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NATURAL RESOURCE RESTORATION PLAN

FERNALD PRESERVE
FERNALD, OHIO

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U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS AND ABBREVIATIONS

BTV	benchmark toxicity value
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRO	Community Reuse Organization
DOE	U.S. Department of Energy
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FCAB	Fernald Citizens Advisory Board
FCP	Fernald Closure Project
FONSI	Finding of No Significant Impact
FPA	Former Production Area
FRL	final remediation level
gpm	gallons per minute
HEA	Habitat Equivalency Analysis
IRDP	Integrated Remedial Design Package
LMICP	Comprehensive Legacy Management and Institutional Control Plan
MCL	maximum contaminant level
µg/L	micrograms per liter
NEPA	National Environmental Policy Act
NRDA	Natural Resource Damage Assessment
NRIA	Natural Resource Impact Assessment
NRRDP	Natural Resource Restoration Design Plan
NRRP	Natural Resource Restoration Plan
NRTs	Natural Resource Trustees
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OSDF	On-Site Disposal Facility
OU	Operable Unit
PAHs	polyaromatic hydrocarbons
PEIC	Public Environmental Information Center
pls	pure live seed
ROD	Record of Decision
SCS	Soil Conservation Service
SEP	Sitewide Excavation Plan
SER	Society for Ecological Restoration
SSOD	Storm Sewer Outfall Ditch
SWU	Southern Waste Unit
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

This Natural Resource Restoration Plan (NRRP) outlines the approach for ecological restoration (hereafter referred to as "restoration") of the Fernald Preserve (Preserve). Restoration of the Preserve will transition the majority of the site from post-remediation conditions to the selected final land use, an undeveloped park with an emphasis on wildlife habitat. The NRRP presents the strategy for site restoration based on a series of restoration projects. The NRRP also outlines the plan for integrating restoration with the sitewide remediation process including the excavation plans outlined in the Sitewide Excavation Plan (SEP; DOE 1998a). In addition, the NRRP outlines the plan for public use of the Preserve.

The Natural Resource Trustees (NRTs) for the Preserve are the Ohio Environmental Protection Agency (OEPA), the U.S. Department of Energy (DOE), and the U.S. Department of Interior (DOI). The NRTs are responsible for overseeing and ensuring the implementation of the NRRP, and in July 2001 agreed to coordinate their efforts through a Trustee Council, which consists of a representative from each of the NRTs and which makes decisions by unanimous agreement. The NRTs' Memorandum of Understanding (Addendum 1) explains in greater detail the NRTs' duties, responsibilities, and decision-making procedures. Where the NRRP calls for joint or collective action or decision-making by the NRTs, the NRTs shall act through the Trustee Council and pursuant to the Memorandum of Understanding.

The NRTs support public accessibility to the site as outlined in Section 3.1.5. Restoration projects implemented at the Preserve are driven by terrestrial impacts as outlined in Sections 1.3 and 1.4. The NRRP also includes the NRTs' agreement for resolving groundwater injuries (Section 1.5).

1.1 ADMINISTRATIVE GOALS OF THE NRRP

The ultimate goal of the NRRP is to resolve past, present and future natural resource impacts at the Preserve while meeting regulatory commitments and addressing stakeholder concerns. The NRRP reflects the discussions between the NRTs and stakeholders (see Section 6.0) regarding restoration of the Preserve. Prior drafts of the NRRP were used as the basis for the development of project-specific restoration designs. The specific administrative goals that guided the development of the NRRP are as follows:

- Establish a restoration plan that is satisfactory to the NRTs;

- Ensure the Preserve is transitioned to the selected final land use for the FCP site and considers the interests of stakeholders to the degree possible and will accommodate future public use as determined appropriate;

- Ensure that restoration of the Preserve is conducted in a manner that is consistent with the established risk levels and decisions reached in the various operable unit records of decision;

- Establish a restoration plan that is fully integrated with the remedial design and remedial action processes at the site.

1.2 NATURAL RESOURCE RESTORATION STRATEGY

The natural resource restoration strategy for the Preserve is to implement a series of specific projects fully integrated with the completion of site remediation. The strategy includes:

- Utilize grading activities at the end of remedial actions to prepare areas for restoration to the degree possible.

- Stabilize remediated areas immediately in a manner that supports future restoration work to the degree possible.

- Utilize excavated areas to support open water, wetland or vernal pool features whenever possible to avoid the need to backfill.

The strategy for natural resource restoration at the site was to begin restoration projects in parallel with site remediation activities. The remediation schedule dictated the timing and sequence of restoration work. Impacted areas requiring excavation were given priority for restoration and non-impacted areas not requiring excavation were restored as the schedule permitted. Ecological restoration projects are discussed in Section 4.0. The conceptual final land use of the Preserve, once all ecological restoration projects have been implemented, is shown in Figure 1-1.

The NRRP strategy also incorporates the restoration goals of the NRTs and the input of other stakeholders in establishing an acceptable final land use for the Preserve. Institutional controls for the site are outlined in a separate document, the Comprehensive Legacy Management and Institutional Control Plan (LMICP) Rev. 2 Final May 2008, and in an Environmental Covenant with OEPA.

