2009
LARGE SCALE FISH HABITAT MANAGEMENT PROJECT
For
LEASER LAKE, LEHIGH COUNTY, PENNSYLVANIA
Sponsored by
LEASER LAKE HERTIAGE FOUNDATION
Plans designed by
THE DIVISION OF HABITAT MANAGEMENT
LAKE SECTION
PENNSYLVANIA FISH AND BOAT COMMISSION
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MANAGEMENT PLAN

The purpose of this plan is to address the habitat needs of Leaser Lake as they relate to its classification, fish species diversity and abundance, angler use and paid and/or volunteer work force. This plan is being installed at the request of the Leaser Lake Heritage Foundation. This project is aimed at long-term and long-lasting artificial habitats that fit the reservoir's existing native habitats.

This proposed plan will provide the basis for the Cooperative Habitat Improvement Program cooperator, Leaser Lake Heritage Foundation, to place artificial fish habitat structures in Leaser Lake. Construction supervision, structure placement and design are the responsibility of the Pennsylvania Fish and Boat Commission's (PFBC), Division of Habitat Management (DHM) and/or its designee. All structures constructed must meet the requirements of the Division of Habitat Management- Lake Section. All structures included in this plan meet the requirements of the Department of Environmental Protection and the U.S. Army Corps of Engineers General Permits (BDWW-GP-1 & SPGP-3).

FINANCIAL ASSISTANCE

Financial assistance is available through the **Division of Habitat Management** (maximum $3000 per project, per calendar year) for the purchase of materials on a 50/50 matching basis with the cooperator. All requests for funding must come from a representative of **Leaser Lake Heritage Foundation** to the PFBC's Division of Habitat Management. The Cooperator is responsible for all other material and labor costs.

IMPOUNDMENT INVENTORY

Leaser Lake is a man-made impoundment, rather than a natural lake. Due to this fact, this impoundment contains native fish habitats (existing physical characteristics), artificial fish habitats (structures or devices placed to act as fish habitat), and natural fish habitats (aquatic vegetation). The native fish habitats in the impoundment combined with the natural topography of the land provide a basis for classification of reservoirs in relationship to habitat. These native habitats existing in Leaser Lake can be enhanced through the placement of appropriate artificial habitats that best match the reservoir's classification, the native habitats, and the fisheries and angler needs.

Leaser Lake was physically surveyed by the Division of Habitat Management- Lake Section on March 4, 2009 using a Lowrance Finder Expedition C handheld GPS (global positioning system). The survey was conducted to inventory the existing native habitats and classify the impoundment, plus find any existing artificial habitats and determine their usefulness. Any existing artificial habitats found are shown on the attached habitat inventory plan map.

HABITAT SECTORS

Thirteen Shore-Zone (7' and less) Habitat Sectors were delineated by Habitat Management Staff (see attached Fish Habitat Improvement Plan Map) (Houser, Thomas & Buzzer). Four of these sectors are to receive habitat treatments (Active Sectors) and the other 9 shore-zone sectors are will not receive habitat treatments (Inactive Sectors). Non-treatment of Inactive sectors is one or more of the following reasons; limited access for land-based construction equipment, abundant native aquatic (or terrestrial) cover and/or substrate or shore slope unsuitability (see Fish Habitat Inventory Plan Map).

Native and artificial Habitat presence and abundance were inventoried for all habitats sectors. Since Leaser Lake has been in a drawdown state for numerous years, terrestrial vegetation cover is abundant, but this "cover" will have a short lifespan once submerged. As for natural habitat cover (aquatic vegetation), none exists, also due the extensive time the reservoir has been drawn down.

IMPOUNDMENT CLASSIFICATION

Leaser Lake has several major bays with feeder streams that have small but distinct stream channels. The points are rounded and the shores near the stream channel are steep. Leaser Lake also has several roadbeds that intersect with the channels which are typical in a Hill-land impoundment. (Lalo, Houser 1982) (Linder 1987) (Houser, 2007).

