

DRAFT
WETLAND MITIGATION PLAN

FOR THE AREA 1, PHASE I MITIGATION SITE
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
In Hamilton and Butler Counties Ohio

Including:

APPENDIX 1: CONSTRUCTION DETAILS

APPENDIX 2: PLANTING DETAILS

APPENDIX 3: MONITORING/MANAGEMENT PLAN

Produced for: Fluor Daniel Fernald
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Revised
23 February 1999

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TABLE OF CONTENTS

Document summary 1

Introduction and project setting 1

Site description 2

Mitigation goals/model 3

Grading and soils specifications 5

Topographic conditions 5

Soil amendments 6

Liner 6

Grading tolerances 7

Inoculation 7

Erosion control 8

Water control structures 8

Hydrology 9

Water sources 10

Embankments and slopes 10

Vegetation 11

Planting design 11

Mulching and soil cover 12

Inoculation/placement 12

Herbivory 12

Cover types and areas 14

Upland cover types 14

Wetland cover types 17

Wildlife amenities 20

Staging and logistics 21

Monitoring and post construction management of the site 21

Conclusions 21

Authorship and technical assistance 22

Bibliography and references cited 22

LIST OF FIGURES

- 1. Existing and proposed site cross section
- 2. Watershed for the mitigation site
- 3. Hydrology of the mitigation area
- 4. Location map

APPENDICES

- DRAFT APPENDIX 1: Construction details
- DRAFT APPENDIX 2: Planting details
- DRAFT APPENDIX 3: Monitoring/management plan

000003

DOCUMENT SUMMARY

This document set presents plans, specifications, and instructions for the construction of a wetland area for mitigation purposes. The document set is composed of the **Mitigation Plan**, **Construction Details Appendix 1**, **Planting Details Appendix 2**, and **Monitoring Plan Appendix 3**. The documents provide description of all aspects of the plan in a descriptive fashion and are accompanied by 50 scale plan sheets and appendices that provide construction detail. The detailed design in this document closely follow the concepts and basic specifications contained in the Conceptual wetland mitigation plan (Munro, 1998) which has been reviewed and approved for this project.

The nature of the document set is that the Mitigation Plan provides the general plan concept, strategies, and data on which all details are based. The appendices related to construction and planting of the site are divided into an earthwork and major structures appendix and a planting, stabilization, and minor structures appendix. The division is based on the expected division of labor and supervision of site personnel and contractors for this project. The project overseer is to be given the role or title of "**Restoration Ecologist**" (qualified restoration ecologists from Fluor Daniel Fernald) and "**Construction Engineer**" (Fluor Daniel Fernald engineering staff). The contract labor is projected to be in two categories, those who work on earthwork and major structures under the supervision of the Construction Engineer are designated as the "**Earthwork Contractor**" and those who work on planting, minor structures, stabilization, and other details under the supervision of the Restoration Ecologist are designated as the "**Planting Contractor**". A number of aspects and details of this plan are designed for labor and contracting conditions on the FEMP site. Since the work will be done by a basic labor pool unfamiliar with the specialty of wetland system construction and planting rather than contractors familiar with such work the documents have been organized to fit this situation rather than that of standard contracting.

INTRODUCTION AND PROJECT SETTING

This document provides detailed plans to develop 6.24 acres of wetland area to replace wetlands already disturbed or destroyed on the site of the Fernald Environmental Management Project (FEMP), Fernald Ohio (Figure 4). Regulatory authority and direction for this process derives from Section 404 of the Clean Water Act and is being regulated by U.S. EPA per its authority under CERCLA. This document has been prepared by Munro Ecological Services Inc. (MES), under contract to Fluor Daniel Fernald (FDF) for the U.S. Department of Energy (DOE).

As a result of a 1993 approved wetland delineation by the U.S. Army Corps of Engineers, Louisville District, approximately 36 acres of jurisdictional wetlands were identified within the 1050-acre Fernald property, which are subject to compensatory wetland mitigation requirements under Sections 404 and 401 of the Clean Water Act (Ebasco 1993). DOE estimates that approximately 10 acres of wetland will be impacted during remediation of the site under CERCLA, which will require mitigation.

On 20 June 1995, DOE met with representatives from the U.S. Environmental Protection Agency (US EPA), Ohio Environmental Protection Agency (OEPA), U.S. Fish and Wildlife Service (US FWS), and Ohio Department of Natural Resources (ODNR) to discuss wetland mitigation requirements at DOE's Fernald Site in Cincinnati, Ohio. Key aspects of the discussion included DOE's preference for addressing mitigation requirements on-property and mitigating the entire 10 acre wetland impacts through restoration or creation actions. All parties agreed to an established mitigation ratio of 1:1.5 acres, resulting in a regulatory commitment of 15 acres of mitigation wetlands.

This wetland mitigation project is a small part of the demolition and cleanup of a former uranium processing plant and its associated debris and waste material. The goal is to return the land to functional and natural conditions under agreement between DOE, US EPA, and Ohio. The present upland area subject of this mitigation plan is one of the first areas to be certified for re-use per the final remediation levels for soil at the site. Since most of the wetlands requiring mitigation have already been destroyed, wetland mitigation must

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begin soon. Upon preliminary site inspection and review it was decided that the site considered in this plan met basic needs for an area to be converted into wetland and a decision was made to proceed with mitigation planning. The wetland acreage proposed for the current site is not sufficient in itself to fully compensate for all wetland impacts on the FEMP. Additional wetland area will be constructed and planted when suitable land is certified and made available through the site cleanup process.

Fieldwork has been conducted on the Fernald site and in surrounding areas and in combination with vegetation literature survey has been used to provide portions of the design basis for the wetlands described in this document. Other aspects of the design follow most-current methods from the fields of ecological restoration and wetland science.

SITE DESCRIPTION

The mitigation site is located in the northeast corner of the FEMP (location map, figure 4) and is referred to as Area 1, Phase I (A1PI). The site was previously a grazed pasture and is currently disturbed grassland covered with mixed forage and stabilization grasses and many weedy forbs. The site is bordered to the west by the North Access Road and on the east by the FEMP property fence. Few of the plants on the site are native. A small quantity which are native have been designated for salvage efforts. Several remnant water and sediment control features exist on the site. The prime modification of the site as a result of site cleanup has been the removal of contaminated surface soils of the site. Approximately six inches of surface soils has been removed and placed in a permanent on-site disposal facility across the road. The A1PI site is now ready for revegetation and final cover.

Relevant site data follows:

Acreage of the site:	12.87
Acreage of wetland proposed:	6.24
Acreage of feeding watershed	20 (approximately)
Number of wetland basins designed:	8
Linear orientation of site:	North-South
Elevation range on site:	+597 to +620 (datum not provided)
Classification of proposed wetlands:	Palustrine, forested, shrub swamp, herbaceous meadow, wet prairie, open fresh water
Proposed disturbance area	12.87 acres
Number of wetland basins designed:	8
Basin #1 area	1.02 acres
Basin #2 area	1.29 acres
Basin #3 area	0.83 acres
Basin #4 area	0.81 acres
Basin #5 area	0.23 acres
Basin #6 area	1.44 acres
Basin #7 area	0.48 acres
Basin #8 area	0.14 acres
Total wetland area	6.24 acres
Total upland area	6.63 acres
Area of wetland remaining to be mitigated	8.76 acres

000005

MITIGATION GOALS / RESTORATION MODEL

The mitigation goals that have been incorporated into the mitigation plans for A1PI wetland mitigation area are as follows:

1. To construct 6.24 acres of ecologically and diverse wetland to satisfy the need to replace wetlands destroyed during the site decontamination process. The remaining wetland mitigation work will be done at other locations on the Fernald site.
2. To provide aquatic habitat for species associated with emergent, and ephemeral wetlands as well as shallow ponds.
3. To construct a wetland system that will be similar in form and structure to those which naturally occurred in Hamilton and Butler Counties, Ohio by following ecological restoration principles.
4. To carefully and efficiently use available water (Figure 3) in order to maximize wetland conditions and wetland success.
5. To re-contour the land surface so that wetland conditions will prevail on a majority of the site without creating a landscape with steep slopes and rectangular shapes.
6. To salvage certain native upland full-grown perennial plants from the existing meadow for re-use on the reconstructed meadow areas.
7. To select and plant vegetation in such a way to create a natural and attractive appearance (Appendix 2, Sheet 1 - pocket).
8. To plant native vegetation in the most suitable soil moisture regimes with sufficient species diversity to provide a variety of food and habitat resources for various species of wildlife.
9. To place visual screens (buffer plantings) at appropriate locations to provide some degree of isolation.
10. To use diverse planting methods that will provide at least 80% live cover within two growing seasons.
11. To avoid the need for long-term maintenance by using low maintenance design strategies for the constructed streams and permanent wetland areas.
12. To provide sufficient wildlife amenities to encourage residence and breeding by various wildlife species that will find suitable on-site habitat.
13. To establish and implement a monitoring plan to insure the highest level of project success possible and to provide a scientific basis for evaluating the constructed wetland system.

RESTORATION MODEL

The wetlands to be constructed as part of this plan are intended to be similar in character to a type of wetland that has largely disappeared from the regional landscape and is worthy of being restored. Wetlands were, prior to clearing of forests for agriculture, quite frequently found on gently rolling high flatlands. These wetlands were often forest covered but were also composed of any number of configurations of pockets of shrub, herbaceous, prairie, and emergent composition. The high flat lands were easy to drain through tile draining and channelization and are survived by their telltale hydric soils that can be found in farming areas.

By using flora and vegetation literature and data for Ohio and specifically Hamilton and Butler Counties, woody species have been selected which are known to be native to this local area. Only these species as well as herbaceous species also known to be native to the two counties will be planted in the mitigation area. Since the character and dynamics of the flatland wetlands of Ohio have not been well documented in the past, we are likely to learn more about them by planting their known components than by pure scientific speculation. For this reason the concept of planting native species and watching what develops over time is entirely appropriate. Given the time-frame and dynamics of natural vegetation pattern shifts it is quite likely that when the A1PI wetlands do begin to assume a fully natural character, it is likely to be in ten or twenty years. This is part of the dilemma of restoration ecology and ecological restoration. When re-creating a poorly documented and presently non-existent vegetation community it is not possible to predict what the re-created system will be.

The system is planned to be constructed within a one-year time period. Full cover of woody communities is not expected for about ten years. Maturity of forest canopy and conditions is not expected for over 30 years. Birds, aquatic macroinvertebrate communities, and terrestrial fauna are expected to use the habitats of the site within the first two years. The hydrologic dynamics of the site are expected to be functional after the first time that the basins all fill to proposed pool levels. The system is designed to begin to appear natural within two to four years of completion.

Herbivory by White-tailed deer, Canada Geese, and other species to a lesser degree are a severe threat to any newly planted large area like this wetland mitigation system. Many unprotected sites of this kind (wetland mitigation, forest plantings, nurseries, gardens, and arboretums) have suffered irreparable damage and stunting by excess herbivory during the first months and years of their existence. To the extent that herbivory is excluded (not just subdued) the site will thrive, otherwise herbivory can easily alter this restoration model. Although a study of the herd concentration of deer in the FEMP has been initiated, colloquial information and casual observations on the FEMP site and on the A1PI site during the past year indicate that the local deer population greatly exceeds the 5 per square mile number that is sustainable in natural conditions. The local area has an apparent heavy deer population which poses a serious threat to mitigation area plantings. For this reason deer exclosure fencing has been recommended for the A1PI site.

Drought, likewise is unpredictable. Drought conditions without adequate watering during the first three years may irreparably alter the site plantings and allow exotic species to fill the gaps.

Management during the first few years to prevent small problems from becoming very expensive or project-threatening problems is a basic assumption of this restoration model.

To the extent that changes are made during construction and planting of the site, the ability of the site to attain the stated goals in the above restoration model may be altered directly or unpredictably. All changes from specifications will be recorded as part of site monitoring and therefore become part of the project record. This record will be accessed during final evaluations near the end of the monitoring period, and compared with the original restoration model.

000007

MITIGATION PLANS

GRADING AND SOIL SPECIFICATIONS

The grading concept for the proposed mitigation (Appendix 1, Sheet 2 - pocket) area consists of the construction of eight wetland basins. The basins will consist of a nearly flat area with a perched water table that is between 0 and 12 inches from the surface. The basins will be surrounded by a low containment embankment or by naturally up-sloping topography.

MES has approximately scaled in overhead wires and support poles known to exist on the site onto the planting plan. Underground communication wires may also exist. Wells related to groundwater monitoring exist on the site. The FEMP managers are advised to consider these utility locations prior to start of grading since the grading plan could potentially affect any of these features. Likewise, a single OEPA air monitoring station is proposed to be moved from the fence-line into the site as part of this mitigation plan to better facilitate the placement of buffering vegetation. The air monitoring station and its utility connection will have to be moved.

TOPOGRAPHIC CONDITIONS

The exact elevation of the existing soil surface is shown on Appendix 1, Existing contours (Pocket). Topsoil of varying depths has been removed from portions of the site. Only a small portion of the site was not stripped of topsoil during remediation work. The changes from original contours on the site relate to the removal of contaminated soils on the site and associated re-grading related to erosion control and stormwater handling. The earthwork is designed to be approximately cut-fill neutral as noted in the typical cross sections (Appendix 1, Sheet 2 - pocket) within the mitigation area. Excesses of soil material may be used on additional isolation embankments along the road or removed for other use on the Fernald site. All make-up areas will be vegetated as per the planting plans.

Soils to be used in the wetland construction will be divided into four categories:

Topsoil - soil to be placed a minimum of 12 inches thick on the surface of the mitigation area, to act as the growing medium for the planted vegetation.

Liner material - clay or claylike material that has very low permeability and is with very low rock or sand component, to be used to form a perched water table that will support wetland growth.

Subsoil material - any on-site natural soil material that is to be graded as part of the base grade, embankments, or above liner but more than 12 inches below the surface.

Amended topsoil - Topsoil as above with organic material mixed in specified quantities (5 pounds per square foot) and spread one foot thick over the entire planting area of the site. See details below.

Amended topsoil will be of such a consistency that holes for trees and shrubs can easily be excavated even when the soil is dry. It will consist of soil scraped from the top 12 inches of the site and stockpiled at labeled topsoil locations. This topsoil will be pushed aside before any subsoil excavation is done. No topsoil will be used for subsoil purposes. Topsoil with relatively high clay content (from the entire area of the site where contaminated soils have been removed) will have 5 pounds of organic material (wood chips, sawdust, composted leaves, or other MES approved material) per cubic foot of soil, incorporated before placement back on the mitigation area. All topsoil to be placed in the wetland basin will have this organic material incorporated into its volume. The small portion of the site with undisturbed topsoil (Figure 5) will have this material stripped and stockpiled for use on areas which will have grassland cover. This soil will not be used without addition of amendments in areas where woody vegetation will be planted.

000008

SOIL AMENDMENTS

Topsoil is to be mixed with organic material to include wood chips, composted leaf mulch (or other comparable organic material accepted by the Restoration Ecologist) through the use of construction equipment. Organic amendments are to be added to topsoil at the rate of 5 pounds per square foot of surface soil or 5 pounds per cubic foot of topsoil. Topsoil placement is to be followed by grading with low ground-pressure grading equipment. Compaction of topsoil is to be avoided. The topsoil of the entire site is to be amended with this organic material with the exception of open water areas, road areas and areas to be left undisturbed. Additional details are included in the Construction Details appendix.

LINER

The liner will consist of clays that are expected to be found onsite (See - Geotechnical Investigation Report On-Site Disposal Facility, Parsons Engineering 1995) and will be installed as a flat compacted clay layer with its edges tapered upward into the surrounding embankments and upland edges (Appendix 1, Figure 2 and Table 1). Only at the two deep pond areas in Basins #2 and #4 will the liner be depressed. The liner will be compacted tightly to the water control structures to prevent any leakage in those critical areas. The addition of granular or pelletized bentonite to the soils around these structures may be used to assure a tight seal. Any installation of poles for wildlife structures or staff gauges or other purposes in lined areas shall be by means that maintain a complete water seal at the liner level. The use of jumping-jack or jackhammer type compactors and bentonite material may be necessary to maintain liner integrity. The use of driven pipe, rather than posts, placed in excavated holes, is recommended.

Liner integrity will not be threatened by roots of woody stock that is proposed for planting in the wetland basins. Tree roots when they are in hydrophytic conditions fan out horizontally to form wide flat support bases. The kinds of trees that normally form taproots are those living in hard or dry soils. Such species are only planted in un-lined upland locations and not in wetland basins where they would not thrive.

LINER CONSTRUCTION AND SPECIFICATIONS

Liner material must be of sufficient low permeability to virtually prevent water passage downward. The liner material must have no stones greater than 6 inches in diameter contained within its matrix. The liner material may have a maximum of 15% stone content (stone of any size). The liner material will be vibrator-roller compacted and tested for 85% modified proctor at appropriate intervals. The results and location of all proctor testing will be provided in the first post construction monitoring report.

Liner material will be excavated from deeper layers under the mitigation site (per recommended pre-construction test pits, Appendix 1).

Figure 2 in Appendix 1 provides the basic formula for the relationship of water level, over-excavation depths, liner elevations and thickness. The same formula and relationships have been applied to all basins but because of the different basin elevations water level and liner elevation are consequently different for each basin.

Liner clay will be placed as a 12 inch thick layer under the entire basin (Appendix 1, Figure 2) and 24 inches thick beneath open water (12-inch thickness under open water areas may be warranted by the presence of documented uniform consistency, low permeability clay base material). Liner material is to be placed and rolled in maximum 6 inch thick lifts and installed per Appendix 1, Figure 2 and Sheet 2 - pocket. Liner placement thickness, compaction, and proctor testing is to be documented in the first post-construction monitoring report. The project geotechnical engineer will provide final guidance on clay acceptability for liner and will provide determinations related to liner integrity. It is possible that clay from the site may be of sufficient quality or be so thick and dense beneath the site that a uniform 12 inch liner thickness may suffice. This determination must be made by the project geotechnical engineer (FDF) and the decision documented including all test pit documentation and proctor analyses.

000009

Subsoil is to be natural material from the wetland mitigation site. No waste material, stone aggregations, or construction rubble will be used under the wetland mitigation area.

All large rocks encountered during grading will be placed at pre-determined stockpile locations on the surface rather than buried beneath the soil.

All areas excavated for clay material are to be backfilled and compacted in lifts of no greater than 8 inches to prevent any possibility of subsidence. The project geotechnical engineer is to provide direct guidance of clay excavation, clay permeability, lift specifications, and sub-surface conditions documentation. Any voids, seeps, unexpected or nonconforming sand or gravel materials, or bedrock outcropping, are to be documented and explored in relation to their hydrologic implications relative to the constructed wetland basin.

Any areas of water seepage or spring activity discovered during excavation are to be brought to the attention of the Restoration Ecologist as soon as they are encountered.

GRADING TOLERANCES

Grading tolerances for the earthwork are critical to the successful construction of wetland conditions throughout the wetland basins. Grading errors of as little as 0.2 feet can make the difference between wetland and upland conditions which are determined by the plants propensities to grow where adequate water is available to them. Grading tolerances in the wetland basin within one foot above and below the target water level are to be no more than + or - 0.2 foot from the proposed elevations as indicated on the grading plan. Grading tolerances outside of the wetland area are to be no more than + or - 0.5 foot from the proposed elevations as indicated on the grading plan. These grades will be established, checked, and recorded by appropriate survey methods.

As soon as final topsoil grades are placed, and prior to planting work, as-built drawings of the earthwork are to be completed. These drawings are to indicate any elevation changes in excess of 0.2 foot in wetland areas and 0.5 foot in upland areas from specifications in this document and are to be at 50 scale. Any and all modifications from plan specifications are to be noted. This as-built grading plan will be provided to the reviewing agencies by attachment to the first post-construction monitoring report.

Any make-up areas consisting of piles or borrow locations will be graded with a maximum 3:1 slopes and have 12 inches of topsoil placed over their entire surfaces. Grading will be consistent with the concepts used in the mitigation plan. Any soil material make-up locations on the mitigation site will be at locations designated on the grading plan.

INOCULATION

Ohio EPA will supply inoculant material for this task and will place the material as part of soil biology research associated with this project. This research work is minor and incidental to the major work of the wetland construction but will likely provide ecological returns greatly out of proportion with the level of effort expended. Inoculant source locations will be carefully chosen to prevent introduction of unwanted exotic species.

Inoculation will occur in three forms:

- Inoculation of UF forest areas with native live forest soils.
- Inoculation of WM marsh areas with live native plugs of soil and sedges.
- Inoculation of OW pond areas with pond muck from existing good-quality ponds.

000010

Inoculation of UF forest areas with native live forest soils.

Up to 20 5-gallon buckets of forest soils taken from existing high-quality forest areas in Hamilton County will be placed in the mitigation area. The forest topsoil will be removed in lump, rather than fine particle form so that it retains as much structural integrity as possible. Forest topsoil will be taken from the top three inches of in-situ soil. On the site the inoculant soil will be placed in 3-inch deep flat holes in the UF areas and covered with wood chips or other specified forest mulch. The soil placement will be at grade and will neither rise above, nor be depressed from the immediate surrounding soil. A marker stake and identification will be placed at the center of the inoculant placement.

Inoculation of WM marsh areas with live native plugs of soil and sedges.

Up to 20, 5-gallon buckets of marsh soil and sedge plugs taken from existing high-quality marsh areas in nearby counties will be placed in the mitigation area. The marsh soils and plugs will be removed in lump, rather than fine particle form so that it retains as much structural integrity as possible. Marsh soil and plugs will be taken from the top four inches of in-situ soil. On the site the inoculant soil and plugs will be placed in small holes so that the plug or soil fits in tightly in the WM areas, and covered with specified straw mulch. The soil placement will be at grade and will neither rise above, nor be depressed from the immediate surrounding soil. A marker stake and identification will be placed at the center of the inoculant placement.

Inoculation of OW pond areas with pond muck from existing good-quality ponds.

Up to 10, 5-gallon buckets of pond shallows muck taken from existing high-quality ponds in nearby counties will be placed newly constructed ponds OW in the mitigation area. The pond shallows muck will be placed in the new (fully filled) pond within one day of removal from its source. On the site the inoculant pond shallows muck will be placed in areas of 3 inch to 12 inch deep pond water. The pond muck will be distributed in small (one pound) amounts in shallows of the selected ponds. All large ponds will receive a full bucket of pond muck. The other ponds will use the remaining pond muck. No markers are needed for these placements since they are in open aquatic condition.

EROSION CONTROL

Standard erosion control practices will be employed during all aspects of the construction of the wetland mitigation basins to the extent that they are needed. The proposed method of work is to grade each basin from the North to the South of the A IPI site with placement of mulches and planting work following immediately within a day or two. During the construction of wetland basins there is very low possibility of significant sedimentation release from the site. Slopes are gentle and clay soils do not erode rapidly. All slopes have basins at their bases where any and all sediment will collect. The need for silt fencing is likely only if work is shut down due to precipitation which continues for days. In order to prevent such a scenario from causing serious erosion damage work has been specified to proceed on a basin-by-basin basis so that a maximum of one entire basin may be in unstabilized (unplanted and un-mulched) at any one time.

Silt fencing will be kept available in the event of un-predicted earthwork shutdown to stabilize exposed soil areas or surround stockpile areas.

All graded areas will be topsoiled and then mulched and planted per the planting plan to establish vegetation growth as soon as possible after the planting work.

The constructed basin areas will provide containment of any eroded material during construction.

As work proceeds on a sequential basis, siltation barriers will be erected around each work area as needed.

All stockpiles of topsoil, subsoil, or liner will be encircled by standard sedimentation barriers (silt fence) if left unused for more than a week or until they are used up.

WATER CONTROL STRUCTURES

The structure design provides an adjustable set of stoplogs for use during the first few years after construction to allow for adjustment by the Restoration Ecologist to determine the optimal permanent pool elevation. At such a time that the optimal pool elevation is determined, the adjustable stop logs will be replaced by a poured concrete plug with that same top elevation. Once this permanent weir is completed no additional water adjustments are to be made. During the period before the weir is finalized, all adjustments of the weir plate will be stipulated by the Restoration Ecologist.

The design of the outlet structures is intended to provide some variation in the length of time that each basin will retain water. Four structure types are provided.

Precast concrete headwall outlet structures (Appendix 1, Figure 4) will provide precise (and adjustable) invert settings with relatively rapid discharge of water above those elevations.

Pole drains (Appendix 2, Figure 3) which are used alone or in combination with concrete structures, provide a slow seepage drain which will allow those basins to gradually drain down over days or weeks.

Log and fabric structures (Appendix 2, Figure 4) have an even wider opening than the concrete structures and will discharge stored water volume more quickly but with less erosive energy. They have been used in basins with lesser sloped discharge channels.

A fabric-covered swale (Appendix 2, Figure 4) is specified between basins 7 and 8. This non-structural water control device will work exactly as the log and fabric structure above, but is located at an even lesser slope.

HYDROLOGY

The hydrologic concept behind the design (Figure 3) of the wetland mitigation area is intended to provide a set of varied wetland and open water regimes. The various surface water sources are connected or blocked by earthwork to allow or prevent water passage to various parts of the constructed wetland. In times of high precipitation or high flows all parts of the wetland system will be flooded to saturation, while during low precipitation times the areas designated as open water (OW) cover are the only areas expected to remain inundated. Surface water flow to the adjacent property to the East will remain unaffected by the construction of the wetlands.

If the presence of any field tiles is detected and they are in locations that potentially drain water from site wetlands they will be crushed and sealed.

The isolated shallow ponds will allow for amphibian habitat as well as the development of more ephemeral benthic macroinvertebrate communities. These ponding areas are expected to contain water on an intermittent basis which will make them well suited for amphibians and unsuitable to fish which would prey on amphibians.

The constructed stream and pond system is designed to provide permanent open water area. Although flow through the stream will occur only during times of moderate to high precipitation, water will be retained at specified depths even when flow stops. The water outlet structure will provide this assurance.

The mitigation area will provide at least four kinds of hydrologic regime:

Stream and corresponding riparian habitat (usually non-flowing).

Deep ponds (2) will contain 7-8 feet of water in their deep areas and will allow some over-winter non-frozen water in deeper areas.

Shallow ponds (6) are present in most basins. These are designed to provide a variety of shallow and permanent to temporary standing water.

Intermittent areas - shallow ponding and marshy areas that will contain standing water for varying amounts of time during the year.

Shallow monitoring wells are to be installed for the purpose of inspecting and tracking the water dynamics in the basins (Appendix 2, Figure 2).

WATER SOURCES

As with any land exposed to the open sky, the site will receive direct precipitation over its entire area.

All surface water which reaches the mitigation site by gravity will flow into some portion of the wetland mitigation system. The present feeding watershed covers approximately 20 acres (Figure 2). The original watershed for this area has been modified over history and is likely to have minor revisions even as other portions of the FEMP site are cleaned up. The top end of the watershed was modified by the road to the north of the FEMP site. The waste material cell being constructed across the road from the wetland mitigation area occupies portions of the original watershed. The modifications to the topography and drainage pattern for the waste cell (dictated by waste management requirements) has shunted additional overland flow from the mitigation site. Even with these watershed modifications the amount of water available to the designed wetland system should be more than adequate.

A likely source of degraded water for the wetlands of the A1PI site is salt used for road de-icing during winter. A significant portion of the feeding watershed is paved highway. Salting of the road will deposit the salt primarily in wetland basins #6 and #1, although all basins are likely to receive some dissolved salt. Salt is highly poisonous to freshwater marsh plant and animal species. If the salt that accumulates during winter in the basins becomes too concentrated or is not adequately flushed through the system during winter dormant period serious damage to the herbaceous components of the system may occur. It is strongly recommended that the road surface within 500 feet of the site be treated with sand or cinders rather than salt. If this is not done the loss of vegetation in shallow herbaceous wetland areas is likely to occur. Salinity measurements in basins 1 and 6 after winter salting activities is recommended as part of the monitoring program.

Although not a source of water, the compacted clay liner will provide the assurance that water will not be lost to subsurface soils. This tight containment will allow the wetland to remain functional through intermittent dry periods.

Hydrologic reference structures will be placed so that the hydrologic aspects of the wetland system can be checked and monitored. These markers are as follows:

1. Shallow wells (Appendix 2, Figure 2) will be placed in various locations in the wetland basins to allow monitoring of the water table in the wetlands.
2. Boundary markers (Appendix 2, Figure 1) will be to mark the horizontal and vertical limits of the wetland at a number of points around the wetland perimeter.
3. Staff gauges placed on structure headwalls and on pipes in several ponds will allow accurate surface water level checking throughout the monitoring period.

EMBANKMENTS AND SLOPES

The containment embankments for the two basins have the same basic configurations and specifications:

1. 3:1 or 4:1 sideslopes
2. flat embankment top
3. Embankment top at least 1 foot above marsh.
4. Embankment top 2 feet above permanent pool level
5. Embankment top ties in to existing topography at grade

The clay liner will be built into the embankment (Appendix 1, Figure 2) so that it extends horizontally beyond the wetland edge by 10 feet and above the top of wetland elevation vertically by 1 foot.

VEGETATION

The vegetation cover designed for the wetland basin is conceived in terms of ecological restoration in that it is modeled on documented historic native vegetation and plant community conditions. The primary references for the ecological model are Andreas (1989), Gordon (1969) and Braun (1950).

- Fieldwork throughout the two counties and the Little Miami and Great Miami watersheds has provided extremely useful information to augment the species selection. The ecological model is defined as a setting of various native wetland communities as would have been likely in Hamilton and Butler County prior to logging and conversion to agricultural land.

PLANTING DESIGN

Native mix - Only plant species native to Hamilton and Butler Counties, Ohio and adjacent counties where the regional distribution pattern reasonably includes Butler or Hamilton counties will be planted in the mitigation area. This will establish a wetland system that is as close to natural as is possible. This limitation to native species will provide the most appropriate species selection for local aquatic fauna. Species selection for any planting type also directly correlates to the moisture regime and physiographic setting in which that plant is normally found. To some extent cluster groupings and uniform species clusters have been based on observed natural conditions.

Patch system with random placements - The plantings are detailed on a patch basis as shown on the planting plan (Appendix 2, Sheet 1 - pocket). A patch is defined as an area of manageable size and typical of naturally expressed groupings of trees shrubs and herbs. The planting directions and specifications are provided as Appendix 2: Planting Details. This document is for the planting Restoration Ecologist and contractor to use during ordering and planting stock. The planting details will allow confirmation of planting of specified quantities and sizes of stock. The patch specifications prescribe quantities and sizes of woody stock as well as mulching and seeding quantities for each patch shown on the planting plan. Stock is specified to be planted within each patch, but locations are to be randomized so that they appear natural. Some placement or clustering guidance is also provided.

Clustering - In the patch system of planting specifications, directions are given to the Restoration Ecologist and contractor as to which species are to be clustered in groups (berry bushes, etc.), and which species are to be placed near the center or edges of the cluster.

Substitutions - All plant stock material is to be procured on the basis of scientific name (not common name) as listed in this document. The substitution policy details what substitutions may be allowed and what limits those substitutions may have. Substitution of smaller stock or stock of different form than specified (B&B, potted, bare root, seedling, cutting) is prohibited unless proportionate quantities or other compensatory

measures are added. All substitutions are to be approved in writing by the Restoration Ecologist. The substitution policy is included in Appendix 2 Planting Details.

Salvage - The only plant material on the existing site that is suitable for salvage is the tall ironweed (*Veronia gigantea*). An estimated growth of several hundred exist on the northern portion of the site. These multi-year old perennial plants are well suited to planting in the upland grassland areas of the mitigation area. Rather than being destroyed during earthwork, it is recommended that at least 100 of these plants be dug from the ground and temporarily potted or wrapped in burlap and stored until the mitigation area is regraded. These plants are to be planted in areas of the upland grassland in locations that are visible from the road.

Density diagrams - Planting densities will be consistent and are based on field-measured densities in natural stands of similar vegetation cover. The planting density figures are shown to allow a visualization of actual vegetation areal cover for the various planting areas.

Plant sources - All plants used in the mitigation area will be native to Hamilton and Butler and surrounding counties in Ohio. To the extent possible planting stock will be purchased from sources as close to the project site as can be found. Unfortunately Ohio's substantial horticultural industry produces only a small percentage of native species. The Restoration Ecologist will coordinate, arrange, and approve stock purchases.

Stock types are to include various live materials. The stock type are as follows:

- B&B tree and shrub stock.
- Potted woody stock.
- Nursery grown plug stock.
- Salvaged herbaceous stock.
- Collected seed.
- Purchased seed.

No bare-root woody stock will be used for direct out-planting. If bare-root stock is the only source of selected species which are considered appropriate for diversity, such stock will be purchased and pot planted then nursery-tended for at least one full growing season prior to out-planting. Planting of these stock plants will be done as part of monitoring work. All planting stock must be alive, healthy, and within specification when planted on the site.

MULCHING AND SOIL COVER

All but a small portion of the site will be covered with amended topsoils (Appendix 1), and patches will all receive covers of different types (Appendix 2) as follows:

Upland and wetland forest	4" wood chip mulch collar around all plants, oat straw between
Upland and shrub swamp	4" wood chip mulch layer over entire patch
Upland grass	2" oat straw
Marsh, wet prairie, and open water	2" salt hay

INOCULATION / PLACEMENT

The use of inoculant materials will be incorporated into the wetland construction. Pond muck material from local healthy ponds will be used in the new ponds (small amounts with great diversity and potential). Some native forest soils and organic surface materials will be introduced into the renovated soils of the wetland mitigation site. These will be introduced by the shovel or bucket full in many locations in order to provide small starter points for the spread of mycorrhizae, macroinvertebrates, fungus and mushroom spores, insect larvae, terrestrial mollusks, etc. Other inoculant methods will also be used. Ohio EPA will provide the various inoculants and assist with their placement.

HERBIVORY

DEER

The wetland mitigation site has a deer population of unknown size. There have been no prior documented attempts to assess the density of the local herd on the site. The observations by site personnel indicate that the mitigation area is in line with normal deer traffic patterns and that deer can frequently be found on the mitigation site. Deer normally feed on young woody swigs, stems, and buds during winter and early spring when other food is in short supply. Browse damage of small and newly planted shrubs and trees can easily and severely damage large percentages of newly planted woody stock. Severely browsed shrubs or trees often die or are permanently "dwarfed". Their appetite for native shrub species is known. Their avoidance of the exotic honeysuckles which dominate the local woodlands of the Cincinnati region is known. The mitigation site will be planted with prime food for deer. For this reason and because the site is immediately surrounded by land poor in deer food, the threat of damage to site vegetation by deer is major and will last until the shrubs are mature and trees are greater than 3" caliper. If populations of deer are over 5 per square mile some control of population is recommended to reduce the populations to this level for forest sustainability.

Known methods of attempted control of excess browsing are:

- Reduction of local deer population by removal or hunting
- Patrolling and firing at deer
- Use of automatic air cannon
- Use of fenced in watch dogs
- Wrapping of trunks of trees
- Use of tree tubes on trees
- Mesh cover of shrubs
- Exclosure fencing
- Use of repellent pellets, bags, and spray, commercial or non-commercial, odor or taste based, contact or area repellents
- Ultrasonic devices

Of these methods, exclosure fencing is recommended as sufficiently reliable, sufficiently effective, and cost effective for the Fernald site. Most of the methods have only partial or poorly documented success and most will not work if local deer food is in short supply even for short periods of the year. Of these methods only fencing and repellents are considered for most applications similar to the Fernald site, and only fencing is considered sufficiently reliable for such a large area as the Fernald A1PI site.

Repellents cover a group of materials of different kinds. If repellents are used the choice of materials is complicated and must be overseen and managed continually by the Restoration Ecologist. Some repellents may not come into contact with open water. Dry stem conditions are required for application. Spraying is required on relatively short intervals and re-spraying may be needed if damage occurs because the spray did not "take". Spraying must be accompanied by regular patrol of a botanist / biologist. Spraying must be done individually on foot for each tree and shrub.

GEESE

A goose fence must be installed on specified larger ponds to discourage use by geese during plant establishment. Any pond (including small ones) that geese land in should be considered as locations for additional goose lines. The fence will consist of a line of 2" x 2" x (36" minimum) stakes placed about 10 feet apart along each pond edge. Two strands of heavy (i.e., 80-lb test) monofilament line will be tensioned and knotted at each post. The bottom strand should be about 4" above the water, and the top strand about 8" above the water (Appendix 2, Figure 5). In the larger ponds some lines should be strung across the ponds to discourage geese from landing in the open water. Care should be used when installing fence posts to not drive posts through the pond liner.

COVER TYPES AND AREAS

Seven vegetation cover types, along with open water and road areas will be established on the mitigation areas. Total areas for the cover types are shown below. These cover types (See Appendix 2, Sheet 1 - pocket) are described in detail in the following sections.

PROPOSED COVER TYPE	ACREAGE	PERCENTAGE OF DISTURBANCE AREA	PERCENT OF WETLANDS
Wetland			
Swamp forest	0.70	5.4	11.2
Shrub swamp	0.95	7.4	15.2
Herbaceous marsh	2.74	21.3	43.9
Wet prairie	0.74	5.7	11.9
Open water	1.11	8.6	17.8
Wetland subtotal	6.24	48.4	100.0
Upland			
Upland forest	1.44	11.2	
Upland shrub	1.12	8.7	
Native perennial grass	3.80	29.5	
Roadway	0.27	2.1	
Upland subtotal	6.63	51.5	
TOTAL AREA	12.87	99.9	

UPLAND COVER TYPES

NATIVE PERENNIAL GRASSLAND - UG

Some of the upland area surrounding the wetland basins will be seeded with species representing a native grassland community of which only remnants now survive in Ohio. The upland grassland areas will cover 3.80 acres of the site. After deer fence is removed a no-mow sign pattern is to be placed within 10 feet of the edge of paving along the road parallel to the site.

Planting of all grassland areas will be done only during appropriate spring or fall seasons. Mid-June through the end of August are inappropriate for seeding. All seeding will be done on tilled, disced, or otherwise prepared soil surface, followed by mulching and watering at intervals appropriate for seed germination and sustained growth.

Mulching of grassland areas will be done with weed free or oat straw. No Canada thistle seed or other noxious invasives are to be introduced to the site via the mulch straw. Hand-shaking is acceptable. The use of mulch blowers (which pulverizes straw and allows fast breakdown of the material rather than the desired long duration) is prohibited for this work.

Seeding specifications:

- | | |
|-----------------------|----------------------------------|
| Preparation | Till or scarify prior to seeding |
| Seeding area | Entire, to disturbance limit |
| Seed application rate | 35 Lbs per acre |
| Mulching rate | 2 Tons per acre |
| Mulch material | Oat straw or weed-free straw |
| Timing | Spring or fall planting only |
- Seed mix ratio noted in Appendix 2.
 No lime or fertilizer is to be used unless specified by the project ecologist.
 Seed and follow immediately with mulching and watering of entire area worked.

NATIVE PERENNIAL GRASSLAND SPECIES LIST

SCIENTIFIC NAME	COMMON NAME
Andropogon gerardii	Big bluestem
Bouteloua curtipendula	Side-oats gramma
Elymus virginicus	Virginia Wild-Rye
Panicum clandestinum	Deertongue
Panicum virgatum	Switch grass
Schyzachyrium scoparium	Little bluestem
Sorghastrum nutans	Indian grass
Avena sativa (at the discretion of the Restoration Ecologist)	Live oats

UPLAND MIXED DECIDUOUS FOREST - UF

This upland planting area will be stocked with native woody forest species common for this area of Ohio. Tree species will be selected which are characteristic of different stages in forest community development to ensure successful establishment of a forest well beyond the early successional stage. Some larger individuals will be planted to increase the probability of success in the development of upland forest. The area to be planted in upland forest is 1.44 acres.

Specifications:

- | | |
|-----------------------|--|
| Mulch placement | 4-inch thick mulch collar, 7-foot diameter collar for 1 1/2" caliper trees, plant, 3-foot diameter for all other trees and shrubs. |
| Mulch material | Bark mulch or wood chips |
| Seeding area | All areas not covered by mulch |
| Seed application rate | 35 lbs per acre |
| Straw mulching rate | 2 tons per acre |
| Trees per acre | 436 |
- Seed mix to be upland grass seed mix as specified elsewhere.
 No lime or fertilizer is to be used unless specified by the Restoration Ecologist.

UPLAND FOREST SPECIES LIST

SCIENTIFIC NAME	COMMON NAME
Acer saccharum	Sugar maple
Aesculus glabra	Ohio buckeye
Aesculus octandra	Sweet buckeye
Amelanchier arborea	Serviceberry
Asimina triloba	Pawpaw
Celtis occidentalis	Hackberry
Ceanothus americanus	New Jersey tea
Cercis canadensis	Redbud
Cornus alternifolia	Opposite-leaved dogwood

Cornus florida
Diospyros virginiana
Fagus grandifolia
Fraxinus americana
Gymnocladus dioica
Juglans cinerea
Juglans nigra
Liriodendron tulipifera
Ostrya virginiana
Prunus americana
Prunus serotina
Quercus alba
Quercus coccinea
Quercus imbricaria
Quercus macrocarpa
Quercus rubra
Quercus shumardii
Quercus velutina
Sassafras albidum
Tilia americana
Zanthoxylum americanum

Flowering dogwood
 Persimmon
 American beech
 White ash
 Kentucky coffeetree
 Butternut
 Black walnut
 Tulip poplar
 Hop hornbeam
 Wild plum
 Black cherry
 White oak
 Scarlet oak
 Shingle oak
 Bur oak
 Red oak
 Shumard oak
 Black oak
 Sassafras
 Basswood
 Toothache tree

SHRUBLAND - US

This upland planting area will be stocked with native woody shrub species common for this area of Ohio. A variety of shrub species has been selected to provide both shrub clump cover as well as species that are attractive and provide seed and berries used by wetland and upland wildlife species. The area to be planted in shrubland is 1.12 acres.

Specifications:

Mulch placement	Complete cover of planting patch area 4" thick.
Mulch material	Bark mulch or wood chips
Seeding area	None
Shrubs per acre	1350

No lime or fertilizer is to be used unless specified by the project ecologist.

UPLAND SHRUB SPECIES LIST

SCIENTIFIC NAME	COMMON NAME
<i>Amelanchier laevis</i>	Smooth serviceberry
<i>Campsis radicans</i>	Trumpet creeper
<i>Celastrus scandens</i>	American bittersweet
<i>Ceanothus americanus</i>	New Jersey-tea
<i>Cercis canadensis</i>	Redbud
<i>Cornus alternifolia</i>	Alternate-leaved dogwood
<i>Cornus amomum</i>	Silky dogwood
<i>Cornus racemosa</i>	Gray dogwood
<i>Corylus americana</i>	Hazelnut
<i>Crateagus crusgalli</i>	Cockspur hawthorn
<i>Crateagus mollis</i>	Downy hawthorn
<i>Hamamelis virginiana</i>	Witchhazel
<i>Hydrangea arborescens</i>	Wild hydrangea
<i>Lindera benzoin</i>	Spicebush
<i>Lonicera sempervirens</i>	Trumpet honeysuckle

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to reflect their characteristic uniform cover that is often present in natural settings. A third type of shrub patch, mixed species, will consist of A variety of shrub species to provide both shrub clump cover as well as species that are attractive and provide seed and berries used by wetland and upland wildlife species. The area to be planted in shrub swamp is 0.95 acres.

Specifications:

Mulch placement	Complete cover of planting patch area 4" thick.
Mulch material	Bark mulch or wood chips
Seeding area	None
Shrubs per acre	1350
Typical shrub size	36" potted or B&B stock
No lime or fertilizer is to be used unless specified by the Restoration Ecologist.	

SHRUB SWAMP SPECIES LIST

SCIENTIFIC NAME	COMMON NAME
<i>Alnus serrulata</i>	Smooth alder
<i>Aronia melanocarpa</i>	Black chokeberry
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Cornus amomum</i>	Silky dogwood
<i>Decodon verticillatus</i>	Swamp loosestrife
<i>Hypericum prolificum</i>	Shrubby St. John's wort
<i>Ilex verticillata</i>	Winterberry
<i>Ribes americanum</i>	Wild black currant
<i>Rosa palustris</i>	Swamp rose
<i>Salix discolor</i>	Pussy willow
<i>Salix exigua</i>	Sandbar willow
<i>Salix sericea</i>	Silky willow
<i>Sambucus canadensis</i>	Elderberry
<i>Spiraea alba</i>	Meadowsweet
<i>Spiraea tomentosa</i>	Steeplebush
<i>Ulmus rubra</i>	Slippery elm
<i>Viburnum dentatum</i>	Southern arrowwood

SWAMP FOREST - WF

This wetland planting area will be stocked with native woody forest species common for this area of Ohio. Tree species will be selected which are characteristic of different stages in forest community development to ensure successful establishment of a forest well beyond the early successional stage. Some larger individuals will be planted to increase the probability of success in the development of upland forest. The area to be planted in swamp forest is 0.70 acres.

Specifications:

Mulch placement	4-inch thick mulch collar, 7-foot diameter collar for 1 1/2" caliper trees, plant, 3-foot diameter for all other trees and shrubs.
Mulch material	Bark mulch or wood chips
Seeding area	All areas not covered by mulch
Seed application rate	20 lbs per acre (not on collars)
Seed mix	Marsh seed mix
Oat straw mulching rate	2 tons per acre (not on collars)
Trees per acre	436
Typical tree size	6-foot whip, B&B or potted stock
Seed mix to be used between mulch collars to be upland grassland mix as specified elsewhere.	
No lime or fertilizer is to be used unless specified by the Restoration Ecologist.	