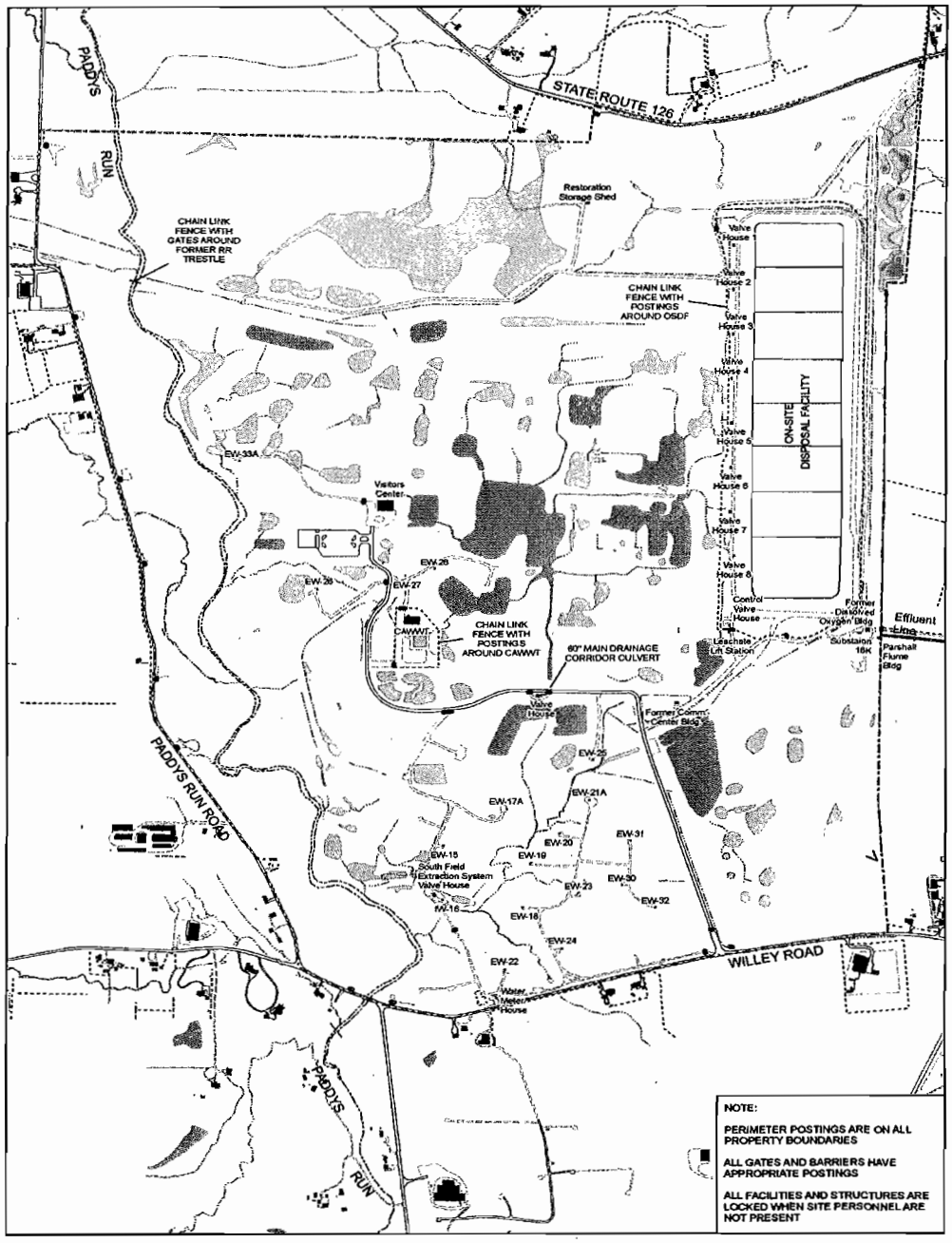

FIGURE 1-1 FERNALD CONCEPTUAL FINAL LAND USE

1.3 SUMMARY OF NATURAL RESOURCE IMPACT ASSESSMENT

The Natural Resource Impact Assessment (NRIA) (DOE, 1998) identified the impacts (i.e., injuries) at the site resulting from past contamination, and those impacts expected to occur as part of remedial actions. The 1998 NRIA identified impacts to the extent possible on an acreage basis sorted by habitat type. Groundwater impacts were identified on both an acre and volumetric basis, as groundwater does not constitute a "habitat." In general, impacts were quantified using existing remedial investigation/ feasibility study information. Past impacts were measured using the soil excavation footprint, which included soils that were considered a risk to human receptors [i.e., soil concentrations exceeding final remediation levels (FRLs). Future impact acreage was identified in cases where physical disturbances would result from the destruction of or reduction in the quality of a particular habitat.

The purpose of the 1998 NRIA was to establish a "baseline" level of impact from which appropriate restoration activities can be developed. The NRIA was designed to function in a manner analogous to an Injury Determination in the formal Natural Resource Damage Assessment (NRDA) process [43 Code of Federal Regulations (CFR) 11]. Since the intent of the NRTs is to pursue a more streamlined evaluation and assessment process and not to conduct a formal NRDA, the 1998 NRIA and this NRRP were designed to meet the substantive aspects of the formal NRDA process to the extent practicable.

The level of impacts identified in the 1998 NRIA was used to assess a required level of natural resource restoration as presented in this NRRP. Habitat Equivalency Analysis (HEA), described in Section 1.4 was used to determine the amount of restoration required to compensate for impacts to terrestrial habitats. The Fernald NRTs have negotiated other projects to compensate for groundwater impacts as discussed in Section 1.5 of this plan. The results of the HEA and NRT negotiations were used to establish the restoration activities outlined in Section 4.0 of this plan. The progress of restoration at the Preserve will be tracked by the NRTs to ensure proper implementation of the NRRP.

1.4 SUMMARY OF 1998 HABITAT EQUIVALENCY ANALYSIS (HEA)

The HEA process was utilized to ensure that the level of natural resource restoration outlined in this NRRP is commensurate with the level of impact identified in the 1998 NRIA . HEA methodology provides a means of compensating for natural resource impacts through the calculation of habitat restoration acreage. By linking estimates of service loss over time to service gains through restoration projects, potentially contentious dollar damage estimates may be avoided.

From the information presented in the 1998 NRIA, conservative assumptions and qualitative judgments were used to develop the HEA calculations. This process allowed for an "order of magnitude" justification for on-property restoration. Also, as described in Section 1.5, HEA was used to calculate terrestrial and surface water habitats only. A separate approach is required for groundwater. Compensation for groundwater is described in Section 1.5 below.