ARTIFICIAL HABITATS

Artificial habitats (refuge, spawning, nesting, and nursery) are designed to be effective, long lasting structures aimed at providing habitats that allow fish to accomplish their daily and seasonal tasks with greater efficiency.

Some artificial habitats have dual purposes and may also provide increased opportunities for anglers to catch and/or harvest fish (fish attraction) and/or may provide increased surface areas for algae attachment, aquatic insect colonization and for other food organisms which may increase fishery production (Wege, Anderson 1979) (Nilsen, Larimore 1973) (Benke, et al. 1984). Many of these artificial habitats are also designed to allow fish species to accomplish daily and seasonal survival tasks (performance structures), which may also provide an opportunity to increase productivity within some impoundments.

Fish utilization of habitat (artificial, native or natural) by small fish may be to avoid predation by occupying habitat where predators cannot forage (Glass 1971) (Savino, Stein 1982) or (as predators) to utilize complex habitat as foraging areas (Werner, et al. 1983). Increasing complex habitat may allow coexistence of predators and prey through the creation of an increase of microhabitat types (Crowder, Cooper 1977). Increasing habitat complexity may positively influence predator efficiency by providing small fish with refuge in areas of high structure densities (Hall, Werner 1977) (Werner, et al. 1983).

Complex structural cover may also provide important habitat for aquatic invertebrates (Nilsen, Larimore 1973) (Benke, et al. 1984) and in turn provide foraging opportunities for juvenile and adult panfish that rely on invertebrates as a food source. Complex structure may also serve as habitat for prey resources of black bass (and other predators), thus increasing prey/predator efficiency. Game and panfish also benefit from complex habitat related to the advantages of camouflage (Angermeier, Karr 1984).

Simple structural cover (Bass Nesting Structures, Half-Log structures) (Hoff 1992) can be more effective at providing positive spawning, nesting and parental habitat for black bass, than complex cover (Wills, Bremigan, Hayes 2004). One reason may be, simple cover has less microhabitat types for invertebrates and refuge areas for small fish. Some studies have shown that angler success does not increase during spawning/nesting periods in spawning areas treated with simple artificial cover (Wills, Bremigan, Hayes 2004). Simple structural cover can play a major roll in black bass spawning and nesting success when placed at appropriate sites with suitable substrate (Hoff 1992) (Hunt 2002) (Martin, Phillips 1998).

Some artificial habitat structure designs matched with appropriate native habitats (physical features existing in the impoundment) may be species select or have preferences toward individual size (juvenile vs. adult) and/or fish habits (Prince, Maughan 1979). Artificial habitats known as "forage type structures" are designed to provide basic habitat needs of the impoundment's forage base (baitfish, invertebrates, and crustaceans) (Warnecke, Forbis 1990). In many cases a number of artificial habitat types are required in one reservoir to create habitat diversity (complex and simple/wood and rock/shallow and deep). This creates an opportunity for a more diverse fish community to develop and flourish (Benson, Magnusion 1992).

Complex large wood structure in lakes may create positive fish habitat for a variety of species (Bozek 2001) (Barwick, Kwak 2004). Rough-cut hemlock lumber is used in all the wood structure designs due to its excellent submerged capabilities to create complex artificial fish habitat. In some cases large hardwood tress are used as large woody structure (Bozek 2001). Other materials used in construction of artificial fish habitats are sandstone, limestone rock, concrete blocks and nails and nylon banding.
All artificial habitats used in this plan have undergone a minimum one-year design phase and two-year durability test. Materials and construction techniques used in the construction of Pennsylvania artificial habitat structures provide the best balance of structure longevity and invertebrate, plankton colonization and fish utilization. Lumber used in the construction of Pennsylvania artificial habitat structures should be green (newly cut), rough-cut true dimensional hemlock or yellow poplar. If other lumber types are required, they will be specified in the plans. All other material types used will be specified in the plan as a specific type of material required for that structure.

ROCK RUBBLE HUMPS

Rock Rubble Humps (see attached standard drawing) provide forage type habitats for a variety of invertebrates, crustaceans and baitfish. Rock Rubble may also benefit various year classes of black bass form young-of-the-year to adult (Jackson, Noble, Irwin, Van Horn 2000).

