



**2022
FISH HABITAT MANAGEMENT PLAN**
For
PYMATUNING RESERVOIR, CRAWFORD COUNTY, PENNSYLVANIA
Sponsored by
DCNR-PYMATUNING STATE PARK
Plans designed by
**THE DIVISION OF HABITAT MANAGEMENT
LAKE SECTION
PENNSYLVANIA FISH AND BOAT COMMISSION**
Plans prepared by
Ben Page

MANAGEMENT PLAN

The purpose of this plan is to address the habitat needs of Pymatuning Reservoir as they relate to fish species diversity and abundance, angler use, and paid and/or volunteer work force. This plan is being installed at the request of the DCNR-Pymatuning State Park. This project is aimed at long-term artificial habitats that fit the reservoir's existing habitat features.

This proposed plan will provide the basis for the Cooperative Habitat Improvement Program cooperator, DCNR-Pymatuning State Park, to place artificial fish habitat structures in Pymatuning Reservoir. 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's 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-5).

IMPOUNDMENT INVENTORY

Pymatuning Reservoir is a man-made impoundment, rather than a natural lake. 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 Pymatuning Reservoir 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.

Pymatuning Reservoir was physically surveyed by the Division of Habitat Management's Lake Section on June 11, 2021 using Lowrance StructureScan sonar and GPS. Proposed shorelines were surveyed on foot. The survey was conducted to inventory the existing native habitats and find any existing artificial habitats. Any existing artificial habitats found are shown on the attached plan map. Personnel from DCNR-Pymatuning State Park were present and involved in the inventory and the design phase of the plan.

ARTIFICIAL HABITATS

Artificial habitats (refuge, spawning, nesting and nursery) are designed to be effective, long lasting structures 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 harvest fish (fish attraction). They can also provide increased surface areas for algae attachment, aquatic insect colonization and other food organisms which may increase fishery production (Wege, Anderson 1979; Nilsen, Larimore 1973; Benke, et al. 1984). Many of these artificial habitats are designed to aide multiple fish species in completing various survival tasks, 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 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). 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, Magnuson 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 trees are used as large woody structure (Bozek 2001). Other materials used in construction of artificial fish habitats are sandstone, limestone rock, concrete blocks, 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.

PENNSYLVANIA PORCUPINE CRIB JR.

The Porcupine Crib Jr. is an adaptation of the original Porcupine Brush Crib. The original Porcupine Crib was designed as a deep-water structure. The "Jr." is a shallow water version with additional density in the gable ends. The Porcupine Jr. was designed to mimic the habitat provided by native stumps. Stumps in shallow water provide an important habitat value in Pennsylvania reservoirs and sometimes are the only true native woody cover in the impoundment.



Typically native habitats in hill-land impoundments benefit most from coarse brush structures (Lalo, Houser 1992). As impoundments age native stump fields may disappear due to erosion by wind and/or annual maintenance drawdowns. As the stump fields disappear, so does that particular type of cover (Bozek 2001). In some cases, impoundments do not contain any native stumps, due to the policies in place during impoundment construction. Porcupine Crib Jr.s should provide similar cover to pre and post spawning adult panfish and black bass, plus seasonal

ambush and security cover for juveniles and adults.



PENNSYLVANIA STYLE ROCK RUBBLE HUMPS

Rock Rubble Humps provide forage type habitats for a variety of invertebrates, crustaceans and baitfish. Rock rubble may also benefit various year classes of black bass from 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's Lake Section has a rock rubble barge that can place small rubble humps or spawning substrate by watercraft during softwater periods (no ice). Placement method will be by heavy machinery or watercraft.



FELLED SHORELINE TREES Where sufficient depths exist near shore (15'>) felling and cabling shoreline trees provide excellent fish habitat (Lalo, Houser 1982). Game fish and panfish use submerged trees in a variety of ways. Spawning, recruitment, foraging and refuge tasks are accomplished by many species and age-class using felled trees (Bozek 2001).

Large branching trees are more suitable due to the complexity of branches creating better fish habitat (Bozek 2001). Trees are felled and cabled to their stumps (see standard drawing) with ¼" galvanized wire rope and cable clamps. Typical placement density is 5 trees per acre.

PENNSYLVANIA STYLE STONE-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 (Houser 2002) as a treatment for shoreline erosion and shoreline aquatic habitat enhancement. Stone deflectors provide armoring to wind/wave eroded shores and manage wave action by deflecting water away from wind driven shorelines. The deflectors also provide excellent angler access that is much safer than sluffing, eroded shorelines.

Stone-framed deflectors are constructed from of R-8 (40"+) size Sandstone rock which are used to create the exterior frame. R-4 (6"-12" stone) size sandstone rock is used as an interior fill. Frame rock should be keyed into bank and bottom of the lake. Interior rock should be shingled in place rather than dumped. Root wads can also be incorporated into the rock framed deflector to increase the habitat complexity of the lakeshore. Stone-framed deflectors are placed using heavy machinery.