SWAMP FOREST SPECIES LIST

SCIENTIFIC NAME	COMMON NAME
<i>Acer rubrum</i>	Red maple
<i>Acer saccharinum</i>	Silver maple
<i>Carpinus caroliniana</i>	Musclewood
<i>Fraxinus nigra</i>	Black ash
<i>Fraxinus pennsylvanica</i>	Green ash
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Nyssa sylvatica</i>	Black gum
<i>Platanus occidentalis</i>	Sycamore
<i>Quercus bicolor</i>	Swamp white oak
<i>Quercus palustris</i>	Pin oak
<i>Salix eriocephala</i>	Heart-leaved willow
<i>Salix nigra</i>	Black willow
<i>Ulmus americana</i>	American elm

OPEN WATER OW (SHALLOWS)

Open water areas will consist of ponds and stream channels. These areas are expected to remain wet most of the time. 2" plugs are to be planted along the wet edge of all open water. These initial plantings are expected to colonize readily after planting.

Specifications:

Stock	2" x 2" wetland plugs
Plugs	Min. 1-year stock
Quantities, plugs	1 every 3 feet of linear edge. Use on both sides of creeks.
Clustering	See planting details (Appendix 2)

SCIENTIFIC NAME	COMMON NAME
<i>Carex comosa</i>	Bottlebrush sedge
<i>Carex crinata</i>	Short hair sedge
<i>Carex hystriana</i>	Porcupine sedge
<i>Carex lacustris</i>	Lake sedge
<i>Carex lupulina</i>	Hop sedge
<i>Carex lurida</i>	Lurid sedge
<i>Carex stipata</i>	Awl-fruited sedge
<i>Carex stricta</i>	Tussock sedge
<i>Carex vulpinoidea</i>	Fox sedge
<i>Juncus effusus</i>	Soft rush
<i>Schoenoplectus acutus</i>	Great bulrush
<i>Schoenoplectus pungens</i>	Three square
<i>Schoenoplectus tabernaemontani</i>	Soft-stem bulrush
<i>Scirpus atrovirens</i>	Black bulrush
<i>Scirpus cyperinus</i>	Woolgrass

WILDLIFE AMENITIES

A small but representative quantity of wildlife amenities (or structures) has been specified. These structures are described below and specifications are included in Appendix 2 Planting Details.

- 1) Sand piles (quantity, 4) will consist of one cubic yard of sand placed in an 8-inch depression near water edges (Appendix 2, Figure 7). The piles will be about 4-feet across and will project above the surrounding soil surface by about 10 inches. These piles will be used by herpetofauna for egg laying.
- 2) Cavity nest boxes (quantity, 4) will be placed for nesting of wood ducks (Appendix 2, Figures 12-13, 17). Boxes will be placed in ponds on driven pipe as pairs.
- 3) A single kestrel nest box will be placed at an upland (Appendix 2, Figures 9,17)
- 4) Tree swallow nest boxes will be placed in grassland areas. 8 boxes will be placed. (Appendix 2, Figures 11, 17)
- 5) Bat roost boxes will be placed on posts in wooded planting areas. 4 structures will be placed (Appendix 2, Figures 10, 17).
- 6) Logs will be placed in ponds to provide protected emerging sites for herpetofauna and amphibians. 7 logs will be placed.(Appendix 2, Figures 6)
- 7) Two den structures will be constructed, one fox den and one snake hibernaculum. These structures will be constructed on embankments above the wetland basins (Appendix 2, Figures 14-15).
- 8) Brush piles (quantity, 7) will be placed for use by burrowing animals and field birds such as song sparrows (Appendix 2, Figure 16).
- 9) Rock placements in creeks (quantity, 5) will be made to provide protection for a wide range of aquatic species (Appendix 2, Sheet 1-pocket). These placements will be made at under-water locations along the side of the creek or edge of pond, as outlined on the included plans, so that their upper surfaces will not restrict water flow in the channel of the creek. The placements are to consist of 1 ton of gray gorge limestone per placement, in an area about 3 feet by 10 feet . This area can be increased if 1 ton adequately covers more than 3 x 10 area. The rock should be placed in a somewhat jumbled manner, rather than evenly.
- 10) Log and woody debris placement in forest areas is recommended. Sources of material, method of placement, and timing of placement is to be determined by the Restoration Ecologist.

STAGING AND LOGISTICS

This work is planned to be done in a one-year construction and planting period. This construction phase will be followed by a post construction monitoring period.

MONITORING AND POST-CONSTRUCTION MANAGEMENT OF THE SITE

These are both discussed in the Monitoring document (Appendix 3).

CONCLUSIONS

This plan, when constructed, will provide better than equivalent quality wetland habitat and function than wetlands disturbed as part of the FEMP cleanup work. The wetlands of the site will provide adequate replacement and compensation for all riparian, stream and vegetated wetland losses incurred by FEMP sitework. The work, as long as all aspects of the plan are constructed in concept and detail as presented here will provide a fully functional wetland system appropriate for the region and the site. The constructed wetland

will provide diverse habitat for aquatic and terrestrial organisms and will provide significant ecological values that will increase as the growth matures and thickens. The mitigation wetlands are expected to provide more diversity and values than were present on equivalent acreage under prior site conditions.

AUTHORSHIP AND TECHNICAL ASSISTANCE

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Editorial review, document production.

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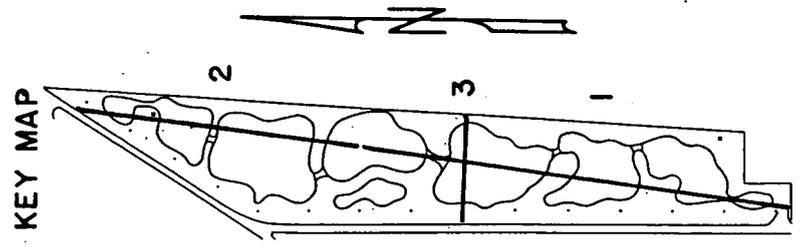
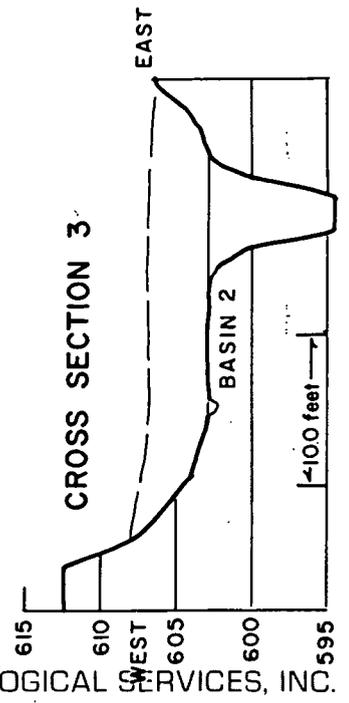
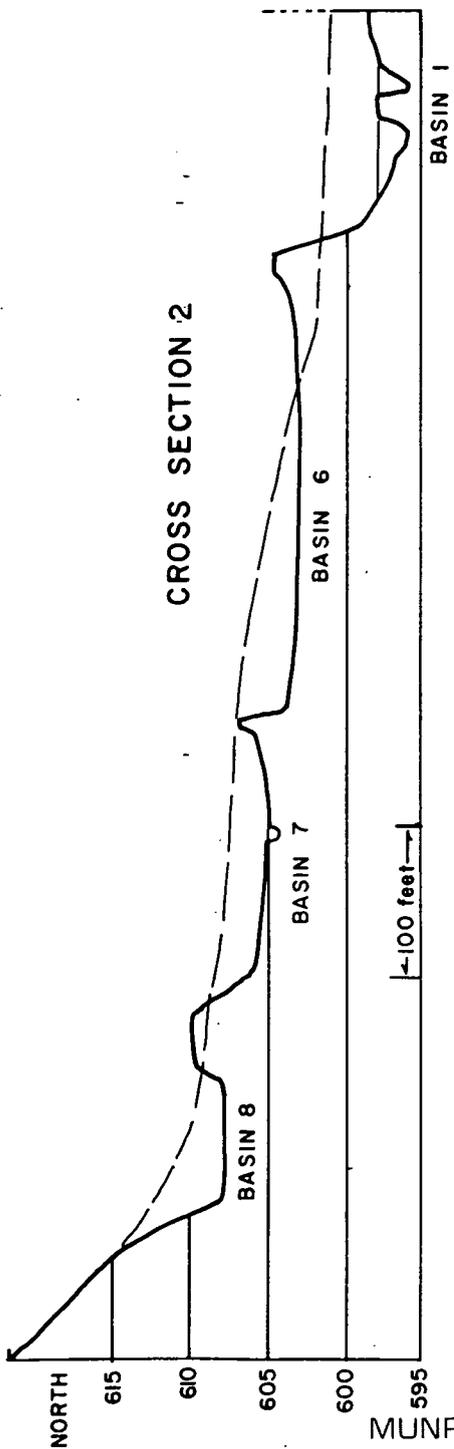
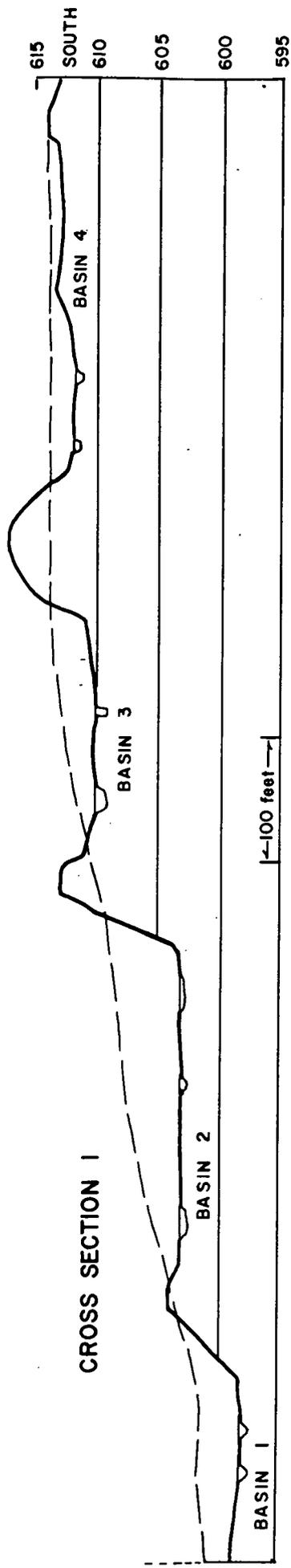


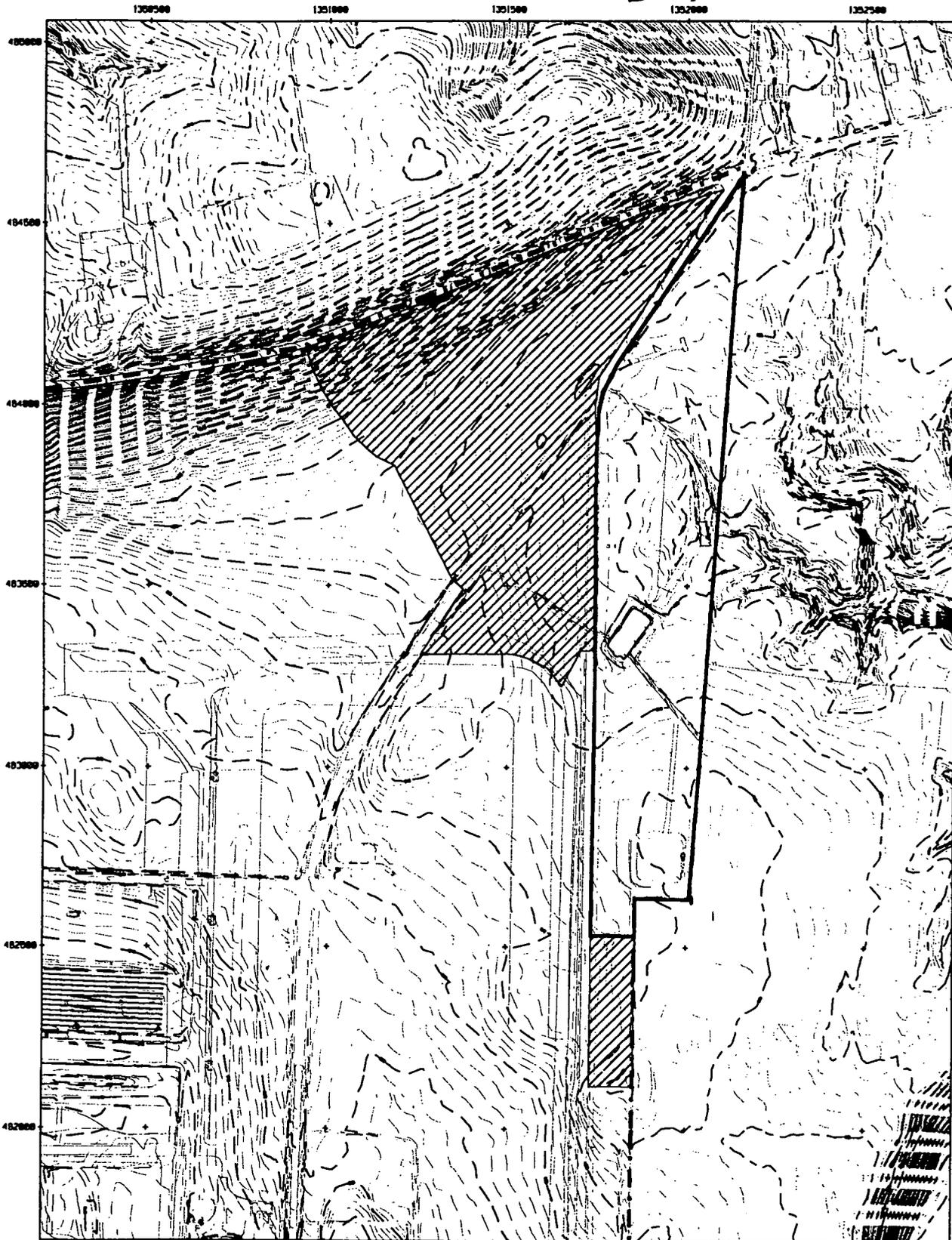
Figure 1. The typical cross sections shown here indicate the terracing of the site to achieve a series of wetland basins. The dashed line gives an approximation of the former natural land surface prior to removal of contaminated soils.

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STATE PLANNING COORDINATE SYSTEM 1983

22-FEB-1999



LEGEND:

--- FEMP BOUNDARY

▨ RECEIVING WATERSHED AREAS

000028

SCALE

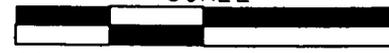
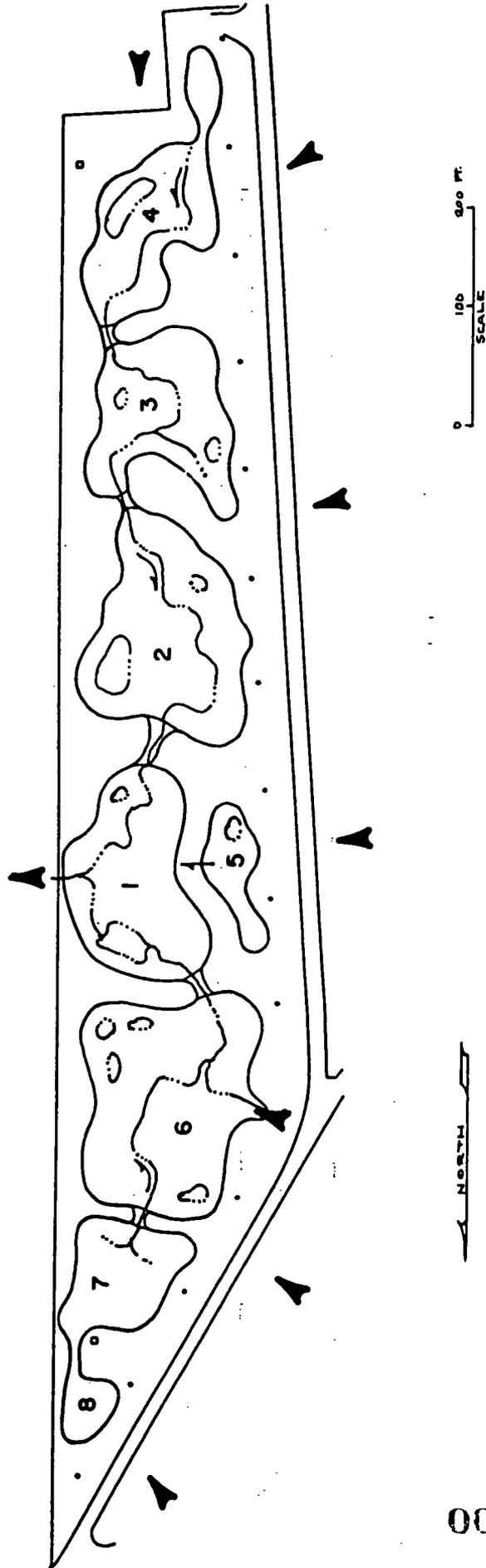


Figure 2. The watershed area for the mitigation site is approximately 20 acres. The watershed formerly included additional areas which have been shunted downslope by highway drainage features. Map supplied by MURRO ECOLOGICAL SERVICES, INC. FDF.



0 100 200 FT.
SCALE

NORTH

000029

Figure 3. The hydrology of the mitigation area is illustrated here. The small feeding watershed for the wetland mitigation area is generally to the west and south of the mitigation area. Some water enters the site from overland flow and some via pipe under the road. Basin #1 will collect all flows from the site.

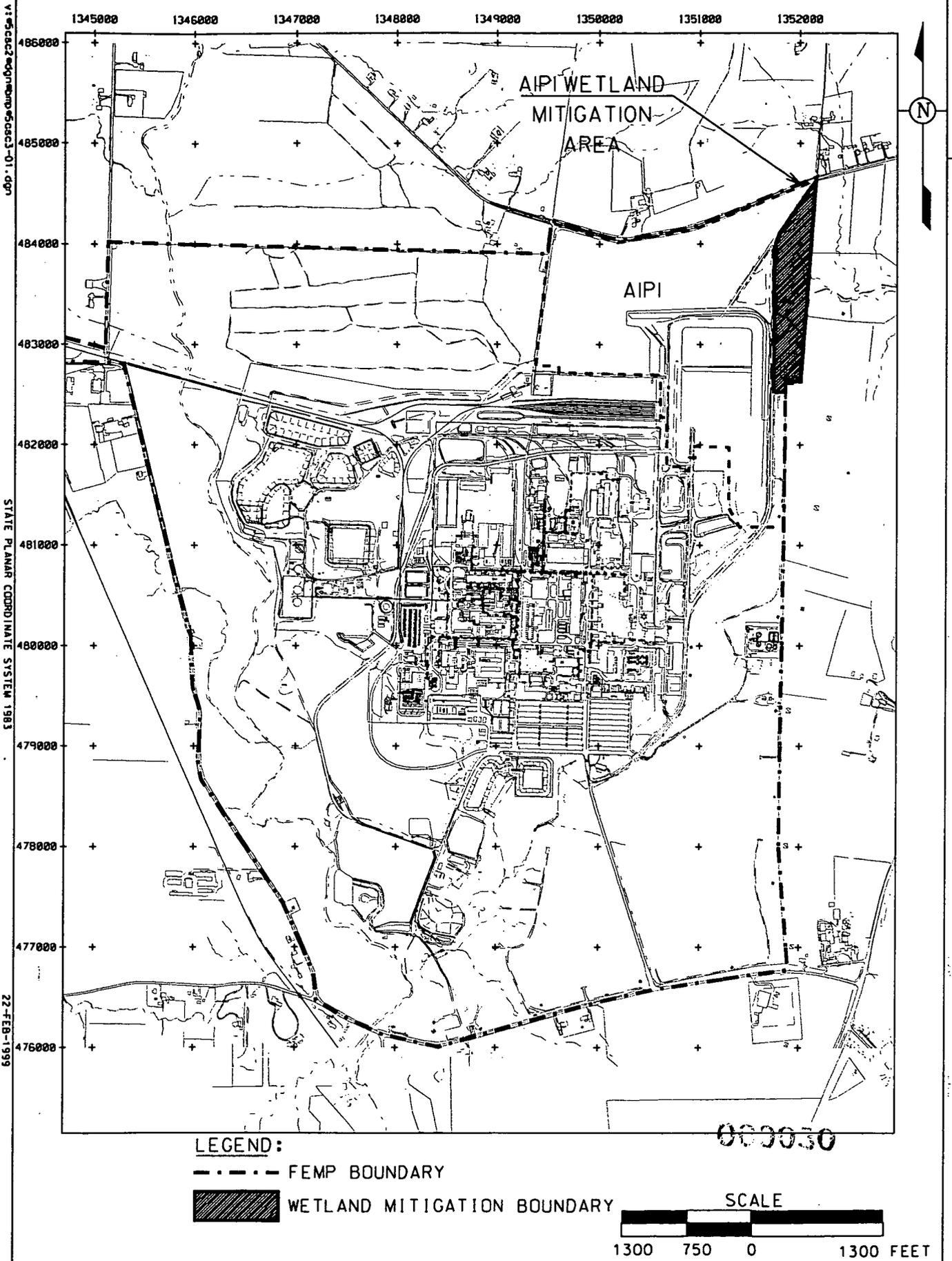
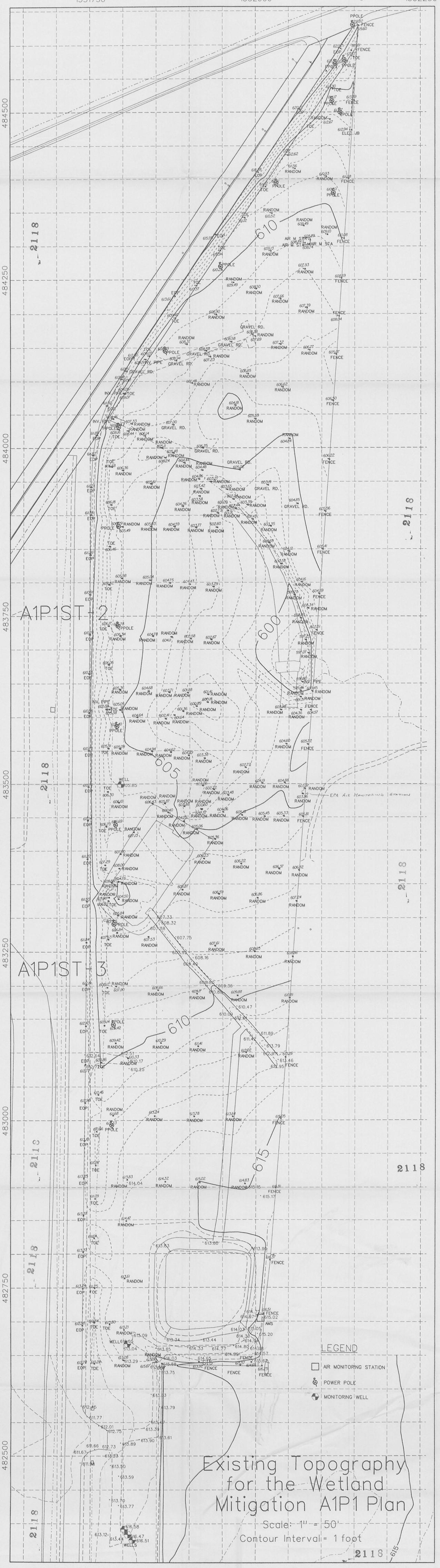


Figure 4. Location of the Area 1 Phase I wetland mitigation area on the FEMP site in Fernald, Butler and Hamilton Counties, Ohio. MUNRO ECOLOGICAL SERVICES, INC.



Existing Topography
for the Wetland
Mitigation A1P1 Plan

Scale: 1" = 50'
Contour Interval = 1 foot

- LEGEND**
- AIR MONITORING STATION
 - ⊗ POWER POLE
 - MONITORING WELL

2118

DRAFT
APPENDIX 1: CONSTRUCTION DETAILS,
WETLAND MITIGATION PLAN FOR THE
AREA 1, PHASE I MITIGATION SITE, FERNALD
ENVIRONMENTAL MANAGEMENT PROJECT
In Hamilton and Butler Counties Ohio

Revised
23 February 1999

Produced for: Fluor Daniel Fernald
7400 Willey Road
Fernald, Ohio 45013

Produced by: Munro Ecological Services, Inc.
990 Old Sumneytown Pike
Harleysville, PA 19438-1215

This document should be cited as: Munro, John W. 1999. Appendix 1: Construction details, wetland mitigation plan for the Area 1 Phase I mitigation site, Fernald Environmental Management Project. Munro Ecological Services, Inc., Harleysville, PA.

000032

PROJECT PARTICIPANTS

The work of constructing the Area 1 PHASE I wetland mitigation site will be done following all parts of this plan and will be supervised, according to the nature of the work by two individuals, and the work is to be done by two work groups. These are defined below:

Construction Engineer* - The Construction Engineer is to supervise, oversee, and provide quality control of all work related to earthwork, liner construction, installation of concrete and wooden water control structures, placement of renovated topsoil, placement of reference elevation markers, final grade adjustments and checking and production of the "red-line" maps (as-built maps) of the completed work.

Restoration Ecologist* - The Restoration ecologist is to supervise, oversee, and provide quality control of all work related to mixing of topsoil amendments, salvaging of plants, inspection and approval of purchased live material, seeding, planting, mulch and straw application, fertilizer placement, placement of woody stock in patches, watering, and planting materials handling,

Grading Contractor - The Grading Contractor is to provide all work related to excavation, liner construction, topsoil handling, topsoil renovation, water control structure installation,

Planting Contractor - The Planting Contractor is to provide all work related to seeding, planting, watering, - fertilizer placement, fence installation, small structure installation, mulch placement, erosion control, and other tasks described in the planting details appendix.

* The Restoration Ecologist and the Construction Engineer will jointly supervise and oversee the layout of planting patches with Planting Contractor assistance. They will also need to coordinate their separate roles regarding the mixing and application of renovated topsoil.

The Construction Engineer and the Restoration Ecologist will work together and coordinate all activities on the site so the work proceeds smoothly and that crews are used efficiently.

SCHEDULE

Earthwork is to be done in a progression as noted on plans. Three Sections are specified on Section pages and on the grading plan (Sheet 2, in pocket). The Sections are to be constructed in numerical order by section. Earthwork within each section is to proceed from northern end of the site to southern end. Within each section, work on separate basins should be staged so that as soon as one basin is completed, it can be vacated by the earthwork contractor and be made available for planting and stabilization work by the planting contractor.

LOGISTICS AND STAGING OF EARTHWORK

Topsoil, the top 12" of soil on the existing site, is to be stripped from each work area before any further work proceeds. The topsoil is to be stockpiled outside of the work area until it is needed for replacement on top of the re-graded contours.

The topsoil pile is to be managed per applicable site and standard erosion and sediment control practices. The topsoil stockpiles are not allowed to remain for more than one week or they are to be surrounded with straw bale or standard silt fence perimeter to prevent erosion of the topsoil from the pile.

Areas outside the wetland basins are to be over-excavated by 12" to allow for replacement of renovated topsoil after re-grading is completed.

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Work is to be staged so that it proceeds incrementally basin-by-basin as noted in the following listing:

- Basin # 8 first
- Basin # 7
- Basin # 6
- Basin # 5
- Basin # 1
- Basin # 2
- Basin # 3
- Basin # 4 last

The work is to be staged so that the planting contractor can move into a basin as soon as construction is completed per plan and meets engineering and ecological approvals. The approvals process must be quick so that seasonal windows are not missed. The work is designed to be started in early spring (March) and completed during 1999, in order to avoid complications including:

Long delays in mid-construction forcing temporary seeding, stabilization, re-tilling and reseeding.

Planting during very hot or very dry conditions which entails much greater risk and expense.

Increased costs due to repeated construction mobilization/demobilization due to erratic work flow.

Construction and planting strung-out over more than one season will require much double work on many aspects of the site construction labor.

If earthwork delays prevent all grassland from being planted by 1 June, planting must be postponed until September due to grass germination and growth requirements.

As with all earthwork construction jobs, precipitation will likely cause some delays. Earthwork should be shut down at appropriate times to avoid too much "churning, pumping, and slurry formation". Thin mud skins can be pushed aside and allowed to dry after precipitation occurs.

Earthwork final elevation tolerances

Earthwork final elevation tolerances are established to assure that the new site contours support the planned vegetation. Grading within the wetland areas is more critical since a small error will produce conditions that will not support wetland plants. The final grading allows for some natural randomization and is not required to be "putting green" perfect. At the same time the specified tolerances must be adhered to as follows:

WITHIN WETLAND BASIN -

Planting areas - Grading errors of no more than + or - 0.2 foot at spot locations (small high and low spots) will be allowed. The average grade must be at the specified elevation.

Open water areas - Grading errors of no more than + or - 0.5 foot at spot locations (small high and low spots) will be allowed. The average grade must be within + or - 0.2 feet of the specified elevation.

UPLAND AREAS OUTSIDE OF BASINS -

All planting areas - Grading errors of no more than + or - 0.5 foot at spot locations (small high and low spots) will be allowed. The average grade must be within + or - 0.2 feet of the specified elevation.

000034

Variation from expected topographic conditions

Due to the fact that the provided existing contour map is based on conditions prior to the now-completed stripping of contaminated surface materials from the site for disposal - including follow-up stabilization and sediment management modifications to the site - the exact topography of the existing site is not known. Without this information no accurate earthwork balance can be performed. The planned topography can be constructed with a possible net export of materials from the site. The possibility of need for import of soil to the site was minimized as part of the site design. It may be necessary to make a choice between export of materials from the site and raising of one or two basins by 2 feet to accommodate an earthwork balance. The planned buffering hills along the roadside may also be vertically expanded within limits to allow for more soil placement on the mitigation site. The need for such modifications will only be known during the latter part of Section 2 of the work.

TOPSOIL RENOVATION

The Restoration Ecologist and Construction Engineer are to supervise all aspects of soils renovation. Topsoil is to be mixed with a minimum of 5 pounds of wood chips sawdust, or composted leaf mulch per square foot of surface area to be covered (5 pounds per cubic foot of topsoil being mixed). The mixing may be by either of two standard methods:

- 1) Excavator and dump truck - Excavator will work from a location adjacent to both topsoil stockpile and wood chip stockpile. The excavator will load two buckets of topsoil into a dump truck. The bucket will be dumped so that the soil is spread rather than being placed in a lump. The excavator will then dump a single bucket of wood chips over the previously dumped topsoil. This process will continue, two buckets of topsoil alternated with one bucket of wood chips until the dump truck is full. The truck will then dump and partly spread the partly mixed materials at a location where the "renovated topsoil" is to be placed. This process produces a double mixing of topsoil and wood chips prior to final spreading and grading. A (moderate to light ground pressure) bulldozer will be used to spread the topsoil to the specified elevation and thickness on the site per plan specifications. To the extent possible the equipment operators are to maximize the materials mixing and avoid placing lumps of soil that does not contain wood chips, or placing large wood chip clumps in the final mixed and renovated soil. Compaction of the topsoil is to be minimized. The renovated topsoil is to be left in a condition hospitable to seeding and planting of woody stock.
- 2) Excavator and pan - A hydraulic excavator (or other appropriate handling machine) will place a flat layer of wood chips over a flat strip of topsoil. The wood chip thickness is to be one half the thickness of the topsoil thickness to be picked up by the pan (pan picks up 6 inches of topsoil covered by 3 inches of chips or 12 inches of topsoil covered by 6 inches of chips). The pan then hauls the once-mixed material to the topsoil deposit location and strip-dumps the load. A (moderate to light ground pressure) bulldozer will be used to spread the topsoil to the specified elevation and thickness on the site per plan specifications. To the extent possible the equipment operators are to maximize the materials mixing and avoid placing lumps of soil that does not contain wood chips, or placing large wood chip clumps in the final mixed and renovated soil. Compaction of the topsoil is to be minimized. The renovated topsoil is to be left in a condition hospitable to seeding and planting of woody stock.

GRADING SPECIFICATIONS

After topsoil is stripped from the basin being worked, the basin is to be rough graded to approximate contours, and then fine graded. The bottom of each basin is to be provided with a clay liner for water containment (see liner construction). Each basin liner area will be over-excavated to specified elevations. Clay for liner material will be selected from suitable materials and suitable soil horizons as found in the mitigation area during basin excavation. Over-excavation for clay material may be necessary if suitable clay is confined to

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limited locations on the site. The Construction Engineer is to supervise all aspects of selection and excavation of clay liner material.

CLAY LINER

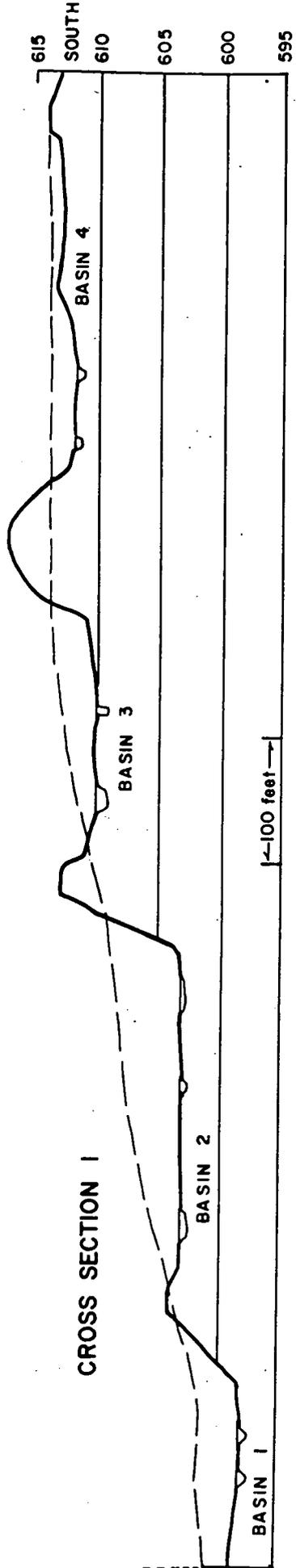
A clay liner of 12" under wetlands and 24" under open water (Figure 2) will be constructed under each wetland basin. The liner (excavated on site) is placed so that its top surface is two feet below the normal pool elevation for each basin. Clay liner is to be placed per construction detail (Figure 2). Clay from the site is to be selected and approved by the Construction Engineer. It is recommended that test pits be excavated prior to site earthwork to determine where suitable clay in sufficient quantity exists on the site, and if excavation beyond the mitigation basins is needed in order to remove the needed clay. Clay is to consist of uniform clay and silt particulate matter with very little sand, granular inclusions, or rock. Rock content of more than 15% or rock inclusions of greater than 4" will disqualify the material as suitable liner material. The clay is to be tested for compaction via nuclear density testing at suitable locations in each basin. Liner must exceed 85% modified proctor. Liner is to be compacted using standard vibration-compaction roller or equivalent equipment and is to be rolled smooth.

If suitable suitable liner material is found to exist at liner-specified locations and elevations, liner will be excavated and re-distributed to assure uniformity and lack of problem inclusions.

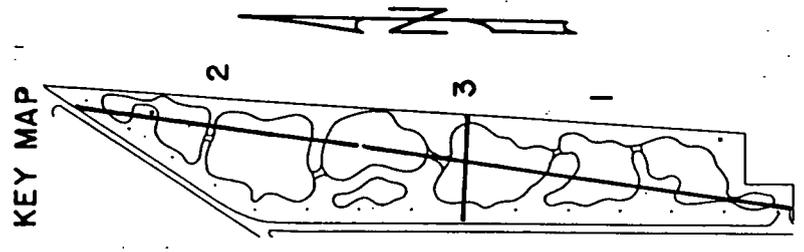
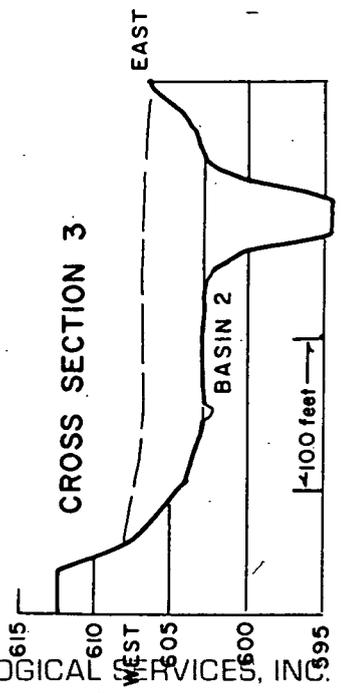
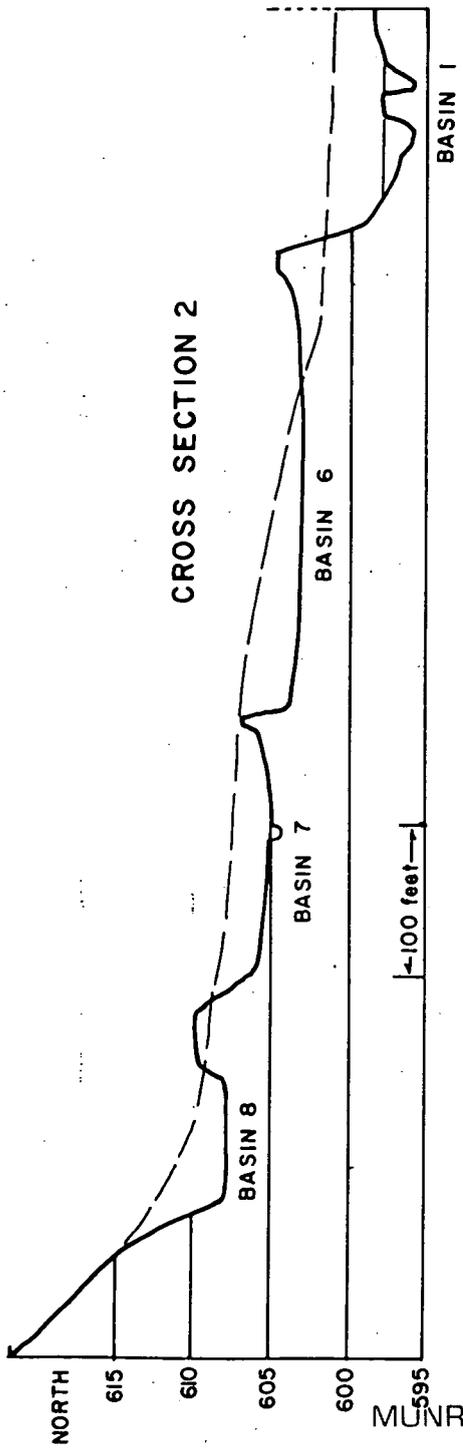
AS-BUILT (AS-CONSTRUCTED) DRAWINGS

The Construction Engineer will supervise the production of a "red-line" style as-constructed topographic map of the site. The Map will consist of a copy of the original grading plan for the mitigation site with red lines and red notations wherever construction and elevations are constructed differently from the plan. The as-constructed drawing will be prepared as portions of the work completes so that it does not impede the important work of stabilizing and planting the basin. All acceptable deviations from the original plan must be within the tolerance ranges established, be changes accepted (with signed documentation by the Restoration Ecologist and the Construction Engineer), or be "minor and of no significance to the wetland mitigation plan" as determined (and signed) by the Restoration Ecologist. All other deviations from the original grading plan must be corrected prior to release of each basin to the planting contractor.

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Figure 1. The typical cross sections shown here indicate the terracing of the site to achieve a series of wetland basins. The dashed line gives an approximation of the former natural land surface prior to removal of contaminated soils.

CLAY LINER INSTALLATION CROSS SECTION

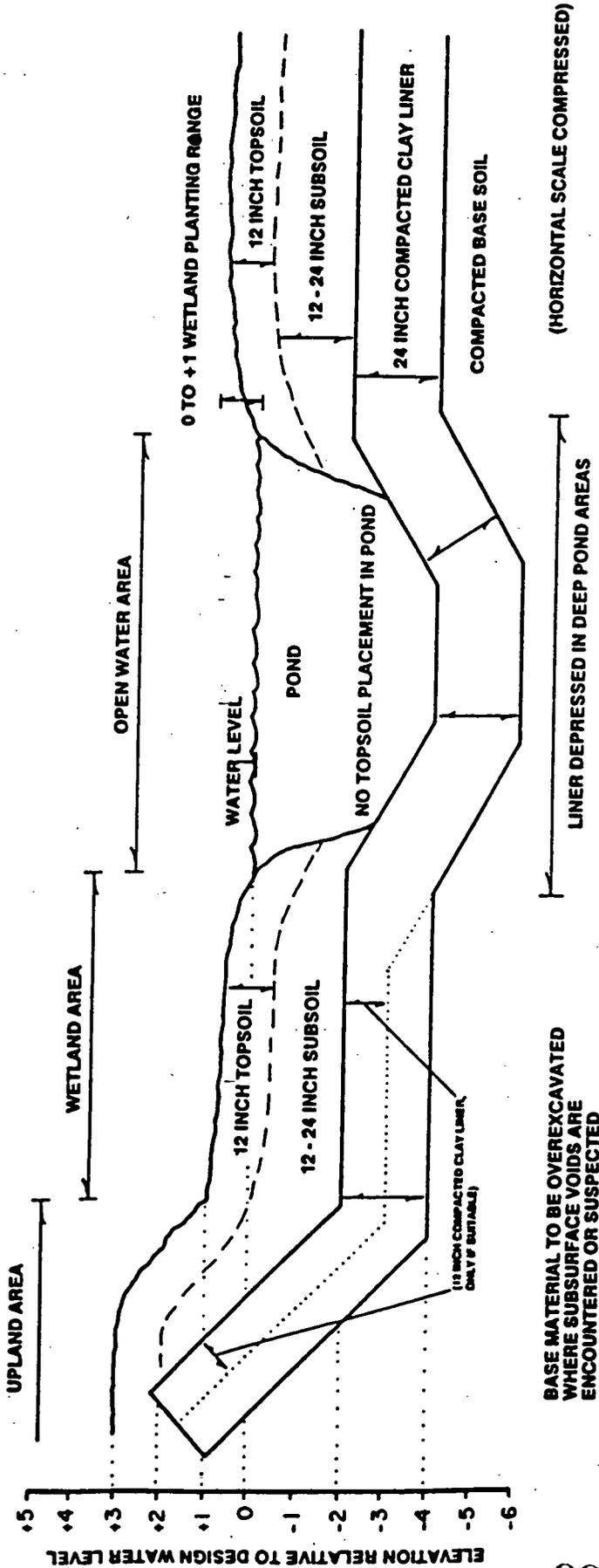


Figure 2. Clay liner is to be present under the entirety of each basin. The relationship of water level to top of liner, a 2 foot vertical offset, is consistent for all basins. Overexcavation of each basin followed by liner installation, compaction, density testing, and then placement of specified topsoil will be the order of work.

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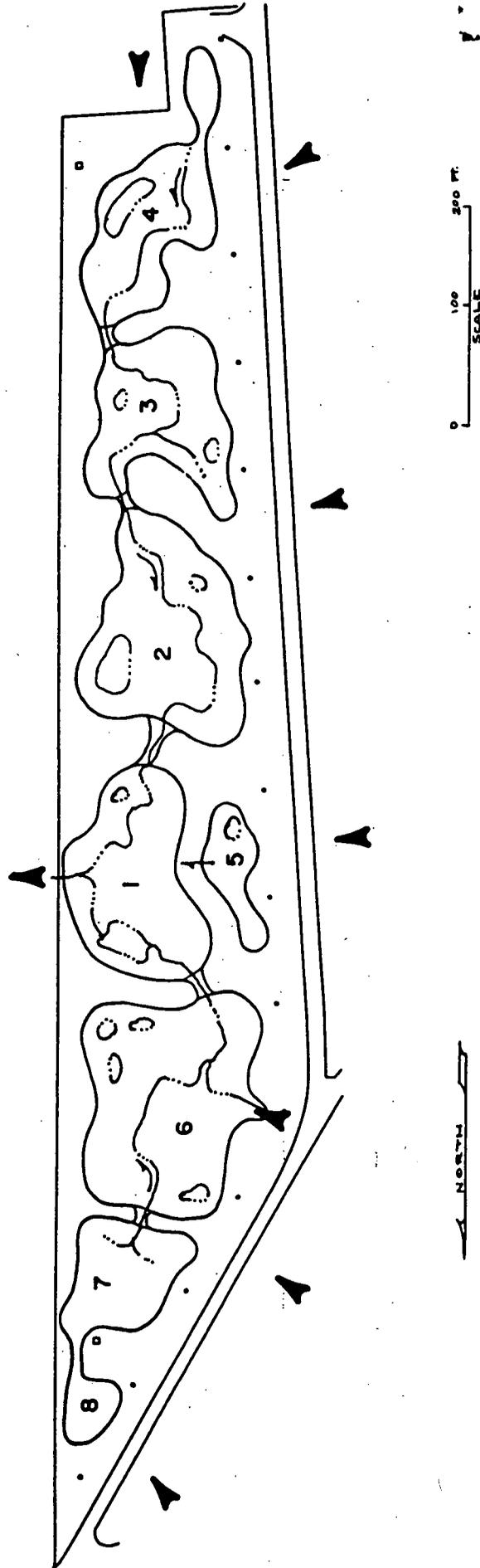


Figure 3. The hydrology of the mitigation area is illustrated here. The small feeding watershed for the wetland mitigation area is generally to the west and south of the mitigation area. Some water enters the site from overland flow and some via pipe under the road. Basin #1 will collect all flows from the site.