1.5 SUMMARY OF GROUNDWATER ISSUES

The HEA process is appropriate for estimating restoration acreage when impacts are associated with ecological functions and habitat loss. Service losses to humans, such as contamination of a drinking water supply, cannot easily be equated to habitat restoration. Restoration activities must be conducted to replace, restore, or acquire the equivalent of the impacted natural resource. Therefore, it is difficult to compensate for groundwater impacts through ecological restoration.

The Great Miami Aquifer is a significant natural resource and a major focus of remediation activities at the Preserve. As discussions regarding compensation for groundwater impacts have progressed, the NRTs have recognized that many actions have been taken to date. The Operable Unit (OU) 5 Record of Decision (ROD),(DOE 1996) committed DOE to pump and treat contaminated groundwater in order to reach the 20-micrograms per liter (μg/L) total uranium FRL. Originally, this effort called for the installation of 28 extraction wells pumping at a combined rate of 4,000 gallons per minute (gpm) for approximately 27 years. An enhanced groundwater remedy was approved as part of the Baseline Remedial Strategy Report. This approach called for the installation of additional extraction wells and the use of groundwater re-injection technology. By implementing this revised strategy, the time to complete groundwater remediation could be shortened by as much as 17 years. Groundwater extraction actually started before the OU5 ROD was finalized, with the implementation of the OU5 South Plume Removal Action. Additionally, the FRL has since been revised in accordance with promulgation of federal drinking water standards for uranium. The 20-μg/L uranium FRL was not risk based, but rather was based on the proposed maximum contaminant level (MCL) for uranium established by U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act. Since the signing of the OU5 ROD, EPA has established a final MCL for uranium at 30 μg/L. Because of this change, in 2001 an Explanation of Significant Differences (ESD) was approved, which revised the OU5 ROD (2001 ESD) and established the revised FRL as 30 μg/L.

In addition to groundwater remediation activities, DOE has undertaken several other efforts to address groundwater contamination. An alternate water supply was provided to several local industries as part of the South Plume Removal Action. Also, in the late 1980s, DOE began providing bottled water to local residents potentially affected by uranium-contaminated groundwater. This program was discontinued when a public water supply was installed in the Fernald area in 1996. DOE contributed $6.4 million towards the installation of the public water supply for residents near the Preserve.

Because the NRTs originally agreed to focus on habitat restoration as compensation for all impacts, an attempt was made to calculate restoration acreage due to groundwater impact. Several scenarios for using HEA were proposed, but the NRTs were not satisfied that justification was adequate. As a result, the NRTs agreed to abandon the use of HEA for groundwater compensation. Instead, the NRTs agreed to ensure that all available on-property areas are ecologically restored. The majority of the specific ecological restoration projects described in Section 4.0 of the NRRP contributes to the protection of groundwater recharge areas (e.g., erosion control, increased infiltration, and decreased runoff).

To further address groundwater issues, the United States of America on behalf of DOE shall pay $13,750,000 into a separate restoration account, which shall be administered jointly by the NRTs. The NRTs agree that funds from this restoration account may be used for habitat enhancements on site at the Preserve. The NRTs agree that funds from this restoration account may be used to acquire additional land or interests in land, to make ecological improvements to that land to enhance habitats and protect water quality in Paddys Run and the Great Miami Aquifer in the vicinity of the Preserve. Any future additional expenses that are the result of the purchase of additional land will be paid from the restoration account.

Within 120 days after this payment, the NRTs will jointly develop a plan for the use of the funds in the restoration account. This plan will address the selection and implementation of projects to be paid for from the restoration account, the acquisition, ownership, and maintenance of any land purchased using the funds from the restoration account, and annual reports on the use of the restoration account and on the progress of the selected fund projects.

By implementation of this NRRP and by completion of remedial activities, the NRTs agree the DOE adequately compensates for impacts to natural resources (including groundwater) associated with the Preserve.

2.0 RESTORATION PLANNING

The ecological restoration projects described in this NRRP were developed by considering the extent of excavation and grading and the sequence of remediation activities so that restoration and establishment of the future land use could be expedited. In addition, consideration was given to uncertainties and a variety of other regulatory and technical considerations. This section provides the basis for the ecological restoration projects and conceptual final land use outlined in this plan.

2.1 ECOLOGICAL RESTORATION GOALS

Ecological restoration goals form the foundation from which conceptual restoration planning decisions are made. They also provide the basis for monitoring to determine the progress of restoration. The ecological restoration goals are stated and described below.

2.1.1 Restoration of Native Vegetation

Goal: *Enhance and restore, as feasible given postexcavation landforms and soils, vegetative communities similar to native communities present in presettlement southwestern Ohio.*

Ecological restoration at the Preserve will promote the native flora of southwestern Ohio. This primarily involves the restoration of contiguous tracts of upland and riparian forest and tallgrass prairie interspersed with open water and/or wetland systems. Section 3.0 provides a more detailed description of habitat types that existed at the Preserve prior to industrial and agricultural development. The intent of this restoration plan is to use the natural dynamics of ecological systems to the extent possible. The vegetative species mix depends on many factors, including soil, elevation, slope, drainage, adjacent existing vegetation, cost, and availability.

2.1.2 Paddys Run Restoration

Goal: *Enhance the natural dynamic stream characteristics and aquatic systems of Paddys Run, as necessary and feasible.*

Just as most other streams in southwestern Ohio, Paddys Run has been significantly altered due to channeling, erosion control, and removal of sand and gravel. In most instances, existing development prevents the restoration of a natural stream function. However, since undeveloped land is available at the

Preserve, the potential exists to enhance the Paddys Run floodplain and subsequent natural stream habitat. Section 3.1.4 provides additional information regarding Paddys Run stream restoration.