PENNSYLVANIA SHORT VERTICAL PLANK STRUCTURE

The Short Vertical Plank Structure is designed to be simple ambush cover for adult black bass and other predatory fish. "Shorty's" are designed for shallow or deep water flats with depths ranging from 5' to 20'. The most effective flats are adjacent to stream or river channels. Shorty's will be placed on these flats in areas void of submerged aquatic vegetation. Shorty's with brush or conifers added to the interior are a beneficial complex habitat. This type of habitat will create excellent overhead cover for ambush or hunt and flush foraging opportunities for adult black bass (Barwick, Kwak 2004). Shorty's should also provide outstanding early season adult panfish cover when coarse brush is added to the structure (Barwick, Kwak 2004).



Vertical wooded and coarse brush structures have been found successful in attracting fish in shallow water (less than 10') in hill-land and highland impoundments. The most effective placement appears to be in dense circles of structures with one or more openings in the center (Bryant 1992) or in an irregular line formation with large openings between individual devices. Largemouth bass, sunfish, crappie and yellow perch favor coarse brush and wooden type structures when placed on or near steep gradient shores that break onto flats or benches (Lynch, Kayle & Johnson 1988).

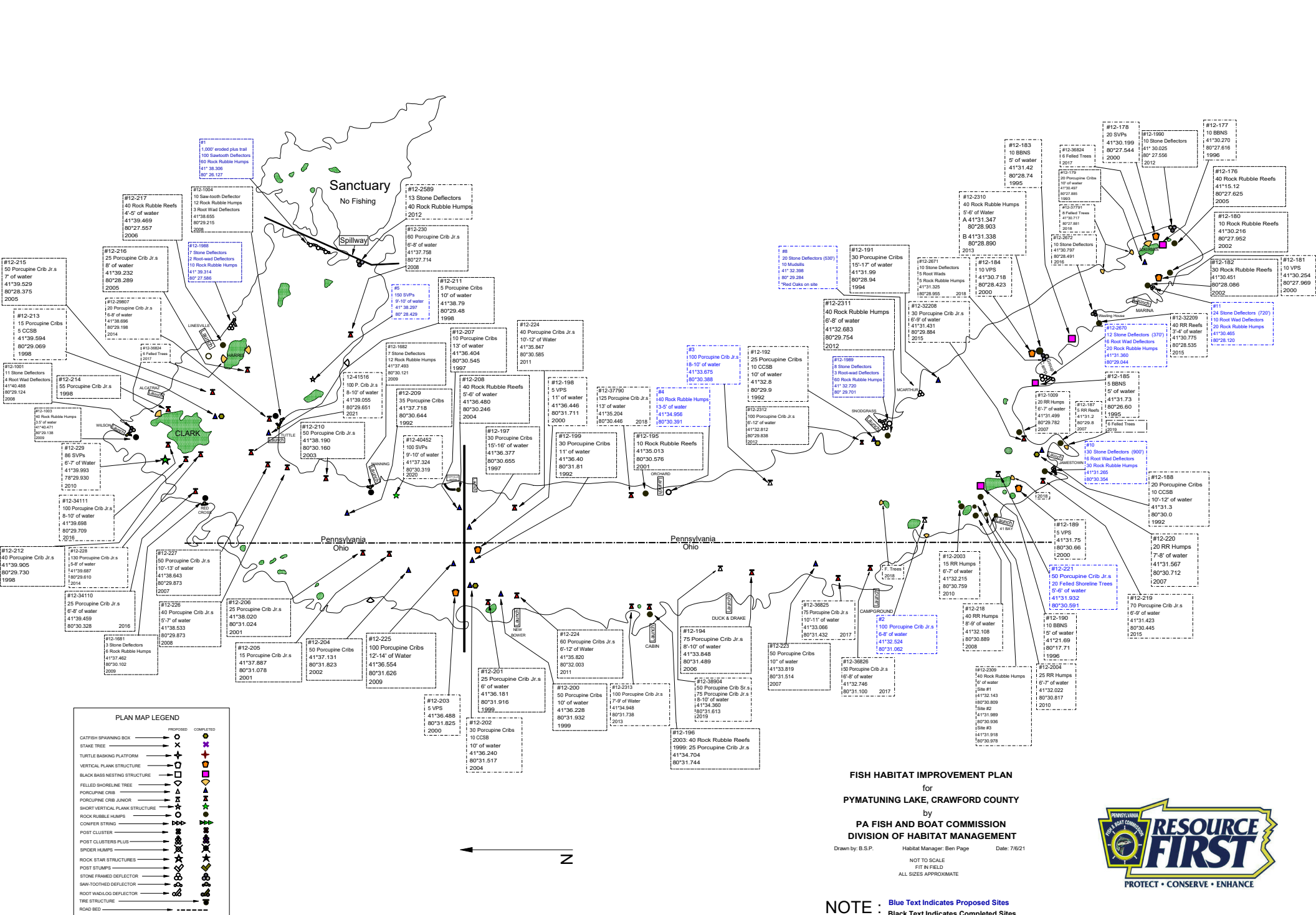
STRUCTURE CONSTRUCTION AND PLACEMENT

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 of all artificial habitats designed for this project. Specialized PFBC tools and equipment may also be utilized by the cooperator to accomplish construction of artificial structures supervised by Habitat Management Staff. Placement of artificial habitats can, in most cases, be accomplished by specially equipped DHM watercraft, operated by trained Lake Section staff. Other state and/or federal watercraft and operators may also be utilized to accomplish projects managed by the Division of Habitat Management. All sites are inventoried by way of G.P.S., with each completed structure placement site having its own waypoint (Lat/Lon). All artificial habitats must be constructed to the specification shown in the standard drawings attached to this plan.