Rubble humps may also act as fish attractors for walleye, black bass, and panfish. Fish use depends upon location and stone size diversity. Traditionally rubble humps are placed on flats or shoals in flatland or hill-land impoundments. The best method for placement is during maintenance or annual drawdowns with heavy machinery, although the Division of Habitat Management- Lake Section has devised a method to place small rubble humps or spawning substrate by watercraft during softwater periods (no ice). Typical placement density is 20 two-ton humps (40 tons) per acre. A total of two hundred and fifty 4 to 20 ton humps are proposed at three sites at approximately 10' to 20' depths (site numbers: 12-1641, 1645, and 1646). Placement method will be by heavy machinery.

PENNSYLVANIA SPIDER HUMP STRUCTURE

Spider Hump Structures (see attached standard drawing) provide similar habitat features as Rock Rubble Humps, but with the addition of wooden ACQ and hemlock posts. The addition of wood to the rock rubble creates a more complex habitat structure that may attract more diversity in invertebrate and fish species.

Spider Hump Structures may also provide foraging and ambush cover for walleye, black bass, and panfish. Fish use depends upon location, placement density and depth. Traditionally site for placement is on shallow flats, slow tapered shores or shoals in flatland or hill-land impoundments.

Spider Humps are placed in a sinuous pattern, parallel to the shoreline. This method has been documented as a successful warmwater fish habitat placement pattern (Prince, Maughan 1979). Construction and placement is accomplished with heavy machinery, typical placement density is five Spider Hump Structures per acre. A total of ten Spider Hump Structures are proposed at one site at approximately 8' to 10' depths (site number: **12-1642**).

PENNSYLVANIA ROCK STAR STRUCTURE

PA Rock Star Structures (see attached standard drawing) provide similar habitat features as Rock Rubble Humps, but with the addition of wooden hemlock timbers. The addition of wood to the rock rubble creates a more complex habitat structure that may attract more diversity in invertebrate and fish species.

Rubble humps (incorporated into the Rock Star design) may also act as fish attractors for walleye, black bass, and panfish. Fish use depends upon location and stone size diversity. Traditionally rubble humps are placed on flats or shoals in flatland or hill-land impoundments. Most rubble humps are placed a star pattern. This method has been documented as a successful warmwater fish habitat placement pattern (Prince, Maughan 1979). The best time for placement is during winter drawdowns with heavy machinery, typical placement density is five Rock Star structures per acre.

A total of five 5-point Rock Star structures are proposed at one site at approximately 7′ to 8′ depths (site number: **12-1637**). Placement method will be by land based machinery.

PENNSYLVANIA POST STUMP CLUSTER

Most PA style artificial wood habitat structure designs are a horizontal cover principal. Post Stumps are designed to create long lasting, functional vertical shallow-water cover for game and panfish. Designed primarily for Flatland and Hill-land impoundments, these post stumps utilize **specialized** agricultural fence posts driven into the impoundment's substrate in addition to rock rubble humps to create simple shallow water vertical ambush cover for black bass (Barwick, Kwak 2004). Post stumps also create simple microhabitat for aquatic invertebrates (Nilsen, Larimore 1973). These microhabitats may also serve as habitat for prey resources of black bass (and other predators), thus increasing prey/predator efficiency. Game and panfish also benefit from simple vertical habitat related to the advantages of camouflage (Angermeier, Karr 1984).

PA Post Stump clusters are typically placed in **10′ to 15′ depths** at slight angles to the substrate (see standard drawing). Placement is accomplished during seasonal or maintenance drawdown periods by specialized construction or agricultural type equipment with a tamper attachment. Locations are normally in a cove or small bay or near a steep break or bench. Typically, twenty-five 8′ X 6″ ACQ Pressure Treated (ACQ Pressure Treatment Standards, 2001) posts are driven into the substrate approximately 3′. This allows 5′ of the post above the substrate, and at least 5′ between the top of the post and the water surface in 10′ depths. **PA Post Stumps Clusters typically include PA Rock Rubble Humps, with 1 to 2 tons per cluster.**

A total of five hundred fifty Post Stump clusters are proposed at four sites at approximately 10′ to 20′ depths (site numbers: **12-1639, 1643, 1644, and 1646**). Placement method will be by land based machinery.