2.1.3 Wildlife Promotion

Goal: *Enhance and restore ecological systems that promote the habitation of wildlife populations native to southwestern Ohio.*

Wildlife use will be considered when selecting flora. Wildlife structures and cover (i.e., bird boxes, brush piles) may be included in ecological restoration designs.

2.1.4 Meet Mitigation Requirements

Goal: *Integrate regulatory mitigation requirements into natural resource restoration plans.*

DOE is required by various laws and regulations to mitigate certain impacts to natural resources. These include commitments under the National Environmental Policy Act (NEPA) and wetland mitigation under Section 404 of the Clean Water Act. To the extent possible, these actions have been conducted on-property and combined with adjacent restoration projects to allow for the contiguous restoration of the Preserve . Similar constraints as outlined in Section 2.1.1 were taken into consideration during design and implementation.

2.2 INTEGRATION WITH SITEWIDE EXCAVATION PLAN

The sequencing of the implementation of the restoration projects was coordinated with the timing and sequencing of soil excavation. In addition, the final restoration of the site is a function of the extent of excavation and final grading required during soil remediation. This section addresses how implementation of the projects outlined in the NRRP is integrated with the guidelines established in the SEP and its appendices.

2.2.1 Sitewide Excavation Plan

The NRRP is fully integrated into the SEP. Many issues identified in the SEP apply directly to the NRRP, such as:

- Restoration strategy,
- Regulatory drivers,
- Certification and benchmark toxicity values (BTVs),
- Restoration grading guidelines,
- Environmental monitoring, and
- Quality assurance/quality control.

2.2.2 Postexcavation Strategy

A key component of the proposed future land use is a series of interconnected open water and wetland habitats. A fundamental assumption was that excavations required for soil remediation would be utilized for natural resource restoration to the maximum extent possible. There have been a variety of excavations in and adjacent to the Former Production Area that accommodated wetland and open water habitat. The specific locations and sizes of the open water/wetland areas were based on the requirements for excavation. In addition, the general pattern of site drainage for proposed final land use was established through the utilization of excavations formed through removal of site utilities.

2.2.3 Sitewide Sequencing Plan

The Sitewide Sequencing Plan, which is Appendix B in the SEP, dictates the sequence and timing of soil remediation activities which dictate the schedule for implementation and completion of long-term restoration projects. For example, revegetation of the Former Production Area was delayed until the certification process was complete for the area-specific constituents of concern of a remediation area. The near-term restoration projects have been designed to be implemented in tandem with soil remediation. However, the certification of certain areas to below-FRL concentrations occurred prior to the implementation of on-site, near-term restoration projects.

2.2.4 Acceleration of Restoration

Efforts were made throughout the remediation process to accelerate completion of both cleanup and restoration projects. The completion of cleanup and restoration work is defined by the "Site Completion Date" under DOE's closure contract with Fluor Fernald, which was October 29, 2006. The NRTs supported efforts to accelerate restoration of the Preserve, but acknowledged the difficulties in completing all restoration work under an accelerated remediation scenario. The NRTs agreed that monitoring work not completed prior to the site completion date would be completed during the first years of long-term stewardship at the Preserve. Monitoring requirements are defined in Section 5.0.

2.2.5 Implementation of Construction

Implementation of Construction, which is Appendix F of the SEP, provided the transition from the excavated areas resulting from soil remediation to the appropriate grades to support natural resource restoration. The final grading designs established in the Integrated Remedial Design Plans (IRDPs)

ensured that appropriate drainage was established, slopes were stabilized, and appropriate surface water diversion and retention were established to support open water/wetland habitats. These designs also ensured that the floodplain of Paddys Run was not restricted as result of soil remediation. The grading required to transition from remediation-driven excavation to a restoration configuration was termed "interim restoration". Seeding to stabilize bare soil was also carried out as part of "interim restoration".

2.3 UNCERTAINTIES AND CONSIDERATIONS DURING RESTORATION

There are several aspects of the NRRP and the natural resource restoration process that involve uncertainties that must be addressed through careful consideration in the project specific design processes. These issues are discussed in the following sections.

2.3.1 Potential for Cross-Contamination During Phasing of Excavation

The potential for cross-contamination is a concern that was addressed during the excavation and grading processes. The overall excavation and grading processes required that particular areas of the site be excavated and graded before or in parallel with other areas. Appropriate administrative and engineering controls were put in place so that cross-contamination was avoided. The specific projects outlined in this plan were not implemented until the certification process was complete for each respective project area and appropriate controls were established to ensure the risk of cross-contamination was minimized.

2.3.2 Ecological Risk Factors

A process was established to ensure that the proposed projects were not implemented in areas that contain contaminants posing a risk to ecological receptors. The process was designed to effectively address the impact of potential contaminants to ecological receptors.

Appendix C of the SEP contains the sitewide review of contaminants of ecological concern. The results of this review indicate that antimony, cadmium, lead, molybdenum, silver, and several polyaromatic hydrocarbons (PAHs) may be a concern in certain areas of the site. Remedial activities addressed any ecological concerns, and the presence of these constituents was verified during the certification process.

3.0 GENERAL ECOLOGICAL RESTORATION PLAN

The purpose of this section is to present the general plans for restoring specific habitats at the Preserve. This section also presents the factors that were considered during the ecological restoration design of specific areas.

3.1 SITEWIDE RESTORATION CONSIDERATIONS

This section outlines other considerations that were factored into the establishment of the specific restoration projects and the final land use outlined in this plan in addition to the issues outlined in Section 2.0. Natural Resource Design Plans (NRRDPs) were developed for each ecological restoration project established in this plan.

The NRRDPs for projects that have been implemented and completed will be reviewed and evaluated by the NRTs to determine whether there are any outstanding issues.