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FISH HABITAT IMPROVEMENT PLAN
 for
PYMATUNING LAKE, CRAWFORD COUNTY
 by
PA FISH AND BOAT COMMISSION
 DIVISION OF HABITAT MANAGEMENT

Drawn by: B.S.P. Habitat Manager: Ben Page Date: 7/6/21



NOTE : Blue Text Indicates Proposed Sites
 Black Text Indicates Completed Sites

NOT TO SCALE
 FIT IN FIELD
 ALL SIZES APPROXIMATE

Pymatuning Reservoir (Site #10, Jamestown Beach)

Material Detail

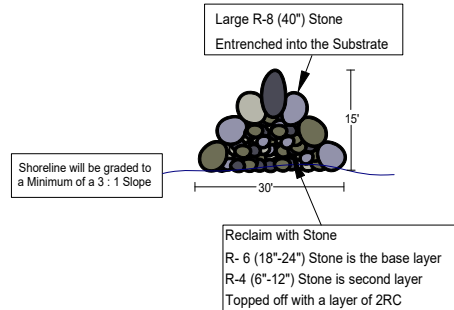
R-8 Sized Stone= 900 tons
 R-6 Sized Stone= 600 tons
 R-4 Sized Stone= 500 tons
 2RC Sized Stone= 300 tons

Structure Detail

30 Stone-framed Deflectors
 30 Rock Rubble Humps



Plan View



Lake Habitat Improvement Plan for Pymatuning Reservoir, Crawford County

by
**PA Fish and Boat Commission
 Division of Habitat Management**

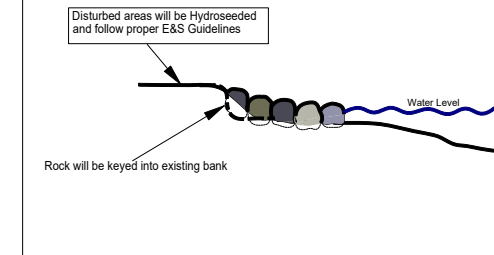
Drawn by: BSP Habitat Manager: Ben Page Date: 7/6/21