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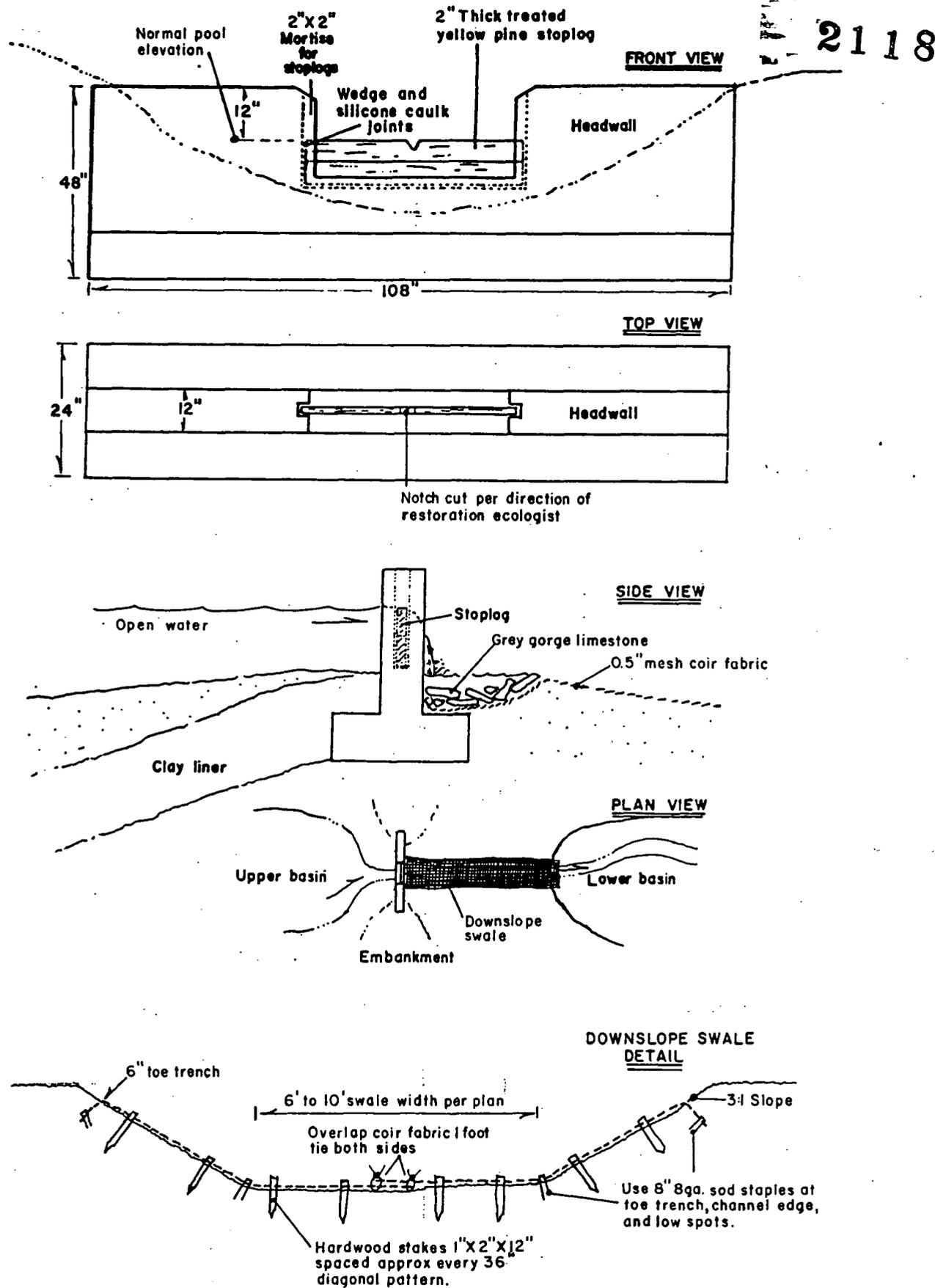
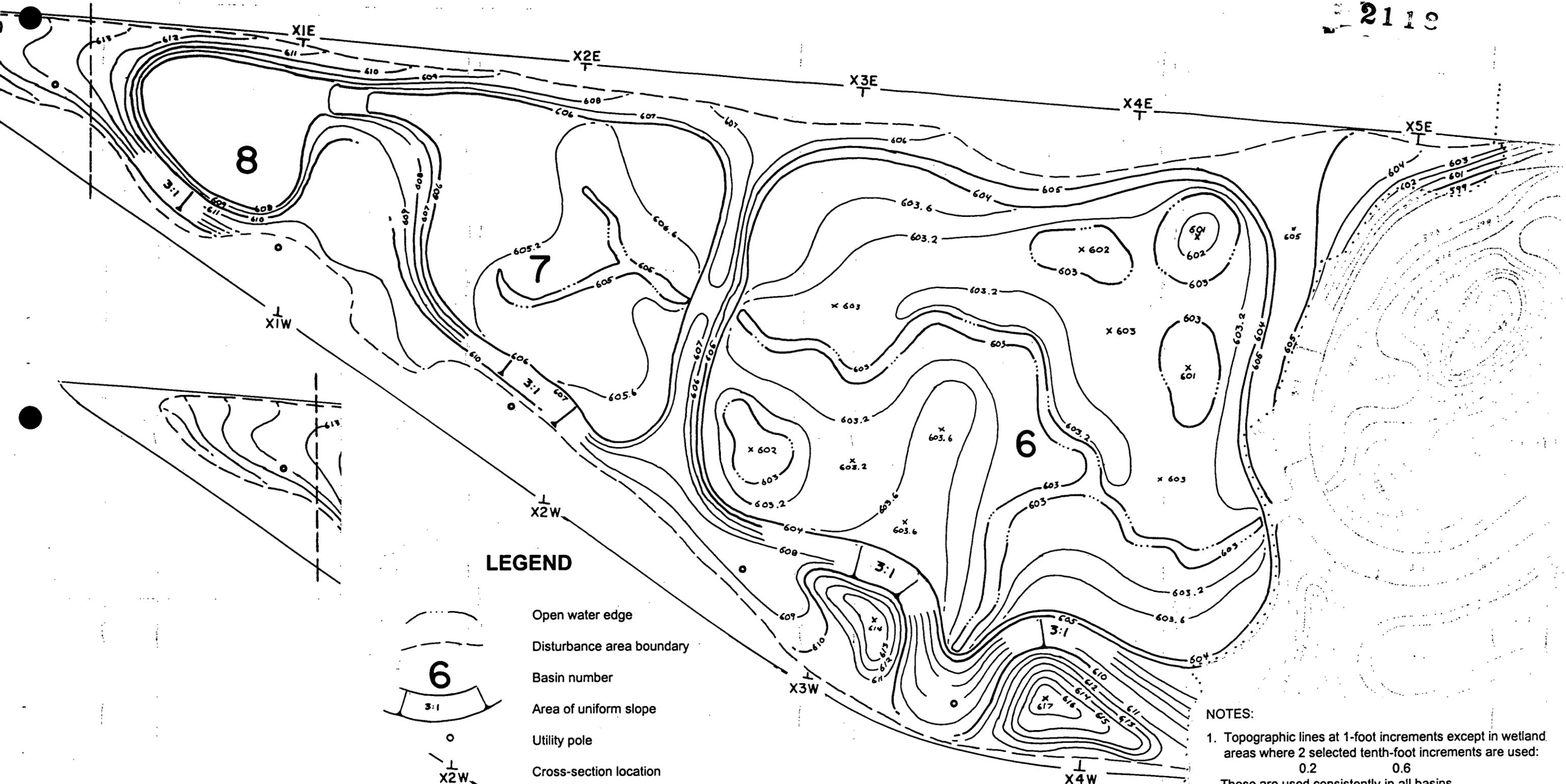


Figure 4. Detail and installation of standard precast concrete headwall and discharge swale proposed for Basins 3, 2, and 6. Stoplog mortise to be cast as "blockouts" by manufacturer. Structure to be placed on flat compacted clay base. No gravel or stone is to be placed under the headwall. Soil and clay will be compacted around the headwall to seal the structure from leaks. Powder-form bentonite may be used to seal concrete to soil. Structure must be placed level.

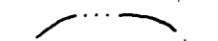
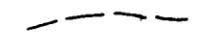
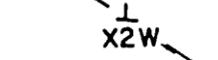
Basin #	Water level	Wetland growth elevation range	Structure invert elevations	Outlet structure type	Contractor performing work	Top of liner
Basin #1	598	597-599	598	Single log, 10' swale	Planting	596
Basin #2	603	602-604	603 603.5	Pole drain, 3' swale Concrete, 6' swale	Planting Earthwork	601
Basin #3	610	609-611	610.5 610	Concrete, 10' swale Pole drain, 3' swale	Earthwork Planting	608
Basin #4	612	611-613	612	Single log at crest 6' swale	Planting	610
Basin #5	603	602-604	603	Pole drain, 3' swale	Planting	601
Basin #6	603	602-604	603	Concrete, 10' swale	Earthwork	601
Basin #7	605	604-606	605	Single log at crest 6' swale	Planting	603
Basin #8	608	608-609	608.4	Fabric only Full width swale	Planting	606

Table 1. Construction and engineering features of wetland basins

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LEGEND

-  Open water edge
-  Disturbance area boundary
-  Basin number
-  Area of uniform slope
-  Utility pole
-  Cross-section location
-  Spot elevation
-  Creek (all 1 foot deep)

NOTES:

1. Topographic lines at 1-foot increments except in wetland areas where 2 selected tenth-foot increments are used:
0.2 0.6
These are used consistently in all basins.
2. Topographic source map undated, contour intervals not labeled, spot elevations at variance with contour lines, and source information date not provided.

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 990 OLD SUMMERTOWN PIKE, HARLEYSVILLE, PA 17438-1215
 24 JAN 1999 JWM



SECTION 1

SECTION 2

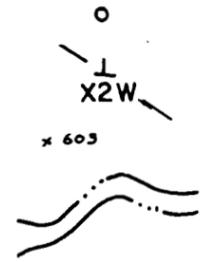
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LEGEND



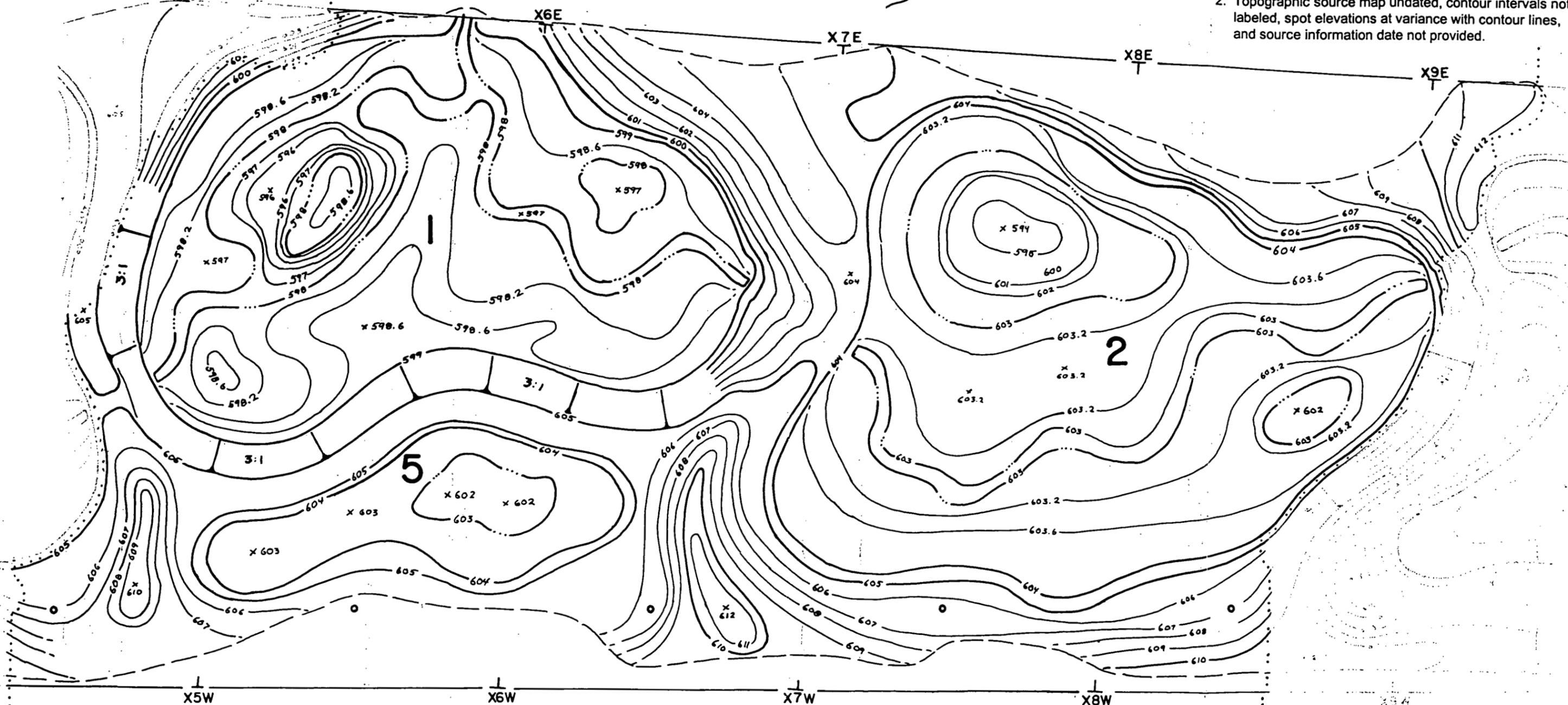
- Open water edge
- Disturbance area boundary
- Basin number
- Area of uniform slope



- Utility pole
- Cross-section location
- Spot elevation
- Creek (all 1 foot deep)

NOTES:

1. Topographic lines at 1-foot increments except in wetland areas where 2 selected tenth-foot increments are used:
0.2 0.6
These are used consistently in all basins.
2. Topographic source map undated, contour intervals not labeled, spot elevations at variance with contour lines, and source information date not provided.



SECTION 2

SECTION 2 SECTION 3

MUNRO ECOLOGICAL SERVICES, INC.
990 OLD SUMNEYTOWN PIKE, HARLEYSVILLE, PA 19438-1265
JWM 24 JAN 1999

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SECTION 3

LEGEND

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NOTES:

- Topographic lines at 1-foot increments except in wetland areas where 2 selected tenth-foot increments are used:
0.2 0.6
These are used consistently in all basins.
- Topographic source map undated, contour intervals not labeled, spot elevations at variance with contour lines, and source information date not provided.



Open water edge

Disturbance area boundary

Basin number

Area of uniform slope

Utility pole

Cross-section location

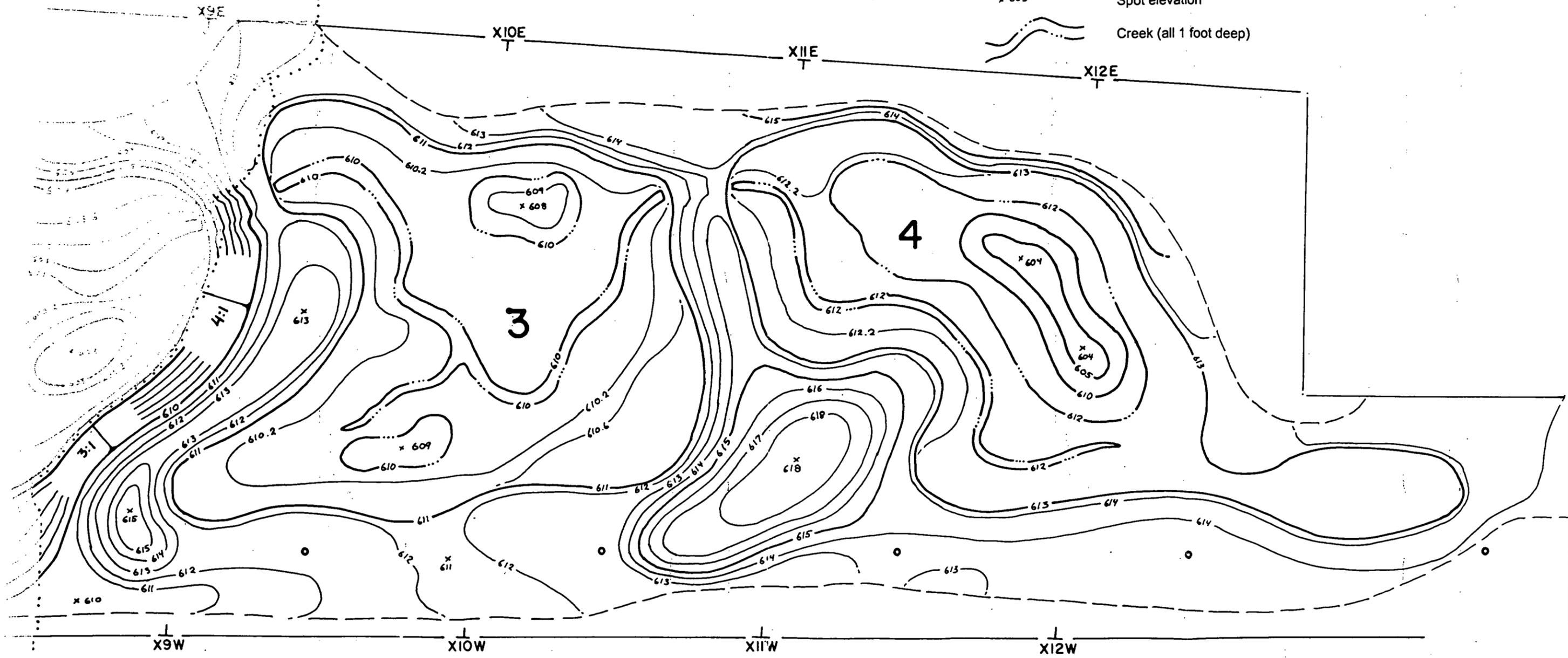
Spot elevation

Creek (all 1 foot deep)

X2W

x 603

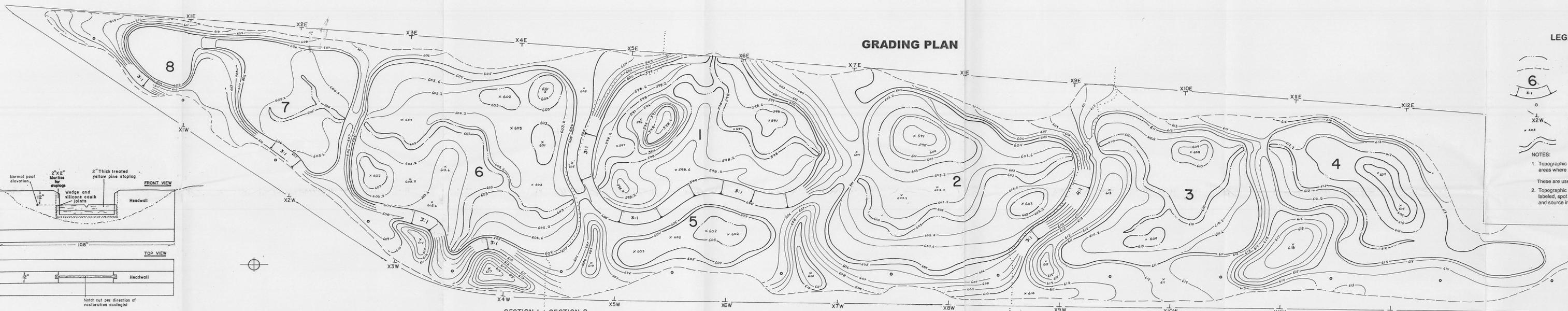
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SECTION 3

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JWM 24 JAN 1999

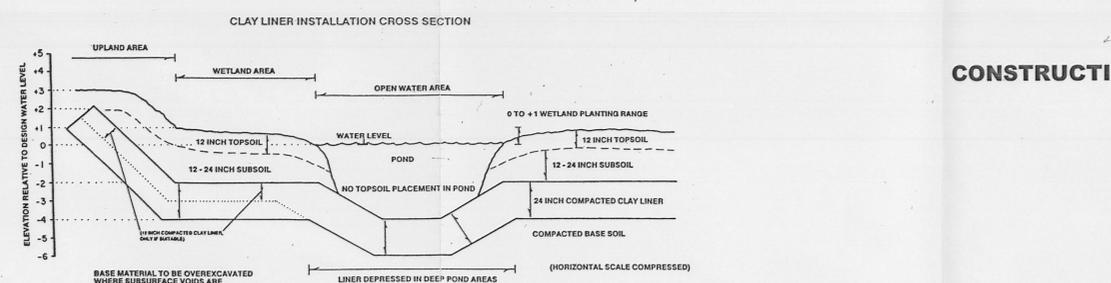
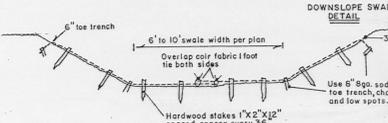
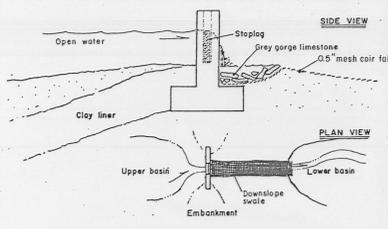
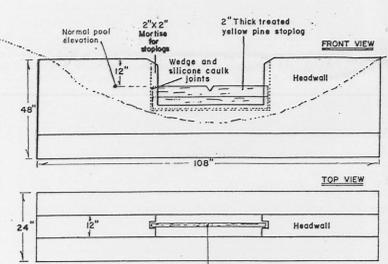
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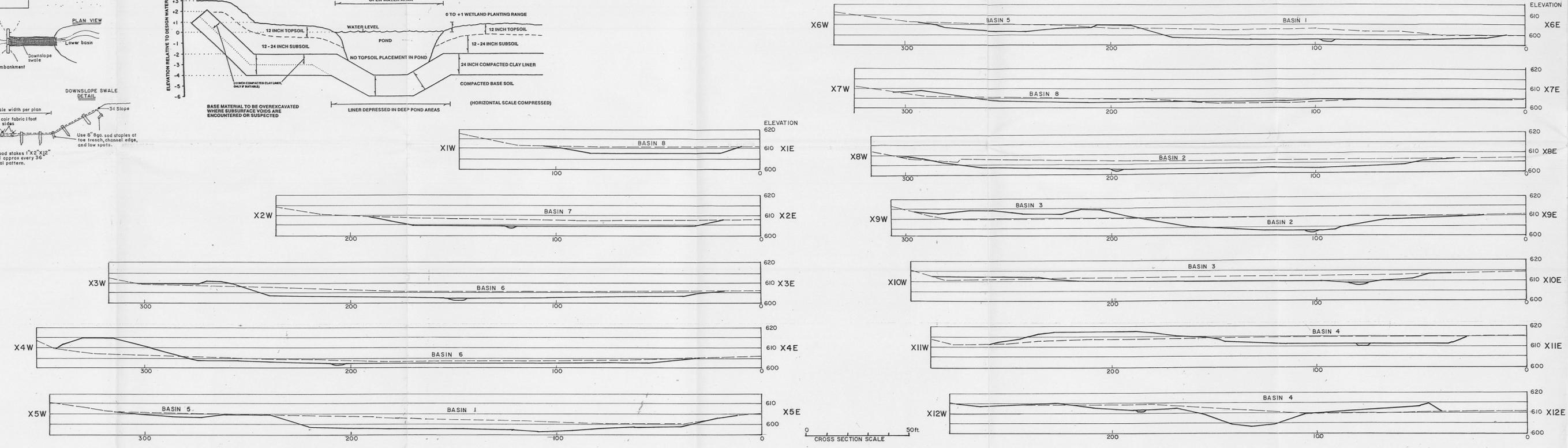
LEGEND

- Open water edge
- Disturbance area boundary
- Basin number
- Area of uniform slope
- Utility pole
- Cross-section location
- Spot elevation
- Creek (all 1 foot deep)

NOTES:
 1. Topographic lines at 1-foot increments except in wetland areas where 2 selected tenth-foot increments are used: 0.2, 0.8. These are used consistently in all basins.
 2. Topographic source map undated, contour intervals not labeled, spot elevations at variance with contour lines, and source information date not provided.



CONSTRUCTION CROSS SECTIONS



**FEMP, AREA 1 PHASE I
 WETLAND MITIGATION SITE
 SHEET 2**

MUNRO ECOLOGICAL SERVICES, INC.
 990 OLD SUMNEYTOWN PIKE, HARLEYSVILLE, PA 19438-1215
 JWJM 26 JAN. 1999

DRAFT
APPENDIX 2: PLANTING DETAILS,
WETLAND MITIGATION PLAN FOR THE
AREA 1, PHASE I MITIGATION SITE, FERNALD
ENVIRONMENTAL MANAGEMENT PROJECT
In Hamilton and Butler Counties Ohio

29 January 1999

Produced for: Fluor Daniel Fernald
7400 Willey Road
Fernald, Ohio 45013

Produced by: Munro Ecological Services, Inc.
990 Old Sumneytown Pike
Harleysville, PA 19438-1215

This document should be cited as: Munro, John W and Thomas R. Witmer. 1999. Appendix 2: Planting details, wetland mitigation plan for the Area 1 Phase I mitigation site, Fernald Environmental Management Project. Munro Ecological Services, Inc., Harleysville, PA.

000046

PROJECT PARTICIPANTS

The work of constructing the Area 1 PHASE I wetland mitigation site will be done following all parts of this plan and will be supervised, according to the nature of the work by two individuals, and the work is to be done by two work groups. These are defined below:

Construction Engineer* - The Construction Engineer is to Supervise, oversee, and provide quality control of all work related to earthwork, liner construction, installation of concrete and wooden water control structures, placement of renovated topsoil, placement of reference elevation markers, final grade adjustments and checking and production of the "red-line" as constructed map of completed work.

Restoration Ecologist* - The Restoration ecologist is to supervise, oversee, and provide quality control of all work related to mixing of topsoil amendments, salvaging of plants, inspection and approval of purchased live material, seeding, planting, mulch and straw application, fertilizer placement, placement of woody stock in patches, watering, planting materials handling,

Grading Contractor - The Grading Contractor is to provide all work related to excavation, liner construction, topsoil handling, topsoil renovation, water control structure installation,

Planting Contractor - The Planting Contractor is to provide all work related to seeding, planting, watering, fertilizer placement, fence installation, small structure installation, mulch placement, erosion control, and other tasks described in the planting details appendix.

* The Restoration ecologist and the Construction Engineer will jointly supervise and oversee the layout of planting patches with Planting Contractor assistance. They will also need to coordinate their separate roles regarding the mixing and application of renovated topsoil.

The Construction Engineer and the Restoration Ecologist will work together and coordinate all activities on the site so the work proceeds smoothly and that crews are used efficiently.

SCHEDULE

The order of work in each basin is as follows:

- Salvage of ironweed on site (all basins)
- Mixing and placement of amended topsoil
- Placement of minor water control structures
- Planting of salvaged stock
- Planting of purchased stock
- Seeding
- Wood chip and mulch placement
- Placement of wildlife structures
- Inventory planted stock
- Check plant stock survival/cover
- Replacement of dead woody plant material

All wetland planting is expected to begin in spring 1999 after earth work is completed in each basin. The work is to be done on a section by section basis. One section should be completed before the next section is started. Planting cannot be started until earthwork in each basin is entirely completed. In the event of excess dryness or heat the planting work should be halted and continued when good planting conditions resume.

All landscaping and other activities undertaken as part of planting of the mitigation site are to be coordinated by the Restoration Ecologist. Any problems encountered during the construction process are to be solved by the Restoration Ecologist, and all changes to the plans contained herein are to be brought immediately to the

000047

attention of the Restoration Ecologist. The Restoration Ecologist must also make an as-built map of the planted areas to reflect any changes. Documented changes and as-built maps are to be included in the monitoring report.

COVER TYPE CONSTRUCTION

Each section has been further divided into several types or "patches," depending on topography and other factors. Plants are specified for each cover type "patch" within the section. Seven cover types have been specified for the mitigation wetlands. They are:

Cover type	Area (acres)
Upland forest	1.44
Upland shrub	1.12
Upland grassland	3.80
Swamp forest	0.70
Shrub swamp	0.95
Marsh	2.74
Wet prairie	0.74

In addition to these, open water comprises 1.11 acres, and roads comprise 0.27 acres.

SALVAGE OF EXISTING PLANT STOCK ON SITE

The Planting Contractor will salvage 100 tall ironweed (*Veronia gigantea*) plants on the site for use in the mitigation areas. The work will consist of hand-digging the stock, wrapping root masses in material that will last 6 months, and moving the stock to a holding area near the mitigation basins until regrading is completed. Digging of the rootstock is best done during early spring before the plants begin to leaf out. The planting contractor is responsible for mulching-in the plants in the storage area and for watering as necessary until they are replanted. All standard landscaping precautions are to be used during this salvage work. The work must be done prior to earthwork because the stock is in the mitigation area footprint. These plants are to be planted in areas of the upland grassland in locations that are visible from the road. Planting patches that are to include salvaged ironweed are noted on the patch pages. The work must be coordinated by the Restoration Ecologist

PLANT STOCK AND PLANTING SPECIFICATIONS

The following paragraphs provide guidelines by which the project Restoration Ecologist can accept or decline plant stock that is shipped to the site, and ensure proper planting by the planting contractor. The contractor will adhere to all landscaping standards and practices during the specified work. Landscaping is to be undertaken in accordance with the instructions contained in this appendix.

Stock inspections

The Restoration Ecologist will inspect plant stock shipped to the site when it arrives. Stock is to be checked for proper species and labeling, general health, and minimum size as elaborated in the following sections. The Restoration Ecologist is to reject stock that does not meet specifications, and not allow the stock to be unloaded and stored at the site. If the stock is acceptable, the planting contractor will place it in the designated holding area in Section 3 (See holding area description below).

000048

Labeling

The Restoration Ecologist should insure that every woody plant shipped to the site has an original nursery tag indicating the scientific name of the plant. Common names are not acceptable since they can often cover a number of different species. The plant names must match those specified in the species list for the project. No cultivars (cultivated varieties) or hybrids are acceptable. Plants that are unlabeled or improperly labeled are not to be accepted. Labels should be securely attached and they should be written with a permanent marker or by embossing so that they remain through the following year's inspection. They should not damage the plant or restrict its growth. Labels are to remain on the plants even after they are planted to allow for identification during survival determinations.

Stock condition

All tree and shrub stock must have healthy and vigorous branches, twigs, buds, and leaves, and the main stem must be free of damage from disease, mishandling, or poor pruning. Plants that have evidence of stress, disease, dieback, or mishandling, before or after planting, should be rejected. No bare root plants are acceptable. All potted stock must have been grown in the current pots rather than be recent transplants into the pots. All B&B material is to have been appropriately root-pruned and prepared for transplant. It is expected that wilt-proofing agents will be used to minimize stress during transport and planting. The general shape and symmetry of the stock is unimportant, as the emphasis is on the natural rather than manicured landscape conditions.

Minimum sizes

Minimum sizes are specified for all species called for in this planting plan. Smaller specimens than those so listed should not be accepted. Plant stock sizes are specified in the table in this document. It is recommended that stock be ordered on a **minimum size basis** rather than on an **average size basis** or **size range basis**. Suppliers provide size specifications in all of the above methods. When ordering is done it is important to communicate exact specifications and have suppliers confirm the availability of stock in those sizes prior to shipping. If terms are left uncertain, stock will arrive in less than specified size.

Stock larger than specified is acceptable, particularly if specified stock is unavailable. If the only stock available for a certain species is smaller than specifications direct and no other supplier can be found, the basis for downsizing specifications should be on the basis of equal or greater cross sectional area at caliper height (6" above ground). Downsizing from 1 inch stock to 0.5 inch stock therefore requires three or four 0.5 inch plants rather than two to replace a single one inch plant.

Open-grown stock

All trees of 1.5" caliper and larger must be open grown stock and characterized by a vigorous branching system. The crown width must be no less than half the height of the tree.

Root balls

Root balls for all balled and burlapped specimens for which a minimum size is specified must be a width and depth sufficient to 1) provide adequate root surface, especially feeder root surface, to ensure survival under normal growing conditions, and 2) provide adequate root and soil mass to hold the plant upright. Where the root ball is slightly undersized and does not anchor the plant in an upright position the plant must be staked. Staking should not scar or damage the tree in any way. The need for staking of specific trees will be determined by the restoration ecologist.

Stock holding area

Plant stock should be stored at the southeast corner of the site, since site construction will progress from north to south. B&B stock must be stored in chip beds. Trees should be stored in a vertical position. Stock should be watered frequently, as soil in pots will dry out quickly in warm, dry, or windy weather.

Soil amendments

The Restoration Ecologist and Construction Engineer must supervise the soil amendments as detailed in the construction document (Appendix 1).

Planting

All planting is to be done according to the plans and patch pages in this appendix. All stock names, sizes, and quantities are provided in Table 2.

All specimens are to be planted at the depth to which they were originally grown. No burlap or other bailing material is to be left exposed. No bare root material is to be planted, except for those species noted on Table 2. All specimens installed in "upland forest" or "upland shrub" on 3:1 slopes or greater are to be planted in a saucer-shaped soil depression designed to capture and hold rainwater. Root collars of woody stock should be planted even with the adjacent soil surface plane.

All small stock is to be planted in holes of at least one foot wide and 1.5 feet deep (then backfilled and firmed to appropriate height) in order to prevent frost heaving.

Some species such as *Asimina triloba* are to be planted in clusters. All such instructions are noted on the individual patch pages.

A "wild trellis" design is provided as an armature over which Virginia creeper, trumpet creeper, trumpet honeysuckle, and bittersweet can climb.(Figure 20).

The Planting Contractor is to remove all extraneous flagging, string, cord, netting, etc. from the above-ground portion of the plant at or before the time it is planted. Only the name tag and any specified flagging is to remain on the plant. Twine or wrapping that holds root balls together should be cut after placing the tree or shrub in the planting hole, and burlap should be loosened and rolled back from the top but not removed. Wire basket tops are to be cut off two inches below the soil surface.

Fertilizing

All trees and shrubs are to be fertilized with Agriform 20-10-5 or equivalent, as per manufacturers instructions. Fertilizer rates are as follows:

Shrubs and very small trees (< 2' ht) - one 5gram tablet/plant
 Most trees (>2' ht but <1 1/2" cal) - one 21 gram tablet/tree
 Large (1 1/2" cal) trees - two 21 gram tablets/tree

Wetland plugs are to be fertilized with Osmocote as discussed below.

Plug planting

Plugs of one-year flat-grown 2" x 2" soil or medium propagated wetland sedges and rushes are specified for the pond and stream edges. Plugs are to be planted along shorelines at an approximate spacing of one per three linear feet of shoreline. Plugs are to be planted within a foot of water at random points within that foot wide strip. Plugs are to be planted only when the substrate soil is already saturated. Holes are to be dug big

000050

enough to fit the plug and allow about 0.25 inch soil cover over the plug base in order to prevent wicking of plug moisture directly to the air. If soil is hard or semi-dry at the time of plug planting, the plug holes should be drilled rather than shovel-pried to prevent the plug from popping out in winter or when water covers the site. Holes for plug planting will be at least 6 inches x 6 inches to alleviate the possibility of frost heaving. Plugs are to be planted so that they are in full ground contact and provided with water at the time of planting. Plug stock must be firmly placed into the soil or they will die.

Tall, gangly, or heavily leaved plugs should be clipped to 6" or 8" height to assure plant growth particularly if drier weather prevails. Tall plugs planted in wet substrate should be bent over or crimped to prevent wind toppling. Several granules (a small pinch) of Osmocote fertilizer may be planted with each plug at the direction of the Restoration Ecologist. The species used in plug planting should be varied over the length of the shoreline with clusters of three or five of one plant species followed by three or five of another.

The number of plugs to plant are noted on the Open Water patch pages. The overall species ratio is as follows:

Species	# flats of 50
Carex comosa	1
Carex crinata	1
Carex hystriana	1
Carex lacustris	1
Carex lupulina	1
Carex lurida	6
Carex stipata	6
Carex stricta	1
Carex vulpinoidea	6
Juncus effusus	2
Schoenoplectus acutus	6
Schoenoplectus pungens	1
Schoenoplectus tabernaemontani	1
Scirpus atrovirens	6
Scirpus cyperinus	6
Total	46 flats (2300 plugs)

These species are available from various wetland plant suppliers. If any species cannot be located it should be substituted by another in this list. The Restoration Contractor will insure that the Planting Contractor keeps the plugs wet and alive from delivery until planting.

Mulching

A wood chip mulch is to be laid around all woody plant material. In upland and wetland forest areas the wood chip collar is to be four inches thick and seven feet in diameter for all 1 1/2" caliper trees, and four inches thick and three feet in diameter for all other stock. In shrub areas, a four-inch wood chip layer is to be installed over the entire patch. (No seeding has been specified for shrub areas). Estimated mulch quantities for each patch are shown on the patch pages. Mulch placement and depth should be checked by the Restoration Ecologist immediately after placement. If too little or too much mulch is present, the Planting Contractor must place or remove mulch accordingly. Since mulch settles quickly, if mulch thickness is checked long after it is placed, it is likely to be less than 4" thick.

Seeded areas are to be mulched with salt hay or oat straw. Only clean mulching material - material free of seeds of exotic plant species - is to be used. Other types of hay or straw are likely to contain weed seeds and should not be used. Any weed seed heads found in hay bales (e.g., *Phragmites australis*) should be carefully contained and discarded. In wetland forest (seeded areas), upland forest (seeded areas), and upland grass

areas, oat straw can be used (hand-shaken) at the rate of two tons/acre. In marsh, wet prairie, and open water areas, a two-inch layer of salt hay is to be hand shaken, the rate of application approximating three tons/acre. The Restoration Ecologist should check oat straw and salt hay thicknesses for two-inch minimums immediately after placement before it settles.

Approximate quantities of all mulching materials have been calculated for each patch, and are included on the patch pages. Total amounts of mulch for the entire site are shown in Table 3 at the end of this document.

Seeding

Three seed mixes - upland grass, marsh, and wet prairie - will be used, the composition of which is as follows:

Upland grass

Andropogon gerardii	20%
Bouteloua curtipendula	10%
Elymus canadensis	10%
Panicum clandestinum	10%
Panicum virgatum	20%
Schizachyrium scoparium	10%
Sorghastrum nutans	20%

Marsh

See species and mix notes in mitigation plan.

Wet prairie

See species and mix notes in mitigation plan.

Seed will be hand-machine broadcast or hydroseeded as appropriate. If hydroseeding is done, the tanks, hoses and pump must be washed and rinsed to free them of seed from any other project prior to use on the Fernald site. (Many standard seeding mixes contain non-native or invasive grasses that are unwanted in this restoration work.)

Grass mix is to broadcast on upland forest areas at the rate of 35 pounds per acre. Soil preparation for seeding is to consist of tilling or raking of the entire soil surface to a depth of three inches so that it is loose and granular at the time of seeding. Excess unbroken clods, or an excessively uneven or hard surface are unacceptable surfaces for seeding. The Restoration Ecologist should be onsite at the time of all seeding.

Marsh mix is to be broadcast on wetland forest and marsh areas at the rate of 20 pounds of acre.

Wet prairie mix is to broadcast on wet prairie patches at the rate of 20 pounds per acre.

Watering

When rainfall is inadequate, it is critical to provide adequate water to plantings and seeded areas throughout the first growing season. The Restoration Ecologist must inspect the completed site regularly to insure that there is adequate soil moisture, and be able to mobilize necessary watering on short notice. Water is to be provided from off site as directed by the Restoration Ecologist to prevent the death of newly-planted material.

Plant stock acquisition

Munro Ecological Services, Inc. (MES) can provide assistance with locating suppliers of plant stock and seed, and with determining seed mixes and mix methods for patches.

000052

Patch boundaries

All patch boundaries are to be marked with a lime line for delineation purposes at the time of planting. Patches should be located accurately according to the planting plan. Surveyor assistance may be necessary to locate boundaries. After planting and ground cover placement, the Restoration Ecologist must insure that any patch boundaries that are not detectable by looking at variation in ground cover are marked for ease of location during the later monitoring period. 1" x 2" x 36" hardwood stakes are to be placed every 10 feet along these patch boundaries to indicate their limits. The stakes are to be driven in to a depth of 12" then spray-painted red. A 2" x 2" x 48" stake driven 12" into the ground is to be placed in the center of all patches. This patch-identifying stake must have a patch label that will last for 5 years.

Equipment routes and damage by equipment

The Restoration Ecologist should work with the Planting Contractor to plan access routes within the site to move equipment and material in, then "back out" of the planted area. If the soil is significantly disturbed (e.g., tire ruts) during any part of the work, the disturbed area should be filled and recontoured to correct grade.

Site cleanup

The Planting Contractor will remove all planting pots, twine, trash, and other artificial debris from the site before the patch inspections are begun. Any materials not specified for the site shall be removed and properly disposed.

SUBSTITUTIONS

Plant species lists for the Fernald mitigation site mirror the composition of plant communities common to Hamilton County. For this reason, stock species specifications should be followed to the letter. Further, substitutions of species, size or form of stock cause considerable recordkeeping problems and expenses. Thus every reasonable effort must be made to use specified stock and avoid substitutions. Substitutions shall be a last resort only. If specified stock cannot be found by thorough searching, substitutions may be made, provided that:

- All substitutions are done according to the plant specifications and substitution list. (Table 2)
- All substitutions must be approved by the Restoration Ecologist prior to ordering.
- No more than 10% substitutions are made on the site (Changes in species, size, or stock form are all considered substitutions)
- Species that constitute $\geq 20\%$ of any patch should not be substituted.
- Substitutions do not decrease the diversity in any patch.
- Species substitutions are made only within the same category. (For example, a substitute for a shrub within the category "diversity" must also be a shrub within the category "diversity".)
- All substitutions are noted on the planting patch pages. (Scientific names are to be used.)

All plant names for this project are specified in the plant specifications and substitution list. Each common name in this list is equivalent only to that scientific name specified in the list. No other equivalents are acceptable.

WOODY PLANT STOCK REPLACEMENT

Stock replacement will be necessary if required stock specifications cannot be met. Replacement stock must meet the specifications and category shown on the plant specification and substitution list (Table 2). Replacement stock must be of the same or a larger size than the original, be of the same species as the original, and be planted in the same location as the original. Planted stock must be healthy and thriving in order to be counted as acceptable. Stock that has only a few live stems or branches with a large amount of the tree or

000053

shrub being dead will be counted as dead. The Restoration Ecologist will make all final determinations regarding the health of questionable stock at the time of inspection.

All terms regarding plant specifications (i.e., stock inspections, labeling, stock condition, minimum size, etc.) and planting methods (i.e., planting, mulching, watering, and fertilizing) apply to replacement of stock as well as original stock.

All replacement stock is to be identified with a nursery tag bearing the scientific name of the plant, and prominently marked with paired flagging of two colors. Written documentation of the numbers of species of all replacement stock within each patch location is to be recorded by the Restoration Ecologist.

When replacing stock, no heavy equipment should be used on or driven across planted areas. A tracked motorized transporter is recommended for transporting of live replacement stock and removal of dead root balls. Damages related to equipment use must be completely corrected by the Planting Contractor so that the site is left with an undisturbed appearance. All tire ruts should be filled and leveled. All mulch should be replaced to original specifications. All areas where chips, salt hay or oat straw is disturbed will be replaced with the same material, per original specifications, and reseeded. Reseeding is to be done with the originally specified seed mixes.

STRUCTURES

All structures to be installed on the mitigation site (except deer fence) are noted on section (tally) and patch pages, and shown on the fold-out section pages at the end of this appendix. These structures are to be installed by the Planting Contractor under supervision of the Restoration Ecologist.

WATER CONTROL STRUCTURES

Four types of water control structures are specified in the mitigation design. They are:

- 1) Log and fabric structure (Figure 4)
- 2) Pre-cast concrete + fabric (Construction Engineer and Earthwork Contractor responsibility)
- 3) Pole drain + fabric (Figure 3)
- 4) Fabric only (figure 4)

Table 1 indicates which of these are to be installed by the Planting Contractor, and where they are to be located. Fabric is to be used mainly in swales between basins. "Fabric" refers to 1/2 inch coconut (coir) mesh Fiber-Blanket (Creative Habitat or exact equivalent). Overlaps are to be 12 inches wide and in shingle fashion (the uphill piece laid over the downhill piece) so that they will not peel back in heavy water flows. The mesh is to be fastened directly to the soil with wood stakes and 8" 8 gauge steel sod staples. These areas are to be seeded with a prairie seed mix at 20 pounds/acre. Swale widths and details are shown in Figure 4, and in Appendix 1 Figure 4.

WATER MONITORING STRUCTURES

Three types of water monitoring structures are proposed for the plan:

- 1) Elevation references are to be constructed at the edge of several basins (Figure 1). These references can be observed during construction and monitoring to see if water levels are on target, and if grading is correct after settling occurs.
- 2) Shallow water monitoring wells (Figure 2) are to be installed in each basin. Water table depth data will be collected from these during the monitoring period.
- 3) Staff gauges are to be installed in several basins to track pond water depths.