3.1.1 Soil Balance and Pre-FCP Topography (i.e., Cut and Fill Maps)

Topographic maps for the site prior to the construction of the Fernald Plant have been utilized to construct a profile of the topography and drainage in the years prior to 1952. In designing the natural resource restoration projects, every effort was made to re-establish original drainage patterns by restoring pre-site topography and elevations to the extent possible. The premise for this approach is that the site, over the long term, will tend to erode back to conditions that existed prior to construction of the site. Therefore, reestablishing the "natural" drainage patterns should facilitate restoration projects (i.e., wetlands and open water) in the long term.

3.1.2 Sequence of Natural Resource Restoration Projects

The long-term restoration projects were implemented as soil remediation was completed and areas could be graded to support restoration. Sequencing in conjunction with remediation of individual excavation areas required that some areas undergo interim restoration. Interim restoration involves grading to stabilize slopes and seeding with native grasses pursuant to guidelines established in the SEP. These actions were required when an area was excavated and certified clean, but could not undergo final restoration until project activities were completed, such as the possible need for borrow material within the area and sequencing with adjacent projects.

3.1.3 Available Watershed

A Water Availability Study provided quantitative modeling results regarding the surface water routing involving four open water areas under post-remediation conditions at the Preserve. The modeling results indicate that four on-property open water areas can be established in the Former Production Area and its vicinity as a result of soil excavation activities.

The size and configuration of open water areas are not limited by this study and were determined during natural resource restoration design. Average water depths were determined by dividing the pond storage capacity by the surface water area. The average water depths in the four primary open water areas are projected to be 8.2, 10.5, 4.5, and 14.8 feet respectively. The acreage associated with the four open water areas under normal conditions at the minimum stage are 10, 12.5, 6.1, and 3.3 acres, respectively. This evaluation concludes that the post-remediation topography can support the establishment of open water/wetland systems.

3.1.4 Restoration Plan for Paddys Run

Within certain reaches of the property, Paddys Run is characterized by extremely high banks and a stream bed that is deeply cut into the surrounding topography. These features result from both the natural geology and stream dynamics of Paddys Run, and historic activities at the site (i.e., stream relocation, dredge of materials). Consequently, the current floodplain of Paddys Run has been greatly reduced from its previous extent, and undissipated flow is carried downstream during storm events. This increased downstream flow works to further cut existing stream banks, causing accelerated loss of riparian habitat, and lowering the elevation of the stream bed.

To counter this process, DOE implemented a restoration strategy that creates additional floodplain along the Paddys Run corridor. This effort involved using remediated areas to increase the amount of floodplain created during restoration activities. Remediation activities resulted in increased floodplain in the Waste Pit Area and the Southern Waste Units. Additional Floodplain can be created in the "Oxbow Area" of Area 8, Phase III north with minimal excavation. Interim management strategies were also established to ensure that these long-term restoration goals are considered when immediate erosion measures are required.

As much floodplain as possible was created in these areas to absorb the flows generated by 1 to 2-year storm events. Flows from 1 to 2-year storm events are considered the channel-forming flows because of their increased frequency over time when compared to larger, more powerful, but infrequent storm events (Leopold 1994, Rosgen 1996). This information was used to support specific restoration design decisions, as summarized below.

Specific restoration activities, in addition to the creation of additional floodplain, will increase the riparian corridor along Paddys Run generally enhancing the quality of habitat along the stream corridor. Restoration Design Plans include vegetation that stabilized the expanded floodplain and enhanced habitat along the stream. Also, bioengineering principles and techniques were used to prevent unwanted bank erosion whenever feasible.

The NRTs, with input from outside organizations with applicable expertise (e.g., Army Corps of Engineers, Ohio Department of Natural Resources (ODNR)), are also committed to evaluating the rate of incision in the streambed of Paddys Run. The NRTs will take appropriate steps (e.g., input from outside consultants) to determine if incision in Paddys Run could create problems with the long-term stability of the stream and/or threaten restored areas of the stream. Two gradient control structures were installed within the Paddys Run channel. One was installed near the waste pit area and the second adjacent to the southern waste unit area.

3.1.5 Future Public Use

In the Fall of 1998, DOE released the Environmental Assessment on Final Land Use at the FCP (DOE 1998b). During the same timeframe the draft NRRP was also made available for public review (see Section 6.0). The public review of the EA was supplemented by a public meeting to obtain input. The EA proposed that the majority of the site (904 acres) be committed to natural resource restoration (i.e., an Undeveloped Park), the OSDF (123 acres) remain committed for its intended land-use, and that a 23-acre area be set aside for potential economic development in the future. Public comments on the EA were generally supportive of the proposed Land Use and DOE issued its final decision in June of 1999 in the form of a Finding of No Significant Impact (FONSI). There has been no further interest in the development or community use of the 23-acre set aside area since the EA was issued in 1998; therefore, DOE is no longer considering any development or community use of the 23 acres. Figure 1-1 presents the most current version of the conceptual final land use.

The public input process in the Fall of 1998 also generated a great deal of input regarding future public use of the Preserve. DOE requested that the Fernald Citizens Advisory Board (FCAB) take a lead role in evaluating the public's desires regarding future public use of the Preserve and make specific recommendations to DOE. The FCAB held three public workshops during 1999 and 2000 regarding future public use of the Preserve and made several recommendations to DOE. The recommendations and feedback provided to DOE as a result of the public workshops include the following:

1. Recommendation to proceed forward as soon as possible with the re-interment of Native American Remains on the Fernald Site (Recommendation #00-3).

2. A collective vision of the future of the Fernald Site was developed that included the Fernald Site being a regional educational center, with a focus on environmental, cultural and other historical information related to the site (Recommendation #00-4).

3. Additional recommendations were made regarding the establishment of trails and a multi-use educational facility (Recommendation #2001-02 and 2001-03).

All of the FCAB recommendations can be found on their web site at www.fernaldcab.org. The NRTs agree that future public use of the site for educational and research purposes, including the construction of interpretive trails and an educational facility, is consistent with the goals of the NRTs. Reburial of Native American remains can occur within restored areas with no impact on the restoration plans outlined in this plan.

