in each slat from the upright pallet.
- 5) Insert 8 cinder blocks on top of the base.
- 6) Complete structure by attaching another upright pallet to the remaining opening of the triangle following instructions from step 4 (cinderblocks should remain within structure if properly constructed).



**Porcupine Crib Juniors (40)**

| Materials     | Amount | Units        | Total Costs |
|---------------|--------|--------------|-------------|
| Lumber        | 3,060  | Running feet | \$2,584.00  |
| Screws        | 30     | Box          | \$210.00    |
| Cinder Blocks | 240    | Individual   | \$240.00    |
| Strap         | 680    | Feet         | \$13.50     |

**Total Cost \$3,047.50**

**Georgia Cubes (30)**

| Materials          | Amount | Units      | Total Costs |
|--------------------|--------|------------|-------------|
| PVC Pips           | 1,200  | Feet       | \$514.80    |
| Screws             | 30     | Box        | \$164.10    |
| Cable Ties         | 30     | Pack       | \$186.90    |
| Perforated Tile    | 3,000  | Feet       | \$1,136.70  |
| PVC Primer         | 15     | Can        | \$89.70     |
| PVC Cement         | 15     | Can        | \$89.70     |
| PVC Tee Fittings   | 240    | Individual | \$396.00    |
| PVC Elbow Fittings | 240    | Individual | \$243.60    |

**Total Cost \$2,821.50**

**Pallet Structures (160)**

| Materials     | Amount | Units      | Total Costs |
|---------------|--------|------------|-------------|
| Pallet        | 800    | Individual | \$0.00      |
| Screws        | 80     | Pound      | \$313.60    |
| Cinder Blocks | 1,280  | Individual | \$1,280.00  |

**Total Cost \$1,593.60**

**TOTAL COST: \$7,462.60**