000054

WILDLIFE STRUCTURES

Plans for wildlife structures to be installed on the mitigation site are shown in Figures 6-17. Any changes to those plans must be approved by the Restoration Ecologist. Locations for those structures are shown on the attached section page maps. Figure 17 illustrates the proper method of installing a post through a pond liner. Wildlife structures are described below:

- 1) Sand piles (quantity, 4) will consist of one cubic yard of sand placed in an 8-inch depression near water edges (Figure 7). The piles will be about 4-feet across and will project above the surrounding soil surface by about 10 inches. These piles will be used by herpetofauna for egg laying.
- 2) Cavity nest boxes (quantity, 4) will be placed for nesting of wood ducks (Figures 12-13, 17). Boxes will be placed in ponds on driven pipe as pairs.
- 3) A single kestrel nest box will be placed at an upland (Figures 9,17)
- 4) Tree swallow nest boxes will be placed in grassland areas. 8 boxes will be placed. (Figures 11, 17)
- 5). Bat roost boxes will be placed on posts in wooded planting areas. 4 structures will be placed (Figures 10, 17).
- 6) Logs will be placed in ponds to provide protected emerging sites for herpetofauna and amphibians. 7 logs will be placed.(Figures 6)
- 7) Two den structures will be constructed, one fox den and one snake hibernaculum. These structures will be constructed on embankments above the wetland basins (Figures 14-15).
- 8) Brush piles (quantity, 7) will be placed for use by burrowing animals and field birds such as song sparrows (Figure 16).
- 9) Rock placements in creeks (quantity, 5) will be made to provide protection for a wide range of aquatic species (Sheet 1-pocket). These placements will be made at under-water locations along the side of the creek or edge of pond, as outlined on the included plans, so that their upper surfaces will not restrict water flow in the channel of the creek. The placements are to consist of 1 ton of gray gorge limestone per placement, in an area about 3 feet by 10 feet . This area can be increased if 1 ton adequately covers more than 3 x 10 area. The rock should be placed in a somewhat jumbled manner, rather than evenly.
- 10) Log and woody debris placement in forest areas is recommended. Sources of material, method of placement, and timing of placement is to be determined by the Restoration Ecologist.

DEER FENCING

Deer fencing is specified to prevent otherwise expected heavy browsing. It is to be installed around the finished site as discussed in the mitigation plan and as shown in the installation legend at the end of this appendix. The specified material is Deer II, a product of Benner's Gardens, or exact equivalent (Figure 19). The intent is to allow growth of woody species and marsh plants for several years without browsing pressure. After stock is well enough established the fencing is to be removed and re-used for other temporary enclosure on other FEMP replanting areas. Both poles and fencing are re-usable. Lighter gauge fencing is not suitable for re-use.

10 foot tall posts of pressure treated yellow pine are to be used for support. Posts are to be placed at 15 foot intervals on the western side of the site. On eastern side poles are to be placed at 20 foot intervals (there is an

000055

existing farm fence on that side. Prior to erection of the deer fence, all poison ivy, oriental bittersweet, multiflora rose, and honeysuckles are to be treated with Roundup herbicide to prevent those species from growing onto the deer fence.

Posts are to be augured, placed, set, and very firmly tamped prior to stretching the fence. The posts must be vertical. End posts and posts at points where the fence makes an angle may need bracing posts as well. Additional posts will be needed at walk-through baffles. Two walk-through baffles are specified to allow pedestrian access without gates in a design through which deer will not pass (Figure 18). Gates will be needed at the two gravel road locations. Gates may be of four configurations (Figure 19):

Benner's gardens provides a frame gate 6.6'X10' for deer fencing - \$665.00

A loose stretch-and-hook method may be used - inexpensive but difficult to work, easy to damage
Standard chain-link fencing (8' tall) gate may be installed - \$????

Benner's Gardens makes Deer Guard, a ground level structure that is always open and vehicle passage is unimpeded. It can be indefinitely moved and re-used - under \$3000.00

The fence is to be attached to the posts with cable staples (1") at least 6 per post. For the purpose of fence re-use, cutting of the fence should be minimized to points of major slope change. Guidance on fence installation is also provided in the Benner's Gardens catalog. Reference material relating to deer fencing is provided in the reference material section of this appendix

GOOSE LINE OR GOOSE FENCE

Since Canada geese can quickly destroy newly-planted herbaceous plugs, goose line or goose fence is specified for those basins with a large area of open water (Basins 1, 2, 3, and 4). Goose line is an effective deterrent if properly installed and maintained. Figure 5 illustrates proper installation. If geese begin to frequent any of the other ponds, goose line should be installed there as well.

RECORD KEEPING

Accurate long-term monitoring of the development of the mitigation areas require careful record keeping on the part of all involved in the construction and planting processes.

The Fernald mitigation plan calls for the construction and planting of eight wetland basins and associated uplands. Those basins have been divided into sections, which have been further subdivided according to cover type, or patch. For the convenience of the Planting Contractor, wood chip, seed, and salt hay/oat straw quantities have been summarized on a specifications page for each section. A specifications page has also been provided for each patch within each section. These specifications pages are to serve as the Planting Contractor's reporting forms.

It is the responsibility of the Restoration ecologist to record the following data for this patch page:

- 1) Number of each woody plant species, and weight of seed of each herbaceous plant species planted in each patch;
- 2) Number of plants substituted, and the species for which they were substituted. (Scientific names are to be used in listing all substitutions.);
- 3) Quantities of all seed mixes broadcast;
- 4) That all mulches have been installed to specifications;
- 5) Any other pertinent notes relative to planting changes.

By signing each patch page, the Restoration Ecologist acknowledges the accuracy of the record. Any changes to the specifications must be noted on the appropriate patch page. All annotated and signed patch pages are to be submitted to the Restoration Ecologist immediately upon completion of planting, seeding, and mulching in

000056

that section. The Restoration Ecologist will inspect each completed patch with the Planting Contractor to confirm patch and section completion.

000057

Basin #	Water level	Wetland growth elevation range	Structure invert elevations	Outlet structure type	Contractor performing work	Top of liner
Basin #1	598	597-599	598	Single log, 10' swale	Planting	596
Basin #2	603	602-604	603 603.5	Pole drain, 3' swale Concrete, 6' swale	Planting Earthwork	601
Basin #3	610	609-611	610.5 610	Concrete, 10' swale Pole drain, 3' swale	Earthwork Planting	608
Basin #4	612	611-613	612	Single log at crest 6' swale	Planting	610
Basin #5	603	602-604	603	Pole drain, 3' swale	Planting	601
Basin #6	603	602-604	603	Concrete, 10' swale	Earthwork	601
Basin #7	605	604-606	605	Single log at crest 6' swale	Planting	603
Basin #8	608	608-609	608.4	Fabric only Full width swale	Planting	606

Table 1. Construction and engineering features of wetland basins

000058

TABLE 2. PLANT SPECIFICATIONS AND SUBSTITUTION LIST

Species	Common name	Minimum Size	Substitution Category
<i>Acer rubrum</i>	Red Maple	1.5" cal	cover
<i>Acer saccharinum</i>	Silver Maple	6'	cover
<i>Acer saccharum</i>	Sugar maple	1.5" cal	cover, mast
<i>Aesculus glabra</i>	Ohio buckeye	6'	diversity
<i>Aesculus octandra</i>	Sweet buckeye	6'	diversity
<i>Alnus serrulata</i>	Smooth alder	36"	cover
<i>Amelanchier arborea</i>	Serviceberry	4'	fruit, diversity
<i>Amelanchier laevis</i>	Smooth serviceberry	36"	cover
<i>Aronia melanocarpa</i>	Black chokeberry	36"	esthetics
<i>Asimina triloba</i>	Pawpaw	12"	fruit, diversity
<i>Campsis radicans</i>	Trumpet creeper	24"	esthetics
<i>Carpinus caroliniana</i>	Musclewood	6'	diversity, mast
<i>Ceanothus americanus</i>	New Jersey tea	36"	diversity
<i>Celastrus scandens</i> (See note 1)	American bittersweet	24"	diversity
<i>Celtis occidentalis</i>	Hackberry	6"	diversity
<i>Cephalanthus occidentalis</i>	Buttonbush	36"	cover
<i>Cercis canadensis</i>	Redbud	6"	esthetics
<i>Cornus alternifolia</i>	Alternate-ld. Dogwood	36"	diversity, cover
<i>Cornus amomum</i>	Silky dogwood	36"	cover
<i>Cornus florida</i>	Flowering dogwood	4'	esthetics
<i>Cornus racemosa</i>	Gray Dogwood	36"	cover
<i>Corylus americana</i>	Hazelnut	36"	diversity
<i>Crataegus crusgalli</i>	Cockspur hawthorn	36"	diversity
<i>Crataegus mollis</i>	Downy hawthorn	36"	cover
<i>Decodon verticillatus</i>	Water-willow	24"	diversity
<i>Diospyros virginiana</i>	Persimmon	4'	fruit, diversity
<i>Fagus grandifolia</i>	Beech	6'	cover, mast
<i>Fraxinus americana</i>	White Ash	1.5" c	cover
<i>Fraxinus nigra</i>	Black ash	4'	diversity
<i>Fraxinus pennsylvanica</i>	Green Ash	1.5" c	cover
<i>Gymnocladus dioica</i>	Kentucky coffeetree	6'	diversity
<i>Hamamelis virginiana</i>	Witchhazel	36"	cover
<i>Hydrangea arborescens</i>	Wild Hydrangea	36"	esthetics
<i>Hypericum prolificum</i>	Shrubby St. John's-wort	12"	diversity
<i>Ilex verticillata</i>	Winterberry	36"	esthetics
<i>Juglans cinerea</i>	Butternut	6'	mast, diversity
<i>Juglans nigra</i>	Black Walnut	6'	mast, diversity
<i>Lindera benzoin</i>	Spicebush	36"	cover
<i>Liquidambar styraciflua</i>	Sweetgum	6'	diversity
<i>Liriodendron tulipifera</i>	Tulip Poplar	1.5" c	cover, esthetics
<i>Lonicera sempervirens</i>	Trumpet honeysuckle	24"	esthetics
<i>Nyssa sylvatica</i>	Black Gum	6'	diversity, esthetics
<i>Ostrya virginiana</i>	Hop Hornbeam	6'	diversity
<i>Parthenocissus quinquefolia</i>	Virginia Creeper	24"	diversity
<i>Physocarpus opulifolius</i>	Ninebark	36"	diversity
<i>Platanus occidentalis</i>	Sycamore	6'	cover
<i>Prunus americana</i>	American plum	36"	diversity, fruit
<i>Prunus serotina</i>	Black Cherry	6'	fruit
<i>Prunus virginiana</i>	Chokecherry	36"	cover

000059

TABLE 2: PLANT SPECIFICATIONS AND SUBSTITUTION LIST (Continued)

Species	Common name	Minimum Size	Substitution Category
<i>Quercus alba</i>	White Oak	1.5" c	cover, mast
<i>Quercus bicolor</i>	Swamp White Oak	6'	cover
<i>Quercus coccinea</i>	Scarlet oak	6'	cover, mast
<i>Quercus imbricaria</i>	Shingle oak	6'	diversity
<i>Quercus macrocarpa</i>	Bur oak	6'	diversity, mast
<i>Quercus palustris</i>	Pin Oak	1.5" c	cover
<i>Quercus rubra</i>	Red Oak	1.5" c	cover, mast
<i>Quercus shumardii</i>	Shumard oak	6'	diversity, mast
<i>Quercus velutina</i>	Black oak	6'	cover, mast
<i>Rhus typhina</i>	Staghorn Sumac	36"	esthetics
<i>Ribes americanum</i>	Black currant	36"	diversity
<i>Rosa caroliniana</i>	Pasture rose	36"	esthetics
<i>Rosa palustris</i>	Swamp Rose	36"	esthetics
<i>Rubus allegheniensis</i>	Blackberry	36"	fruit
<i>Rubus occidentalis</i>	Black raspberry	36"	fruit
<i>Salix discolor</i>	Pussy Willow	36"	cover
<i>Salix eriocephala</i> (See note 2)	Heart-leaved willow	36"	diversity
<i>Salix exigua</i>	Sandbar willow	36"	cover
<i>Salix nigra</i>	Black Willow	6'	cover
<i>Salix sericea</i>	Silky Willow	36"	cover
<i>Sambucus canadensis</i>	Elderberry	36"	fruit
<i>Sassafras albidum</i>	Sassafras	6'	diversity
<i>Spiraea alba</i>	Meadowsweet	36"	esthetics
<i>Spiraea tomentosa</i>	Steeplebush	36"	esthetics
<i>Staphylea trifolia</i>	Bladdernut	36"	diversity
<i>Symphoricarpos orbiculatus</i>	Coralberry	24"	diversity
<i>Tilia americana</i>	Basswood	6'	cover, esthetics
<i>Ulmus americana</i>	American elm	6'	cover
<i>Ulmus rubra</i>	Slippery elm	6'	cover
<i>Viburnum acerifolium</i>	Maple-leaved viburnum	36"	diversity
<i>Viburnum dentatum</i>	Southern arrowwood	36"	cover
<i>Viburnum prunifolium</i>	Black Haw	36"	cover
<i>Zanthoxylem americanum</i> (See note 3)	Toothache tree	12"	diversity

All woody stock must be B&B or potted. See notes 1 and 2 for exceptions.

Minimum size is denoted as height except where "c" is used to indicate stem caliper, measured six inches above ground level.

Note 1: *Celastrus scandens* must be large enough to bear fruit so that it can be positively identified.

Note 2: If not available in B&B or pot, four 12" (min.) live cuttings can be substituted for each individual specified.

Note 3: If not available in B&B or pot, three 12" (min) live bare-root cuttings can be substituted for each individual specified.

000060

**TABLE 3: FERNALD WETLAND MITIGATION AREA
SOIL AMENDMENTS, MULCHES, AND SEED**

Soil Amendments and Mulches

Material	Quantity
Wood chips	1306.2 cubic yards
Oat straw	11.2 tons
Salt hay	13.3 tons

Seed Mixes

Material	Quantity
Upland grass mix	175.9 pounds
Marsh mix	66.1 pounds
Wet prairie mix	14.8 pounds

000061

2118

000062

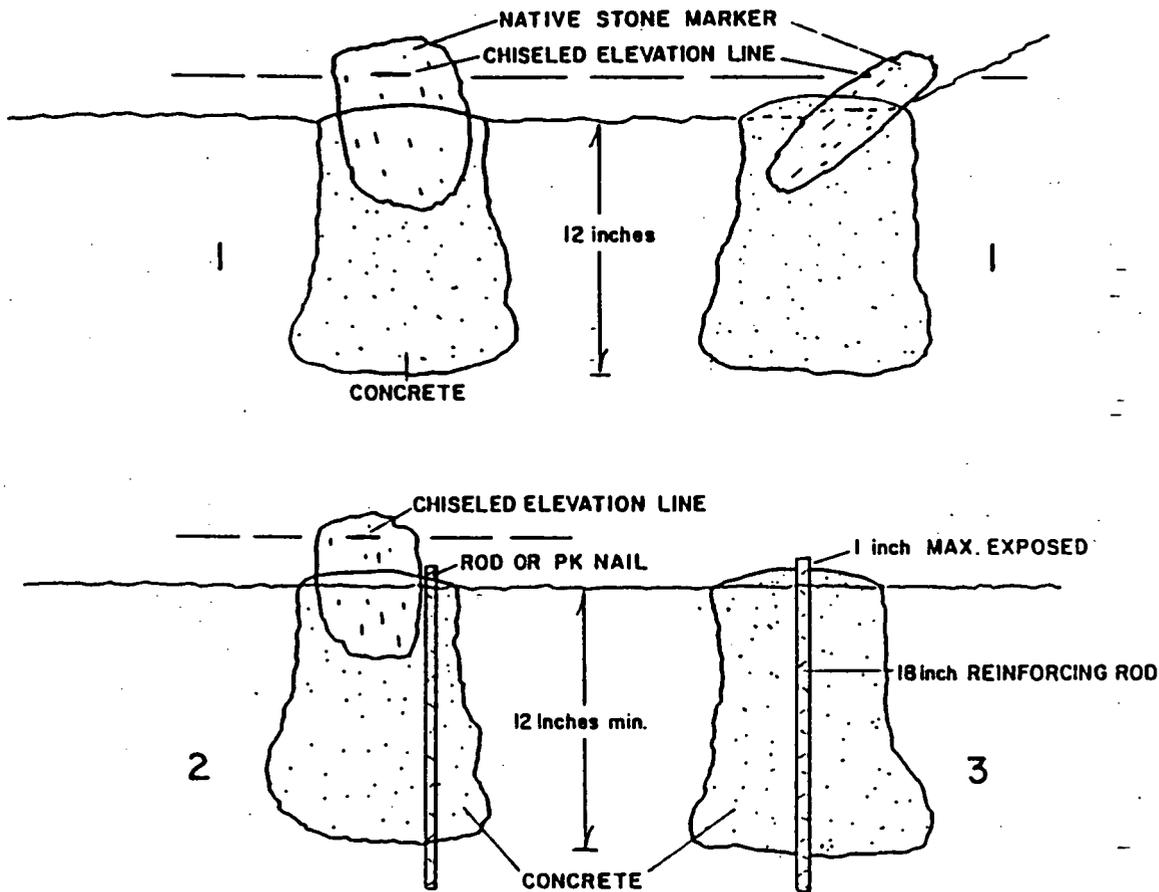


Figure 1. Illustration of marker configurations for designating the edge of the constructed wetland. The elevation line indicates the highest proposed wetland limit. Configuration #3 is proposed for this site. Each marker will be placed on the wetland boundary of its specified basin. The elevation of the top of the rebar will be recorded and noted in the monitoring reports.

000063

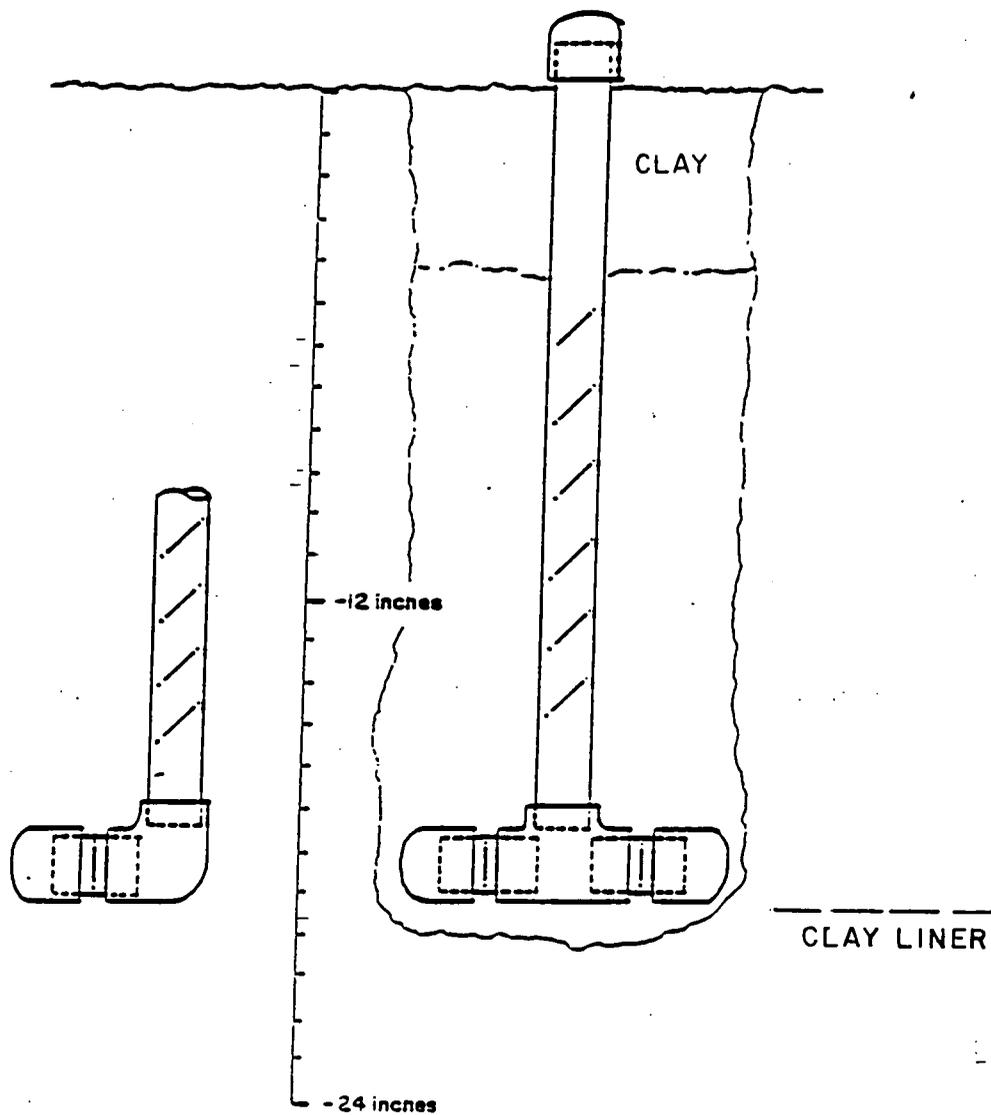
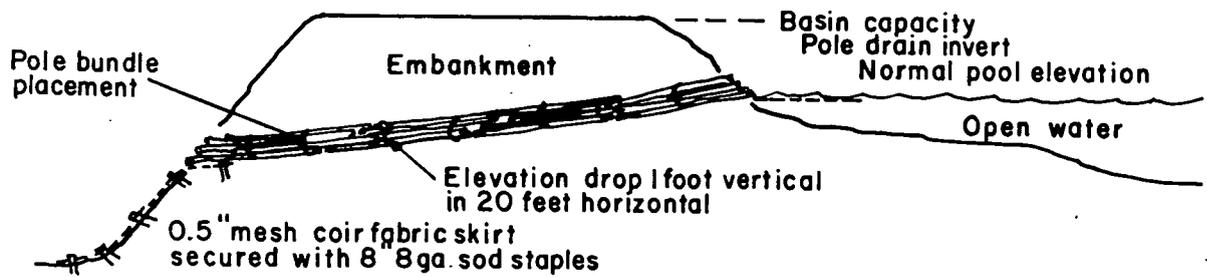


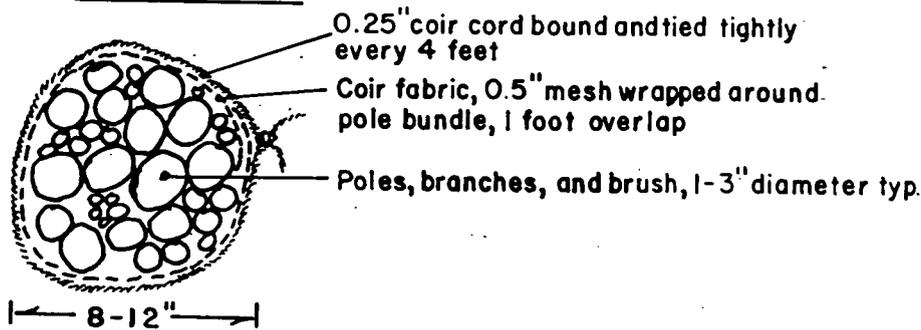
Figure 2. The shallow water table monitoring wells will be constructed of Schedule 40 PVC pipe 1 inch ID. The T configuration is for installation in sandy soils, and the elbow configuration for clay soils. The clay cap in the top four inches of the well prevents surface water from entering the pipe. The installation of these wells does not involve the excavation of any liner.

000064

EMBANKMENT CROSS SECTION



BUNDLE DETAIL



TRENCH CROSS SECTION

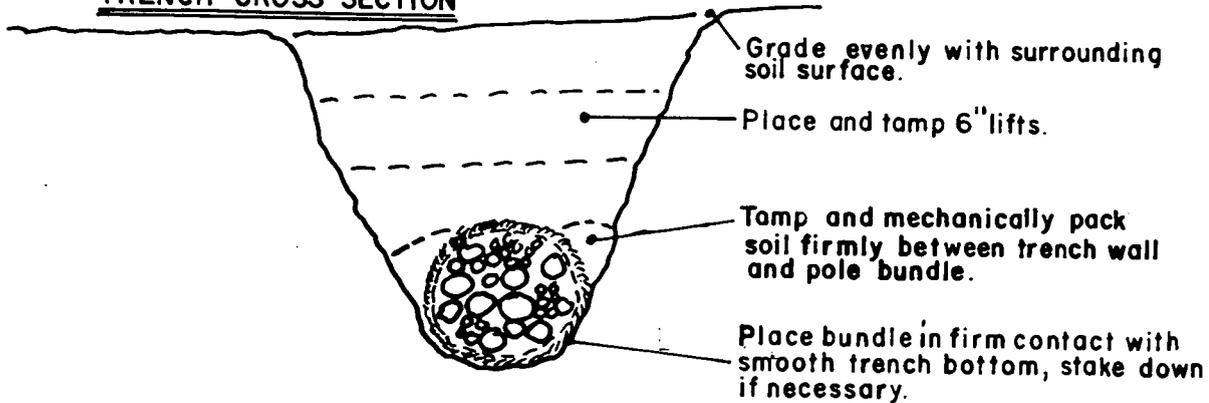
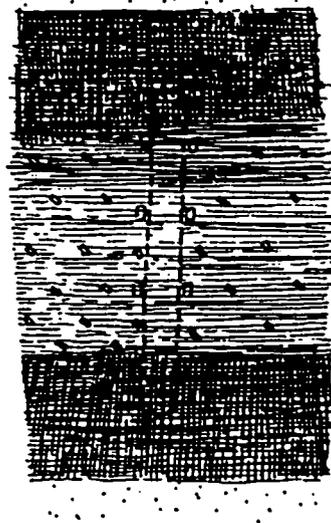


Figure 3. Pole drain structures will be used to provide slow draindown for Basins # 2,3, and 8. Basin 8 will have a pole drain as its sole outlet. The purpose of these structures is to retain water in the basins for a longer duration while allowing for gradual seepage discharge.

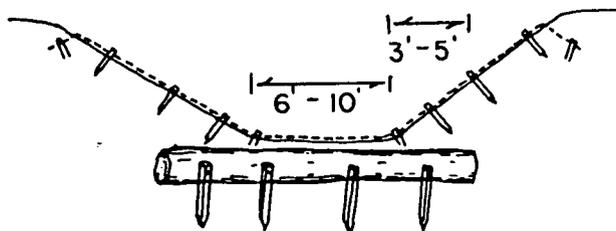
000065

TOP VIEW

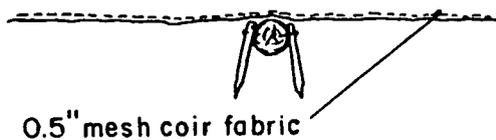
2118



SIDE VIEW ACROSS SWALE



SIDE VIEW ALONG SWALE



INSTALLATION DETAIL

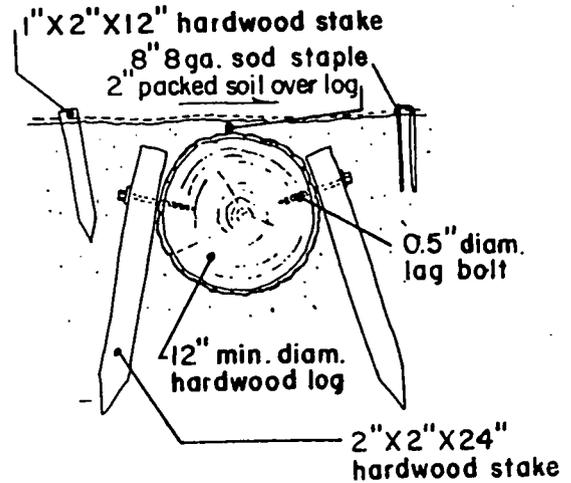


Figure 4. Log and fabric structures. These structures will not be visible on the surface except as a fabric covered swale. The log is buried, staked, filled in, and compacted so that it is just beneath the swale surface. The log must protrude into deep soil on both sides of the channel and will prevent downcutting of the channel.

000066

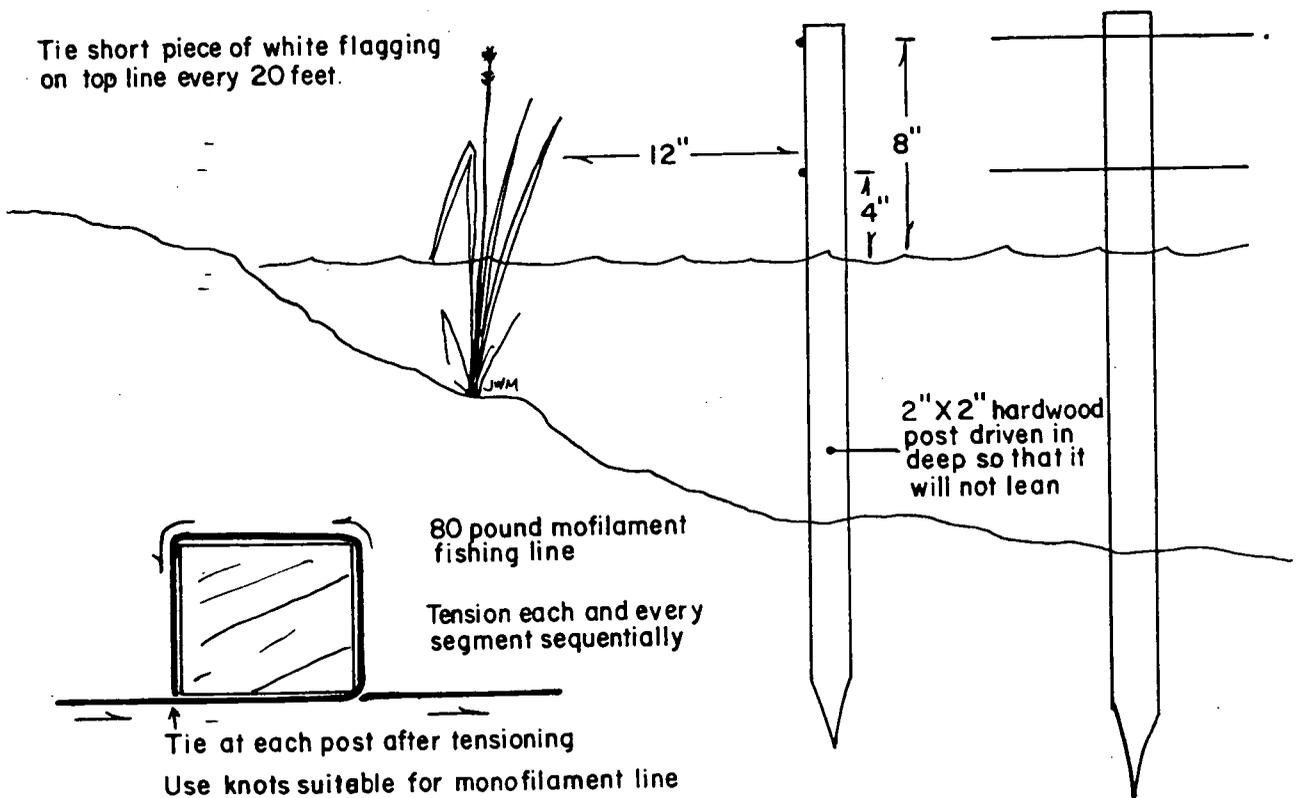


Figure 5. Goose line or goose fencing is proposed for several ponds to discourage use of the mitigation ponds and marshes by flocks of geese which can potentially destroy large quantities of new herbaceous plants. Proper installation and upkeep of the fence is essential.

000067

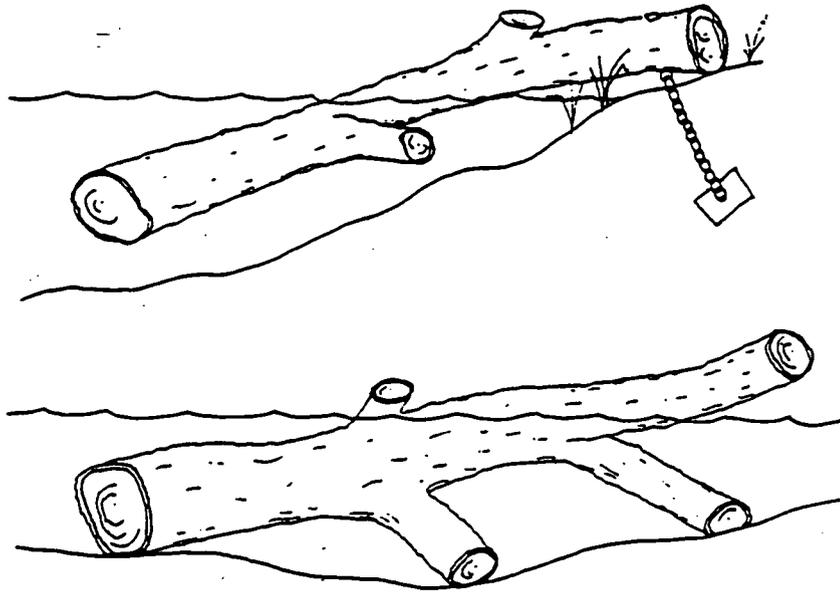


Figure 6. Logs with lengths from 12 to 15 feet and diameters of 10 to 15 inches are to be used. Several stubby branches (24"-30" long) and other irregularities such as bent trunks, knothole cavities, and irregular cross-sections are required. The trees are to be taken as standing dead trees. Some rotting is acceptable.

SAND PILE

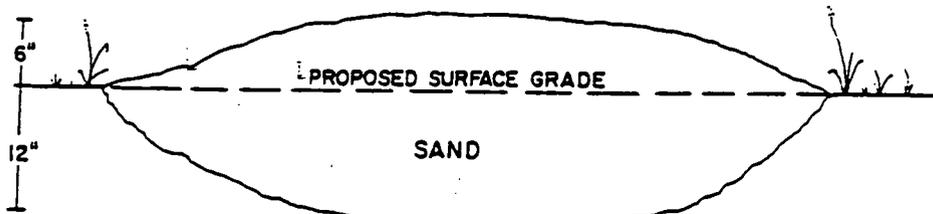


Figure 7. Each sand pile is to be made from 2 to 4 cubic yards of washed sand. The sand is to be placed so that it forms a smooth mound which protrudes 6 inches above the surface and extends 12 inches below the surface.

000068

WREN/CHICKADEE/NUTHATCH NESTBOX

HOUSE WREN
 BLACK-CAPPED CHICKADEE
 WHITE-BREASTED NUTHATCH

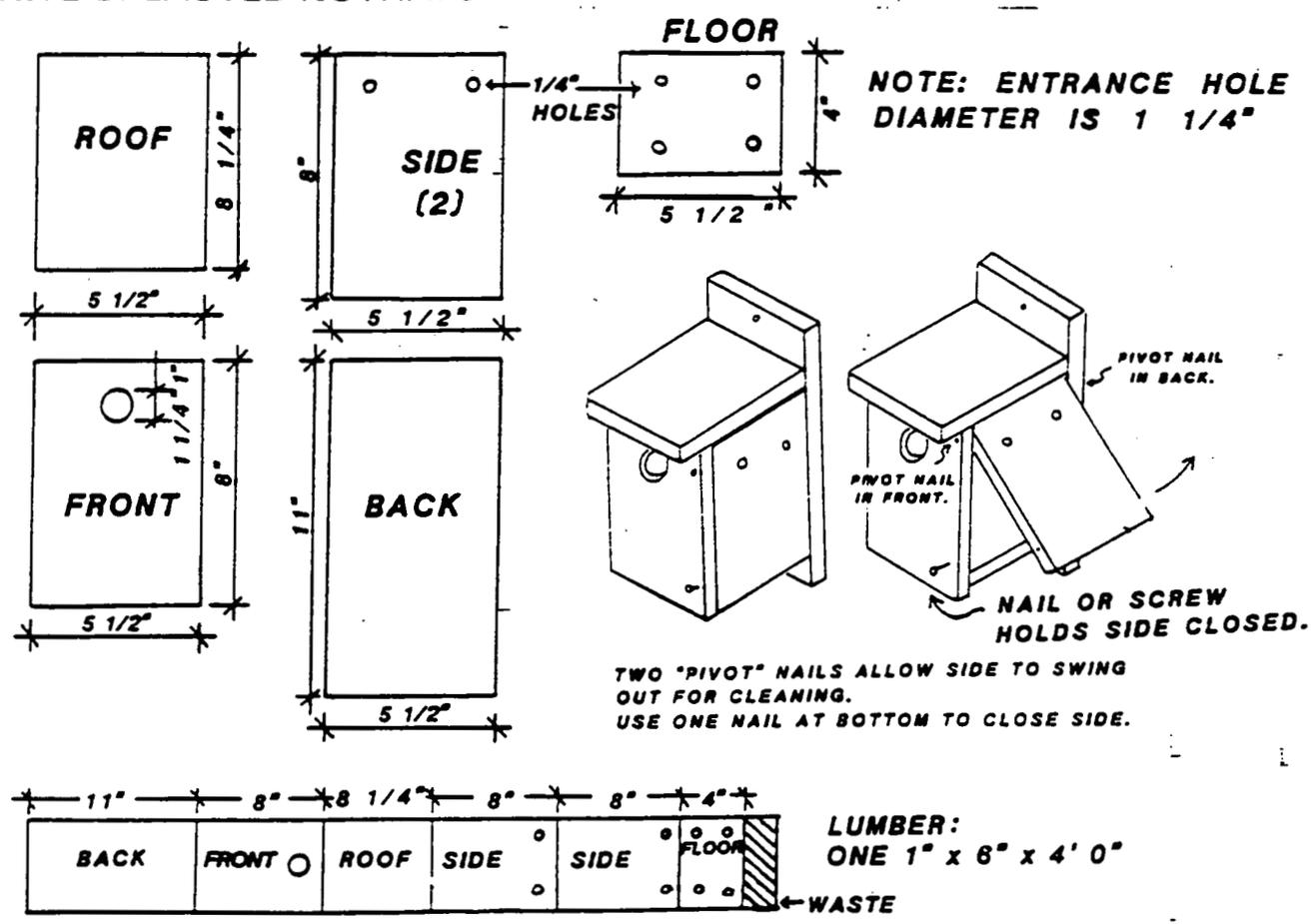


Figure 8. These boxes will be placed 6 feet above the ground on posts with a top diameter of not less than 3 inches and a length of 10 feet. Boxes are to be painted with light brown exterior latex paint on the outside only. Paint should not prevent door from opening.

000069

**AMERICAN KESTREL
NORTHERN SCREECH-OWL**

2118

NEST BOX

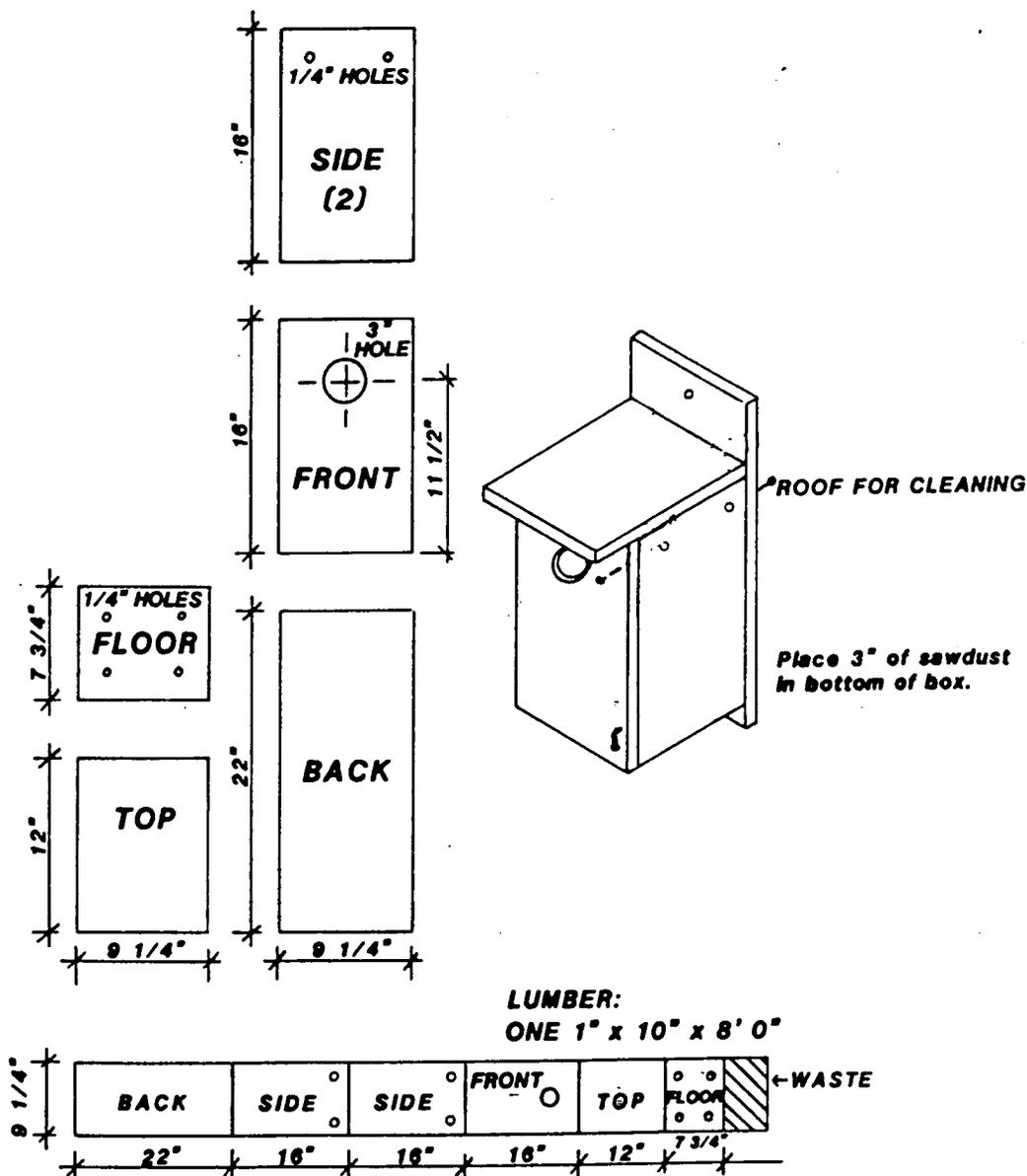
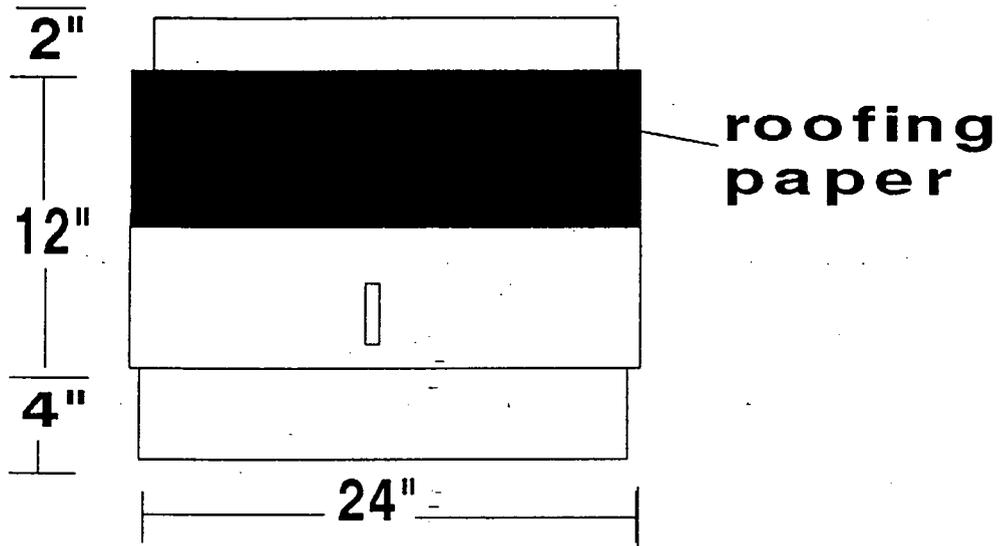


Figure 9. These boxes will be placed 10 feet above the ground on posts with a top diameter of not less than 3 inches and a length of 12 feet. Boxes are to be painted with light brown exterior latex paint on the outside only. Paint should not prevent door from opening.