NOT TO SCALE
 FIT IN FIELD
 ALL SIZES APPROXIMATE

Note • Blue Text Indicates Proposed Sites
 • Black Text Indicates Proposed Sites



Section View



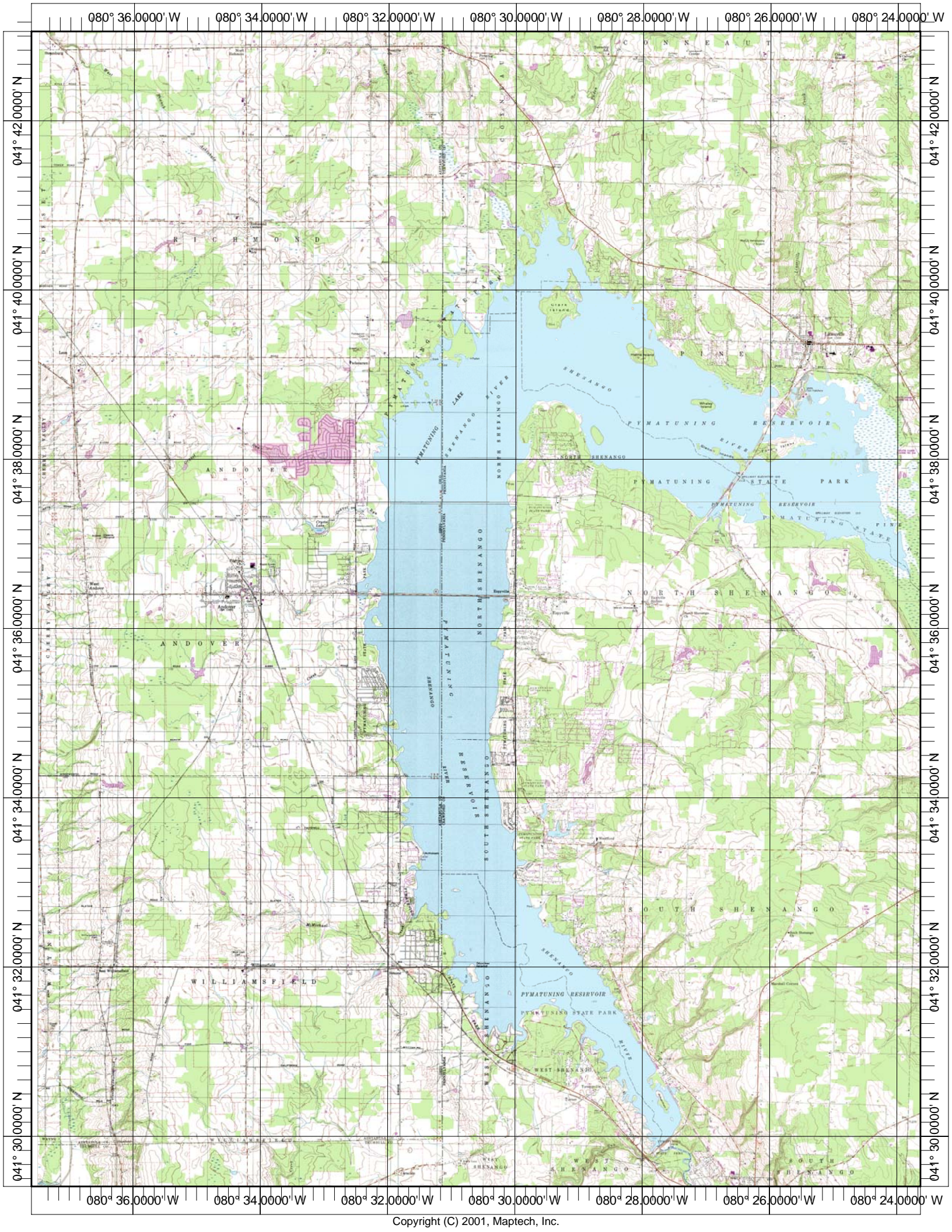
Jamestown Beach Shoreline Map



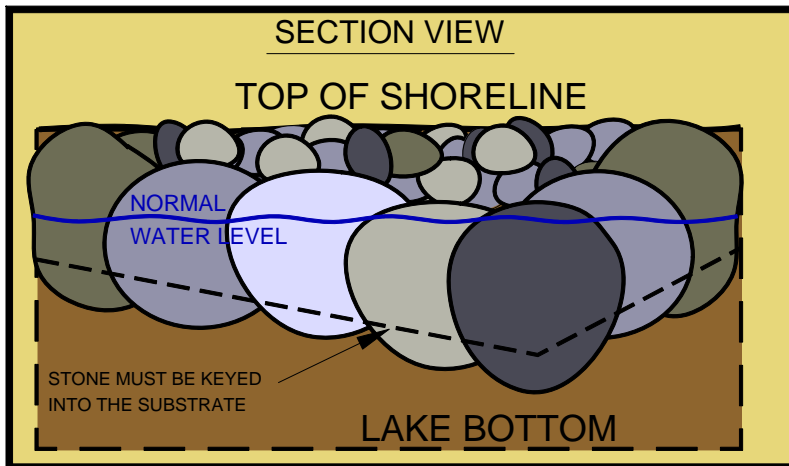
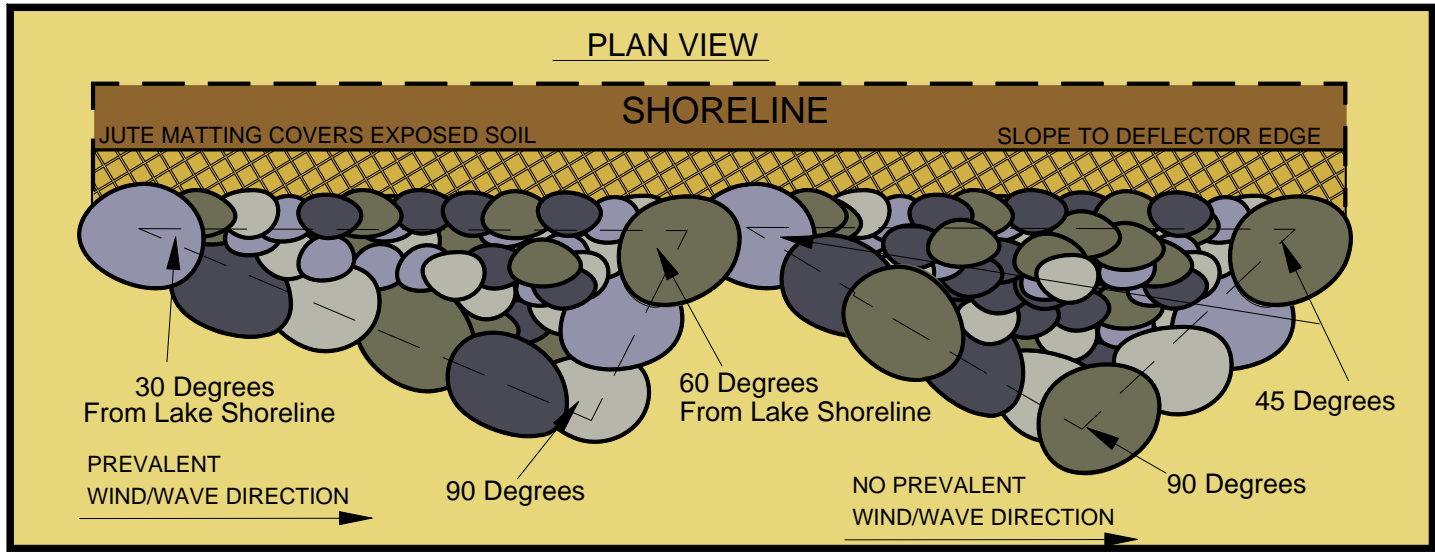
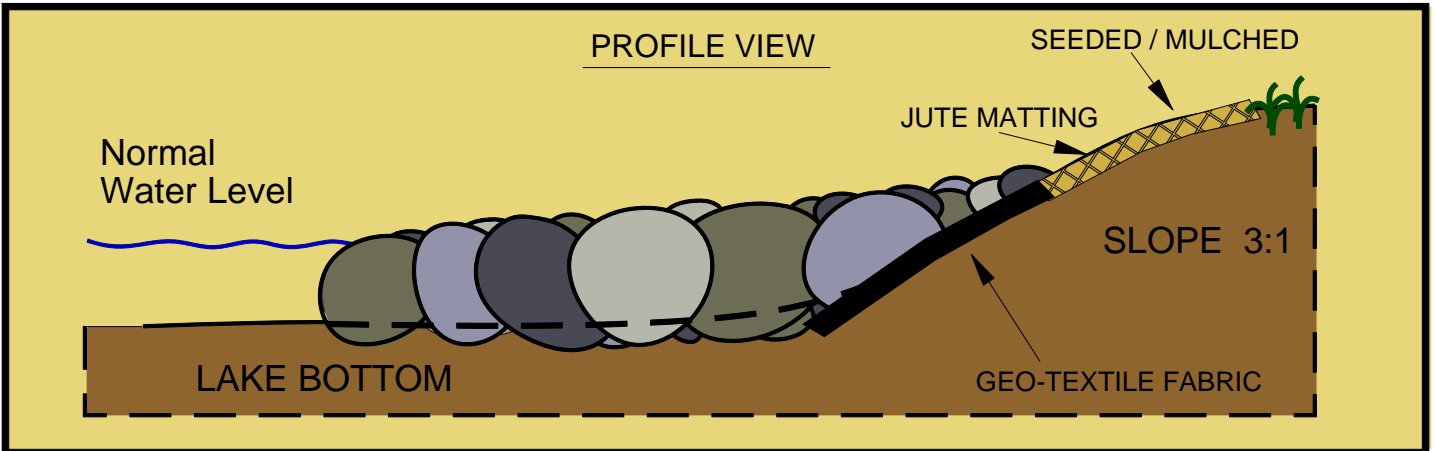
Eroding Shoreline at Proposed Project Site