The NRTs agree that low-impact trails should be integrated in select restored areas to further educational and interpretive use of the Preserve. The NRTs agree that at least three miles of mulched trails (or suitable alternative) should be included on the Preserve. Cleared or mowed trails may be adequate. Trails should focus on the Paddys Run stream corridor, portions of the Borrow Area, and the Southern Waste Units. Trails should provide viewing areas for the OSDF, Former Production Area and Northern Woodlot, but should limit entry into these areas. Boardwalks of one-half mile or less should be incorporated into the trail design for restored areas to provide viewing of wetlands if necessary. Interpretive signs/displays should be installed at appropriate locations on the trails and overlooks should be constructed at various points on the trail as jointly determined by the NRTs. The NRTs support trails providing handicap access to the restored areas of the Preserve, as determined appropriate by DOE. The

NRTs do not support any use of trails that will result in an activity destructive to restored areas of the Preserve. The NRTs do not support trails for biking or off-road vehicles.

3.1.6 Soil Preparation

Specific ecological restoration designs took into consideration the types of soil present when determining vegetation plans. In general, the restoration design process included a predesign investigation that evaluated the condition of soils present to determine if soil amendment/fertilization was required to establish the desired vegetation. For undisturbed areas, Hamilton and Butler County soil survey maps were used as a preliminary guide [Soil Conservation Service (SCS) 1982a, 1982b]. Where necessary, analysis was conducted to determine the specific characteristics of the soil, such as moisture and organic content.

For excavated areas, the remaining subsoils may not be amenable to revegetation. The NRRP addresses nutrient deficient excavated areas by considering native prairie grasses and pioneer tree and shrub species that survive in nutrient-poor soil conditions. Nevertheless, soil amendments were necessary. Research has been conducted on site to assist in determining the optimal amendment strategy for the restoration of native prairie grasses. The results of this effort were used to guide soil preparation activities in excavated areas.

3.1.7 Use of Plants and Seeds and Invasive Plant Species Management

All plants and seeds used for ecological restoration at the FCP are native to southwest Ohio. To preserve regional genotypes, an effort was made to obtain plants and seeds from local sources. However, because of the scope and scale of restoration projects at the Preserve, non-local plants and seeds were also needed. When feasible, restored areas were interseeded with seeds collected on-property. Invasive species control was incorporated into applicable NRRDPs. For example, the NRRDP for the North Woodlot included the plan for large-scale removal of bush honeysuckle.

3.1.8 Long-Term Maintenance

Long-term maintenance is aimed at facilitating progress of restored areas to achieving the restoration goals and maintaining the function of the ecosystems. For example, supporting canopy closure in forested areas and achieving wetland status in wetland areas. Adaptive management has been used during implementation monitoring and will continue to be relied upon during the long-term maintenance phase

of the project. Long-term maintenance will generally be focused upon the following areas:

- Invasive species control
- Water level and control structure maintenance
- Erosion control
- Wildlife structures
- Herbivory control
- Burning/mowing & dethatching
- Trails, interpretive signs/display, overlooks

A maintenance plan will be developed and submitted for review and approval to the NRTs within 120 days of the effective date of a consent decree which resolves past, present, and future natural resource impacts at the Preserve. The NRTs will jointly review and approve the maintenance plan.

3.1.9 Institutional Controls

Institutional controls are required under the OU5 Record of Decision and are further defined in the LMICP and in the Environmental Covenant.

3.2 HABITAT-SPECIFIC RESTORATION PLANS

The majority of ecological restoration at the Preserve consists of a combination of upland forest, riparian forest, tallgrass prairie/savanna and wetland/open water systems, as well as enhancement of existing habitats such as pine plantations. The individual restoration projects set forth in Section 4.0 specify each habitat and describe the area-specific factors that were considered in the design. The descriptions below provide the basis for restoration of these specific habitats.

3.2.1 Upland Forest

Prior to settlement of the area, the land now occupied by the Preserve probably consisted of forest. The sitewide characterization report describes the Preserve as existing in a transition zone between the Oak-Hickory and Beech-Maple sections of the Eastern Deciduous Forest province (DOE 1993). Braun (1989) describes the area slightly differently, as a transition from Beech-Maple to Western Mesophytic forest. Regardless, these forests share many similar species, such as American beech (*Fagus grandifolia*), sugar maple (*Acer saccharinum*), tulip poplar (*Liriodendron tulipifera*), white ash (*Fraxinus americana*),

northern red oak (*Quercus rubra*), Ohio buckeye (*Aesculus glabra*), and shagbark hickory (*Carya ovata*). Therefore, restoration of upland forests at the Preserve focused on the establishment of this Beech-Maple, Oak-Hickory transition zone.

Specific planting plans were detailed in individual NRRDPs. Each NRRDP specified soil preparation, species mix, planting density, planting instructions, cover, short-term maintenance, herbivore control, and monitoring requirements. Other revegetation design methodologies were used as well, depending on the specific needs identified in individual NRRDPs. Revegetation of each area depends on a variety of factors, including soils, topography, hydrology, existing vegetation, cost, and relationship to other restoration projects. Most trees and shrubs were selected from the tree and shrub guide established for the Preserve (Table 3-1). Considerations were given to mimic natural successional processes. Pioneer tree species were planted in disturbed areas, while late successional species were used to enhance existing woodlots.

Table 3-1 has been established as a guide for the NRRDPs. The trees listed are all native to southwestern Ohio, as described by Braun (1989). The master list has been divided into general categories of upland and riparian trees and shrubs. However, site-specific conditions dictate the species mix within each NRRDP. To assist in these decisions, supplemental information is included in Table 3-1. This information was used in determining species mixes for specific ecological restoration projects. Further information is included in the Comments section of Table 3-1.