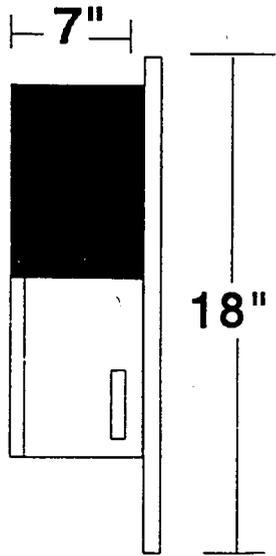
000070

PA MEDIUM MATERNITY COLONY BAT BOX (18" x 24" x 7")

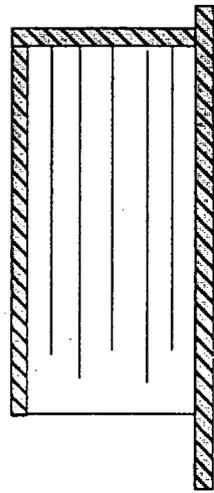
FRONT VIEW



SIDE VIEW



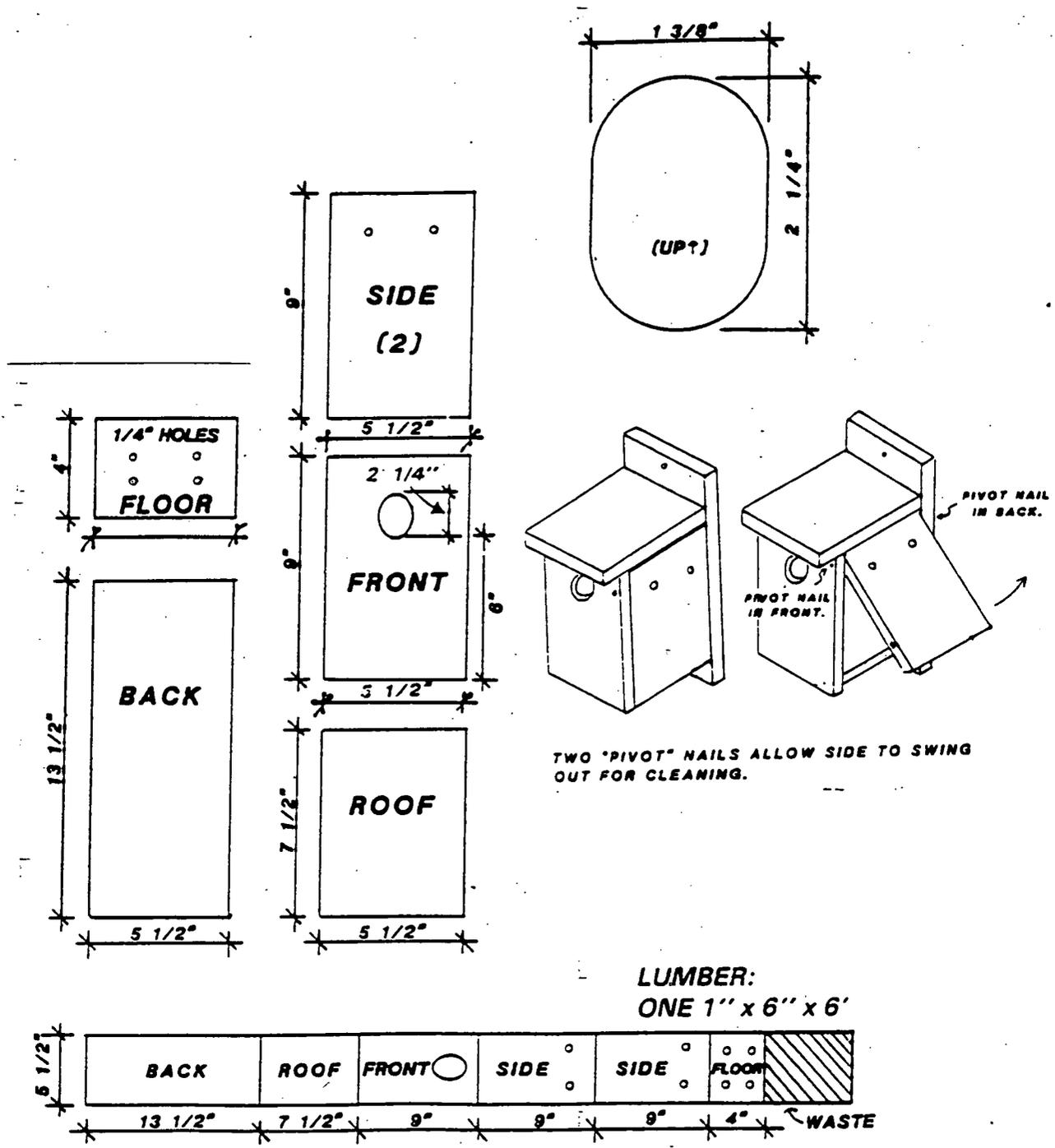
CUTAWAY VIEW



Crevice Widths:
1" (first 5 crevices)
3/4"-1 3/4" (rear)

Figure 10. These boxes will be placed 10 feet above the ground on posts with a top diameter of not less than 3 inches and a length of 12 feet. Boxes are to be painted with light brown exterior latex paint on the outside only. Paint should not prevent door from opening.

000071



TWO "PIVOT" NAILS ALLOW SIDE TO SWING OUT FOR CLEANING.

LUMBER:
ONE 1" x 6" x 6'

Figure 11. Tree swallow boxes will be placed 6 feet above the ground on posts with a top diameter of not less than 3 inches and a length of 10 feet. Boxes are to be painted with light brown exterior latex paint on the outside only. Paint should not prevent door from opening.

000072

WOOD DUCK NESTBOX

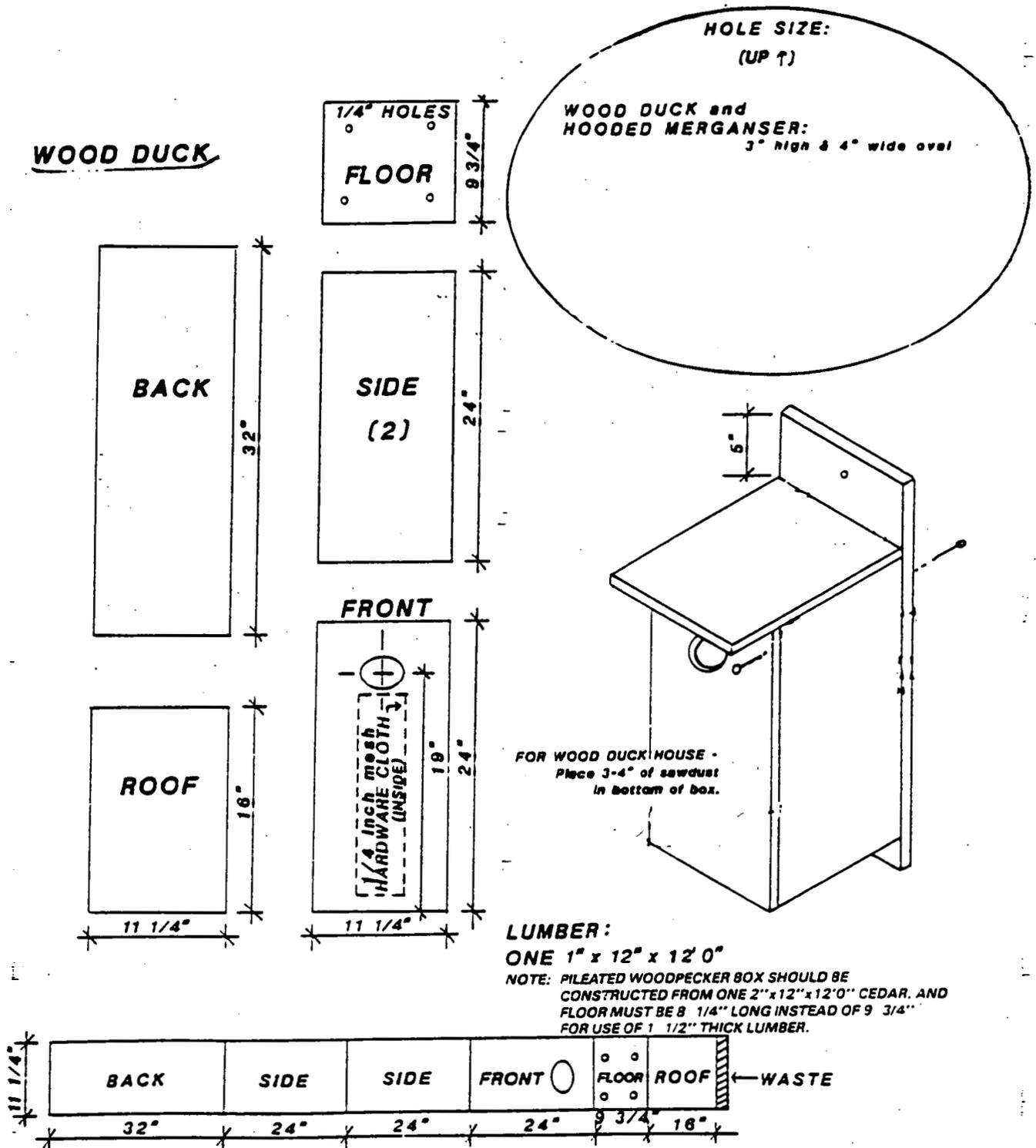
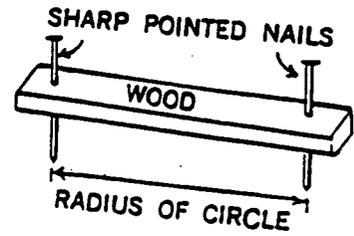
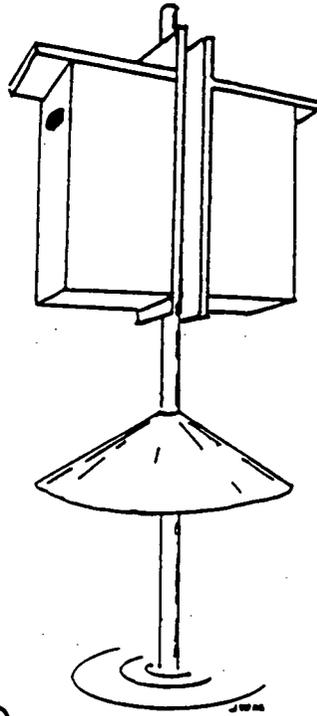


Figure 12. These structures are to be built as paired structures on a single post. The posts will be locust or white oak and will be approximately 4 inches in diameter at the top and approximately 12 feet in length. One predator cone will be built to fit each post (see details on following page). Boxes are to be painted with light brown exterior latex paint on the outside only. Paint should not prevent door from opening.

000073

Figure 13.



HOME MADE COMPASS FOR SCRIBING METAL

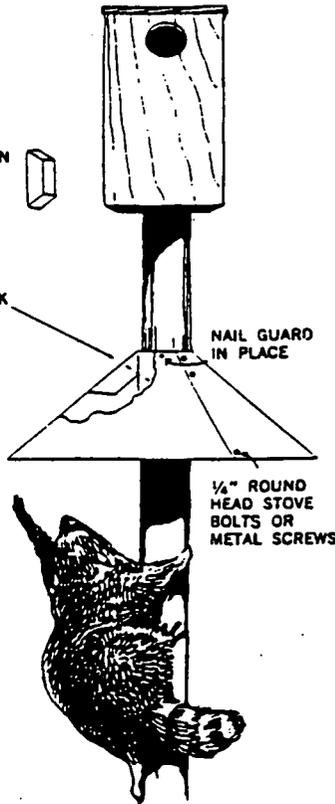
PREDATOR GUARD

Cone-shaped, sheet-metal guard for protecting nest structures from predators. At right is layout for cutting 3 predator guards from a 3' x 8' sheet of 26-gauge galvanized metal. When installing the guard, overlap the cut edge to the dotted line. To facilitate cutting (on solid lines only) follow the sequence of numbers. Make circular cuts in counterclockwise direction. To make initial cut on line A-B, make a slot at A with a cold chisel. Use tinsnips and wear leather gloves.

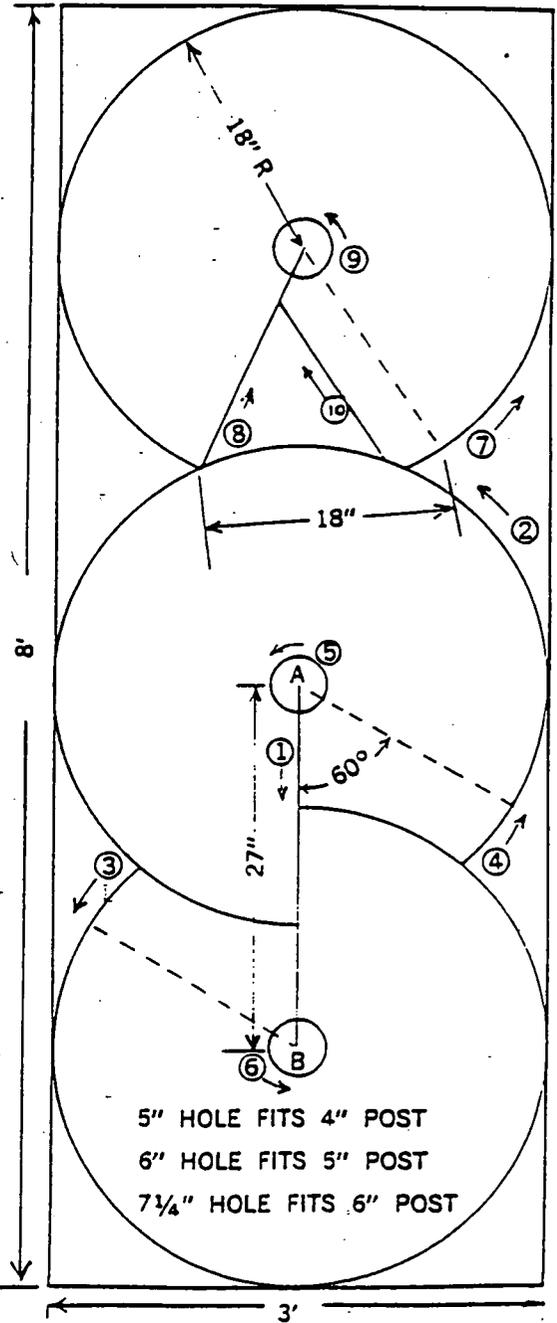
USE 3 WOODEN MOUNTING BLOCKS

DRILL PILOT HOLE FOR NAILING BLOCK TO POST

SIDE VIEW CUT AWAY TO SHOW MOUNTING BLOCK



1/4" ROUND HEAD STOVE BOLTS OR METAL SCREWS



5" HOLE FITS 4" POST
 6" HOLE FITS 5" POST
 7 1/4" HOLE FITS 6" POST

FOX DEN STRUCTURE

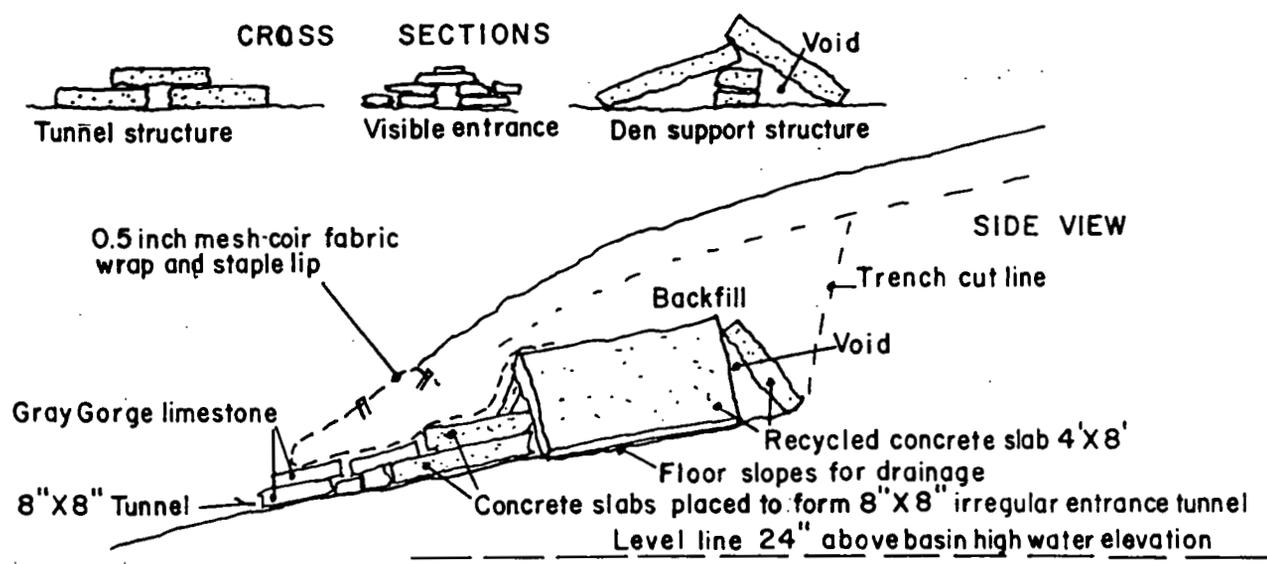


Figure 14. A fox den structure is proposed. The structure is to be made of native stone and concrete paving slabs. The interior of the structure must be sloped to provide good drainage.

SNAKE HIBERNACULUM

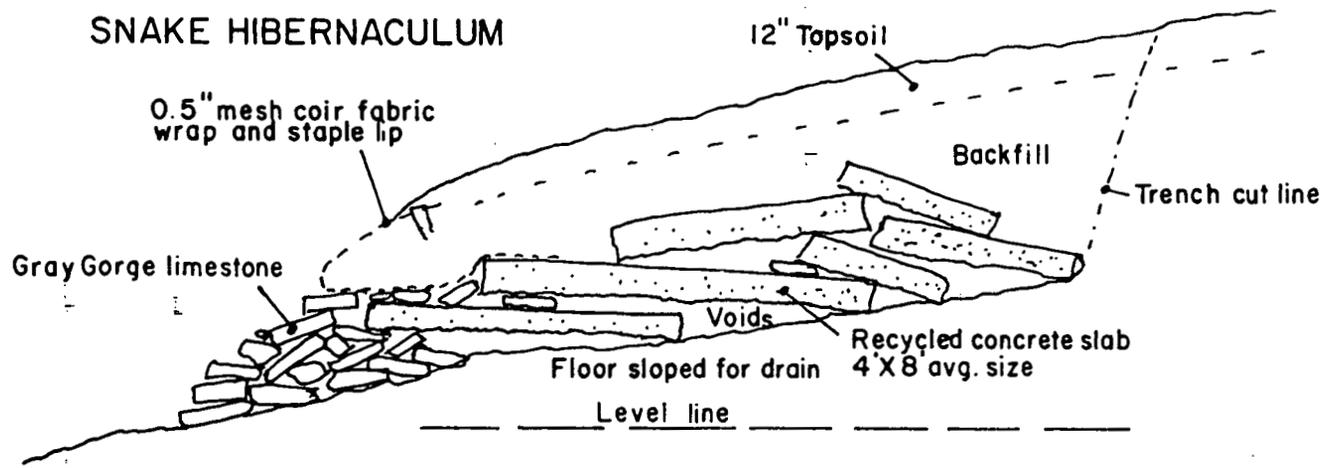


Figure 15. A snake hibernaculum is proposed. The structure is designed as a series of random and wedge-shaped voids and with no main entrance tunnel. Care must be taken during construction to avoid filling in cracks between stones of the entrance area.

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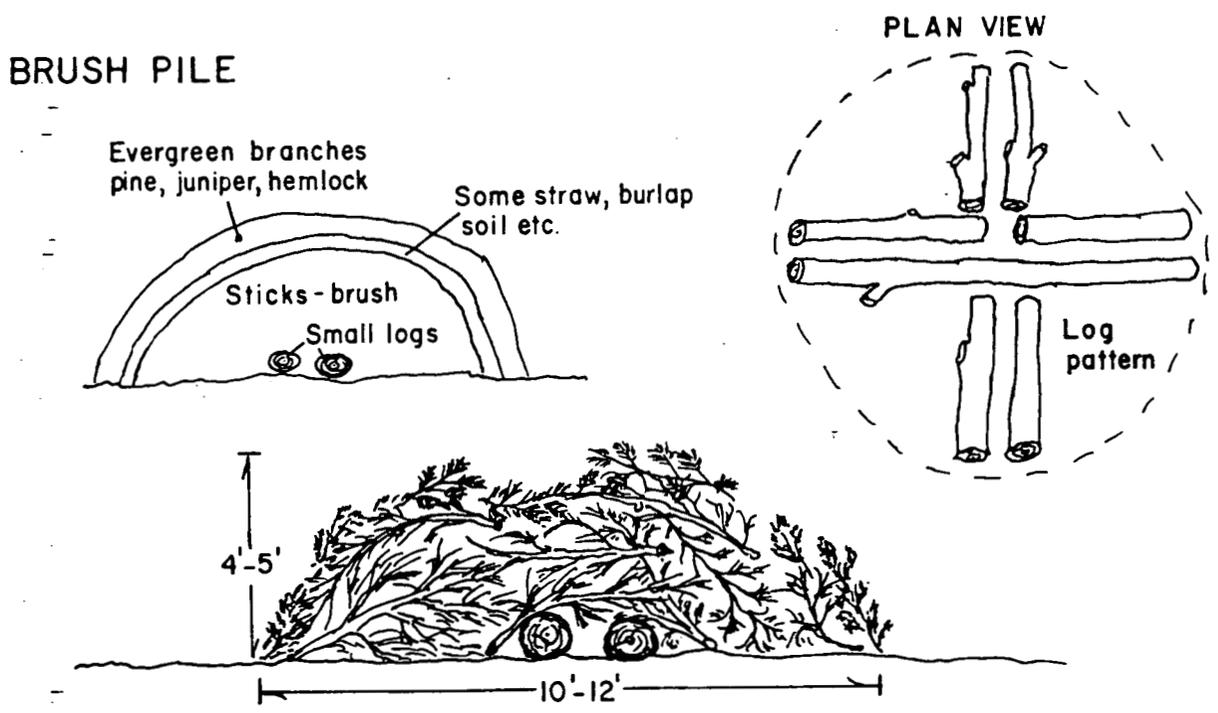


Figure 16. The brush pile design is to provide cover and nesting/burrowing habitat for meadow birds and small mammals. In newly constructed wetland systems little cover is available for small animals.

000076

POST INSTALLATION DETAIL

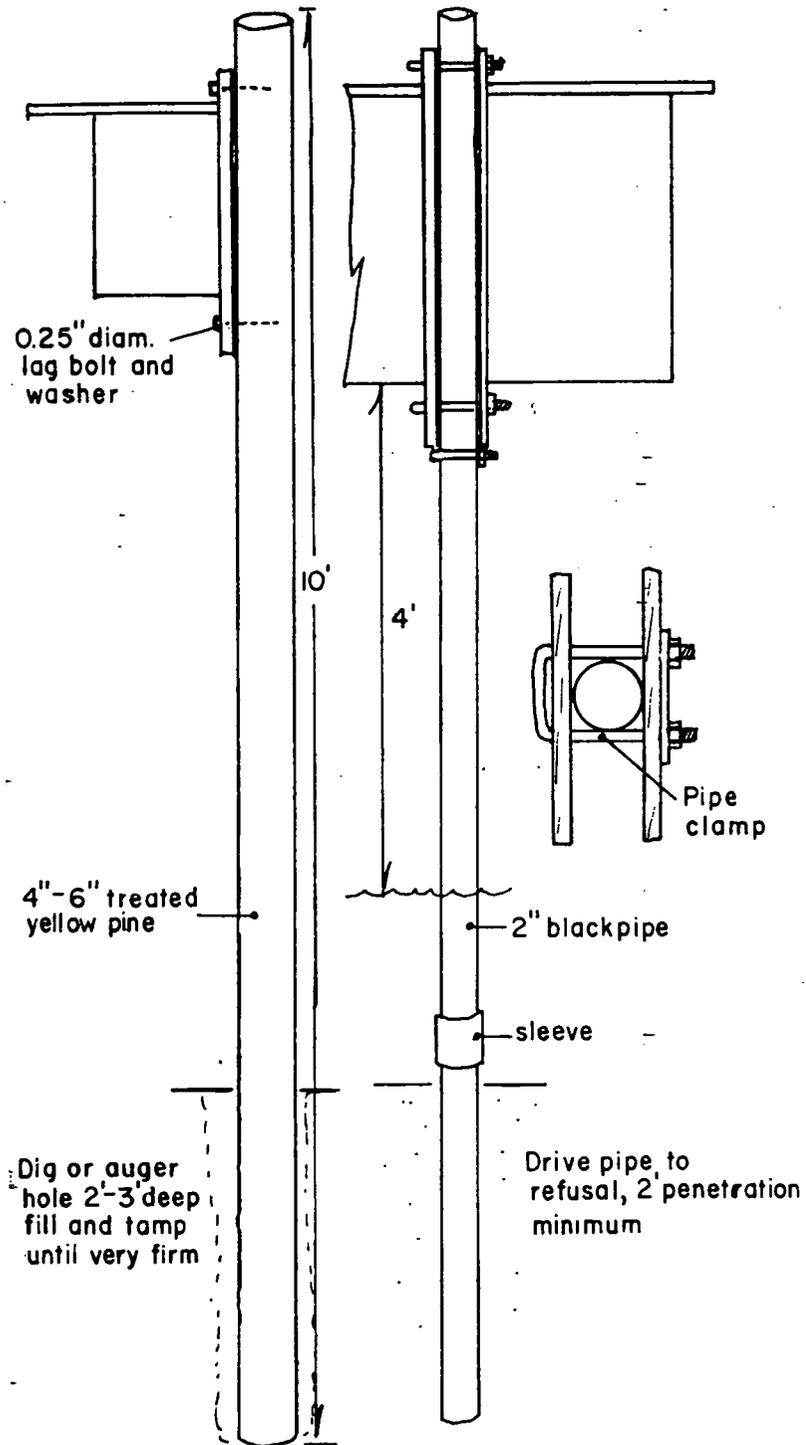
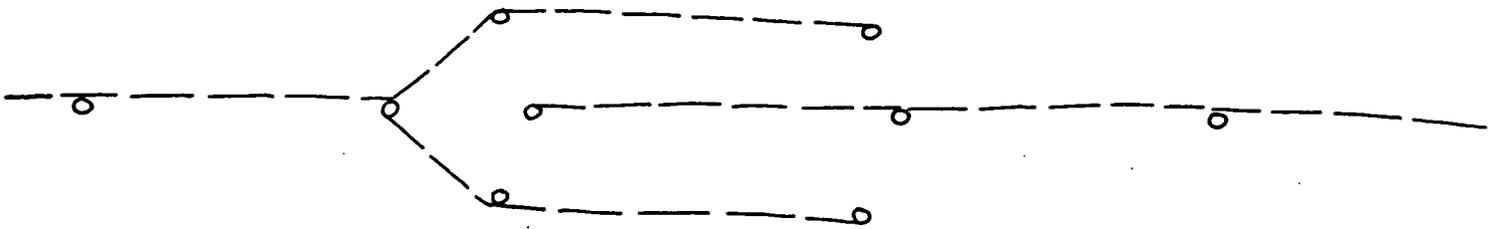


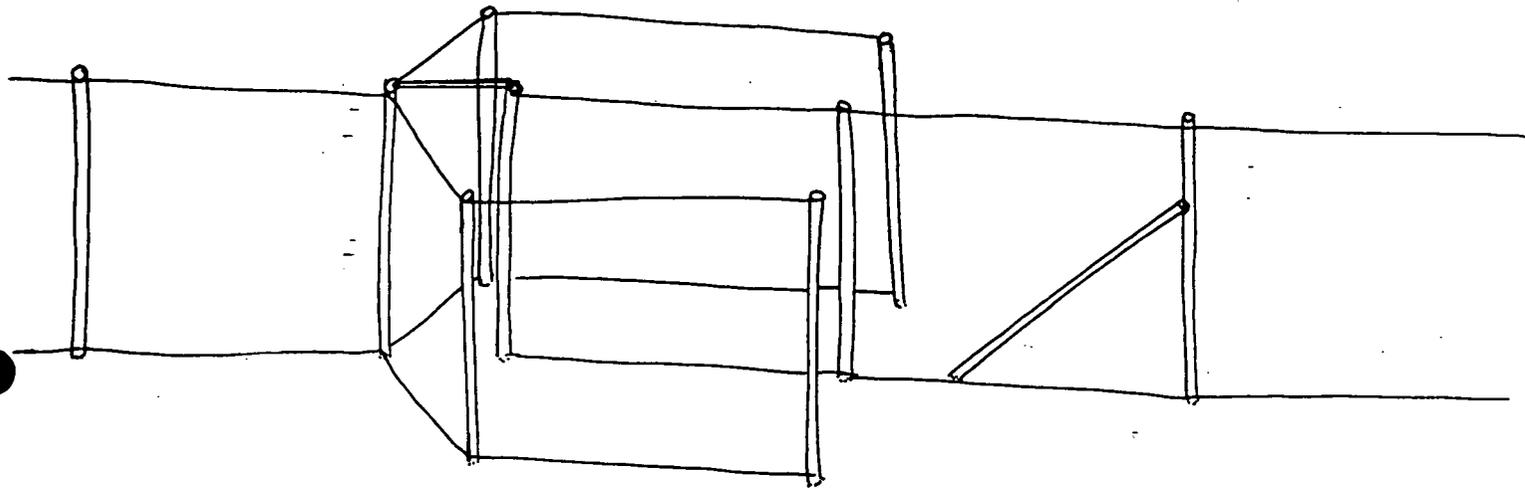
Figure 17. Two post designs are provided. 1) Wooden posts are to be used on upland areas and auger-excavated. 2) Black pipe is to be driven into stream and pond bottom areas.

000077

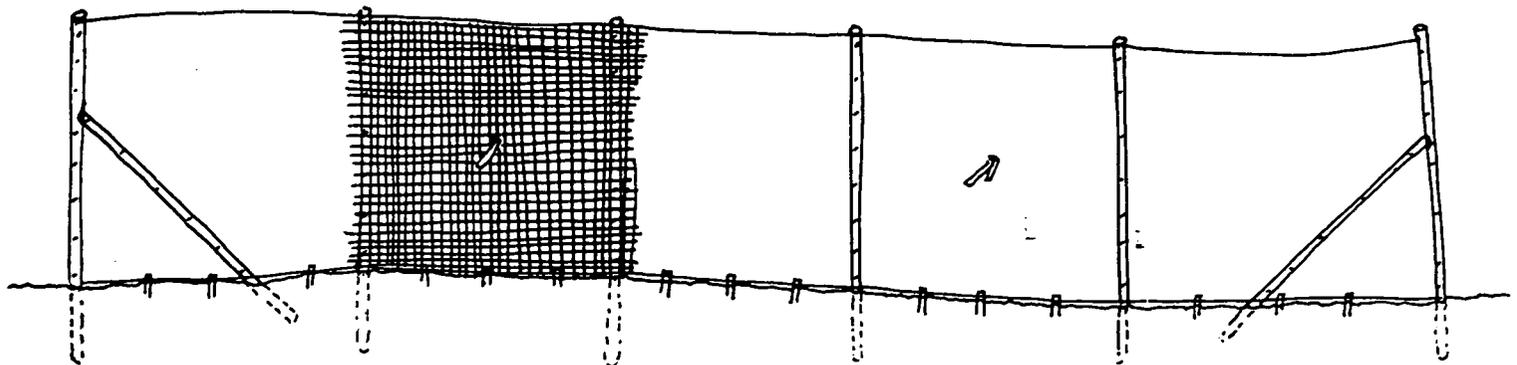
TOP VIEW - BAFFLE ENTRANCE



OBLIQUE VIEW - BAFFLE ENTRANCE



FENCE CONSTRUCTION DETAIL



Post spacing 15' max. 20' along field fence.

Figure 18. Deer fencing is proposed to provide assurance that the large quantity of shrubs and young trees are not quickly reduced to deer food. The baffle entrance allows human foot traffic to be gate-free and unimpeded, whereas deer do not enter the baffle. The baffle passageway should be no wider than 20" and about 10 feet long. The following pages provide guidance and an alternative entrance structure.

000078

Figure 19.

HOW TO CREATE A GATE OR ACCESS POINT IN BENNER'S DEER FENCING

This question seems to be arising quite often, so we have decided to address it. The first thing to remember is that our fencing material can be cut with a pruning shears, so this allows you to create an access point wherever you so desire. This is most easily achieved during the initial installation. The easiest type of "gate" to create is really not a gate at all, but just a section of fence that you pull back for access. Because the material is flexible, all you need to do is select a tree or post at which you will cut the fence right at the center of the support. You then drive three or four long nails into the side of the post or tree facing away from the protected area. Next, attach one of our fiberglass posts, a bamboo pole, or 2" x 2" to the loose end of the fence (our plastic cinch ties work well). Now all you have to do is stretch the end of the fence with the pole attached to it up and over the large nails, hooking the support pole over the nails. To access the area, just unhook the pole from the nails and pull the section back as far as necessary. You can create as long of a flexible gate section as desired (for tractor access, etc.) You should still keep a couple of ground stakes at the bottom of this section so the deer don't try to go underneath. The alternate option for gates is a framed swing gate constructed of wood or aluminum. In this case the swing gate sits between two posts and is framed out to the desired width. This type of gate is obviously more time consuming to install and will also be more visible. Benner's Gardens does manufacture a top-quality, custom made, aluminum swing gate for driveway openings and if the demand for smaller width access gates appears to be significant, we may also begin constructing these as well – please inquire.

DeerGuard™

Gateless Deer Protection for Driveways



000079

MUNRO ECOLOGICAL SERVICES, INC.

Figure 19.

DEER FENCING INSTALLATION INSTRUCTIONS

(FOR THOSE CUSTOMERS WHO PURCHASED 2 OR MORE ROLLS OF FENCING, WE STRONGLY RECOMMEND VIEWING OUR INSTRUCTIONAL VIDEO BEFORE INSTALLATION BEGINS.)

1) First decide which area(s) of your property you would like to protect. For proper deer protection, these areas must be completely enclosed. Depending upon the size of your property, you may wish to either surround the entire area with our barrier, or just a particular section. If you happen to decide to just install the fencing along one or two sides of your property, please be advised that this will only, at best, help minimize your deer problem. One would think that this technique would keep deer out from a particular direction, but what typically happens is that the deer wander the perimeter of the fence until they find an opening. Once inside the protected area they can do extensive damage to plant material, and then will often times (particularly if frightened), attempt to exit where the fencing has been installed. This can possibly damage the fencing. The key to success is to completely enclose the area you wish to protect. This will often times require enclosing a large portion, or often times the entire property. You will most likely have to address the driveway as well, since deer will follow the fence line to this opening.

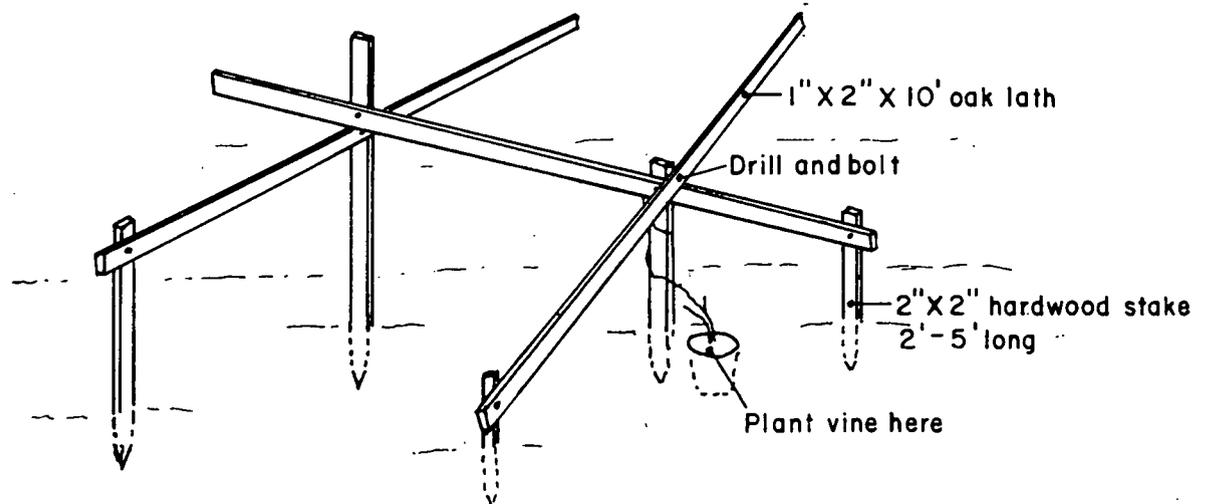
2) Start at a corner of the area to be protected, and unroll the fencing as you connect it to existing trees along the perimeter of the area. Approximately 8 nails (3-inch long galvanized nails are recommended) should be hammered into each tree that you will be attaching the material to. Start at ground level, and hammer each nail one foot apart until a height of approximately 7 feet is achieved. Drive the nails in half way, stretch the fencing up over the nails as tight as possible, and then bend the nails over in the direction that you are unrolling the fencing (this will increase the tension on the fence). Begin attaching the fencing at the bottom and work your way up the tree or post. The fencing should overlap onto the ground slightly (2 inches in the direction away from the area being protected) so it can be staked securely later without a gap. It is very important to pull the material tight from tree to tree since this ensures sufficient tension should deer push against it. Pressure treated 4 x 4's, fiberglass, and, or metal posts should be used for support in areas where there are not enough trees. As a general rule of thumb, trees should be attached to every 25' or closer if possible. Where there aren't enough trees, fiberglass or metal posts should be used, and spaced approximately every 10' for the standard fiberglass "t" posts, and 12' for the heavy duty round posts. Use no more than 2 "t" or 3 heavy duty fiberglass posts consecutively without a tree or 4 x 4 for sufficient strength. Spans approaching 25' are possible between 4 x 4's. For connecting the fence to the fiberglass posts, use the locking ties that are provided with each post order (five per post).

3) Be sure the fencing slightly overlaps the ground and is anchored with 12" long (18" for sandy soil) ground stakes every 5'-6'. This is critical since deer have been notorious for trying to push under the fencing. It is also very important to attach 12" long white streamers (provided with each order of fencing) at a height of 4'-5' every 12 feet. This will ensure that the deer see the newly installed barrier, and won't run into it. These streamers should be left up for at least 2 months to "train" the deer. They are most critical along areas where the deer have developed time-worn paths. These frequently traveled paths can also get a double layer of fencing, or be spanned with our new "Deer II" material.

4) For sloped areas it is strongly recommended that the fence be cut and re-attached (at a 4 x 4 or tree) periodically so as to keep it on an even plane with the ground and maintain its' full height. Once cut, overlap the fence around the tree or post, and re-connect it with ties to the fence & secure it to the nails. *NOTE: If following installation you notice holes being chewed through the bottom of the fence, this is due to rabbits and/or groundhogs. Although, this is fairly uncommon, the remedy is to run a 18"-24" high strip of chicken wire (or our corrosion-resistant, vinyl (black) coated "rabbit fence") across the bottom of the fence. Attach it with ties and stake it to the ground along with the fencing. (OVER)

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VINE SUPPORT STRUCTURE



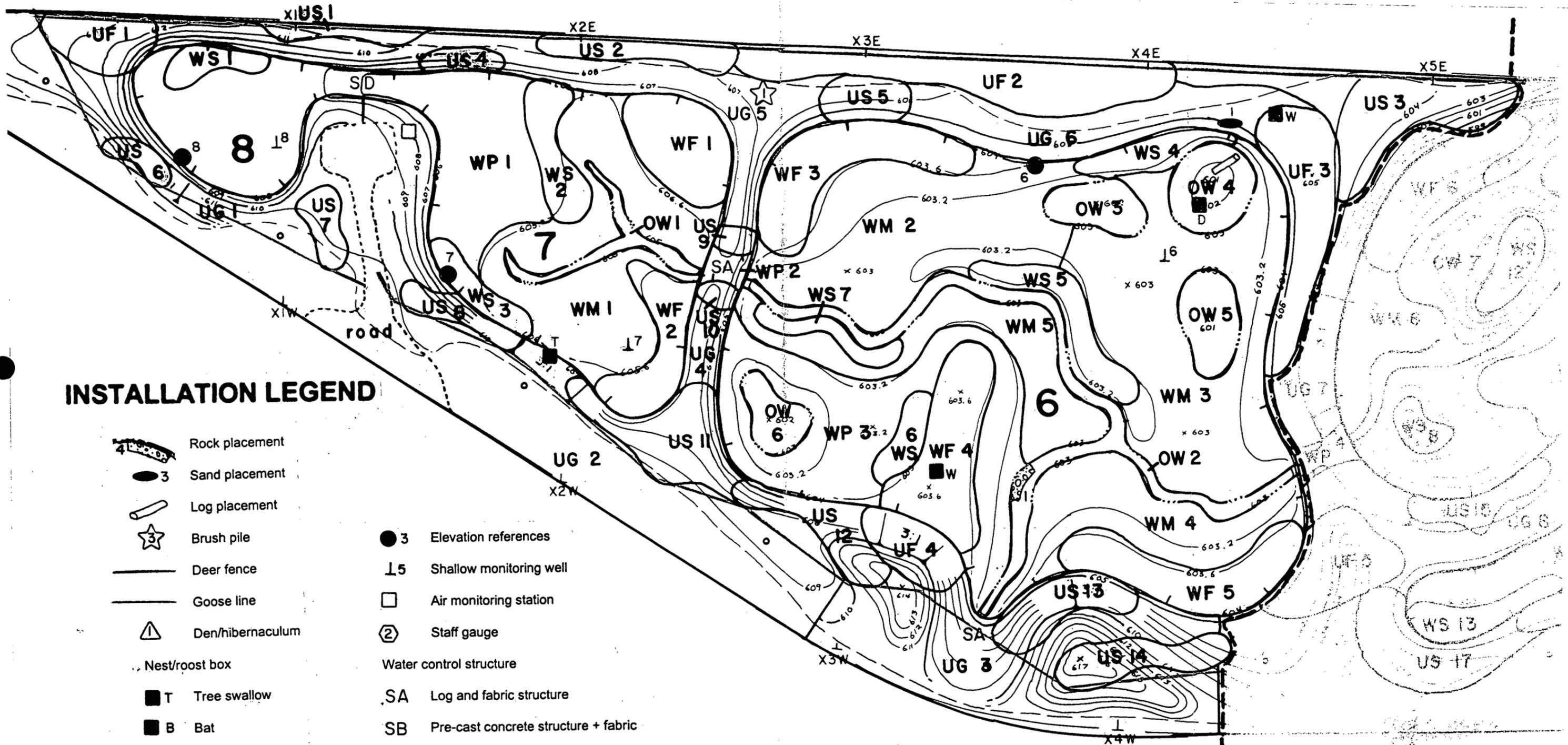
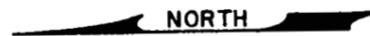
Random placement of stakes and crossarms.
 Structure can be extended.
 Crossarms can extend to 7 feet above ground.

Figure 20. Several species of woody vines are included in upland planting areas. These trellis-like structures will eventually form mound-like vine-covered shapes. Without some structure, vines will not thrive or will climb trees.