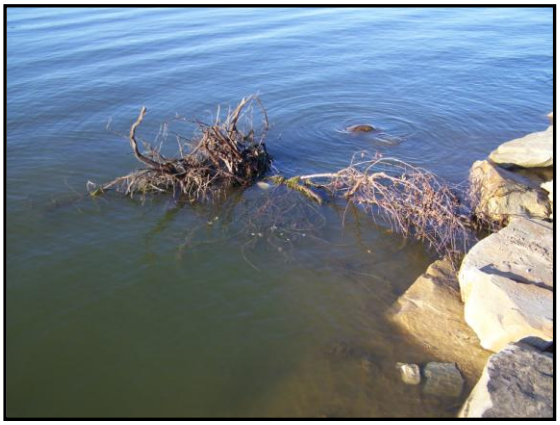
PENNSYLVANIA STYLE ROCK FRAMED DEFLECTORS

Normally used as a flowing water fish enhancement device (K. Lutz, 2007), rock framed deflectors have been used successfully in numerous PA impoundments (D. Houser, Chapman Lake, 2002) as a treatment for shoreline erosion and shoreline aquatic habitat enhancement. Rock deflectors provide armoring to wind/wave eroded shores and manage wave action by deflecting water away from wind driven shorelines.

Rock framed deflectors are constructed from of R-7 (15 to 30 inch stone) size Sandstone Rock (exterior frame), with an estimated twenty tons per deflector and R-4 (6 to 12 inch stone) size sandstone rock as an interior fill, with an estimated of 15 tons per deflector. Frame rock should be keyed into bank and bottom. Interior rock should be shingled in place rather than dumped. Root wad deflectors will also be incorporated into the rock framed deflector to increase the habitat complexity of the lakeshore.

A total of **twenty six** rock-framed deflectors are proposed at two **sites** at approximately 2' depths **(site number: 12-1638, and 1640)**. Placement method will be by heavy equipment.

PENNSYLVANIA STYLE ROOT WAD DEFLECTORS



Although best known as a natural stream habitat component (Rosgen, D. L. 1996), root wads can be an effective submerged artificial fish habitat structure in impoundments (Bozek 2001). Root wads are large tree butt sections with the root system attached. The root wad is anchored by trenching the butt of the log into the shore with the root system exposed submerged in the water. The root system provide excellent course brush type habitat for gamefish and panfish. Six root wads are proposed at one location. Placement should be with heavy equipment during the reconstruction drawdown. Ten root wads are proposed at two sites (site numbers: **12-1636 and 1641**).

STRUCTURE CONSTRUCTION AND PLACEMENT

The construction and placement of all artificial structures in this plan must be coordinated with the Lake Section of the Division of Habitat Management. Representatives of the Lake Section will be on hand to supervise and assist in construction (or a designated representative) of all artificial habitats designed for this project. Placement of artificial habitats will be implemented by land based heavy machinery. Specialized PFBC tools and equipment may also be utilized by the cooperator to accomplish construction of artificial structures supervised by Habitat Management Staff. All artificial habitats must be constructed to the specification shown in the standard drawings attached to this plan packet.

PROJECT APPROVAL AND COMPLETION

This project is automatically approved after a fifteen-day review period that begins from the date of the cover letter or memo.

This three-year plan provides the Cooperative Habitat Improvement Program cooperator an opportunity to construct and place a total of **two hundred and fifty-one** artificial habitat structures in **Lake** at an approximate rate of **Number** per year. This three-year plan begins in **2009** and is planned for completion by **2011**, unless otherwise extended by a cooperative agreement between **Cooperator Name** and the Pennsylvania Fish and Boat Commission's **Division of Habitat Management** (DFH, 09).

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