3.2.2 Riparian Forest

The Paddys Run floodplain was expanded as part of the long-term management plan for Paddys Run. Within these floodplain areas, the corridor of Paddys Run and the Storm Sewer Outfall Ditch (SSOD) was expanded through revegetation as described above for upland forests. The trees species chosen from Table 3-1 were those that can withstand periodic inundation. Wetland indicator status was used as a guide for specific planting designs. Typical species that were planted in floodplain areas include eastern cottonwood (*Populus deltoides*), swamp white oak (*Quercus bicolor*), black willow (*Salix nigra*), American sycamore (*Platanus occidentalis*), and green ash (*Fraxinus pennsylvanica*). As with the upland forest revegetation, individual NRRDPs established planting plans based on a variety of site-specific factors.

3.2.3 Tallgrass Prairie/Savanna

The Preserve is generally located east of the range where tallgrass prairies and savannas were predominant, but prairie remnants did exist in Ohio prior to European settlement [Society for Ecological Restoration (SER 1997)]. At one point, at least 300 prairies were present across Ohio (Gordon 1969).

TABLE 3-1
Master List of Trees and Shrubs used in Natural Resource Restoration at the Fernald Preserve

Scientific Name	Common Name	Form	Function	Use	Comments
Acer nigrum	black maple	canopy tree	cover	B	Similar to *Acer saccharum,* but likes slightly moister conditions.
Acer rubrum	red maple	canopy tree	cover	H R W	Tolerates a wide variety of conditions. Can pioneer disturbed sites
Acer saccharinum	silver maple	canopy tree	cover	R W	Fast growing. Pioneers disturbed banks following *Populus deltoides*
Acer saccharum	sugar maple	canopy tree	cover, mast	B H	Co-dominant in beech-maple forest
Aesculus glabra	ohio buckeye	understory tree	diversity	R W	Tolerates a wide variety of conditions. Avoided by deer
Aesculus octandra	yellow buckeye	understory tree	diversity	O	Generally found east of FEMP in unglaciated portions of Ohio
Alnus serrulata	brookside alder	shrub	cover	R W	Obligate wetland species
Amelanchier arborea	downy serviceberry	shrub	fruit, diversity	H R W	Found mostly east of FEMP. Associated with *Acer rubrum*
Amelanchier laevis	allegheny serviceberry	shrub	cover	O	Not common in Ohio. Abundant in southern Appalachian highlands
Amorpha fruticosa	false indigo-bush	shrub	cover	W	Fast growing. Avoided by deer. Facultative wetland species
Aronia melanocarpa	black chokeberry	shrub	aesthetics	O	Found in wet areas and dry ledges/slopes. Found mostly east of FEMP
Asimina triloba	paw paw	understory tree	fruit, diversity	B R	Forms clustered stands in forest understory. Tap root
Campsis radicans	trumpet creeper	vine	aesthetics	R E	Showy. Naturalized in Ohio
Carpinus caroliniana	hornbeam	understory tree	diversity, mast	B R	Very shade tolerant. Found in moist and mesophytic woods
Carya cordiformis	bitternut hickory	canopy tree	cover	B H R	Common *Carya* spp. at FEMP. Tap root
Carya laciniosa	shellbark hickory	canopy tree	cover, mast	R	Found in moist to wet sites and along streams
Carya ovata	shagbark hickory	canopy tree	cover, mast	H R W	Similar to *Carya laciniosa,* but found in drier areas as well
Castanea dentata	chestnut	canopy tree	diversity, mast	O	Rare due to chestnut blight. Historically found mostly east of FEMP
Ceanothus americanus	new jersey tea	shrub	diversity	H R W	Found mostly east of FEMP
Celastrus scandens	bittersweet	vine	diversity	R	Drought and flood tolerant
Celtis occidentalis	hackberry	canopy tree	diversity	R E	Common at FEMP in a variety of habitats
Cephalanthus occidentalis	buttonbush	shrub	cover	W	Emergent species that forms pure stands
Cercis canadensis	redbud	understory tree	aesthetics	H E	Showy edge species
Cornus alternafolia	alternate-leaved dogwood	understory tree	diversity, cover	B R	Found mostly east of FEMP
Cornus amomum	silky dogwood	shrub	cover	R W	Can reproduce by dormant live cuttings. Suitable for erosion control
Cornus drumondii	roughleaf dogwood	shrub	cover	H E	Edge species
Cornus florida	flowering dogwood	understory tree	aesthetics	H	Showy shade tolerant species
Cornus racemosa	grey dogwood	shrub	cover	H	Seems to compete well with *Lonicera mackii*