000081

SECTION 1

2118



INSTALLATION LEGEND

- Rock placement
- Sand placement
- Log placement
- Brush pile
- Deer fence
- Goose line
- Den/hibernaculum

- Elevation references
- Shallow monitoring well
- Air monitoring station
- Staff gauge

Nest/roost box

- T Tree swallow
- B Bat
- D Wood duck
- K Kestrel
- W Wren

Water control structure

- SA Log and fabric structure
- SB Pre-cast concrete structure + fabric
- SC Pole drain + fabric
- SD Fabric only

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990 OLD SUNNYSIDE PIKE, HARLEYSVILLE, PA 19438-125
JWM 24 JAN 1999

SECTION 1 | SECTION 2

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SECTION 2

2118

INSTALLATION LEGEND

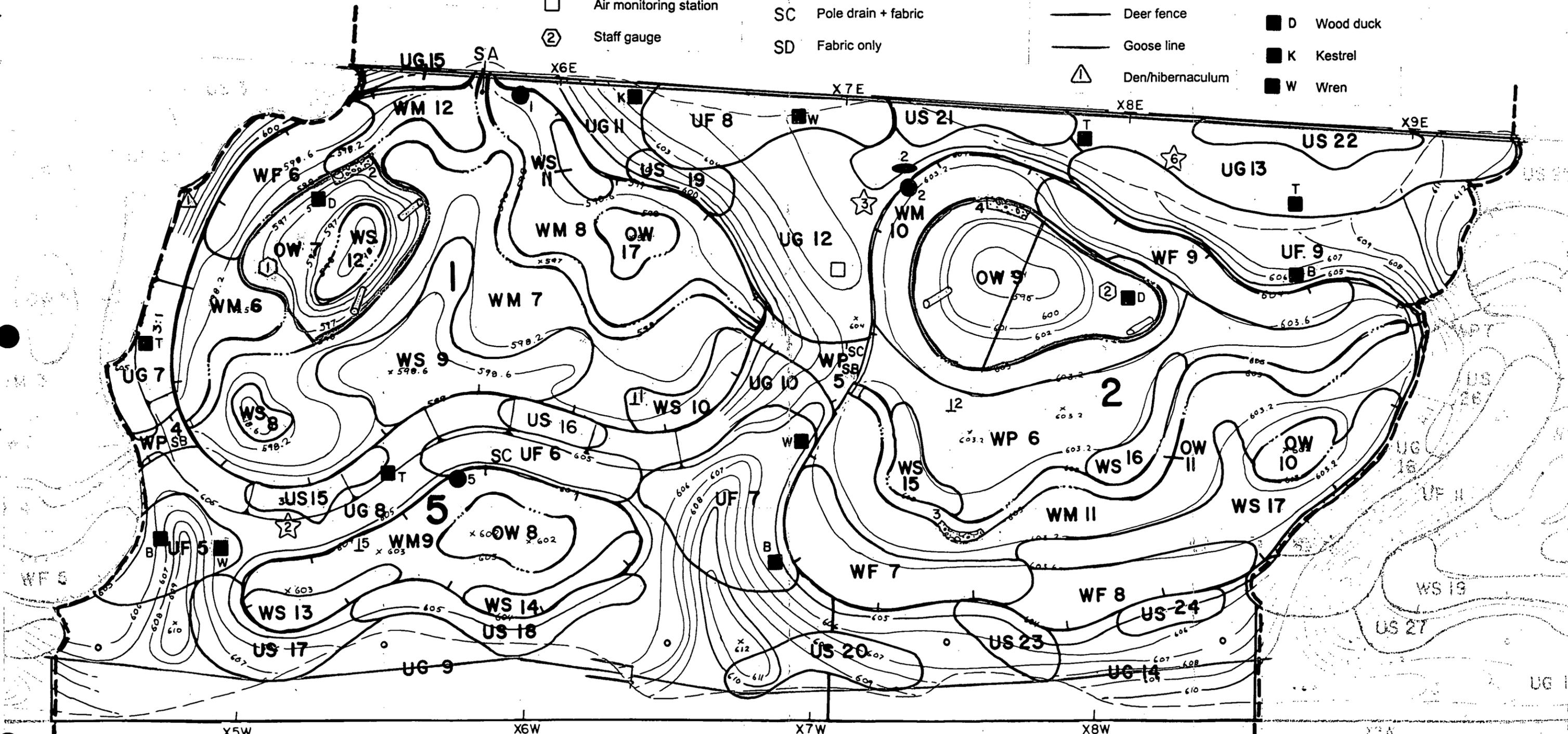


- 3 Elevation references
- ⊥ 5 Shallow monitoring well
- Air monitoring station
- ② Staff gauge

- Water control structure
- SA Log and fabric structure
 - SB Pre-cast concrete structure + fabric
 - SC Pole drain + fabric
 - SD Fabric only

- Rock placement
- 3 Sand placement
- Log placement
- ☆ 3 Brush pile
- Deer fence
- Goose line
- △ Den/hibernaculum

- Nest/roost box
- T Tree swallow
 - B Bat
 - D Wood duck
 - K Kestrel
 - W Wren



SECTION 2

MUNRO ECOLOGICAL SERVICES, INC.
990 OLD SUMMERTOWN PIKE, HARLEYSVILLE, PA 19438-225
JWA 24 JAN 1999

SECTION 2

SECTION 3

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SECTION 3

INSTALLATION LEGEND



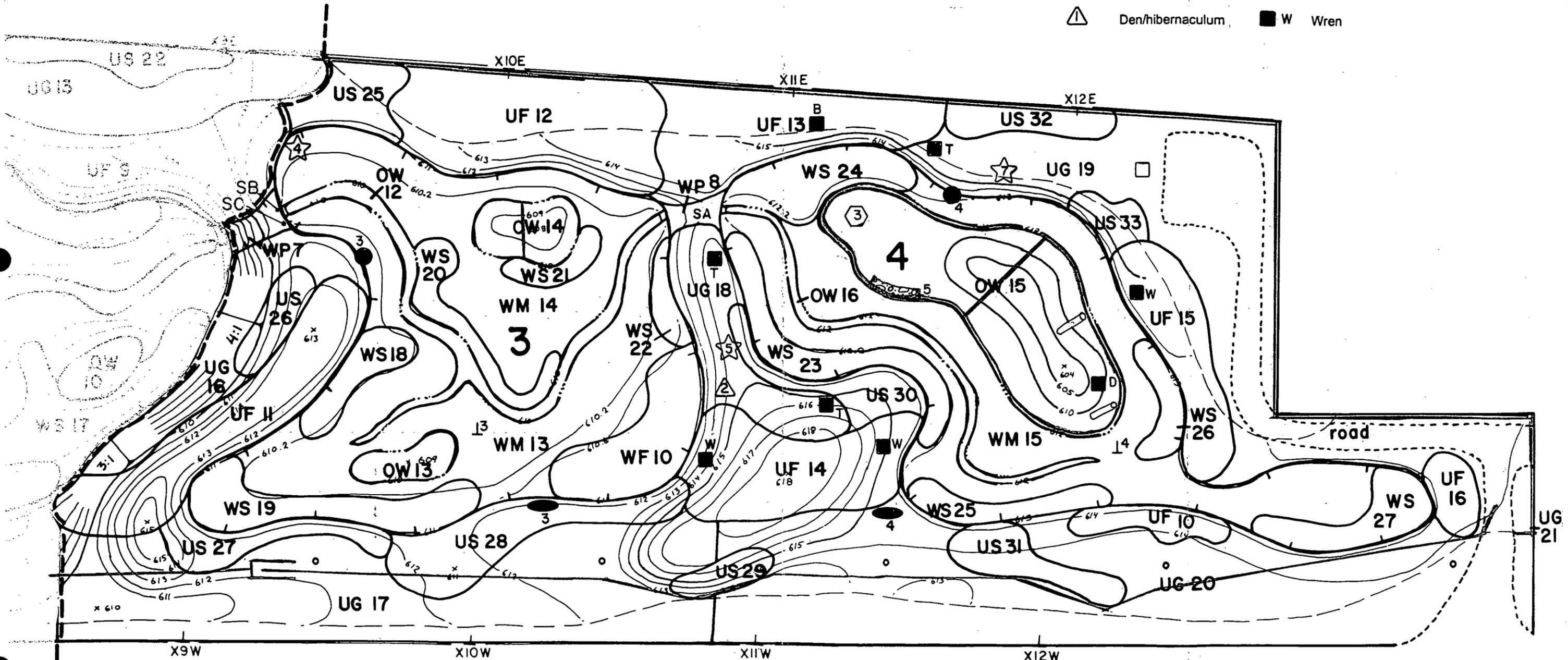
- 3 Elevation references
- ⊥ 5 Shallow monitoring well
- Air monitoring station
- Ⓜ 2 Staff gauge

- Water control structure
- SA Log and fabric structure
 - SB Pre-cast concrete structure + fabric
 - SC Pole drain + fabric
 - SD Fabric only

- Rock placement
- 3 Sand placement
- Log placement
- ☆ Brush pile
- Deer fence
- Goose line
- ⚠ Den/hibernaculum

- Nest/root box
- T Tree swallow
 - B Bat
 - D Wood duck
 - K Kestrel
 - W Wren

2118

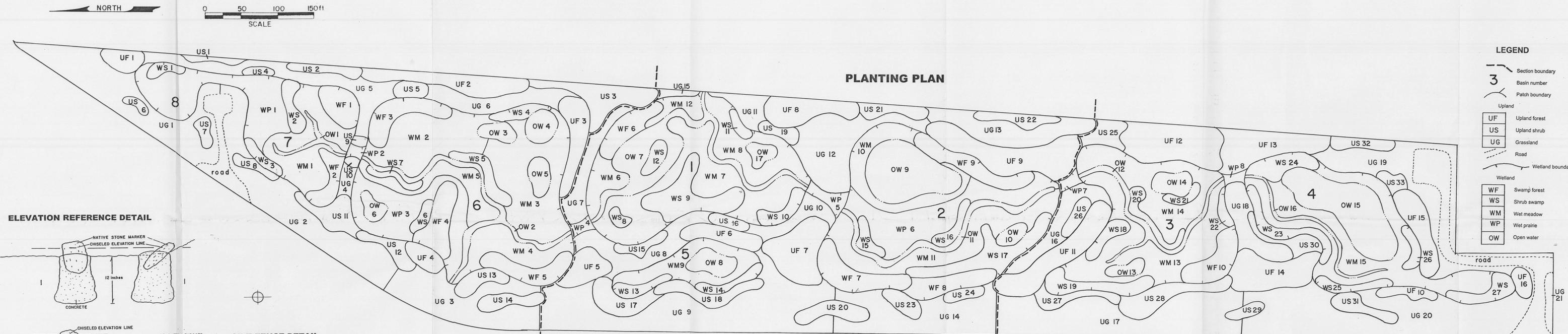


SECTION 3

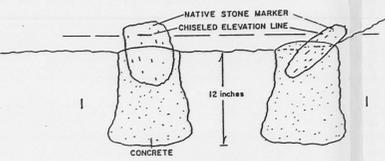
MUNRO ECOLOGICAL SERVICES, INC.
 990 OLD SUMNEYTOWN PIKE, HARLEYSVILLE, PA 17438-125
 JMM 24 JAN 1999

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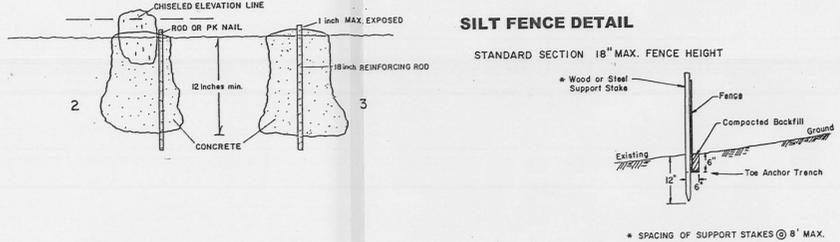
PLANTING PLAN



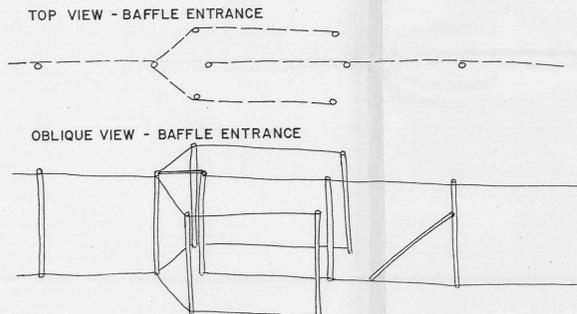
ELEVATION REFERENCE DETAIL



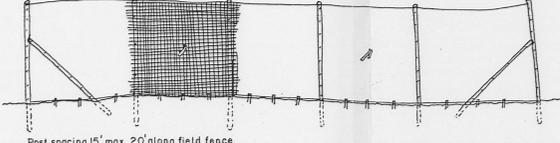
SILT FENCE DETAIL



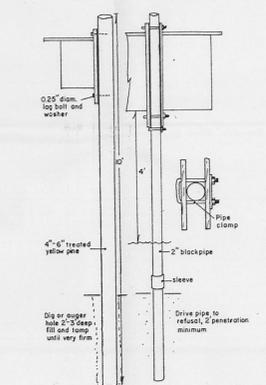
DEER FENCING DETAIL



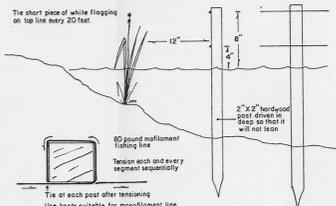
FENCE CONSTRUCTION DETAIL



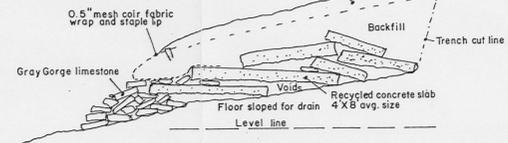
POST INSTALLATION DETAIL



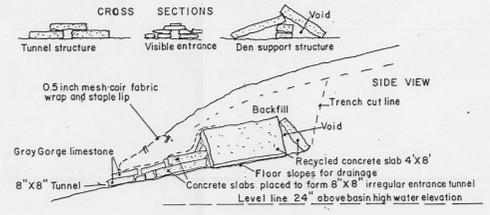
GOOSE LINE DETAIL



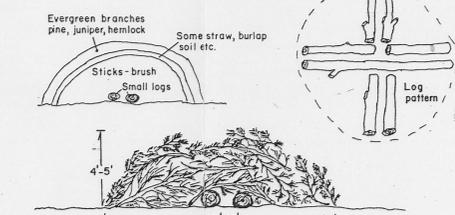
SNAKE HIBERNACULUM



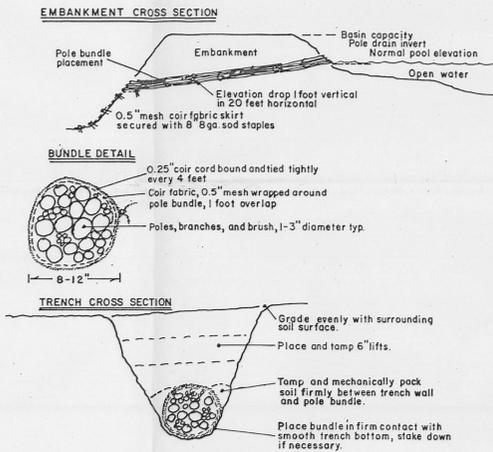
FOX DEN STRUCTURE



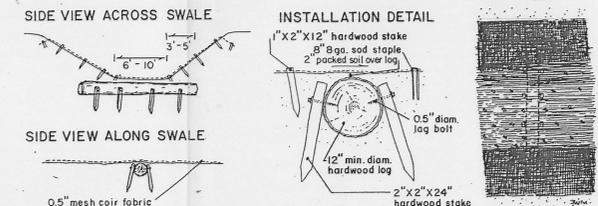
BRUSH PILE



POLE DRAIN STRUCTURE



LOG & FABRIC STRUCTURE



FEMP, AREA 1 PHASE I WETLAND MITIGATION SITE SHEET 1

MUNRO ECOLOGICAL SERVICES, INC.
990 OLD SUNNEYTOWN PIKE, HARLEYSVILLE, PA 19438-1215

JWM 26 JAN 1999

SURFACE MULCH AREAS & QUANTITIES

Wood chips 371.7 cu. yds.
 Salt hay 135 bales @ 70 lbs./bale
 Oat straw 160 bales @ 40 lbs./bale

SEEDING MIXES

Marsh mix 23.1 lb. _____ oz
 Wet prairie mix 9.0 lb. _____ oz
 Upland grass mix 47.1 lb. _____ oz
 Wildflower mix _____ lb. _____ oz

WETLAND PLUGS 637 plugs

STRUCTURES

Elevation reference 3
 Shallow monitoring well 3
 Staff gauge _____
 Log and fabric structure 2
 Pre-cast concrete + fabric _____
 Pole drain + fabric _____

Fabric only 1
 Rock placement 1
 Sand placement 1
 Log in water 1
 Brush pile 1
 Goose line _____

Den/hibernaculum _____
 Tree swallow nest box 1
 Bat roost box _____
 Wood duck nest box 1
 Kestrel nest box _____
 Wren nest box 2

WOODY PLANTS

Species	Number	Species	Number	Species	Number
Acer rubrum	23	Fraxinus nigra	7	Quercus rubra	7
Acer saccharinum	5	Fraxinus pennsylvanica	17	Quercus shumardii	3
Acer saccharum	6	Gymnocladus dioica	2	Quercus velutina	5
Aesculus glabra	3	Hamamelis virginiana	21	Rhus typhina	25
Aesculus octandra	3	Hydrangea arborescens	16	Ribes americanum	19
Alnus serrulata	15	Hypericum prolificum	0	Rosa caroliniana	26
Amelanchier arborea	4	Ilex verticillata	16	Rosa palustris	54
Amelanchier laevis	28	Juglans cinerea	3	Rubus allegheniensis	13
Aronia melanocarpa	9	Juglans nigra	2	Rubus occidentalis	19
Asimina triloba	6	Lindera benzoin	39	Salix discolor	9
Campsis radicans	8	Liquidambar styraciflua	6	Salix eriocephala	6
Carpinus caroliniana	6	Liriodendron tulipifera	5	Salix exigua	6
Ceanothus americanus	18	Lonicera sempervirens	13	Salix nigra	7
Celastrus scandens	11	Nyssa sylvatica	14	Salix sericea	5
Celtis occidentalis	2	Ostrya virginiana	2	Sambucus canadensis	11
Cephalanthus occidentalis	56	Parthenocissus quinquefolia	14	Sassafras albidum	4
Cercis canadensis	15	Physocarpus opulifolius	18	Spiraea alba	6
Cornus alternifolia	32	Platanus occidentalis	6	Spiraea tomentosa	6
Cornus amomum	55	Prunus americana	3	Staphylea trifolia	16
Cornus racemosa	34	Prunus serotina	2	Symphoricarpos orbiculatus	17
Corylus americana	18	Prunus virginiana	33	Tilia americana	5
Cornus florida	2	Quercus alba	7	Ulmus americana	10
Crateagus crugalli	11	Quercus bicolor	12	Ulmus rubra	8
Crateagus mollis	20	Quercus coccinea	2	Viburnum acerifolium	16
Decodon verticillatus	0	Quercus imbricaria	2	Viburnum dentatum	14
Diospyros virginiana	3	Quercus macrocarpa	2	Viburnum prunifolium	38
Fagus grandifolia	5	Quercus palustris	20	Zanthoxylum americanum	3
Fraxinus americana	8				

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>2</u>	Acer saccharum				Juglans nigra		
	Aesculus glabra				Liriodendron tulipifera		
	Aesculus octandra				Ostrya virginiana		
<u>1</u>	Amelanchier arborea				Prunus americana		
	Asimina triloba				Prunus serotina		
	Ceanothus americanus			<u>2</u>	Quercus alba		
	Celtis occidentalis				Quercus coccinea		
	Cercis canadensis				Quercus imbricaria		
	Cornus alternifolia				Quercus macrocarpa		
	Cornus florida				Quercus rubra		
<u>2</u>	Diospyros virginiana			<u>1</u>	Quercus shumardii		
<u>2</u>	Fagus grandifolia				Quercus velutina		
<u>3</u>	Fraxinus americana				Sassafras albidum		
	Gymnocladus dioica				Tilia americana		
	Juglans cinerea				Zanthoxylum americanum		

TOTAL WOODY STOCK IN PATCH 13

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 2.5 cu. yds.

Salt hay Qat straw _____ acres, 100 lbs.
Circle one

SEEDING MIXES

Grass mix .025 acres, 0.9 lb. _____ oz

000087

2118

PATCH SPECIFICATION SHEET

Patch area: 0.11 acres

SECTION 1 UF 2

UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
3	Acer saccharum				Juglans nigra		
3	Aesculus glabra			3	Liriodendron tulipifera		
	Aesculus octandra				Ostrya virginiana		
3	Amelanchier arborea			2	Prunus americana		
	Asimina triloba			2	Prunus serotina		
	Ceanothus americanus			3	Quercus alba		
	Celtis occidentalis			2	Quercus coccinea		
2	Cercis canadensis				Quercus imbricaria		
	Cornus alternifolia			2	Quercus macrocarpa		
2	Cornus florida			5	Quercus rubra		
	Diospyros virginiana				Quercus shumardii		
3	Fagus grandifolia			3	Quercus velutina		
3	Fraxinus americana			3	Sassafras albidum		
	Gymnocladus dioica			4	Tilia americana		
	Juglans cinerea				Zanthoxylum americanum		

Sassafras - plant along grass edge

TOTAL WOODY STOCK IN PATCH 48

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 9.1 cu. yds.

Salt hay Oat straw _____ acres, 372 lbs.
Circle one

SEEDING MIXES

Grass mix .093 acres, 3.3 lb. _____ oz

000088

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>1</u>	Acer saccharum			<u>2</u>	Juglans nigra		
	Aesculus glabra			<u>2</u>	Liriodendron tulipifera		
<u>3</u>	Aesculus octandra			<u>2</u>	Ostrya virginiana		
	Amelanchier arborea			<u>1</u>	Prunus americana		
	Asimina triloba				Prunus serotina		
<u>3</u>	Ceanothus americanus			<u>2</u>	Quercus alba		
<u>2</u>	Celtis occidentalis				Quercus coccinea		
	Cercis canadensis			<u>2</u>	Quercus imbricaria		
<u>3</u>	Cornus alternifolia				Quercus macrocarpa		
	Cornus florida				Quercus rubra		
	Diospyros virginiana			<u>2</u>	Quercus shumardii		
	Fagus grandifolia			<u>2</u>	Quercus velutina		
	Fraxinus americana				Sassafras albidum		
<u>2</u>	Gymnocladus dioica				Tilia americana		
<u>3</u>	Juglans cinerea			<u>3</u>	Zanthoxylum americanum		

Ceanothos - plant in one cluster
Zanthoxylum - plant near wetland edge

TOTAL WOODY STOCK IN PATCH 35

STRUCTURES

1 wren nest box

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 6.6 cu. yds.

Salt hay Oat straw _____ acres, 272 lbs.
Circle one

SEEDING MIXES

Grass mix .068 acres, 2.4 lb. _____ oz

00089

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION

1 UF 4
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Acer saccharum			_____	Juglans nigra		
_____	Aesculus glabra			_____	Liriodendron tulipifera		
_____	Aesculus octandra			_____	Ostrya virginiana		
_____	Amelanchier arborea			_____	Prunus americana		
<u>6</u>	Asimina triloba			_____	Prunus serotina		
_____	Ceanothus americanus			_____	Quercus alba		
_____	Celtis occidentalis			_____	Quercus coccinea		
_____	Cercis canadensis			_____	Quercus imbricaria		
_____	Cornus alternifolia			_____	Quercus macrocarpa		
_____	Cornus florida			<u>2</u>	Quercus rubra		
<u>1</u>	Diospyros virginiana			_____	Quercus shumardii		
_____	Fagus grandifolia			_____	Quercus velutina		
<u>2</u>	Fraxinus americana			<u>1</u>	Sassafras albidum		
_____	Gymnocladus dioica			<u>1</u>	Tilia americana		
_____	Juglans cinerea			_____	Zanthoxylum americanum		

Asimina - plant in one cluster
Sassafras - plant along grass edge

TOTAL WOODY STOCK IN PATCH 13

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

- Wood chips _____ acres, 2.5 cu. yds.
- Salt hay Oat straw _____ acres, 100 lbs.
Circle one

SEEDING MIXES

Grass mix .025 acres, 0.9 lb. _____ oz

000090

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis			<u>2</u>	Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
<u>2</u>	Celastrus scandens				Physocarpus opulifolius		
	Ceanothus americanus				Prunus virginiana		
	Cercis canadensis				Rhus typhina		
	Cornus alternifolia				Ribes americanum		
	Cornus amomum				Rosa caroliniana		
	Cornus racemosa				Rubus allegheniensis		
	Corylus americana			<u>3</u>	Rubus occidentalis		
<u>1</u>	Erateagus crugalli				Staphylea trifolia		
	Erateagus mollis				Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 14

Lonicera - plant on edge near grass

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000091

Wood chips _____ acres, 5.4 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION

1 US 2

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>2</u>	Prunus virginiana		
_____	Cercis canadensis			<u>3</u>	Rhus typhina		
_____	Cornus alternifolia			_____	Ribes americanum		
<u>3</u>	Cornus amomum			_____	Rosa caroliniana		
<u>4</u>	Cornus racemosa			<u>2</u>	Rubus allegheniensis		
<u>3</u>	Corylus americana			<u>3</u>	Rubus occidentalis		
<u>2</u>	Crateagus crugalli			_____	Staphylea trifolia		
<u>3</u>	Crateagus mollis			<u>3</u>	Symphoricarpos orbiculatus		
_____	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			<u>2</u>	Viburnum prunifolium		
<u>5</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 41

Lonicera - plant along grass edge
 Rubus allegheniensis - plant along grass edge
 Symphoricarpos - plant along grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000092

Wood chips _____ acres, 16.1 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.10 acres

2118

SECTION

1 US 3
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>9</u>	Amelanchier laevis				Lonicera sempervirens		
<u>3</u>	Campsis radicans			<u>6</u>	Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens				Physocarpus opulifolius		
<u>6</u>	Ceanothus americanus			<u>12</u>	Prunus virginiana		
<u>5</u>	Cercis canadensis			<u>9</u>	Rhus typhina		
<u>6</u>	Cornus alternifolia				Ribes americanum		
<u>9</u>	Cornus amomum			<u>6</u>	Rosa caroliniana		
<u>9</u>	Cornus racemosa			<u>6</u>	Rubus allegheniensis		
<u>7</u>	Corylus americana			<u>6</u>	Rubus occidentalis		
<u>6</u>	Crataegus crusgalli				Staphylea trifolia		
	Crateagus mollis			<u>6</u>	Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>12</u>	Viburnum prunifolium		
<u>9</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 135

Campsis - plant along grass edge
 Parthenocissus - plant along grass edge
 Rubus allegheniensis - plant along grass edge
 Symphoricarpos - plant along grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000093

Wood chips _____ acres, 53.8 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION

1 US 4

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>1</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			<u>2</u>	Physocarpus opulifolius		
	Ceanothus americanus			<u>2</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
	Cornus alternifolia			<u>2</u>	Ribes americanum		
<u>3</u>	Cornus amomum				Rosa caroliniana		
<u>2</u>	Cornus racemosa				Rubus allegheniensis		
	Corylus americana				Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
	Crateagus mollis				Symphoricarpos orbiculatus		
<u>2</u>	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens				Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 14

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000094

Wood chips _____ acres, 5.4 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			<u>3</u>	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>3</u>	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
<u>3</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>3</u>	Cornus amomum			_____	Rosa caroliniana		
_____	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crusgalli			<u>3</u>	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Staphylea - plant in cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000095

Wood chips _____ acres, 10.8 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION 1 US 6

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			<u>2</u>	Lonicera sempervirens		
_____	Campsis radicans			<u>2</u>	Parthenocissus quinquefolia		
_____	Celastrus scandens				Physocarpus opulifolius		
_____	Ceanothus americanus				Prunus virginiana		
_____	Cercis canadensis			<u>3</u>	Rhus typhina		
_____	Cornus alternifolia				Ribes americanum		
_____	Cornus amomum			<u>2</u>	Rosa caroliniana		
_____	Cornus racemosa				Rubus allegheniensis		
_____	Corylus americana			<u>2</u>	Rubus occidentalis		
_____	Crateagus crugalli				Staphylea trifolia		
_____	Crateagus mollis			<u>3</u>	Symphoricarpos orbiculatus		
_____	Hamamelis virginiana				Viburnum acerifolium		
_____	Hydrangea arborescens				Viburnum prunifolium		
_____	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 14

Plant Lonicera, Parthenocissus, and Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.4 cu. yds.

000096

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 1

US 7

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
<u>2</u>	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
<u>3</u>	Ceanothus americanus			_____	Prunus virginiana		
_____	Cercis canadensis			<u>5</u>	Rhus typhina		
_____	Cornus alternifolia			_____	Ribes americanum		
<u>2</u>	Cornus amomum			<u>4</u>	Rosa caroliniana		
_____	Cornus racemosa			<u>2</u>	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			_____	Staphylea trifolia		
<u>3</u>	Crateagus mollis			_____	Symphoricarpos orbiculatus		
_____	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
_____	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Plant Campsis, Lonicera, and Rubus near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000097

Wood chips _____ acres, 10.8 cu. yds.
MUNRO ECOLOGICAL SERVICES, INC.

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>3</u>	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
<u>3</u>	Cornus alternifolia			_____	Ribes americanum		
<u>5</u>	Cornus amomum			_____	Rosa caroliniana		
<u>2</u>	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			_____	Staphylea trifolia		
<u>3</u>	Crateagus mollis			<u>2</u>	Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
_____	Hydrangea arborescens			_____	Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Plant Symphoricarpos near grass edge
Plant Viburnum in cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000098

Wood chips _____ acres, 10.8 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

SECTION 1 US 9
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			_____	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
_____	Cornus alternifolia			_____	Ribes americanum		
_____	Cornus amomum			_____	Rosa caroliniana		
_____	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			<u>3</u>	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
_____	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
<u>5</u>	Hydrangea arborescens			_____	Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 14

Plant Staphylea and Viburnum in clusters

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.4 cu. yds.

000099

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION 1

US 10

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			<u>2</u>	Physocarpus opulifolius		
_____	Ceanothus americanus			_____	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
<u>3</u>	Cornus alternifolia			_____	Ribes americanum		
_____	Cornus amomum			_____	Rosa caroliniana		
_____	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			_____	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>2</u>	Hamamelis virginiana			<u>2</u>	Viburnum acerifolium		
<u>3</u>	Hydrangea arborescens			_____	Viburnum prunifolium		
<u>2</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 14

Plant Viburnum a. together

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000100

Wood chips _____ acres, 5.4 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>5</u>	Amelanchier laevis				Lonicera sempervirens		
<u>3</u>	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			<u>5</u>	Physocarpus opulifolius		
	Ceanothus americanus			<u>5</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
<u>5</u>	Cornus alternifolia			<u>5</u>	Ribes americanum		
<u>7</u>	Cornus amomum			<u>5</u>	Rosa caroliniana		
<u>7</u>	Cornus racemosa				Rubus allegheniensis		
	Corylus americana				Rubus occidentalis		
	Crateagus crugalli			<u>5</u>	Staphylea trifolia		
<u>5</u>	Crateagus mollis				Symphoricarpos orbiculatus		
<u>5</u>	Hamamelis virginiana			<u>5</u>	Viburnum acerifolium		
<u>3</u>	Hydrangea arborescens			<u>6</u>	Viburnum prunifolium		
<u>5</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH **81**

Plant Campsis near grass edge
Plant Staphylea and Viburnum a. in clusters

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000101

Wood chips _____ acres, 32.3 cu. yds.
MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2118

SECTION 1 US 12

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>5</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			<u>3</u>	Physocarpus opulifolius		
<u>3</u>	Ceanothus americanus			<u>2</u>	Prunus virginiana		
<u>3</u>	Cercis canadensis				Rhus typhina		
<u>4</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>3</u>	Cornus amomum			<u>4</u>	Rosa caroliniana		
<u>2</u>	Cornus racemosa				Rubus allegheniensis		
	Corylus americana			<u>2</u>	Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
<u>3</u>	Crateagus mollis				Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
<u>5</u>	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Viburnum a. in cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000102

Wood chips _____ acres, 21.5 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2116

SECTION

1 US 13

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans			<u>3</u>	Parthenocissus quinquefolia		
	Celastrus scandens			<u>3</u>	Physocarpus opulifolius		
	Ceanothus americanus			<u>4</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
<u>5</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>5</u>	Cornus amomum				Rosa caroliniana		
<u>3</u>	Cornus racemosa				Rubus allegheniensis		
<u>5</u>	Corylus americana			<u>3</u>	Rubus occidentalis		
	Crateagus crugalli			<u>5</u>	Staphylea trifolia		
	Crateagus mollis				Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
<u>6</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

plant Parthenocissus near grass edge
 plant Staphylea in cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000103

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2118

SECTION

1 US 14

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>2</u>	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
	Campsis radicans			<u>3</u>	Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens				Physocarpus opulifolius		
<u>3</u>	Ceanothus americanus				Prunus virginiana		
<u>5</u>	Cercis canadensis			<u>5</u>	Rhus typhina		
	Cornus alternifolia				Ribes americanum		
<u>3</u>	Cornus amomum			<u>5</u>	Rosa caroliniana		
<u>5</u>	Cornus racemosa			<u>3</u>	Rubus allegheniensis		
<u>3</u>	Corylus americana				Rubus occidentalis		
<u>2</u>	Crateagus crusgalli				Staphylea trifolia		
<u>3</u>	Crateagus mollis			<u>3</u>	Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Lonicera, Parthenocissus, and Rubus near grass edge
 Plant Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000104

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.31 acres

SECTION 1 UG 1
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1240 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 10.9 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000105

PATCH SPECIFICATION SHEET

Patch area: 0.30 acres **2118** SECTION 1 UG 2
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 tree swallow nest box

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1200 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 10.5 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

Place salvaged stock

000106

PATCH SPECIFICATION SHEET

Patch area: 0.24 acres

SECTION 1 UG 3
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 log and fabric structure

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 960 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 8.4 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

Place salvaged stock

000107

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 1 UG 4
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 80 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 0.7 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000108

2118

PATCH SPECIFICATION SHEET

Patch area: 0.16 acres

SECTION 1 UG 5
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 boush pile

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 640 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 5.6 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000109

2118

PATCH SPECIFICATION SHEET

Patch area: 0.10 acres

SECTION 1 UG 6
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 sand placement

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 400 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 3.5 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000110

2118

PATCH SPECIFICATION SHEET

Patch area: 0.07 acres

SECTION 1 ROAD

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, _____ lbs.
Circle one

000111

PATCH SPECIFICATION SHEET

Patch area: 0.05 acres

2118
SECTION

1 WF 1
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer rubrum				Platanus occidentalis		
<u>1</u>	Acer saccharinum			<u>3</u>	Quercus bicolor		
	Carpinus caroliniana			<u>3</u>	Quercus palustris		
	Fraxinus nigra				Salix eriocephala		
<u>3</u>	Fraxinus pennsylvanica				Salix nigra		
	Liquidambar styraciflua			<u>3</u>	Ulmus americana		
<u>6</u>	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH **22**

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.2 cu. yds.

Salt hay Oat straw _____ acres, 160 lbs.
Circle one

SEEDING MIXES

Marsh mix .040 acres, 0.8 lb. _____ oz

000112

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 1 WF 2

WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer rubrum			<u>3</u>	Platanus occidentalis		
_____	Acer saccharinum			_____	Quercus bicolor		
_____	Carpinus caroliniana			<u>3</u>	Quercus palustris		
_____	Fraxinus nigra			_____	Salix eriocephala		
<u>4</u>	Fraxinus pennsylvanica			<u>4</u>	Salix nigra		
_____	Liquidambar styraciflua			_____	Ulmus americana		
_____	Nyssa sylvatica						

- TOTAL WOODY STOCK IN PATCH 17

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 4.2 cu. yds.

Salt hay Oat straw _____ acres, 128 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ . 032 acres, 0.6 lb. _____ oz

000113

PATCH SPECIFICATION SHEET

Patch area: 0.08 acres

2118

SECTION 1 WF 3

WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation _____

Inspector (sign) _____ Date _____ One growing season survival _____

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Acer rubrum				Platanus occidentalis		
	Acer saccharinum				Quercus bicolor		
<u>3</u>	Carpinus caroliniana			<u>6</u>	Quercus palustris		
<u>4</u>	Fraxinus nigra			<u>6</u>	Salix eriocephala		
<u>3</u>	Fraxinus pennsylvanica				Salix nigra		
<u>3</u>	Liquidambar styraciflua			<u>4</u>	Ulmus americana		
	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 35

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 8.3 cu. yds.

Salt hay oat straw _____ acres, 256 lbs.
Circle one

SEEDING MIXES

Marsh mix .064 acres, 1.3 lb. _____ oz

000114

PATCH SPECIFICATION SHEET

Patch area: 0.08 acres

2118

SECTION

1 WF 4
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Acer rubrum				Platanus occidentalis		
	Acer saccharinum			<u>6</u>	Quercus bicolor		
<u>3</u>	Carpinus caroliniana			<u>3</u>	Quercus palustris		
<u>3</u>	Fraxinus nigra				Salix eriocephala		
<u>4</u>	Fraxinus pennsylvanica			<u>3</u>	Salix nigra		
<u>3</u>	Liquidambar styraciflua				Ulmus americana		
<u>4</u>	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 35

STRUCTURES

1 wren nest box

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 8.3 cu. yds.

Salt hay Oat straw _____ acres, 256 lbs.
Circle one

SEEDING MIXES

Marsh mix .064 acres, 1.3 lb. _____ oz

000115

2118

PATCH SPECIFICATION SHEET

Patch area: 0.07 acres

SECTION 1 WF 5
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
5	Acer rubrum			3	Platanus occidentalis		
4	Acer saccharinum			3	Quercus bicolor		
	Carpinus caroliniana			5	Quercus palustris		
	Fraxinus nigra				Salix eriocephala		
3	Fraxinus pennsylvanica				Salix nigra		
	Liquidambar styraciflua			3	Ulmus americana		
4	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 30

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 7.3 cu. yds.

Salt hay Oat straw _____ acres, 224 lbs.
Circle one

SEEDING MIXES

Marsh mix .056 acres, 1.1 lb. oz

000116

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118
SECTION

1 WS 1
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Alnus serrulata				Rosa palustris		
<u>3</u>	Aronia melanocarpa			<u>3</u>	Salix discolor		
	Cephalanthus occidentalis				Salix exigua		
<u>3</u>	Cornus amomum			<u>2</u>	Salix sericea		
	Decodon verticillatus			<u>3</u>	Sambucus canadensis		
	Hypericum prolificum				Spiraea alba		
<u>5</u>	Ilex verticillata				Spiraea tomentosa		
	Ribes americanum				Ulmus rubra		
				<u>5</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH **27**

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000117

Wood chips _____ acres, 10.8 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION

1 WS 2

WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	<i>Ainus serrulata</i>				<i>Rosa palustris</i>		
<u>3</u>	<i>Aronia melanocarpa</i>				<i>Salix discolor</i>		
	<i>Cephalanthus occidentalis</i>				<i>Salix exigua</i>		
<u>3</u>	<i>Cornus amomum</i>			<u>3</u>	<i>Salix sericea</i>		
	<i>Decodon verticillatus</i>				<i>Sambucus canadensis</i>		
	<i>Hypericum prolificum</i>			<u>6</u>	<i>Spiraea alba</i>		
<u>5</u>	<i>Ilex verticillata</i>			<u>6</u>	<i>Spiraea tomentosa</i>		
<u>3</u>	<i>Ribes americanum</i>			<u>6</u>	<i>Ulmus rubra</i>		
					<i>Viburnum dentatum</i>		

TOTAL WOODY STOCK IN PATCH 41

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000118

Wood chips _____ acres, 16.1 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 1 WS 3
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			<u>27</u>	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
_____	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

1 elevation reference

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000119

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION

1 WS 4
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Alnus serrulata				Rosa palustris		
<u>3</u>	Aronia melanocarpa			<u>3</u>	Salix discolor		
	Cephalanthus occidentalis			<u>3</u>	Salix exigua		
<u>3</u>	Cornus amomum				Salix sericea		
	Decodon verticillatus			<u>5</u>	Sambucus canadensis		
	Hypericum prolificum				Spiraea alba		
<u>3</u>	Ilex verticillata				Spiraea tomentosa		
	Ribes americanum				Ulmus rubra		
				<u>4</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH

Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000120

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2118

SECTION

1 WS 5

WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata	_____	_____	_____	Rosa palustris	_____	_____
_____	Aronia melanocarpa	_____	_____	_____	Salix discolor	_____	_____
<u>54</u>	Cephalanthus occidentalis	_____	_____	_____	Salix exigua	_____	_____
_____	Cornus amomum	_____	_____	_____	Salix sericea	_____	_____
_____	Decodon verticillatus	_____	_____	_____	Sambucus canadensis	_____	_____
_____	Hypericum prolificum	_____	_____	_____	Spiraea alba	_____	_____
_____	Ilex verticillata	_____	_____	_____	Spiraea tomentosa	_____	_____
_____	Ribes americanum	_____	_____	_____	Ulmus rubra	_____	_____
				_____	Viburnum dentatum	_____	_____

TOTAL WOODY STOCK IN PATCH 54

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000121

Wood chips _____ acres, 21.5 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION

1 WS 6
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			<u>27</u>	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
_____	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000122

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 1 WS 7
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Alnus serrulata				Rosa palustris		
	Aronia melanocarpa			<u>3</u>	Salix discolor		
<u>2</u>	Cephalanthus occidentalis			<u>3</u>	Salix exigua		
<u>3</u>	Cornus amomum				Salix sericea		
	Decodon verticillatus			<u>3</u>	Sambucus canadensis		
	Hypericum prolificum				Spiraea alba		
<u>3</u>	Ilex verticillata				Spiraea tomentosa		
	Ribes americanum			<u>2</u>	Ulmus rubra		
				<u>5</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

Plant Cephalanthus in low areas
Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000123

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 1 OW 1
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 120 lbs.
Circle one

106 plugs @ 1 every 3 feet of linear edge

PATCH SPECIFICATION SHEET

Patch area: 0.08 acres

SECTION 1 OW 2
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 rock placement

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 480 lbs.
Circle one

348 plugs @ 1 every 3 feet of linear edge

000125

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION 1 OW 3
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 180 lbs.
Circle one

Plant 45 plugs @ 1 every 3 feet of linear edge

000126

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2118

SECTION 1 OW 4
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 log placement
1 wood duck nest box

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 240 lbs.
Circle one

49 plugs @ 1 every 3 feet of linear edge

000127

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION 1

OW 5

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 180 lbs.
Circle one

48 plugs @ 1 every 3 feet of linear edge

000128

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION

1 OW 6

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 120 lbs.
Circle one

41 plugs @ 1 every 3 feet of linear edge

000129

PATCH SPECIFICATION SHEET

Patch area: 0.19 acres

SECTION 1

WM 1
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 shallow monitoring well

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1140 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 3.8 lb. _____ oz

000130

PATCH SPECIFICATION SHEET

Patch area: 0.22 acres

2118

SECTION 1 WM 2

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 elevation reference

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1320 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 4.4 lb. _____ oz

000131

PATCH SPECIFICATION SHEET

Patch area: 0.27 acres

2118

SECTION 1 WM 3
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 shallow monitoring well

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1620 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 5.4 lb. _____ oz

000132

PATCH SPECIFICATION SHEET

Patch area: 0.12 acres

2118

SECTION

1

WM

4

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 720 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 2.4 lb. _____ oz

000133

PATCH SPECIFICATION SHEET

Patch area: 0.10 acres

2118
SECTION 1 WM 5
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 600 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 2.0 lb. _____ oz

000134

PATCH SPECIFICATION SHEET

Patch area: 0.24 acres

2118

SECTION 1

WP 1

WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

- 1 Elevation reference
- 1 water control structure (fabric only)
- 1 shallow monitoring well

Salt hay Oat straw _____ acres, 1440 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 4.8 lb. _____ oz.

000135

2118

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

SECTION 1

WP 2

WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 log and fabric structure

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 60 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 0.2 lb. _____ oz.

000136

2118

PATCH SPECIFICATION SHEET

Patch area: 0.20 acres

SECTION 1 WP 3
WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1200 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 4.0 lb. _____ oz.

000137

SURFACE MULCH AREAS & QUANTITIES

Wood chips 494.3 cu. yds.
 Salt hay 141 bales @ 70 lbs./bale
 Oat straw 205 bales @ 40 lbs./bale

SEEDING MIXES

Marsh mix 25.5 lb. oz
 Wet prairie mix 5.4 lb. oz
 Upland grass mix 63.3 lb. oz
 Wildflower mix _____ lb. _____ oz

WETLAND PLUGS 946 plugs

STRUCTURES

Elevation reference <u>3</u>	Fabric only _____	Den/hibernaculum <u>1</u>
Shallow monitoring well <u>3</u>	Rock placement <u>3</u>	Tree swallow nest box <u>4</u>
Staff gauge <u>2</u>	Sand placement <u>1</u>	Bat roost box <u>3</u>
Log and fabric structure <u>1</u>	Log in water <u>4</u>	Wood duck nest box <u>2</u>
Pre-cast concrete + fabric <u>2</u>	Brush pile <u>3</u>	Kestrel nest box <u>1</u>
Pole drain + fabric <u>2</u>	Goose line <u>2</u>	Wren nest box <u>3</u>

WOODY PLANTS

Species	Number	Species	Number	Species	Number
Acer rubrum	17	Fraxinus nigra	5	Quercus rubra	7
Acer saccharinum	5	Fraxinus pensylvanica	16	Quercus shumardii	4
Acer saccharum	17	Gymnocladus dioica	4	Quercus velutina	8
Aesculus glabra	5	Hamamelis virginiana	21	Rhus typhina	22
Aesculus octandra	5	Hydrangea arborescens	14	Ribes americanum	31
Alnus serrulata	44	Hypericum prolificum	15	Rosa caroliniana	13
Amelanchier arborea	5	Ilex verticillata	30	Rosa palustris	49
Amelanchier laevis	25	Juglans cinerea	5	Rubus allegheniensis	10
Aronia melanocarpa	27	Juglans nigra	5	Rubus occidentalis	12
Asimina triloba	8	Lindera benzoin	27	Salix discolor	27
Campsis radicans	7	Liquidambar styraciflua	6	Salix eriocephala	6
Carpinus caroliniana	5	Liriodendron tulipifera	13	Salix exigua	18
Ceanothus americanus	21	Lonicera sempervirens	8	Salix nigra	17
Celastrus scandens	8	Nyssa sylvatica	13	Salix sericea	18
Celtis occidentalis	5	Ostrya virginiana	8	Sambucus canadensis	35
Cephalanthus occidentalis	104	Parthenocissus quinquefolia	12	Sassafras albidum	7
Cercis canadensis	17	Physocarpus opulifolius	16	Spiraea alba	28
Cornus alternifolia	32	Platanus occidentalis	6	Spiraea tomentosa	38
Cornus amomum	68	Prunus americana	8	Staphylea trifolia	19
Cornus racemosa	35	Prunus serotina	7	Symphoricarpos orbiculatus	18
Corylus americana	18	Prunus virginiana	29	Tilia americana	10
Cornus florida	5	Quercus alba	10	Ulmus americana	12
Crateagus crugalli	7	Quercus bicolor	12	Ulmus rubra	28
Crateagus mollis	24	Quercus coccinea	5	Viburnum acerifolium	11
Decodon verticillatus	15	Quercus imbricaria	4	Viburnum dentatum	44
Diospyros virginiana	7	Quercus macrocarpa	4	Viburnum prunifolium	34
Fagus grandifolia	10	Quercus palustris	14	Zanthoxylum americanum	7
Fraxinus americana	14				

000138

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer saccharum				Juglans nigra		
	Aesculus glabra			<u>3</u>	Liriodendron tulipifera		
	Aesculus octandra				Ostrya virginiana		
	Amelanchier arborea				Prunus americana		
	Asimina triloba			<u>3</u>	Prunus serotina		
	Ceanothus americanus				Quercus alba		
	Celtis occidentalis			<u>2</u>	Quercus coccinea		
<u>2</u>	Cercis canadensis				Quercus imbricaria		
	Cornus alternifolia			<u>2</u>	Quercus macrocarpa		
	Cornus florida			<u>3</u>	Quercus rubra		
	Diospyros virginiana				Quercus shumardii		
<u>2</u>	Fagus grandifolia				Quercus velutina		
<u>2</u>	Fraxinus americana			<u>3</u>	Sassafras albidum		
<u>1</u>	Gymnocladus dioica				Tilia americana		
	Juglans cinerea				Zanthoxylum americanum		

Sassafras - plant along grass edge

TOTAL WOODY STOCK IN PATCH 26

STRUCTURES

*1 bat roost box
1 wren nest box*

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.0 cu. yds.