PENNSYLVANIA STYLE STONE FRAMED DEFLECTOR STANDARD DRAWING



MATERIALS AND NOTES

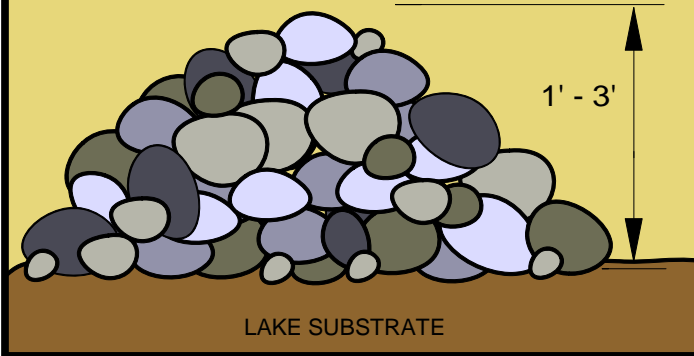
MATERIALS:
 R7 SANDSTONE (20"-30")
 R5 SANDSTONE (9"-18")
 R4 SANDSTONE (6"-12")
 2RC GRAVEL
 JUTE MATTING
 OPTIONAL: LOG/ROOT WAD MAY BE ADDED

NOTES:
 LIMESTONE CAN SUBSTITUTE SANDSTONE
 LARGER STONES MAKE A TRIANGULAR FRAME
 FRAME ROCKS SHOULD BE KEYED INTO LAKE SUBSTRATE
 STONE FRAME IS BACK FILLED WITH SMALLER STONE
 DEFLECTORS ARE BLENDED INTO THE SHORELINE
 JUTE MATTING WILL TEMPORARILY STABILIZE SHORE
 RIPARIAN BUFFER MAY BE ESTABLISHED
 NOT TO SCALE
 ALL SIZES ARE APPROXIMATE
 FIT IN FIELD

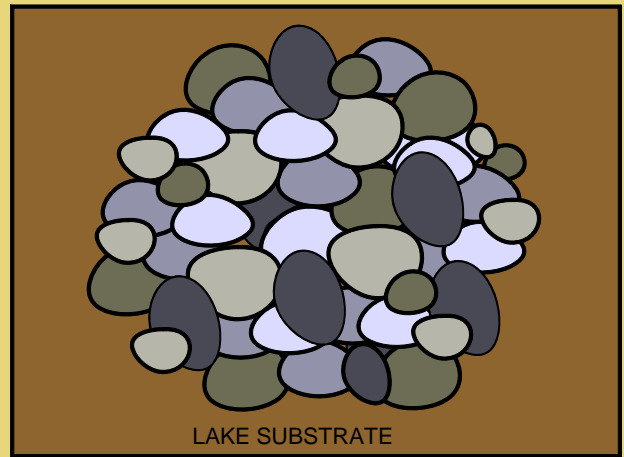
SUGGESTED EQUIPMENT:
 EXCAVATOR WITH THUMB
 TRACKED LOADER OR SKIDSTEER

PENNSYLVANIA STYLE ROCK RUBBLE HUMPS STANDARD DRAWING

PROFILE & SECTION VIEW



PLAN VIEW



MATERIALS AND NOTES

MATERIALS:

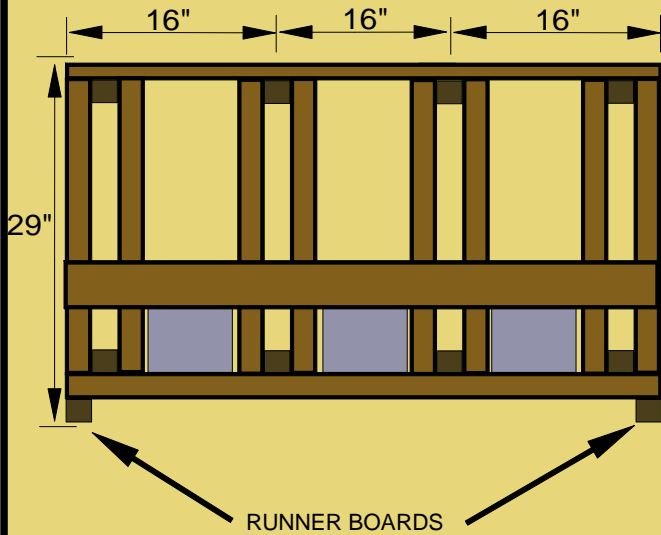
R4 SANDSTONE- (9"-18")

NOTES:

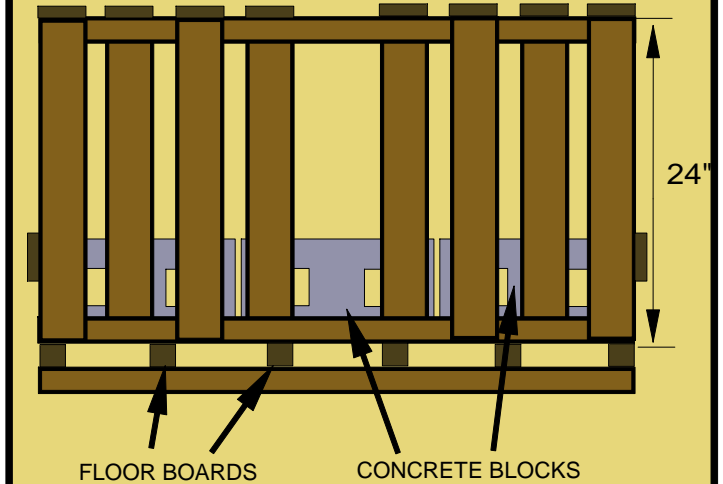
RECOMMENDED DENSITY IS 20 TONS/ACRE
PLACED IN 1-3 TON HUMPS
LIMESTONE CAN SUBSTITUTE SANDSTONE
NOT TO SCALE
ALL SIZES ARE APPROXIMATE
FIT IN FIELD

PENNSYLVANIA "SHORT" VERTICAL PLANK STRUCTURE STANDARD DRAWING

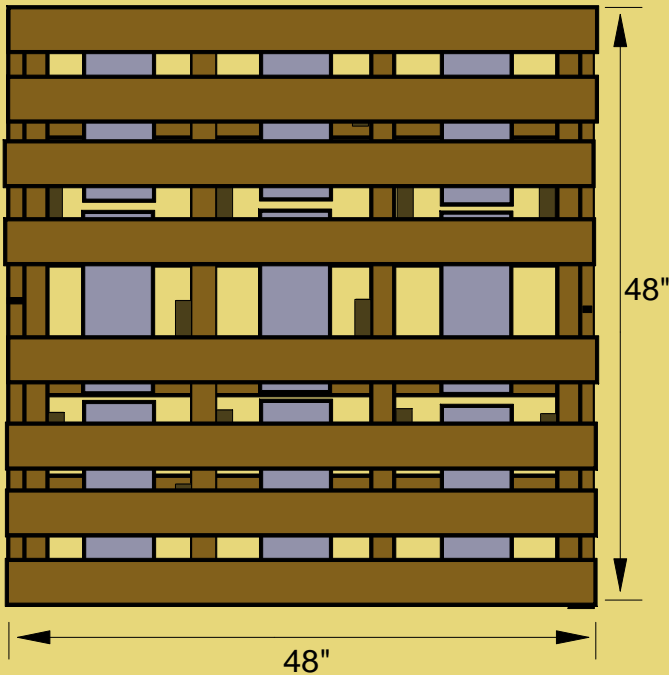
SECTION VIEW



PROFILE VIEW



PLAN VIEW



MATERIALS AND NOTES

MATERIALS:

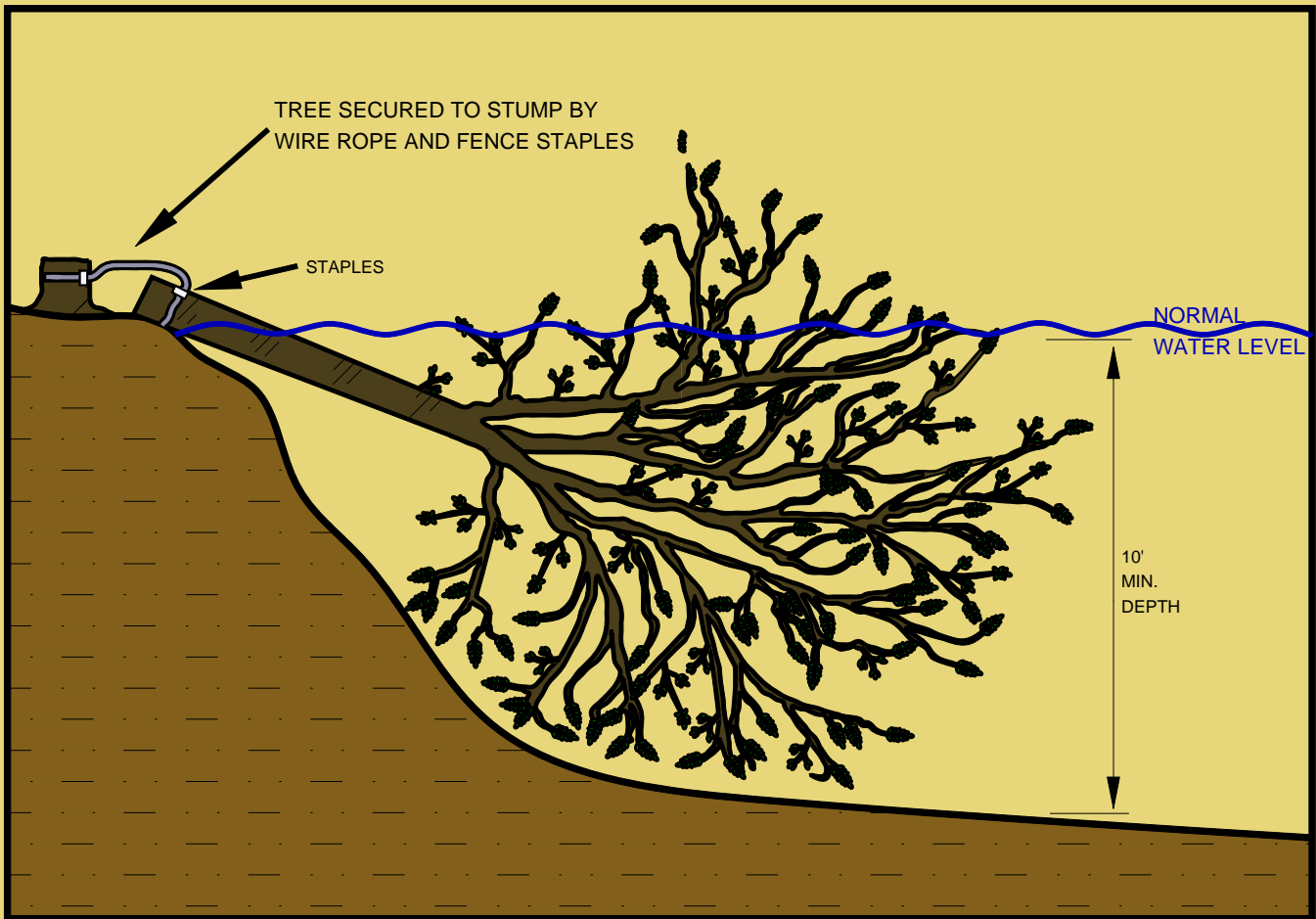
- ROUGH CUT HEMLOCK LUMBER 1" X 4" X 24" - 32 PEICES
- ROUGH CUT HEMLOCK LUMBER 1" X 4" X 48" - 10 PEICES
- ROUGH CUT HEMLOCK LUMBER 2" X 2" X 48" - 16 PEICES
- 8" X 8" X 16" 2 CORE CONCRETE BLOCKS- 9 TOTAL
- COMMON NAILS (12D) - 1/2 LB
- COMMON NAILS (8D) - 1 LB
- OPTIONAL: 1 OR 2 SMALL CONIFER TREES MAY BE ADDED

NOTES:

- LUMBER MUST BE TRUE DIMENSIONAL
- LUMBER MUST BE GREEN (FRESH CUT)
- YELLOW POPLAR MAY BE SUBSTITUTED FOR HEMLOCK
- CONCRETE BLOCKS MINIMUM WEIGHT: 35 LBS
- NOT TO SCALE
- ALL SIZES ARE APPROXIMATE
- FIT IN FIELD

PENNSYLVANIA STYLE- FELLED SHORELINE TREE STANDARD DRAWING

SECTION VIEW



MATERIALS AND EQUIPMENT

MATERIALS:

LARGE HARDWOOD TREE - 1 PIECE
1/4" GALVANIZED CABLE 20' - 1 PIECE
FENCE POST STAPLES - 4 TOTAL

SUGGESTED EQUIPMENT:

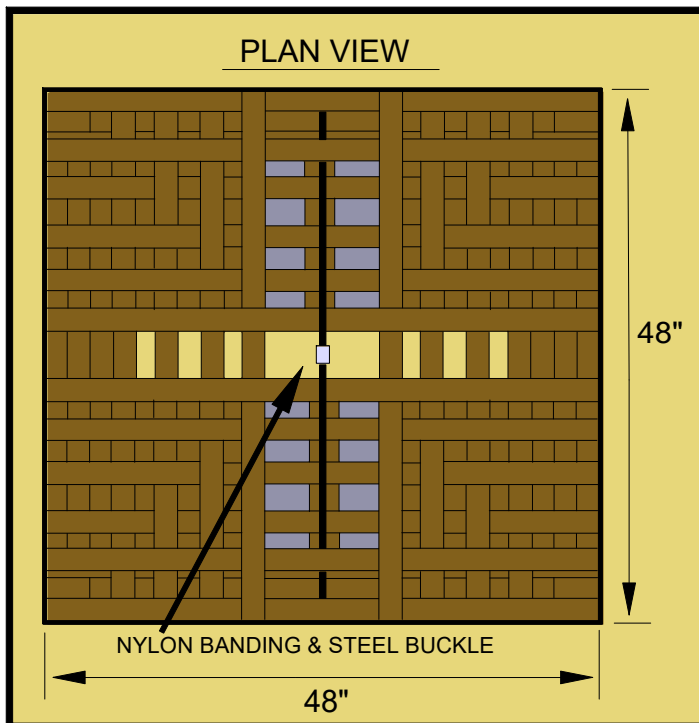
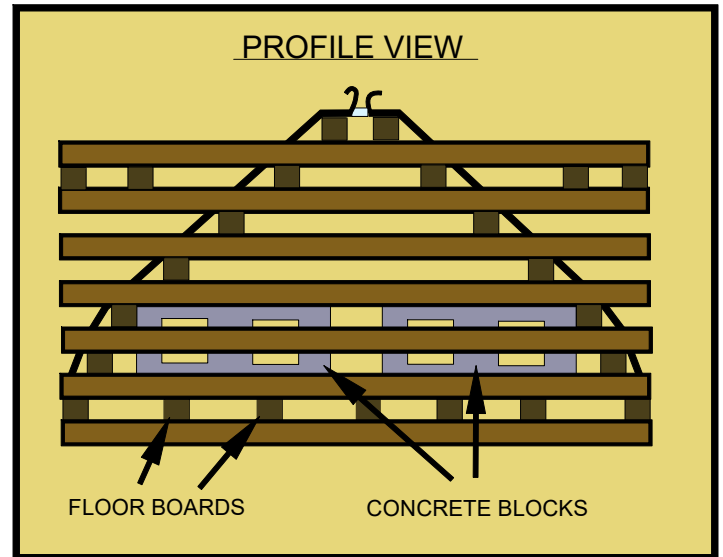
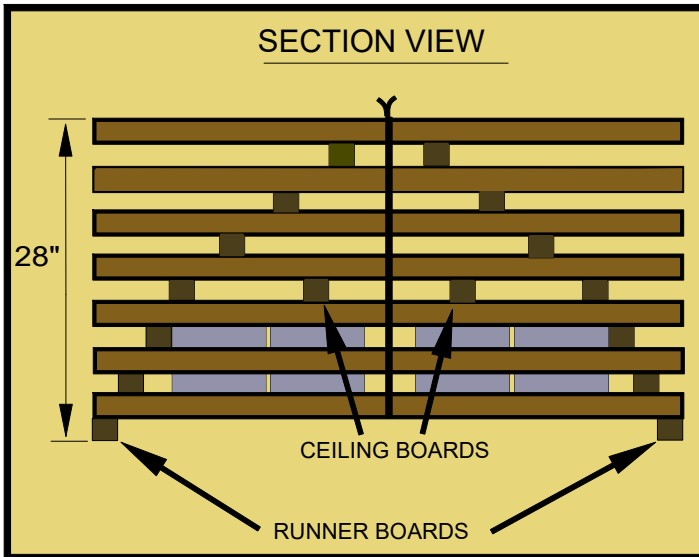
CABLE CUTTERS
CHAINSAW
WEDGES
MINI SLEDGEHAMMER

NOTES

NOTES:

WIRE ROPE AND STAPLES MUST BE USED
TREES SHOULD BE CUT IN SUMMER WHEN THEY HAVE MAX. FOLIAGE
TREE CANOPY SHOULD BE MOSTLY SUBMERGED
TREES SHOULD BE CUT BY PROFESSIONALS
AREA MUST BE RESTRICTED TO OTHERS DURING THE CUTTING
NOT TO SCALE
ALL SIZES ARE APPROXIMATE
FIT IN FIELD

PENNSYLVANIA PORCUPINE CRIB JUNIOR STRUCTURE STANDARD DRAWING



MATERIALS AND NOTES

MATERIALS:
 ROUGH CUT HEMLOCK LUMBER 2" x 2" x 4'- 38 PIECES
 8" x 8" x 16" 2 CORE CONCRETE BLOCKS- 8 TOTAL
 16D COMMON NAILS- 2 LBS. (OR 2 STRIPS OF 12D)
 1/2" NYLON BANDING- 18'
 1 STEEL BUCKLE

NOTES:
 LUMBER MUST BE TRUE DIMENSIONAL
 LUMBER MUST BE GREEN (FRESH CUT)
 YELLOW POPLAR MAY BE SUBSTITUTED FOR HEMLOCK
 CONCRETE BLOCKS MINIMUM WEIGHT: 35 LBS
 NYLON BANDING: 600 LBS TENSILE STRENGTH
 NOT TO SCALE
 ALL SIZES ARE APPROXIMATE
 FIT IN FIELD