Salt hay Oat straw _____ acres, 204 lbs.
Circle one

SEEDING MIXES

Grass mix .051 acres, 1.8 lb. _____ oz

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

SECTION 2 UF 6
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>1</u>	Acer saccharum			<u>1</u>	Juglans nigra		
<u>3</u>	Aesculus glabra			<u>2</u>	Liriodendron tulipifera		
_____	Aesculus octandra			_____	Ostrya virginiana		
_____	Amelanchier arborea			_____	Prunus americana		
_____	Asimina triloba			<u>1</u>	Prunus serotina		
_____	Ceanothus americanus			_____	Quercus alba		
<u>3</u>	Celtis occidentalis			_____	Quercus coccinea		
_____	Cercis canadensis			<u>2</u>	Quercus imbricaria		
_____	Cornus alternifolia			_____	Quercus macrocarpa		
_____	Cornus florida			<u>2</u>	Quercus rubra		
<u>2</u>	Diospyros virginiana			<u>2</u>	Quercus shumardii		
_____	Fagus grandifolia			<u>2</u>	Quercus velutina		
<u>2</u>	Fraxinus americana			_____	Sassafras albidum		
_____	Gymnocladus dioica			<u>3</u>	Tilia americana		
_____	Juglans cinerea			_____	Zanthoxylum americanum		

TOTAL WOODY STOCK IN PATCH 26

STRUCTURES

1 pole drain and fabric

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.0 cu. yds.

Salt hay Oat straw _____ acres, 204 lbs.
Circle one

SEEDING MIXES

Grass mix .051 acres, 1.8 lb. _____ oz

000140

PATCH SPECIFICATION SHEET

Patch area: 0.12 acres

SECTION 2 UF 7 UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
3	Acer saccharum				Juglans nigra		
	Aesculus glabra				Liriodendron tulipifera		
	Aesculus octandra			5	Ostrya virginiana		
	Amelanchier arborea			3	Prunus americana		
8	Asimina triloba				Prunus serotina		
3	Ceanothus americanus			5	Quercus alba		
	Celtis occidentalis				Quercus coccinea		
	Cercis canadensis				Quercus imbricaria		
3	Cornus alternifolia				Quercus macrocarpa		
	Cornus florida			2	Quercus rubra		
	Diospyros virginiana				Quercus shumardii		
3	Fagus grandifolia			2	Quercus velutina		
	Fraxinus americana			4	Sassafras albidum		
	Gymnocladus dioica			2	Tilia americana		
3	Juglans cinerea			3	Zanthoxylum americanum		

TOTAL WOODY STOCK IN PATCH 52

Asimina - plant in one cluster
 Ceanothus - plant in one cluster
 Sassafras - plant along grass edge
 Zanthoxylum - plant near wetland edge

STRUCTURES

1 bat roost box
 1 wren nest box

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.0 cu. yds.
 Salt hay Oat straw _____ acres, 404 lbs.
Circle one

SEEDING MIXES

Grass mix .101 acres, 3.6 lb. _____ oz

2118

PATCH SPECIFICATION SHEET

Patch area: 0.09 acres

SECTION 2 UF 8
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer saccharum				Juglans nigra		
	Aesculus glabra			<u>3</u>	Liriodendron tulipifera		
	Aesculus octandra				Ostrya virginiana		
	Amelanchier arborea				Prunus americana		
	Asimina triloba			<u>3</u>	Prunus serotina		
	Ceanothus americanus				Quercus alba		
	Celtis occidentalis			<u>3</u>	Quercus coccinea		
<u>5</u>	Cercis canadensis				Quercus imbricaria		
	Cornus alternifolia			<u>2</u>	Quercus macrocarpa		
	Cornus florida				Quercus rubra		
<u>5</u>	Diospyros virginiana				Quercus shumardii		
<u>5</u>	Fagus grandifolia			<u>2</u>	Quercus velutina		
<u>3</u>	Fraxinus americana				Sassafras albidum		
<u>3</u>	Gymnocladus dioica			<u>2</u>	Tilia americana		
	Juglans cinerea				Zanthoxylum americanum		

TOTAL WOODY STOCK IN PATCH 39

STRUCTURES

1 wren nest box

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 7.5 cu. yds.

Salt hay Oat straw _____ acres, 304 lbs.
Circle one

SEEDING MIXES

Grass mix .076 acres, 2.7 lb. _____ oz

000142

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>7</u>	Acer saccharum			<u>4</u>	Juglans nigra		
<u>2</u>	Aesculus glabra			<u>5</u>	Liriodendron tulipifera		
<u>2</u>	Aesculus octandra			<u>3</u>	Ostrya virginiana		
<u>5</u>	Amelanchier arborea			<u>5</u>	Prunus americana		
	Asimina triloba				Prunus serotina		
<u>6</u>	Ceanothus americanus			<u>5</u>	Quercus alba		
<u>2</u>	Celtis occidentalis				Quercus coccinea		
	Cercis canadensis			<u>2</u>	Quercus imbricaria		
<u>5</u>	Cornus alternifolia				Quercus macrocarpa		
<u>5</u>	Cornus florida				Quercus rubra		
	Diospyros virginiana			<u>2</u>	Quercus shumardii		
	Fagus grandifolia			<u>2</u>	Quercus velutina		
<u>7</u>	Fraxinus americana				Sassafras albidum		
	Gymnocladus dioica			<u>3</u>	Tilia americana		
<u>2</u>	Juglans cinerea			<u>4</u>	Zanthoxylum americanum		

Ceanothus - plant in 3's
Zanthoxylum - plant near wetland edge

TOTAL WOODY STOCK IN PATCH 78

STRUCTURES

1 bat roost box

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 15.0 cu. yds.

Salt hay Oat straw _____ acres, 608 lbs.
Circle one

SEEDING MIXES

Grass mix .152 acres, 5.3 lb. _____ oz

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 2 US 15
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
<u>2</u>	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			<u>3</u>	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>3</u>	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
_____	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>3</u>	Cornus amomum			_____	Rosa caroliniana		
<u>2</u>	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			<u>3</u>	Rubus occidentalis		
_____	Crateagus crusgalli			_____	Staphylea trifolia		
<u>2</u>	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
_____	Hydrangea arborescens			_____	Viburnum prunifolium		
_____	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Plant *Viburnum a.* in cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000144

Wood chips _____ acres, 10.8 cu. yds.
MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 2 US 16
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>2</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens				Physocarpus opulifolius		
	Ceanothus americanus			<u>3</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
<u>3</u>	Cornus alternifolia				Ribes americanum		
<u>5</u>	Cornus amomum				Rosa caroliniana		
	Cornus racemosa				Rubus allegheniensis		
	Corylus americana				Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
<u>3</u>	Crateagus mollis				Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
<u>3</u>	Hydrangea arborescens			<u>5</u>	Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000145

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

SECTION 2 US 17
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			<u>5</u>	Physocarpus opulifolius		
	Ceanothus americanus			<u>5</u>	Prunus virginiana		
<u>2</u>	Cercis canadensis				Rhus typhina		
<u>6</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>7</u>	Cornus amomum				Rosa caroliniana		
<u>9</u>	Cornus racemosa				Rubus allegheniensis		
<u>5</u>	Corylus americana				Rubus occidentalis		
	Crateagus crugalli			<u>9</u>	Staphylea trifolia		
<u>5</u>	Crateagus mollis				Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana			<u>5</u>	Viburnum acerifolium		
<u>3</u>	Hydrangea arborescens			<u>4</u>	Viburnum prunifolium		
<u>7</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 81

Plant Staphylea in two clusters
Plant Viburnum a. in one cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 32.3 cu. yds.

000146

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

SECTION 2 US 18

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
5	Amelanchier laevis				Lonicera sempervirens		
1	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			5	Physocarpus opulifolius		
3	Ceanothus americanus			6	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
6	Cornus alternifolia			6	Ribes americanum		
7	Cornus amomum			3	Rosa caroliniana		
7	Cornus racemosa				Rubus allegheniensis		
3	Corylus americana				Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
6	Crateagus mollis				Symphoricarpos orbiculatus		
5	Hamamelis virginiana				Viburnum acerifolium		
3	Hydrangea arborescens			6	Viburnum prunifolium		
9	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 81

Plant Campsis near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 32.3 cu. yds.

000147

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 2 US 19
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			<u>3</u>	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>3</u>	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
<u>3</u>	Cornus alternifolia			_____	Ribes americanum		
<u>3</u>	Cornus amomum			_____	Rosa caroliniana		
<u>5</u>	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
<u>3</u>	Crateagus crugalli			<u>4</u>	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
_____	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			_____	Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Plant Parthenocissus near grass edge
Plant Staphylea in one cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000148

PATCH SPECIFICATION SHEET

Patch area: 0.05 acres

2118

SECTION 2 US 20

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
<u>2</u>	Campsis radicans				Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens				Physocarpus opulifolius		
<u>6</u>	Ceanothus americanus				Prunus virginiana		
<u>5</u>	Cercis canadensis			<u>9</u>	Rhus typhina		
	Cornus alternifolia				Ribes americanum		
	Cornus amomum			<u>4</u>	Rosa caroliniana		
	Cornus racemosa			<u>3</u>	Rubus allegheniensis		
<u>5</u>	Corylus americana			<u>3</u>	Rubus occidentalis		
<u>4</u>	Crateagus crugalli				Staphylea trifolia		
<u>3</u>	Crateagus mollis			<u>6</u>	Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>6</u>	Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 68

Plant Campsis, Lonicera, Rubus, and Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 26.9 cu. yds.

000149

MUNRO ECOLOGICAL SERVICES, INC.

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
	Campsis radicans			<u>3</u>	Parthenocissus quinquefolia		
<u>2</u>	Celastrus scandens				Physocarpus opulifolius		
	Ceanothus americanus			<u>6</u>	Prunus virginiana		
<u>3</u>	Cercis canadensis			<u>6</u>	Rhus typhina		
	Cornus alternifolia				Ribes americanum		
	Cornus amomum				Rosa caroliniana		
<u>6</u>	Cornus racemosa			<u>4</u>	Rubus allegheniensis		
<u>2</u>	Corylus americana			<u>3</u>	Rubus occidentalis		
	Crateagus crusgalli				Staphylea trifolia		
	Crateagus mollis			<u>6</u>	Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>4</u>	Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Lonicera, Parthenocissus, Rubus, and Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000150

2118

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 2 US 22
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans			<u>6</u>	Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens				Physocarpus opulifolius		
<u>3</u>	Ceanothus americanus				Prunus virginiana		
	Cercis canadensis			<u>7</u>	Rhus typhina		
	Cornus alternifolia				Ribes americanum		
	Cornus amomum			<u>6</u>	Rosa caroliniana		
	Cornus racemosa			<u>3</u>	Rubus allegheniensis		
<u>3</u>	Corylus americana			<u>3</u>	Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
<u>5</u>	Crateagus mollis			<u>6</u>	Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>6</u>	Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Parthenocissus, Rubus, and Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000151

2118

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

SECTION 2 US 23
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			<u>3</u>	Physocarpus opulifolius		
	Ceanothus americanus			<u>3</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
<u>3</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>5</u>	Cornus amomum				Rosa caroliniana		
<u>3</u>	Cornus racemosa				Rubus allegheniensis		
	Corylus americana				Rubus occidentalis		
	Crateagus crugalli			<u>6</u>	Staphylea trifolia		
	Crateagus mollis				Symphoricarpos orbiculatus		
<u>3</u>	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
<u>3</u>	Hydrangea arborescens				Viburnum prunifolium		
<u>3</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 41

Plant Staphylea and Viburnum in clusters of 3.

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000152

Wood chips _____ acres, 16.1 cu. yds.

2110

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 2 US 24
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			<u>2</u>	Lonicera sempervirens		
<u>2</u>	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			_____	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
<u>3</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>3</u>	Cornus amomum			_____	Rosa caroliniana		
<u>3</u>	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			_____	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>4</u>	Hamamelis virginiana			_____	Viburnum acerifolium		
<u>2</u>	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
<u>2</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Plant Campsis and Lonicera near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000153

2118

PATCH SPECIFICATION SHEET

Patch area: 0.09 acres

SECTION 2 UG 7
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 fox den
1 tree swallow nest box

SURFACE MULCH AREAS & QUANTITIES

Salt hay Qat straw _____ acres, 360 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 3.2 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000154

PATCH SPECIFICATION SHEET

Patch area: 0.12 acres

SECTION 2 UG 8
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 tree swallow nest box
1 brush pile

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 480 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 4.2 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

2118

PATCH SPECIFICATION SHEET

Patch area: 0.48 acres

SECTION 2 UG 9
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1920 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 16.8 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

place salvaged stock

000156

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

2118

SECTION

2 UG 10

UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 240 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 2.1 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000157

2118

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 2 UG 11
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 Kestrel nest box

SURFACE MULCH AREAS & QUANTITIES

Salt hay Qat straw _____ acres, 160 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 1.4 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000158

PATCH SPECIFICATION SHEET

Patch area: 0.20 acres

2118

SECTION 2 UG 12
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 sand placement
1 brush pile

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 800 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 7.0 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000159

2118

PATCH SPECIFICATION SHEET

Patch area: 0.14 acres

SECTION 2 UG 13
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover.

STRUCTURES

2 tree swallow nest boxes
1 brush pile

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 560 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 4.9 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000160

2118

PATCH SPECIFICATION SHEET

Patch area: 0.23 acres

SECTION 2 UG 14

UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 920 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 8.1 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

Place salvaged stock

000161

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION 2 UG 15

UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Qat straw _____ acres, 40 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 0.4 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000162

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

2118

SECTION 2 WF 6
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer rubrum				Platanus occidentalis		
	Acer saccharinum				Quercus bicolor		
	Carpinus caroliniana			<u>4</u>	Quercus palustris		
<u>2</u>	Fraxinus nigra			<u>3</u>	Salix eriocephala		
<u>3</u>	Fraxinus pennsylvanica			<u>3</u>	Salix nigra		
	Liquidambar styraciflua			<u>3</u>	Ulmus americana		
<u>5</u>	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 26

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 6.2 cu. yds.

Salt hay Qat straw _____ acres, 192 lbs.
Circle one

SEEDING MIXES

Marsh mix .048 acres, 1.0 lb. _____ oz

000163

PATCH SPECIFICATION SHEET

Patch area: 0.09 acres **2118**

SECTION 2 WF 7
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Acer rubrum			<u>3</u>	Platanus occidentalis		
<u>3</u>	Acer saccharinum			<u>3</u>	Quercus bicolor		
	Carpinus caroliniana			<u>5</u>	Quercus palustris		
	Fraxinus nigra				Salix eriocephala		
<u>4</u>	Fraxinus pennsylvanica			<u>5</u>	Salix nigra		
<u>3</u>	Liquidambar styraciflua			<u>4</u>	Ulmus americana		
<u>3</u>	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH **39**

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 9.3 cu. yds.

Salt hay Oat straw _____ acres, 292 lbs.
Circle one

SEEDING MIXES

Marsh mix .073 acres, 1.5 lb. _____ oz

000164

PATCH SPECIFICATION SHEET

Patch area: 0.07 acres

2118
SECTION 2 WF 8
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer rubrum			<u>3</u>	Platanus occidentalis		
	Acer saccharinum			<u>3</u>	Quercus bicolor		
<u>2</u>	Carpinus caroliniana			<u>5</u>	Quercus palustris		
<u>3</u>	Fraxinus nigra			<u>3</u>	Salix eriocephala		
<u>3</u>	Fraxinus pennsylvanica			<u>3</u>	Salix nigra		
	Liquidambar styraciflua			<u>2</u>	Ulmus americana		
	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 30

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 7.3 cu. yds.

Salt hay Oat straw _____ acres, 224 lbs.
Circle one

SEEDING MIXES

Marsh mix .056 acres, 1.1 lb. _____ oz

000165

PATCH SPECIFICATION SHEET

Patch area: 0.09 acres

SECTION 2 WF 9
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>5</u>	Acer rubrum				Platanus occidentalis		
<u>2</u>	Acer saccharinum			<u>6</u>	Quercus bicolor		
<u>3</u>	Carpinus caroliniana				Quercus palustris		
	Fraxinus nigra				Salix eriocephala		
<u>6</u>	Fraxinus pennsylvanica			<u>6</u>	Salix nigra		
<u>3</u>	Liquidambar styraciflua			<u>3</u>	Ulmus americana		
<u>5</u>	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 39

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 9.3 cu. yds.

Salt hay Oat straw _____ acres, 292 lbs.
Circle one

SEEDING MIXES

Marsh mix .073 acres, 1.5 lb. _____ oz

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION 2 WS 8
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			_____	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
<u>14</u>	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 14

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000167

Wood chips _____ acres, 5.4 cu. yds.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.12 acres

SECTION 2 WS 9
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>15</u>	<u>Alnus serrulata</u>			<u>12</u>	<u>Rosa palustris</u>		
<u>9</u>	<u>Aronia melanocarpa</u>			<u>12</u>	<u>Salix discolor</u>		
<u>10</u>	<u>Cephalanthus occidentalis</u>			<u>6</u>	<u>Salix exigua</u>		
<u>10</u>	<u>Cornus amomum</u>			<u>9</u>	<u>Salix sericea</u>		
	<u>Decodon verticillatus</u>			<u>12</u>	<u>Sambucus canadensis</u>		
<u>9</u>	<u>Hypericum prolificum</u>			<u>10</u>	<u>Spiraea alba</u>		
<u>9</u>	<u>Ilex verticillata</u>			<u>12</u>	<u>Spiraea tomentosa</u>		
<u>6</u>	<u>Ribes americanum</u>			<u>6</u>	<u>Ulmus rubra</u>		
				<u>15</u>	<u>Viburnum dentatum</u>		

TOTAL WOODY STOCK IN PATCH 162

Plant Cephalanthus in low areas
Plant Hypericum in dryer areas
Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 64.5 cu. yds.

000168

MUNRO ECOLOGICAL SERVICES, INC.

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>9</u>	Alnus serrulata			<u>6</u>	Rosa palustris		
	Aronia melanocarpa			<u>3</u>	Salix discolor		
	Cephalanthus occidentalis				Salix exigua		
<u>6</u>	Cornus amomum			<u>3</u>	Salix sericea		
	Decodon verticillatus			<u>3</u>	Sambucus canadensis		
	Hypericum prolificum			<u>6</u>	Spiraea alba		
<u>3</u>	Ilex verticillata			<u>6</u>	Spiraea tomentosa		
	Ribes americanum			<u>3</u>	Ulmus rubra		
				<u>6</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 54

STRUCTURES

1 shallow monitoring well

SURFACE MULCH AREAS & QUANTITIES

000169 Wood chips _____ acres, 21.5 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION 2 WS 11
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			<u>14</u>	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
_____	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 14

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.4 cu. yds.

000170

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 2 WS 12
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			_____	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
<u>27</u>	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000171

2118

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

SECTION 2 WS 13
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>4</u>	<i>Alnus serrulata</i>				<i>Rosa palustris</i>		
	<i>Aronia melanocarpa</i>			<u>3</u>	<i>Salix discolor</i>		
	<i>Cephalanthus occidentalis</i>			<u>3</u>	<i>Salix exigua</i>		
<u>3</u>	<i>Cornus amomum</i>				<i>Salix sericea</i>		
	<i>Decodon verticillatus</i>			<u>6</u>	<i>Sambucus canadensis</i>		
	<i>Hypericum prolificum</i>				<i>Spiraea alba</i>		
<u>6</u>	<i>Ilex verticillata</i>			<u>6</u>	<i>Spiraea tomentosa</i>		
	<i>Ribes americanum</i>			<u>4</u>	<i>Ulmus rubra</i>		
				<u>6</u>	<i>Viburnum dentatum</i>		

TOTAL WOODY STOCK IN PATCH 41

Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 16.1 cu. yds.

000172

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres **2118**

SECTION 2 WS 14
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>4</u>	Alnus serrulata			<u>4</u>	Rosa palustris		
_____	Aronia melanocarpa			<u>3</u>	Salix discolor		
_____	Cephalanthus occidentalis			<u>3</u>	Salix exigua		
<u>6</u>	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
<u>3</u>	Ilex verticillata			<u>5</u>	Spiraea tomentosa		
<u>3</u>	Ribes americanum			<u>5</u>	Ulmus rubra		
				<u>5</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 41

Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 16.1 cu. yds.

000173

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 2 WS 15

WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			<u>4</u>	Rosa palustris		
<u>9</u>	Aronia melanocarpa			_____	Salix discolor		
_____	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			<u>6</u>	Salix sericea		
<u>5</u>	Decodon verticillatus			<u>3</u>	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

Plant Decodon on water's edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000174

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

SECTION 2 WS 16

WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata	_____	_____	_____	Rosa palustris	_____	_____
_____	Aronia melanocarpa	_____	_____	_____	Salix discolor	_____	_____
<u>41</u>	Cephalanthus occidentalis	_____	_____	_____	Salix exigua	_____	_____
_____	Cornus amomum	_____	_____	_____	Salix sericea	_____	_____
_____	Decodon verticillatus	_____	_____	_____	Sambucus canadensis	_____	_____
_____	Hypericum prolificum	_____	_____	_____	Spiraea alba	_____	_____
_____	Ilex verticillata	_____	_____	_____	Spiraea tomentosa	_____	_____
_____	Ribes americanum	_____	_____	_____	Ulmus rubra	_____	_____
				_____	Viburnum dentatum	_____	_____

TOTAL WOODY STOCK IN PATCH 41

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000175

Wood chips _____ acres, 16.1 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.11 acres

2118

SECTION 2 WS 17
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>12</u>	Alnus serrulata			<u>9</u>	Rosa palustris		
<u>9</u>	Aronia melanocarpa			<u>6</u>	Salix discolor		
<u>12</u>	Cephalanthus occidentalis			<u>6</u>	Salix exigua		
<u>10</u>	Cornus amomum				Salix sericea		
<u>10</u>	Decodon verticillatus			<u>11</u>	Sambucus canadensis		
<u>6</u>	Hypericum prolificum			<u>12</u>	Spiraea alba		
<u>9</u>	Ilex verticillata			<u>9</u>	Spiraea tomentosa		
<u>6</u>	Ribes americanum			<u>10</u>	Ulmus rubra		
				<u>12</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 149

Plant Cephalanthus in low areas
Plant Decodon and Salix exigua at edge of water
Plant Hypericum in dryer areas

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 59.2 cu. yds.

000176

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 2 OW 7

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

- 1 log and fabric structure
- 2 log placements
- 1 rock placement
- 1 wood duck nest box
- 1 staff gauge
- 1 goose liner

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 120 lbs.
Circle one

416 plugs @ 1 every 3 foot of linear edge

2118

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 2 OW 8
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 240 lbs.
Circle one

60 plugs @ 1 every 3 feet of linear edge

2118

PATCH SPECIFICATION SHEET

Patch area: 0.18 acres

SECTION 2 OW 9
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

- 1 rock placement
- 2 log placements
- 1 wood duck nest box
- 1 staff gauge
- goose line

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1080 lbs.
Circle one

117 plugs @ 1 every 3 feet of linear edge

000179

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION

2

OW 10

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 120 lbs.
Circle one

40 plugs @ 1 every 3 feet of linear edge

PATCH SPECIFICATION SHEET

Patch area: 0.08 acres

2118

SECTION 2 OW 11

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 rock placement

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 480 lbs.
Circle one

271 plugs @ 1 every 3 feet of linear edge

000181

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 2 OW 17

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 120 lbs.
Circle one

42 plugs @ 1 every 3 feet of linear edge

000182

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

2118

SECTION 2 WM 6
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 360 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 1.2 lb. _____ oz

000183

PATCH SPECIFICATION SHEET

Patch area: 0.31 acres

2118

SECTION 2 WM 7
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1860 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 6.2 lb. _____ oz

000184

PATCH SPECIFICATION SHEET

Patch area: 0.14 acres

2118

SECTION

2

WM

8

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 elevation reference

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 840 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 2.8 lb. _____ oz

000185

PATCH SPECIFICATION SHEET

Patch area: 0.13 acres

2118

SECTION 2 WM 9
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 elevation reference
1 shallow monitoring well

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 780 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 2.6 lb. _____ oz

000186

PATCH SPECIFICATION SHEET

Patch area: 0.13 acres

2118

SECTION 2

WM 10

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 elevation reference

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 780 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 2.6 lb. _____ oz

000187

PATCH SPECIFICATION SHEET

Patch area: 0.21 acres

2118

SECTION 2

WM 11

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1260 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 4.2 lb. _____ oz

000188

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres **2118** SECTION 2 WM 12
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 240 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 0.8 lb. _____ oz

000189

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION 2 WP 4

WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 pre-cast concrete structure
+ fabric

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 60 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 0.2 lb. _____ oz.

000190

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION 2 WP 5
WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 pole drain + fabric
1 pre-cast concrete structures
+ fabric

SURFACE MULCH AREAS & QUANTITIES

Salt hay Circle one Oat straw _____ acres, 180 lbs.

SEEDING MIXES

Wet prairie mix _____ acres, 0.6 lb. _____ oz.

000191

PATCH SPECIFICATION SHEET

Patch area: 0.25 acres

2118

SECTION 2 WP 6
WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 shallow monitoring well

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1380 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 4.6 lb. _____ oz.

000192

SURFACE MULCH AREAS & QUANTITIES

Wood chips 440.2 cu. yds.
 Salt hay 104 bales @ 70 lbs./bale
 Oat straw 193 bales @ 40 lbs./bale

SEEDING MIXES

Marsh mix 17.5 lb. 02
 Wet prairie mix 0.4 lb. 02
 Upland grass mix 65.5 lb. 02
 Wildflower mix _____ lb. _____ oz

WETLAND PLUGS 715 plugs

STRUCTURES

Elevation reference 2
 Shallow monitoring well 2
 Staff gauge 1
 Log and fabric structure 1
 Pre-cast concrete + fabric 1
 Pole drain + fabric 1

Fabric only 1
 Rock placement 1
 Sand placement 2
 Log in water 2
 Brush pile 3
 Goose line 2

Den/hibernaculum 1
 Tree swallow nest box 3
 Bat roost box 1
 Wood duck nest box 1
 Kestrel nest box _____
 Wren nest box 3

WOODY PLANTS

Species	Number	Species	Number	Species	Number
Acer rubrum	3	Fraxinus nigra	0	Quercus rubra	12
Acer saccharinum	3	Fraxinus pensylvanica	6	Quercus shumardii	8
Acer saccharum	18	Gymnocladus dioica	6	Quercus velutina	9
Aesculus glabra	8	Hamamelis virginiana	30	Rhus typhina	13
Aesculus octandra	5	Hydrangea arborescens	9	Ribes americanum	36
Alnus serrulata	54	Hypericum prolificum	12	Rosa caroliniana	11
Amelanchier arborea	9	Ilex verticillata	35	Rosa palustris	28
Amelanchier laevis	28	Juglans cinerea	6	Rubus allegheniensis	8
Aronia melanocarpa	21	Juglans nigra	10	Rubus occidentalis	9
Asimina triloba	13	Lindera benzoin	41	Salix discolor	33
Campsis radicans	6	Liquidambar styraciflua	0	Salix eriocephala	0
Carpinus caroliniana	0	Liriodendron tulipifera	15	Salix exigua	17
Ceanothus americanus	21	Lonicera sempervirens	8	Salix nigra	3
Celastrus scandens	6	Nyssa sylvatica	3	Salix sericea	12
Celtis occidentalis	7	Ostrya virginiana	9	Sambucus canadensis	44
Cephalanthus occidentalis	62	Parthenocissus quinquefolia	14	Sassafras albidum	10
Cercis canadensis	20	Physocarpus opulifolius	12	Spiraea alba	26
Cornus alternifolia	30	Platanus occidentalis	0	Spiraea tomentosa	19
Cornus amomum	78	Prunus americana	8	Staphylea trifolia	19
Cornus racemosa	33	Prunus serotina	8	Symphoricarpos orbiculatus	9
Corylus americana	6	Prunus virginiana	39	Tilia americana	16
Cornus florida	10	Quercus alba	11	Ulmus americana	3
Crateagus crusgalli	6	Quercus bicolor	6	Ulmus rubra	19
Crateagus mollis	5	Quercus coccinea	7	Viburnum acerifolium	18
Decodon verticillatus	5	Quercus imbricaria	6	Viburnum dentatum	45
Diospyros virginiana	9	Quercus macrocarpa	6	Viburnum prunifolium	35
Fagus grandifolia	15	Quercus palustris	3	Zanthoxylum americanum	6
Fraxinus americana	17				

000193

2118

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

SECTION 3 UF 10
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Acer saccharum	_____	_____	_____	Juglans nigra	_____	_____
_____	Aesculus glabra	_____	_____	_____	Liriodendron tulipifera	_____	_____
_____	Aesculus octandra	_____	_____	_____	Ostrya virginiana	_____	_____
_____	Amelanchier arborea	_____	_____	_____	Prunus americana	_____	_____
_____	Asimina triloba	_____	_____	_____	Prunus serotina	_____	_____
_____	Ceanothus americanus	_____	_____	<u>3</u>	Quercus alba	_____	_____
_____	Celtis occidentalis	_____	_____	_____	Quercus coccinea	_____	_____
_____	Cercis canadensis	_____	_____	_____	Quercus imbricaria	_____	_____
_____	Cornus alternifolia	_____	_____	_____	Quercus macrocarpa	_____	_____
<u>5</u>	Cornus florida	_____	_____	_____	Quercus rubra	_____	_____
_____	Diospyros virginiana	_____	_____	<u>2</u>	Quercus shumardii	_____	_____
<u>2</u>	Fagus grandifolia	_____	_____	_____	Quercus velutina	_____	_____
_____	Fraxinus americana	_____	_____	_____	Sassafras albidum	_____	_____
_____	Gymnocladus dioica	_____	_____	<u>1</u>	Tilia americana	_____	_____
_____	Juglans cinerea	_____	_____	_____	Zanthoxylum americanum	_____	_____

TOTAL WOODY STOCK IN PATCH 13

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 2.5 cu. yds.

Salt hay Oat straw _____ acres, 100 lbs.
Circle one

SEEDING MIXES

Grass mix .025 acres, 0.9 lb. _____ oz

000194

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.14 acres

SECTION 3 UF 11
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer saccharum				Juglans nigra		
<u>5</u>	Aesculus glabra			<u>5</u>	Liriodendron tulipifera		
	Aesculus octandra			<u>2</u>	Ostrya virginiana		
	Amelanchier arborea				Prunus americana		
<u>7</u>	Asimina triloba			<u>3</u>	Prunus serotina		
<u>3</u>	Ceanothus americanus				Quercus alba		
	Celtis occidentalis				Quercus coccinea		
	Cercis canadensis				Quercus imbricaria		
<u>3</u>	Cornus alternifolia			<u>3</u>	Quercus macrocarpa		
	Cornus florida			<u>5</u>	Quercus rubra		
	Diospyros virginiana				Quercus shumardii		
<u>5</u>	Fagus grandifolia			<u>3</u>	Quercus velutina		
<u>5</u>	Fraxinus americana				Sassafras albidum		
<u>3</u>	Gymnocladus dioica			<u>3</u>	Tilia americana		
<u>3</u>	Juglans cinerea				Zanthoxylum americanum		

Asimina - plant in one cluster
Ceanothus - plant in one cluster

TOTAL WOODY STOCK IN PATCH 61

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

- Wood chips _____ acres, 11.6 cu. yds.
- Salt hay Oat straw _____ acres, 472 lbs.
Circle one

SEEDING MIXES

Grass mix .118 acres, 4.1 lb. _____ oz

PATCH SPECIFICATION SHEET

Patch area: 2118 0.16 acres

SECTION 3 UF 12
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>5</u>	Acer saccharum			<u>5</u>	Juglans nigra		
	Aesculus glabra			<u>4</u>	Liriodendron tulipifera		
<u>3</u>	Aesculus octandra			<u>5</u>	Ostrya virginiana		
<u>6</u>	Amelanchier arborea				Prunus americana		
	Asimina triloba				Prunus serotina		
<u>6</u>	Ceanothus americanus				Quercus alba		
	Celtis occidentalis			<u>3</u>	Quercus coccinea		
<u>5</u>	Cercis canadensis				Quercus imbricaria		
	Cornus alternifolia				Quercus macrocarpa		
<u>3</u>	Cornus florida				Quercus rubra		
<u>3</u>	Diospyros virginiana			<u>4</u>	Quercus shumardii		
<u>5</u>	Fagus grandifolia				Quercus velutina		
<u>3</u>	Fraxinus americana			<u>5</u>	Sassafras albidum		
	Gymnocladus dioica			<u>5</u>	Tilia americana		
	Juglans cinerea				Zanthoxylum americanum		

Ceanothus - plant in 3's
Sassafras - plant along grass edge

TOTAL WOODY STOCK IN PATCH 70

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 13.3 cu. yds.

Salt hay Oat straw _____ acres, 540 lbs.
Circle one

SEEDING MIXES

Grass mix .135 acres, 4.7 lb. _____ oz

000196

PATCH SPECIFICATION SHEET

Patch area: 0.13 acres

2118

SECTION 3 UF 13
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Acer saccharum			<u>3</u>	Juglans nigra		
_____	Aesculus glabra			<u>3</u>	Liriodendron tulipifera		
_____	Aesculus octandra			<u>2</u>	Ostrya virginiana		
_____	Amelanchier arborea			<u>5</u>	Prunus americana		
_____	Asimina triloba			_____	Prunus serotina		
_____	Ceanothus americanus			<u>5</u>	Quercus alba		
<u>3</u>	Celtis occidentalis			_____	Quercus coccinea		
_____	Cercis canadensis			<u>3</u>	Quercus imbricaria		
<u>5</u>	Cornus alternifolia			_____	Quercus macrocarpa		
_____	Cornus florida			<u>4</u>	Quercus rubra		
<u>3</u>	Diospyros virginiana			_____	Quercus shumardii		
_____	Fagus grandifolia			_____	Quercus velutina		
<u>5</u>	Fraxinus americana			<u>5</u>	Sassafras albidum		
_____	Gymnocladus dioica			<u>5</u>	Tilia americana		
<u>3</u>	Juglans cinerea			<u>3</u>	Zanthoxylum americanum		

Sassafras - plant along grass edge
Zanthoxylum - plant near wetland edge

TOTAL WOODY STOCK IN PATCH 57

STRUCTURES

1 bat roost box

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

Salt hay Oat straw _____ acres, 440 lbs.
Circle one

SEEDING MIXES

Grass mix .110 acres, 3.8 lb. _____ oz

000197

2118

PATCH SPECIFICATION SHEET

Patch area: 0.12 acres

SECTION 3 UF 14
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>7</u>	Acer saccharum				Juglans nigra		
<u>3</u>	Aesculus glabra			<u>3</u>	Liriodendron tulipifera		
	Aesculus octandra				Ostrya virginiana		
<u>3</u>	Amelanchier arborea				Prunus americana		
	Asimina triloba			<u>5</u>	Prunus serotina		
	Ceanothus americanus				Quercus alba		
<u>4</u>	Celtis occidentalis			<u>4</u>	Quercus coccinea		
<u>5</u>	Cercis canadensis				Quercus imbricaria		
	Cornus alternifolia			<u>3</u>	Quercus macrocarpa		
<u>2</u>	Cornus florida				Quercus rubra		
	Diospyros virginiana			<u>2</u>	Quercus shumardii		
<u>3</u>	Fagus grandifolia			<u>3</u>	Quercus velutina		
<u>2</u>	Fraxinus americana				Sassafras albidum		
<u>3</u>	Gymnocladus dioica				Tilia americana		
	Juglans cinerea				Zanthoxylum americanum		

TOTAL WOODY STOCK IN PATCH 52

STRUCTURES

2 wren nest boxes

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.0 cu. yds.

Salt hay oat straw _____ acres, 404 lbs.
Circle one

SEEDING MIXES

Grass mix .101 acres, 3.6 lb. _____ oz

000198

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.08 acres

SECTION 3 UF 15
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer saccharum			<u>2</u>	Juglans nigra		
	Aesculus glabra				Liriodendron tulipifera		
<u>2</u>	Aesculus octandra				Ostrya virginiana		
	Amelanchier arborea			<u>3</u>	Prunus americana		
<u>6</u>	Asimina triloba				Prunus serotina		
<u>3</u>	Ceanothus americanus			<u>3</u>	Quercus alba		
	Celtis occidentalis				Quercus coccinea		
	Cercis canadensis			<u>3</u>	Quercus imbricaria		
	Cornus alternifolia				Quercus macrocarpa		
	Cornus florida				Quercus rubra		
	Diospyros virginiana				Quercus shumardii		
	Fagus grandifolia			<u>3</u>	Quercus velutina		
<u>2</u>	Fraxinus americana				Sassafras albidum		
	Gymnocladus dioica			<u>2</u>	Tilia americana		
	Juglans cinerea			<u>3</u>	Zanthoxylum americanum		

Asimina - plant in one cluster
Zanthoxylum - plant near wetland edge

TOTAL WOODY STOCK IN PATCH 35

STRUCTURES

1 Wren nest box

SURFACE MULCH AREAS & QUANTITIES

- Wood chips _____ acres, 6.6 cu. yds.
- Salt hay Qat straw _____ acres, 272 lbs.
Circle one

SEEDING MIXES

Grass mix .068 acres, 2.4 lb. _____ oz

000199

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 3 UF 16
UPLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Acer saccharum			_____	Juglans nigra		
_____	Aesculus glabra			_____	Liriodendron tulipifera		
_____	Aesculus octandra			_____	Ostrya virginiana		
_____	Amelanchier arborea			_____	Prunus americana		
_____	Asimina triloba			_____	Prunus serotina		
_____	Ceanothus americanus			_____	Quercus alba		
_____	Celtis occidentalis			_____	Quercus coccinea		
_____	Cercis canadensis			_____	Quercus imbricaria		
<u>3</u>	Cornus alternifolia			_____	Quercus macrocarpa		
_____	Cornus florida			<u>3</u>	Quercus rubra		
<u>3</u>	Diospyros virginiana			_____	Quercus shumardii		
_____	Fagus grandifolia			_____	Quercus velutina		
_____	Fraxinus americana			_____	Sassafras albidum		
_____	Gymnocladus dioica			_____	Tilia americana		
_____	Juglans cinerea			_____	Zanthoxylum americanum		

TOTAL WOODY STOCK IN PATCH 9

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

- Wood chips _____ acres, 1.7 cu. yds.
- Salt hay Oat straw _____ acres, 68 lbs.
Circle one

SEEDING MIXES

Grass mix .017 acres, 0.6 lb. _____ oz

000200

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens				Physocarpus opulifolius		
<u>3</u>	Ceanothus americanus			<u>9</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>6</u>	Cornus amomum				Rosa caroliniana		
<u>6</u>	Cornus racemosa				Rubus allegheniensis		
<u>3</u>	Corylus americana				Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
	Crateagus mollis				Symphoricarpos orbiculatus		
<u>4</u>	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
	Hydrangea arborescens			<u>5</u>	Viburnum prunifolium		
<u>6</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Viburnum in cluster

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000201

Wood chips _____ acres, 21.5 cu. yds.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

SECTION 3 US 26
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
<u>3</u>	Campsis radicans			<u>5</u>	Parthenocissus quinquefolia		
	Celastrus scandens				Physocarpus opulifolius		
	Ceanothus americanus				Prunus virginiana		
	Cercis canadensis			<u>6</u>	Rhus typhina		
<u>5</u>	Cornus alternifolia				Ribes americanum		
	Cornus amomum			<u>4</u>	Rosa caroliniana		
	Cornus racemosa			<u>3</u>	Rubus allegheniensis		
	Corylus americana			<u>3</u>	Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
	Crateagus mollis			<u>6</u>	Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens				Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 41

Plant Campsis, Lonicera, Parthenocissus, Rubus, and Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 16.1 cu. yds.

000202

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 3 US 27
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Amelanchier laevis			<u>2</u>	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>6</u>	Prunus virginiana		
<u>2</u>	Cercis canadensis			_____	Rhus typhina		
_____	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>6</u>	Cornus amomum			_____	Rosa caroliniana		
<u>6</u>	Cornus racemosa			<u>2</u>	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
<u>3</u>	Crateagus crugalli			_____	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>6</u>	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			<u>6</u>	Viburnum prunifolium		
<u>6</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Lonicera and Rubus near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000203

Wood chips _____ acres, 21.5 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.08 acres

2118

SECTION

3

US 28

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans				Parthenocissus quinquefolia		
	Celastrus scandens			<u>6</u>	Physocarpus opulifolius		
<u>6</u>	Ceanothus americanus			<u>9</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
<u>5</u>	Cornus alternifolia			<u>9</u>	Ribes americanum		
<u>9</u>	Cornus amomum				Rosa caroliniana		
<u>6</u>	Cornus racemosa				Rubus allegheniensis		
	Corylus americana				Rubus occidentalis		
	Crateagus crugalli			<u>10</u>	Staphylea trifolia		
<u>3</u>	Crateagus mollis				Symphoricarpos orbiculatus		
<u>6</u>	Hamamelis virginiana			<u>6</u>	Viburnum acerifolium		
<u>6</u>	Hydrangea arborescens			<u>9</u>	Viburnum prunifolium		
<u>12</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 108

Plant Staphylea in 3 clusters
Plant Viburnum in 2 clusters

STRUCTURES

1 sand placement

SURFACE MULCH AREAS & QUANTITIES

000204

Wood chips _____ acres, 43.0 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 3 US 29
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			<u>3</u>	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			_____	Prunus virginiana		
<u>3</u>	Cercis canadensis			<u>3</u>	Rhus typhina		
<u>3</u>	Cornus alternifolia			_____	Ribes americanum		
_____	Cornus amomum			<u>3</u>	Rosa caroliniana		
_____	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			<u>3</u>	Rubus occidentalis		
_____	Crateagus crugalli			_____	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
_____	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			<u>6</u>	Viburnum prunifolium		
_____	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

Plant Lonicera near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000205

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2118

SECTION 3 US 30
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			<u>6</u>	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>6</u>	Prunus virginiana		
_____	Cercis canadensis			_____	Rhus typhina		
_____	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>6</u>	Cornus amomum			_____	Rosa caroliniana		
<u>6</u>	Cornus racemosa			_____	Rubus allegheniensis		
_____	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			<u>9</u>	Staphylea trifolia		
_____	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>5</u>	Hamamelis virginiana			<u>3</u>	Viburnum acerifolium		
_____	Hydrangea arborescens			<u>3</u>	Viburnum prunifolium		
<u>7</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Staphylea and Viburnum in clusters of 3

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000206

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 3 US 31
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>4</u>	Amelanchier laevis				Lonicera sempervirens		
	Campsis radicans			<u>3</u>	Parthenocissus quinquefolia		
	Celastrus scandens				Physocarpus opulifolius		
	Ceanothus americanus			<u>6</u>	Prunus virginiana		
	Cercis canadensis				Rhus typhina		
<u>6</u>	Cornus alternifolia			<u>3</u>	Ribes americanum		
<u>6</u>	Cornus amomum				Rosa caroliniana		
<u>6</u>	Cornus racemosa				Rubus allegheniensis		
	Corylus americana				Rubus occidentalis		
	Crateagus crugalli				Staphylea trifolia		
	Crateagus mollis				Symphoricarpos orbiculatus		
<u>5</u>	Hamamelis virginiana			<u>6</u>	Viburnum acerifolium		
<u>3</u>	Hydrangea arborescens				Viburnum prunifolium		
<u>6</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 54

Plant Parthenocissus near grass edge
Plant Viburnum in clusters of 3

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000207

2118

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

SECTION 3 US 32
UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Amelanchier laevis				Lonicera sempervirens		
<u>3</u>	Campsis radicans			<u>6</u>	Parthenocissus quinquefolia		
<u>3</u>	Celastrus scandens				Physocarpus opulifolius		
	Ceanothus americanus				Prunus virginiana		
	Cercis canadensis			<u>4</u>	Rhus typhina		
	Cornus alternifolia				Ribes americanum		
	Cornus amomum			<u>4</u>	Rosa caroliniana		
	Cornus racemosa			<u>3</u>	Rubus allegheniensis		
	Corylus americana			<u>3</u>	Rubus occidentalis		
<u>3</u>	Crateagus crusgalli				Staphylea trifolia		
	Crateagus mollis			<u>3</u>	Symphoricarpos orbiculatus		
	Hamamelis virginiana				Viburnum acerifolium		
	Hydrangea arborescens			<u>6</u>	Viburnum prunifolium		
	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 41

Plant Campsis, Parthenocissus, Rubus a., and Symphoricarpos near grass edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000208

Wood chips _____ acres, 16.1 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

21 18

SECTION 3 US 33

UPLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Amelanchier laevis			_____	Lonicera sempervirens		
_____	Campsis radicans			_____	Parthenocissus quinquefolia		
_____	Celastrus scandens			_____	Physocarpus opulifolius		
_____	Ceanothus americanus			<u>3</u>	Prunus virginiana		
<u>5</u>	Cercis canadensis			_____	Rhus typhina		
_____	Cornus alternifolia			_____	Ribes americanum		
<u>3</u>	Cornus amomum			_____	Rosa caroliniana		
<u>3</u>	Cornus racemosa			_____	Rubus allegheniensis		
<u>3</u>	Corylus americana			_____	Rubus occidentalis		
_____	Crateagus crugalli			_____	Staphylea trifolia		
<u>2</u>	Crateagus mollis			_____	Symphoricarpos orbiculatus		
<u>4</u>	Hamamelis virginiana			_____	Viburnum acerifolium		
_____	Hydrangea arborescens			_____	Viburnum prunifolium		
<u>4</u>	Lindera benzoin						

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000209

Wood chips _____ acres, 10.8 cu. yds.

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.10 acres

SECTION 3 UG 16

UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 400 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 3.5 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000210

2118

PATCH SPECIFICATION SHEET

Patch area: 0.38 acres

SECTION 3 UG 17
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1520 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 13.3 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

Place salvaged stock

000211

PATCH SPECIFICATION SHEET

Patch area: 0.09 acres ²¹¹⁸

SECTION 3 UG 18

UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

2 tree swallow nest boxes

1 brush pile

1 snake hibernaculum

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 360 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 3.2 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000212

PATCH SPECIFICATION SHEET

Patch area: 0.22 acres ²¹¹⁸

SECTION 3 UG 19
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation _____

Inspector (sign) _____ Date _____ One growing season cover _____

STRUCTURES

1 tree swallow nest box
1 brush pile

SURFACE MULCH AREAS & QUANTITIES

Salt hay Qat straw _____ acres, 880 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 7.7 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000213

PATCH SPECIFICATION SHEET

Patch area: 0.49 acres ²¹¹⁸

SECTION 3 UG 20
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

1 sand placement

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1960 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 17.0 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000214

2118

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

SECTION 3 UG 21
UPLAND GRASS

Inspector (sign) _____ Date _____ Seeded stock confirmation

Inspector (sign) _____ Date _____ One growing season cover

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 80 lbs.
Circle one

SEEDING MIXES

Grass mix _____ acres, 0.7 lb. _____ oz

Wildflower mix _____ acres, _____ lb. _____ oz

000215

PATCH SPECIFICATION SHEET

Patch area: 0.20 acres

2118

SECTION 3 ROAD

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, _____ lbs.
Circle one

000216

PATCH SPECIFICATION SHEET

Patch area: 0.07 acres

2118

SECTION 3 WF 10
WETLAND FOREST

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>3</u>	Acer rubrum				Platanus occidentalis		
<u>3</u>	Acer saccharinum			<u>6</u>	Quercus bicolor		
	Carpinus caroliniana			<u>3</u>	Quercus palustris		
	Fraxinus nigra				Salix eriocephala		
<u>6</u>	Fraxinus pennsylvanica			<u>3</u>	Salix nigra		
	Liquidambar styraciflua			<u>3</u>	Ulmus americana		
<u>3</u>	Nyssa sylvatica						

TOTAL WOODY STOCK IN PATCH 30

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 7.3 cu. yds.

Salt hay Oat straw _____ acres, 224 lbs.
Circle one

SEEDING MIXES

Marsh mix .056 acres, 1.1 lb. _____ oz

000217

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres **2118**

SECTION 3 WS 18
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Ainus serrulata				Rosa palustris		
	Aronia melanocarpa				Salix discolor		
<u>3</u>	Cephalanthus occidentalis			<u>5</u>	Salix exigua		
<u>6</u>	Comus amomum				Salix sericea		
	Decodon verticillatus			<u>6</u>	Sambucus canadensis		
	Hypericum prolificum			<u>6</u>	Spiraea alba		
<u>6</u>	Ilex verticillata				Spiraea tomentosa		
	Ribes americanum			<u>3</u>	Ulmus rubra		
					Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 41

Plant Cephalanthus in low areas
Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 16.1 cu. yds.

000218

PATCH SPECIFICATION SHEET

Patch area: 0.07 acres

2118

SECTION 3 WS 19

WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>12</u>	Alnus serrulata				Rosa palustris		
<u>9</u>	Aronia melanocarpa			<u>6</u>	Salix discolor		
	Cephalanthus occidentalis				Salix exigua		
<u>9</u>	Cornus amomum			<u>6</u>	Salix sericea		
	Decodon verticillatus			<u>10</u>	Sambucus canadensis		
	Hypericum prolificum			<u>9</u>	Spiraea alba		
<u>6</u>	Ilex verticillata			<u>4</u>	Spiraea tomentosa		
<u>6</u>	Ribes americanum			<u>6</u>	Ulmus rubra		
				<u>12</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 95

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 37.6 cu. yds.

000219

MUNRO ECOLOGICAL SERVICES, INC.

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION 3 WS 20
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>5</u>	Alnus serrulata				Rosa palustris		
	Aronia melanocarpa			<u>4</u>	Salix discolor		
	Cephalanthus occidentalis			<u>6</u>	Salix exigua		
<u>3</u>	Cornus amomum				Salix sericea		
	Decodon verticillatus				Sambucus canadensis		
<u>6</u>	Hypericum prolificum				Spiraea alba		
<u>5</u>	Ilex verticillata			<u>6</u>	Spiraea tomentosa		
	Ribes americanum				Ulmus rubra		
				<u>6</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 41

Plant Hypericum in dryer areas
Plant Salix exigua at edge of water

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000220

Wood chips _____ acres, 16.1 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres

2118

SECTION 3 WS 21
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			_____	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
<u>27</u>	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000221

MUNRO ECOLOGICAL SERVICES, INC.

2118

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

SECTION 3 WS 22
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Ainus serrulata			<u>14</u>	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
_____	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 14

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 5.4 cu. yds.

000222

2118

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

SECTION 3 WS 23
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
				<u>8</u>	Rosa palustris		
<u>9</u>	Ainus serrulata			<u>9</u>	Salix discolor		
<u>6</u>	Aronia melanocarpa				Salix exigua		
	Cephalanthus occidentalis				Salix sericea		
<u>6</u>	Cornus amomum			<u>6</u>	Sambucus canadensis		
	Decodon verticillatus			<u>7</u>	Spiraea alba		
	Hypericum prolificum				Spiraea tomentosa		
<u>6</u>	Ilex verticillata			<u>6</u>	Ulmus rubra		
<u>6</u>	Ribes americanum			<u>12</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 81

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000223

Wood chips _____ acres, 32.3 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.05 acres

21 18

SECTION 3 WS 24
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>7</u>	<i>Alnus serrulata</i>				<i>Rosa palustris</i>		
<u>6</u>	<i>Aronia melanocarpa</i>			<u>6</u>	<i>Salix discolor</i>		
<u>5</u>	<i>Cephalanthus occidentalis</i>			<u>6</u>	<i>Salix exigua</i>		
<u>6</u>	<i>Cornus amomum</i>				<i>Salix sericea</i>		
<u>5</u>	<i>Decodon verticillatus</i>			<u>6</u>	<i>Sambucus canadensis</i>		
	<i>Hypericum prolificum</i>				<i>Spiraea alba</i>		
<u>6</u>	<i>Ilex verticillata</i>			<u>6</u>	<i>Spiraea tomentosa</i>		
	<i>Ribes americanum</i>				<i>Ulmus rubra</i>		
				<u>9</u>	<i>Viburnum dentatum</i>		

TOTAL WOODY STOCK IN PATCH 68

Plant *Cephalanthus* in low areas

Plant *Decodon* and *Salix exigua* at water's edge

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

000224

Wood chips _____ acres, 26.9 cu. yds.

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION 3 WS 25
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>6</u>	Alnus serrulata				Rosa palustris		
	Aronia melanocarpa			<u>8</u>	Salix discolor		
	Cephalanthus occidentalis				Salix exigua		
<u>6</u>	Cornus amomum			<u>6</u>	Salix sericea		
	Decodon verticillatus			<u>9</u>	Sambucus canadensis		
	Hypericum prolificum			<u>4</u>	Spiraea alba		
	Ilex verticillata				Spiraea tomentosa		
	Ribes americanum			<u>2</u>	Ulmus rubra		
					Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 41

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 16.1 cu. yds.

000225

MUNRO ECOLOGICAL SERVICES, INC.

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
_____	Alnus serrulata			_____	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
<u>27</u>	Cephalanthus occidentalis			_____	Salix exigua		
_____	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			_____	Sambucus canadensis		
_____	Hypericum prolificum			_____	Spiraea alba		
_____	Ilex verticillata			_____	Spiraea tomentosa		
_____	Ribes americanum			_____	Ulmus rubra		
				_____	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 27

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 10.8 cu. yds.

000226

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

SECTION 3 WS 27
WETLAND SHRUB

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

Spec.	Species	Installed/alive	Total	Spec	Species	Installed/alive	Total
<u>9</u>	Alnus serrulata			<u>6</u>	Rosa palustris		
_____	Aronia melanocarpa			_____	Salix discolor		
_____	Cephalanthus occidentalis			_____	Salix exigua		
<u>6</u>	Cornus amomum			_____	Salix sericea		
_____	Decodon verticillatus			<u>7</u>	Sambucus canadensis		
<u>6</u>	Hypericum prolificum			_____	Spiraea alba		
<u>6</u>	Ilex verticillata			<u>3</u>	Spiraea tomentosa		
<u>3</u>	Ribes americanum			<u>2</u>	Ulmus rubra		
				<u>6</u>	Viburnum dentatum		

TOTAL WOODY STOCK IN PATCH 54

Plant Hypericum in dryer areas

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Wood chips _____ acres, 21.5 cu. yds.

000227

PATCH SPECIFICATION SHEET

Patch area: 0.06 acres

2118

SECTION 3 OW 12
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 360 lbs.
Circle one

268 plugs at 1 every 3 feet of linear edge

000228

PATCH SPECIFICATION SHEET

Patch area: 0.02 acres **2118** SECTION 3 OW 13
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 120 lbs.
Circle one

44 plugs @ 1 every 3 foot of linear edge

000229

PATCH SPECIFICATION SHEET

Patch area: 0.04 acres

2118

SECTION 3 OW 14

OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

Goose line

SURFACE MULCH AREAS & QUANTITIES

Salt hay Circle one Oat straw _____ acres, 240 lbs.

51 plugs @ 1 every 3 feet of liner edge

000230

2118

PATCH SPECIFICATION SHEET

Patch area: 0.22 acres

SECTION 3 OW 15
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

- 2 log placements
- 1 wood duck nest box
- 1 rock placement
- 1 staff gauge
- goose line

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1320 lbs.
Circle one

152 plugs @ 1 every 3 feet of linear edge

000231

PATCH SPECIFICATION SHEET

Patch area: 0.03 acres

2118

SECTION 3 OW 16
OPEN WATER

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

SURFACE MULCH AREAS & QUANTITIES

~~Salt hay~~ Oat straw _____ acres, 180 lbs.
Circle one

200 plugs @ 1 every 3 feet of linear edge

000232

2118

PATCH SPECIFICATION SHEET

Patch area: 0.27 acres

SECTION 3 WM 13
MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 elevation reference
1 shallow monitoring well

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1620 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 5.4 lb. _____ oz

000233

2118

PATCH SPECIFICATION SHEET

Patch area: 0.20 acres

SECTION 3

WM 14

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 brush pile

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 1200 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 4.0 lb. _____ oz

000234

PATCH SPECIFICATION SHEET

Patch area: 0.35 acres

2118

SECTION 3

WM 15

MARSH

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 shallow monitoring well
1 elevation reference

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 2100 lbs.
Circle one

SEEDING MIXES

Marsh mix _____ acres, 7.0 lb. _____ oz

000235

PATCH SPECIFICATION SHEET

Patch area: 0.01 acres

2118

SECTION

3

WP 7

WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 pre-cast concrete structure + fabric
1 pole drain + fabric

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 60 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 0.2 lb. _____ oz.

000236

PATCH SPECIFICATION SHEET

Patch area: 0.07 acres **2118**

SECTION 3 WP 8
WET PRAIRIE

Inspector (sign) _____ Date _____ Planted stock confirmation

Inspector (sign) _____ Date _____ One growing season survival

STRUCTURES

1 log and fabric structure

SURFACE MULCH AREAS & QUANTITIES

Salt hay Oat straw _____ acres, 60 lbs.
Circle one

SEEDING MIXES

Wet prairie mix _____ acres, 0.2 lb. _____ oz.

000237

DRAFT
APPENDIX 3: MONITORING/MANAGEMENT PLAN,
WETLAND MITIGATION PLAN ,
AREA 1, PHASE I MITIGATION SITE, FERNALD
ENVIRONMENTAL MANAGEMENT PROJECT
 In Hamilton and Butler Counties Ohio

Revised
 23 February 1999

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000238

TABLE OF CONTENTS

Introduction..... 1

Post-construction period..... 1

Monitoring plan objectives 1

 Tracking 1

 Specific goals 2

Construction period..... 2

Monitoring plan methods 3

 Survival/cover requirements 3

 Survival requirement - woody species 3

 Cover requirement - herbaceous areas 4

 Related details 5

 Surface and groundwater levels 5

 Water depth measurements 5

 Water quality sampling 6

 Animal populations 6

 Observations..... 6

 Animal data collection 7

 Wetland soils..... 7

 Soil sampling..... 7

Reports 7

Monitoring schedule 9

Selected bibliography..... 10

Authorship and technical assistance..... 11

ATTACHMENTS

- Monitoring section maps, Sections 1-3
- Data forms

INTRODUCTION

Construction and planting of 6.24 acres of mitigation wetland on the FEMP site, Fernald, Ohio requires some amount of follow-up monitoring for both internal purposes of assuring success of the project as well as required regulatory monitoring.

Munro Ecological Services, Inc. (MES), has designed the mitigation area totaling 12.87 acres, of which 6.24 acres will be hydric in character.

The proposed monitoring program is based on the nature of the proposed wetland design and the restoration model and is consistent with monitoring programs for mitigation wetlands on other sites. The monitoring program, described here in detail, is designed:

- a) to track the evolution of the mitigation wetlands, with an eye to correcting quickly any defects that become apparent;
- b) to establish that certain criteria by which the permitting agencies define success have been met; and
- c) to establish that the constructed wetland systems are in fact functioning as do natural systems.

POST-CONSTRUCTION PERIOD

The post-construction monitoring period (year one) will begin in early spring immediately following construction. Monitoring of various aspects of the performance of the constructed wetland will be done in two forms:

- 1) Survival and cover assurance (year one, and year two if survival and cover requirements are not met in year one)
- 2) Observation of the developing ecological system (stop after year three unless there is an established need for data gathering and a specified public repository for the data.

MONITORING PLAN OBJECTIVES

Tracking

Primary monitoring features are shown in the section maps at the end of this document. Frequent inspection of the mitigation site or "tracking" will insure that the wetlands are constructed as specified and are maturing as projected. Unexpected and undesirable developments can be handled immediately, before the costs of correcting them become excessive.

The construction work is to be done in a one-year period. The work is expected to be completed by the end of 1999. The monitoring is divided into construction period monitoring and post-construction monitoring. The post-construction monitoring will begin during late winter or early spring of the year 2000. The intent is that each monitoring year will be composed of a full growing season rather than being divided arbitrarily.

The monitoring period will begin in March of the year following certification by the Restoration Ecologist that 100 percent of the plants specified have been planted. As part of tracking, the Restoration Ecologist will also provide construction oversight during the construction and planting of the mitigation basins. Any noteworthy changes or developments will be documented and included in the year one monitoring report. This documentation will bridge the gap between permit issuance and post-construction monitoring.

A construction period chronology summarizing beginning and completion of various parts of the work on each basin will be compiled and presented in the year one monitoring report following completion of construction.

000240

Though constructed, the FEMP mitigation wetlands will be subject to natural processes that could change the course of their evolution toward mature, functioning wetland systems. Undesirable alterations in their character may also be caused by human error or oversight. Wetland construction is not something with which most contractors or laborers are familiar, and seemingly innocent changes in the as-built plan or the materials list can change projected water levels or introduce invasive, exotic plant species. Typical failure scenarios include:

- 1) Irregular or sloppy wetland grading that causes areas to be too high in relation to the water table to maintain wetland character. Result: loss of wetland acreage.
- 2) Deviation from liner specifications which may allow a piping conduit to form and drain the wetland to subsurface voids. Result: loss of wetland hydrologic characteristics.
- 3) Errors in construction of water control structures which may produce a structure that is flawed. Result: water may be too deep, causing ponds, not marshes, to develop.
- 4) Deviation from planting specifications which may cause planting deficiencies or non-wetland plant communities to prevail. Result: lack of required 85% survival of specified stock or need to construct additional wetlands to meet permit requirements.

Tracking will also enable the DOE to enhance the values of the mitigation wetlands by seizing opportunities when they arise. For example, a planting of soft rush may become established so quickly and flower so profusely that its seed can be harvested for planting elsewhere on the mitigation area.

Specific goals

Monitoring, however, has more than a trouble-shooting function. This plan will address six specific questions, affirmative answers to which will establish the success of the mitigation effort. Those questions are as follows:

- 1) Have the requirements of the reviewing agencies been met? That is, a) have at least 85 percent of the woody plants installed as part of the mitigation survived; and b) has at least 85 percent vegetative cover been achieved in the herbaceous wetland areas?
- 2) Have sufficiently dense wetland plant communities been established in wetland areas?
- 3) Do surface and groundwater levels support wetland conditions?
- 4) Does surface and groundwater quality fall within parameters indicative of a comparable healthy system?
- 5) Have animal populations adapted to wetland settings successfully colonized the sites?
- 6) Have wetland soils been created?

CONSTRUCTION PERIOD

Construction of the wetland mitigation area will be monitored and will include inspection and consultations concerning the work in progress. The monitoring will be done by the Restoration Ecologist and will be done at intervals frequent enough to document the construction process. This monitoring will be paired with directed corrective measures to make certain that no major construction flaws are allowed to remain at the end of the construction period.

000241

Any changes in grading, structure construction, or plantings, or any detail related to the mitigation plan will be documented.

As-built grading drawings will be done as soon as the earthwork is completed. These drawings will be done in grading increments used in the mitigation plan. A "red-line" form of this documentation is recommended. The original grading plan will be used as a base map for the red line map. Where topographic variations that exceed project specifications exist they will be noted in red line form on a copy of the original topographic map.

Color photographs of the construction process will be taken at increments during the work. These photographs are to be taken at designated points (See section maps at the end of this appendix.)

Problems encountered during construction will be described and resolutions of proposed corrective actions will be included in the text.

All of the above items will be included in the construction completion report which will be prepared when all earthwork, structure work, planting, and detailing are completed. The report will include incidental information regarding observations until November of the construction year

MONITORING PLAN METHODS

Survival/cover requirements

Jurisdictional wetlands are defined on the basis of three features--hydrology, hydric soils, and hydrophytic vegetation. In judging created wetlands, however most wetland regulatory agencies rely on vegetation as the prime indicator. Hydrology (that is, soil saturation or inundation) constantly changes, and measurements must be understood as instantaneous readings rather than representing long time periods. Hydric soils develop only slowly. Hydrophytic vegetation, however, will not survive long in mesic conditions. Conversely, where it does survive, hydric conditions are assumed present.

The Army Corps and the US EPA have typically judged as successful those mitigation sites where at least 85 percent of the hydrophytic vegetation becomes successfully established. Survival requirement to be used on the FEMP site will be 80%. The term usually specified for this establishment is from one to two years. In the case of woody plants, 80 percent of the total number of individual specimens planted must survive. In herbaceous plantings, at least 80 percent of the total surface area of such communities must be covered with live vegetation.

Survival requirement - woody species

80% survival and cover will be necessary after the site is complete. Since on-site labor will be used and landscape contractors will not be performing the planting work, the normal process of requiring guarantees of stock and survival is not available. Responsibility is normally divided between owner, supplier and installer. For this project all three roles are held collectively by DOE and FDF (the site managers). The terms of landscape contractor and construction contractor used in the plan and appendices refer to the division of labor for the work and do not apply to responsibility for quality of work. The landscape contractor and earthwork contractor will work under DOE/FDF supervision and oversight and will have no responsibilities for quality of work. DOE/FDF site managers will be responsible for determining both cover and survival rates as well as replacement work.

The Restoration Ecologist will independently confirm that all specified woody plants in the forest and shrub patches have been planted or that back orders or approved substitutions have been made. This check will be done soon after each patch is completed by the Planting Contractor. Confirmation and later monitoring will use the wetland construction plan and the construction and planting details appendices as baseline references.

000242

Success of the system will be gauged according to the original plans and details presented in these documents. The construction details and planting details appendices provide details concerning quantities of seeds, types and quantities of mulch, quantities and species of planting stock, seeding rates, seed mix specifications, fertilizer rates, and other relevant details. The construction details and planting details appendices also provide information on the details and location of wildlife nest and habitat structures..

Mortality Counts

In September, following a full season of growth after the Restoration Ecologist has certified that planting as specified is complete and all necessary replacement plantings have been made, the Restoration Ecologist will survey mortality. This determination will be made at the end of the growing season and before leaf fall. Each individual forest and shrub patch on the mitigation site will be systematically walked from one end to the other. Each dead specimen will be counted and flagged for replacement. A count of those woody plants that have not survived after at least one growing season and a computation of the percentage of the total they represent will establish whether the 85 percent survival requirement has been met.

A mortality of less than 20 percent discovered by such a survey will establish that the 80 percent survival requirement has been met. If mortality exceeds 20 percent, the Restoration Ecologist will specify that replacement stock be planted. Replacement stock will be of the same specifications as the original material or (due to unavailability of stock) by substitution specified in the stock specifications and substitution list in the planting details appendix. If necessary, one full growing season thereafter, mortality counts will again be taken only in patches not previously meeting acceptable rates using the methods specified for the first year count. This mortality count will not be repeated after 80% survival is achieved. Agency commentors will advise FEMP as to whether upland stock is to be held to the 80% standard.

Cover requirement - herbaceous areas

Approximately 3.48 acres will be covered with herbaceous marsh or wet prairie communities. These areas will be created by broadcasting seeding. The distribution of herbaceous areas is shown on the planting plans (Figure 1, mitigation plan). Cover by herbaceous plants is generally required to be of 80% or greater within 1 to 1 1/2 years after construction and planting work is completed.

Cover estimates

Cover estimates will be conducted near the end of the first full growing season. The work will require that the Restoration Ecologist check every herbaceous patch visually for herbaceous coverage via walking survey. The walking survey will act as the primary method of determining whether the 80% cover has been achieved. During this work the Restoration Ecologist will record a listing of all plant species observed and the appearance of any new species that were not specified. Plots not meeting the 80% cover requirement will be examined closely and notes will be taken to indicate observations and suspected problems. The monitoring report will provide interpretation of how the cover estimates relate to the plot data. Should areal cover fall short of the 80 percent required, the process will be repeated one full growing season thereafter, when young seedlings should have become fully established. If some patches do not meet the required 80% cover those patches will be examined to determine whether re-seeding is necessary and if so, how the work should be done. This program will continue yearly until 80 percent cover has been achieved and the Restoration Ecologist confirms this condition. With adequate rainfall during the first growing season, there will be no need for repeating the process. Photographs taken frequently throughout the monitoring period (See section maps) will also record the maturation of such plant communities.

Stereographic photographs will be taken of patches that do not meet specified 80% cover. These color print photographs will be reproduced (in color) in the next monitoring report.

000243

The intent of this herbaceous data collection is to confirm that wetland communities have in fact become established in the mitigation areas. The reviewing agencies must indicate whether cover requirements will be required for upland areas.

Related details

The planting plans prepared for the FEMP mitigation site specifies plants adapted to hydric conditions in wetlands. Wetland forest and wetland shrub plant communities, once established, are unlikely to change appreciably during the monitoring period. In herbaceous marsh and wet prairie areas, however, the composition of the communities could change in a fairly short time. Drought-induced low water levels, the introduction of seeds of exotic plants in mulch or soil amendments, and other factors could cause the composition of the communities to be dominated by weedy species that are not as dependent on wetland conditions. The creation of upland communities in "wetland" areas is not the intent of the designer nor the FEMP.

The Restoration Ecologist will watch for drought conditions and specify when watering should be conducted to assure plant survival and prevent dry conditions during critical periods. Watering will be from sources outside of the mitigation area. If water is pumped from the ponds of the mitigation site for easy spraying on other portions of the site it will be replaced up to the target water elevation for that pond on the same day that any withdrawal is made. Water imported to the site will be pumped or drained into ponds in such a way that no soil disturbance or turbidity is introduced to the ponds. Use of spreaders or placement of hoses directly into the ponds is recommended.

As a part of construction monitoring and post-construction monitoring, the Restoration Ecologist will be alert to the introduction of weedy species such as Japanese knotweed, common reed, Canada thistle, autumn olive, and Tartarian and Amur honeysuckles. Corrective action including pulling or spot herbicide (glyphosate only) application will be specified if necessary.

All deer and goose fences, pole drains, and minor structures should be checked in each monitoring period and problems documented. All fence and structures should be maintained regularly. Deer and goose fences should be repaired within two days of discovering problems.

Surface and groundwater levels

Of the three factors by which wetlands are defined, hydrology is controlling. Wetland soils and plant communities are created and sustained by the hydrologic processes typical of wetland systems. Water levels measured at frequent, regular intervals can give an indication of the extent to which wetland hydrologic criteria have been met on the FEMP Area 1 Phase I wetland mitigation site. Local weekly precipitation data should be collected on a monthly basis to track excess or deficient water conditions that may influence the site hydrology.

Water depth measurements

Wetland basin water levels will be observed routinely and recorded in order to determine that they can support the establishment and continued maturation of wetland systems. Staff gauges will be permanently installed in selected open water basins (See section pages). Shallow groundwater wells will be installed in all of the mitigation site's 8 basins. Locations of these wells are noted in the section pages at the end of the monitoring plan.

In year one of the monitoring period, surface and groundwater levels will be measured monthly, March through October. Frequent monitoring in the project's initial stages will point out any changes that may be needed or repairs that may be required. In later years those levels will be measured twice annually, in May

000244

and September, unless instability of water levels or other hydrologic problems occur. In that case, water level readings will be taken at monthly intervals.

Water quality sampling

Water quality will be sampled at several constructed pond locations where nearly perennial ponding is expected. Water samples will be taken and analyzed on site for pH, dissolved oxygen, conductivity, temperature, turbidity, odor, color, and the presence or absence of aquatic life. This data will be recorded on monitoring data forms (See data forms) and included as appendix information in the annual monitoring report.

These basic field measurements will be sufficient to provide a guide to the health of the aquatic systems. If the data from these readings shows an imbalance in the system, corrective action can be planned. If the data from field measurements shows no abnormal indicators but aquatic indicator organisms show a stressed environment, further organic or inorganic lab analysis could be specified to determine the cause of the stress. Such additional analysis is not likely to be needed.

If any presence of salt NaCl or other road salting materials including CaCl and their ionic indicators is detected (as salinity readings or as crystals) in the mitigation area open waters or as crusts at any location, its presence must be quantified and any vegetation or aquatic organism kill related to the salt presence must be documented. Such salt presence is extremely harmful to freshwater wetlands and freshwater aquatic environments and corrective action must be taken to prevent all further salt input to the wetland system. If it is discovered that road salting negatively affects mitigation wetland success or performance the use of sand, grit, or other non-dissolved material on the adjacent road will be a necessary alternative treatment.

Interpretation of the water data will be provided in the monitoring reports. Notes on corrective action taken, and suggested changes will be included in the monitoring reports.

Animal populations adapted to wetland settings

It is the intent of the wetland designer and DOE/FDF to create functioning wetland systems, not simply naturalistic landscapes. Although jurisdictional wetlands are defined on the basis of three criteria, wetland systems are defined by the ecologist on the basis of the interaction of many factors. The presence of certain typical animal populations is one of them.

The wetland mitigation plan allows for the in-migration of typical wetland wildlife populations. Although no aquatic species presently exist on the site, over time aquatic species will arrive on the site. With a diverse set of aquatic habitats and a marsh area, this increase in species diversity will occur.

To hasten the establishment of new aquatic systems, introduction of pond muck as "innoculant" will be done from selected local aquatic areas to the new wetland basins to "jump-start" pond life systems. This will be done when water is present in sufficient quantities in the deeper ponds of the constructed wetlands.

Observations

Wildlife observation will begin as soon as construction and the installation of plant material and wildlife structures is complete. Throughout the monitoring period, then, wildlife observations will be recorded on each visit. Photographs of any exceptional signs of wildlife activity will be routinely taken. The Restoration Ecologist will record wildlife observations. Observations of deer and geese by FEMP employees should be included in these records. A list of all wildlife species seen on the Area 1 Phase I mitigation site will be included in each monitoring report and additions will be added as they are observed.

000245

Animal data collection

Once the mitigation sites have become fully established, animal populations are likely to increase. Breeding populations of certain species are likely to colonize the sites. The presence of breeding songbirds, waterfowl, raptors, small mammals, and amphibians will be most apparent and documentable in late spring.

In May of years three and five, therefore, animal populations will be observed and recorded.

Amphibians will be inventoried by appropriate means.

Aquatic macroinvertebrates will be sampled by various means to provide data to characterize the aquatic life. Quantitative studies are not planned. Species should be identified and a level of diversity determined relative to other nearby healthy open water systems. Observations and interpretations should be given regarding the presence or absence of indicator species which confirm or negate the presence of healthy aquatic conditions. An aquatic macroinvertebrate study will be performed by the Restoration Ecologist in the spring of monitoring year 3 in the three permanent ponds and several selected small ponds.

Wetland soils

Hydric soil presence is one of the three criteria by which jurisdictional wetlands are defined. It is not practical to create hydric soils out of non-hydric soils for the purpose of placing them in wetlands. Hydric soils only develop over time through complicated processes dependent on water, temperature, soil density, and the presence of oxygen, trace metals, bacteria, and nutrients.

MES knows of no available information into the rate at which constructed wetland soils take on hydric characteristics. A successful constructed wetland, however, will develop soils that are hydric as long as sufficient water is present. That process is one worth investigating.

Soil sampling

In year one soil samples will be taken to establish a number of representative areas of non-hydric soil in wetland basins. These areas will be marked. In year three, the Restoration Ecologist will seek to establish that some development of hydric soils has occurred. Soil samples will be taken at appropriate depths at previously marked locations, and will be compared to Munsell color charts. Interpretation of this data will be provided in the monitoring report.

REPORTS

Monitoring reports will include discussion on:

1. Map of monitoring points and data collection locations.
2. Summary of changes throughout the previous year.
3. Tables of collected data.
4. Standard and special photographs (color copies).
5. Summaries of observations.
6. Problems encountered and recommended corrective actions.
7. Status of the site.
8. Conclusory discussion.

Monitoring reports will be produced in a standard report format. Data will be collected and presented on data forms as included following this text. Reports to be produced are:

000246

1. Construction completion report
2. Year-1 post construction monitoring report
3. Year-2 post construction monitoring report
4. Year-3 post construction monitoring report

At this point a decision must be made to continue or discontinue monitoring based on performance of the site and any specific needs for continuation of data collection.

5. Year-4 post construction monitoring report
6. Final post construction monitoring report

All data forms (End of this document) will be maintained by the Restoration Ecologist over the monitoring period and as permanent records. Those forms will be included or summarized in the monitoring reports to be submitted to the reviewing agencies at the end of each year. This information should be made available to the public at the conclusion of the wetland mitigation process.

Photographs tracking the development of the mitigation sites will be taken at locations noted on foldout pages for Sections 1-3 in May and September of each year. Copies of these and other routine photographs will be incorporated in the annual monitoring reports. Copies of these reports will include color copies of the photographs. Black-and-white reproduction of these photographs are useless.

Vertical stereoscopic aerial photography at a contact scale of 1":300' will be taken of the mitigation area during October of the third year following mitigation construction. These photographs will provide visual documentation of site conditions. Copies of these photographs will be provided to project participants and reviewers. A 50 scale color enlargement of the photographs will be made for comparison with the original plans.

Each annual monitoring report will interpret and summarize all data gathered during the year and will answer, to the extent possible, the questions addressed in that year's data collection. In the aggregate, the annual monitoring reports will provide the assessment of the mitigation project the reviewing agencies require.

000247

MONITORING SCHEDULE

The monitoring period will begin in March of the year following certification by the Restoration Ecologist that 100 percent of the plants specified have been planted. It is assumed that the monitored basins will have been completely constructed according to plans and will be hydrologically intact when monitoring begins.

Monitoring year	Task	Schedule
Year One		
85% survival	mortality count	September
85% cover	patch/plot sampling	September
Water levels	measure water depths	monthly, March-October
Water quality	sample water quality	March, May, July, September
Wildlife presence	record observations	monthly, March-October
Visual change	photographs	May, September
Soils	baseline conditions	May
Nest box cleanout	cleanout/disinfect	winter
Year Two		
85% survival (if not in yr. 1)	mortality counts	September
85% cover (if not in yr. 1)	patch/plot sampling	September
Water levels	measure water depths	May, September
Water quality	sample water quality	May, September
Wildlife presence	record observations	May, September
Visual change	photographs	May, September
Nest box cleanout	cleanout/disinfect	winter
Year Three		
85% cover (if not in yr. 1)	patch/plot sampling	September
Wetland wildlife populations	observations, mammals, macroinvertebrates	May
Water levels	measure water depths	May, September
Water quality	sample water quality	May, September
Wildlife presence	record observations	May, September
Visual change	photographs	May, September
Aerial photographs	flyover	Sept./Oct.
Nest box cleanout	cleanout/disinfect	winter
Year Four		
Water levels	measure water depths	May, September
Water quality	sample water quality	May, September
Wildlife presence	record observations	May, September
Visual change	photographs	May, September
Nest box cleanout	cleanout/disinfect	winter
Year Five		
ecological success	woody plant census	September
85% cover	patch/plot sampling	September
Wetland wildlife populations	observations	May
Wetland soils	sample and analyze soils	May
Water levels	measure water depths	May, September
Water quality	sample water quality	May, September
Presence of wetland flora	plot sampling	September
Wildlife presence	record observations	May, September
Visual change	photographs	May, September
Nest box cleanout	cleanout/disinfect	winter

000248

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000249

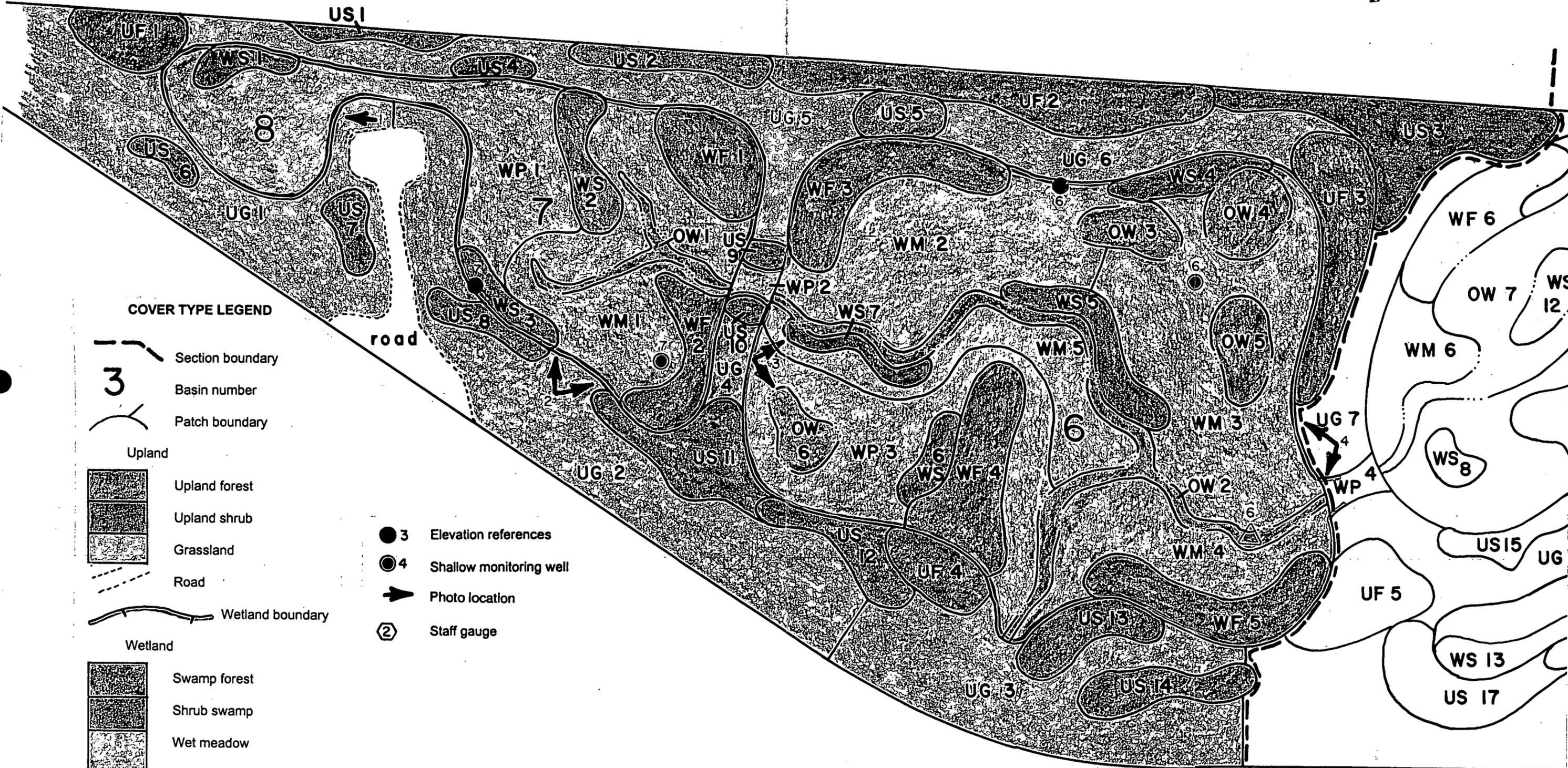
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Editorial review

000250

SECTION 1

2118



COVER TYPE LEGEND

- Section boundary
- 3** Basin number
- Patch boundary
- Upland**
- Upland forest
- Upland shrub
- Grassland
- Road
- Wetland boundary
- Wetland**
- Swamp forest
- Shrub swamp
- Wet meadow
- Wet prairie
- Open water

- 3 Elevation references
- 4 Shallow monitoring well
- Photo location
- Staff gauge

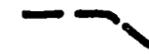
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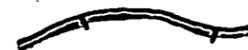
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SECTION 2

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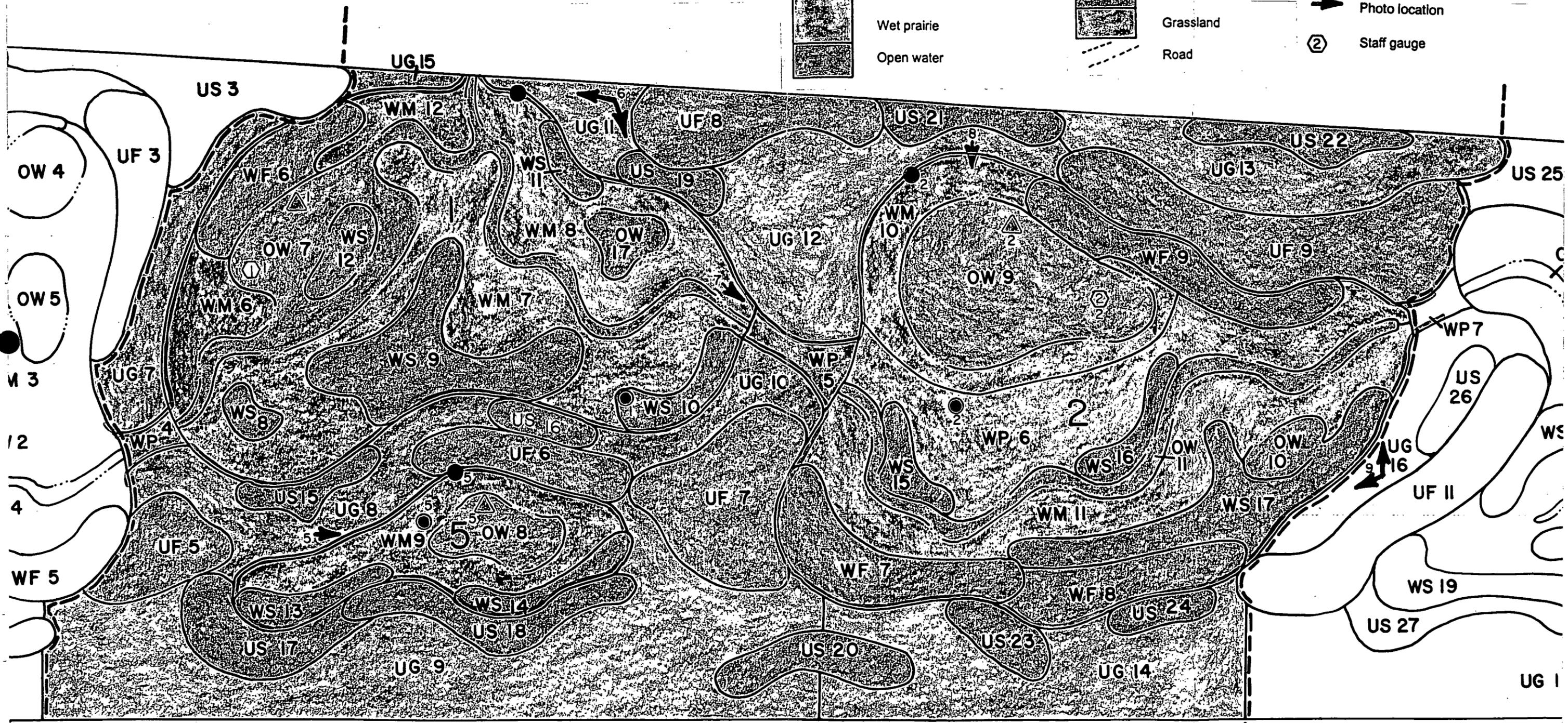
COVER TYPE LEGEND

-  Section boundary
- 3** Basin number
-  Patch boundary

-  Wetland boundary
- Wetland
-  Swamp forest
 -  Shrub swamp
 -  Wet meadow
 -  Wet prairie
 -  Open water

- Upland
-  Upland forest
 -  Upland shrub
 -  Grassland
 -  Road

-  3 Elevation references
-  4 Shallow monitoring well
-  Photo location
-  2 Staff gauge



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SECTION 3

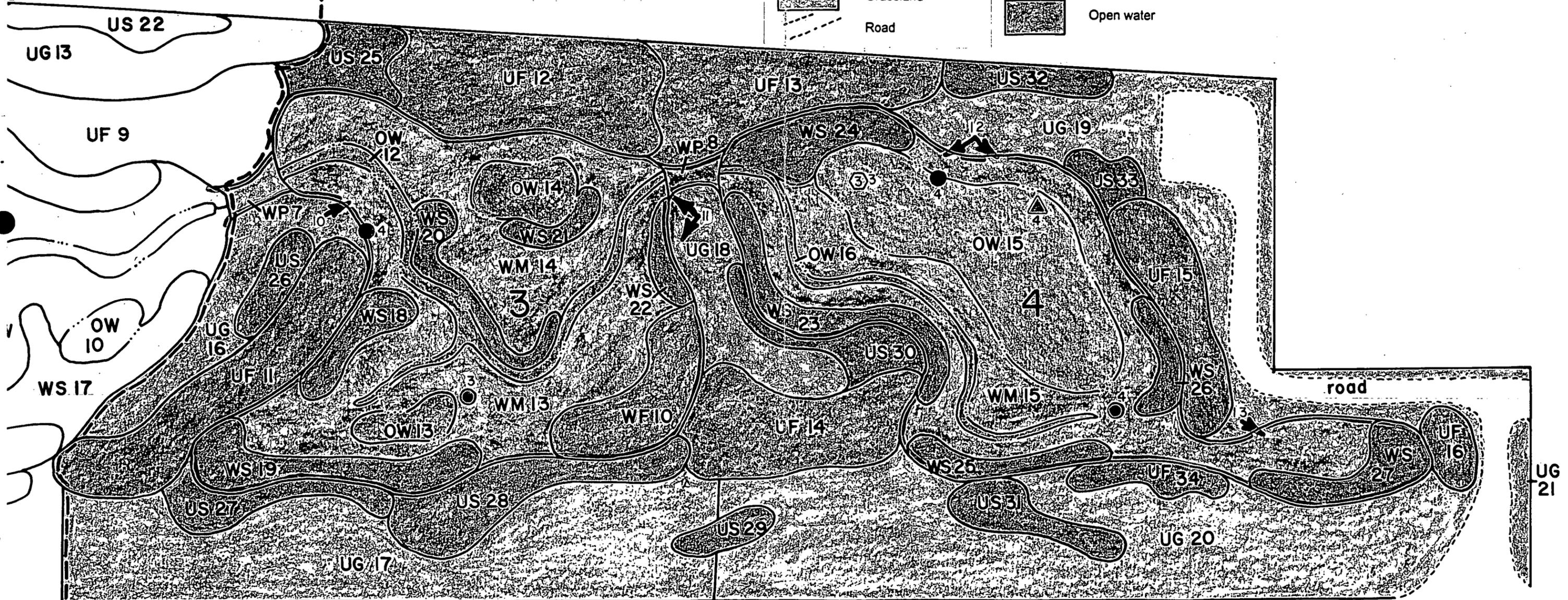
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COVER TYPE LEGEND

- 3 Elevation references
- 4 Shallow monitoring well
- ➔ Photo location
- ② Staff gauge

- Section boundary
- 3** Basin number
- Patch boundary
- Upland
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- Upland shrub
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- Wet meadow
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- Open water



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DATAFORMS

000254

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**AREA 1, PHASE I MITIGATION SITE, FERNALD
ENVIRONMENTAL MANAGEMENT PROJECT**

SHALLOW WELL WATER LEVELS

Measured by: _____

Date: _____

Weather: _____
recent precip., unusual conditions, snow present..etc

Well Number	Water Depth Below Surface	Hydrologic Observations
1		
2		
3		
4		
5		
6		
7		
8		

NOTES:

000255