Scientific Name	Common Name	Form	Function	Use	Comments
Cornus stolonifera	red-osier dogwood	shrub	cover	R W	Can reproduce by dormant live cuttings. Suitable for erosion control
Corylus americana	hazel nut	shrub	diversity	R W	Found in a variety of habitats. Can form large patches
Crataegus crus-galli	cockspur hawthorne	shrub	diversity	E	Thorny edge species
Crataegus mollis	downy hawthorne	understory tree	cover	B	Thorny
Crataegus phaenopyrum	Washington hawthorne	understory tree	diversity	E	Thorny
Decodon verticillatus	water willow	shrub	diversity	W	Emergent species
Diospyros virginiana	persimmon	understory tree	fruit	O	Edible fruit. Found mostly east of FEMP in unglaciated areas
Euonymus atropurpureus	eastern wahoo	understory tree	aesthetics	R	Showy
Fagus grandifolia	beech	canopy tree	cover, mast	B	Co-dominant in beech-maple forest
Fraxinus americana	white ash	canopy tree	cover	B H	Common at FEMP in a variety of habitats
Fraxinus nigra	black ash	canopy tree	cover, diversity	R W	Can tolerate standing water. Smaller than *Fraxinus americana*
Fraxinus pennsylvanicum	green ash	canopy tree	cover	R	Flood tolerant bottomland species
Fraxinus quadrangulata	blue ash	canopy tree	cover, diversity	H	Most drought-resistant *Fraxinus* spp.
Gymnocladus dioica	kentucky coffeetree	canopy tree	diversity	H	Most common in southwestern portion of Ohio
Hamamelis virginiana	witch hazel	understory tree	cover	B	Found in a variety of habitats singularly or in groups
Hydrangea arborescens	wild hydrangea	shrub	aesthetics	O	Found in ravines and shaded bluffs
Hypericum spathulatum	shrubby st. john's wort	shrub	diversity	W	Showy species that can form large patches
Ilex verticallata	winterberry	shrub	aesthetics	W	Found mostly east of FEMP
Juglans cinerea	butternut	canopy tree	mast, diversity	O	Rare Ohio species
Juglans nigra	black walnut	canopy tree	mast, diversity	B R	Allelopathic. Can form pure stands
Juniperus virginiana	eastern red cedar	understory tree	cover	E	Only coniferous species native to FEMP
Lindera benzoin	spicebush	shrub	cover	B	Common shrub of beech-maple forest
Liquidambar styraciflua	sweetgum	canopy tree	diversity	O	Southern tree found mostly east and south of FEMP
Liriodendron tulipifera	tulip poplar	canopy tree	cover, aesthetics	B H	Tallest deciduous species in the eastern U.S.
Lonicera sempervirens	trumpet honeysuckle	vine	aesthetics	O	Southern species uncommon in Ohio
Morus rubra	red mulberry	understory tree	fruit	E	Fast growing. Shade tolerant
Nyssa sylvatica	black gum	canopy tree	diversity, aesthetics	H R	Found in a variety of habitats
Ostrya virginiana	hop-hornbeam	understory tree	diversity	B R W	Found in a variety of habitats
Parthenocissus quinquefolia	Virginia creeper	vine	diversity	H	Showy in autumn
Physocarpus opulifolius	ninebark	shrub	diversity	E	Plant in open areas
Platanus occidentalis	sycamore	canopy tree	cover	R E	Fast growing streamside spp. Can also pioneer old fields

Scientific Name	Common Name	Form	Function	Use	Comments
Populus deltoides	cottonwood	canopy tree	cover	R E	Fast growing streamside spp. Can also pioneer old fields
Prunus americana	American plum	understory tree	diversity, fruit	E	Forms large patches
Prunus serotina	black cherry	canopy tree	fruit	B	Found in a variety of habitats. Largest *Prunus* spp. In Ohio
Prunus virginiana	choke cherry	shrub	cover	O	Found mostly north of FEMP
Quercus alba	white oak	canopy tree	cover, mast	H	Found in a variety of habitats.
Quercus bicolor	swamp white oak	canopy tree	cover, mast	R W	Flood tolerant bottomland spp.
Quercus coccinea	scarlet oak	canopy tree	cover, mast	H	Found mostly east of FEMP
Quercus inbricaria	shingle oak	canopy tree	diversity	H	Found in a variety of habitats
Quercus macrocarpa	bur oak	canopy tree	diversity, mast	R S	Burn resistant woody dominant of savanna habitat
Quercus muehlenbergii	chinquapin oak	canopy tree	diversity, mast	H	Most common in southwestern portion of Ohio
Quercus palustris	pin oak	canopy tree	cover	R W	Can form pure stands in bottomlands
Quercus prinus	chestnut oak	canopy tree	diversity	O	Found mostly east of FEMP in unglaciated areas
Quercus rubra	red oak	canopy tree	cover, mast	B H	Found in a variety of upland habitats
Quercus shumardii	shumard oak	canopy tree	diversity, mast	H	Southern tree found in southwest Ohio
Quercus velutina	black oak	canopy tree	cover, mast	H	Similar to *Quercus rubra*
Rhus aromatica	fragrant sumac	shrub	cover, aesthetics	H	Prefers dry, gravelly, rocky banks
Rhus glabra	smooth sumac	shrub	aesthetics	E	Showy species. Most abundant *Rhus* spp. In Ohio
Rhus typhina	staghorn sumac	shrub	aesthetics	E	Similar to *Rhus glabra*
Ribes americanum	black currant	shrub	diversity	O	Found mostly north of FEMP
Rosa caroliniana	carolina rose	shrub	aesthetics	E S	Prefers dry open areas
Rosa palustris	swamp rose	shrub	aesthetics	R W	Prefers wet areas and banks of slow-flowing stream
Rosa setigera	prairie rose	shrub	aesthetics	E S	Can form large stands
Rubus allegheniensis	blackberry	shrub	fruit	E	Thorny. Edible fruit
Rubus occidentalis	black raspberry	shrub	fruit	E	Thorny. Edible fruit
Salix amygdaloides	peach-leaf willow	understory tree	cover	R	Can reproduce by dormant live cuttings. Suitable for erosion control
Salix discolor	pussy willow	shrub	cover	R W	Can reproduce by dormant live cuttings. Suitable for erosion control
Salix eriocephala	heart-leaved willow	shrub	diversity	R W	Can reproduce by dormant live cuttings. Suitable for erosion control
Salix exigua	sandbar willow	understory tree	cover	R	Can reproduce by dormant live cuttings. Suitable for erosion control
Salix humila	prairie willow	shrub	cover	S	Can reproduce by dormant live cuttings.
Salix nigra	black willow	understory tree	cover	R W	Can reproduce by dormant live cuttings. Suitable for erosion control
Salix sericea	silky willow	shrub	cover	R W	Can reproduce by dormant live cuttings. Suitable for erosion control

Scientific Name	Common Name	Form	Function	Use	Comments
Sambucus canadensis	elder	shrub	fruit	R W	Can reproduce by dormant live cuttings. Suitable for erosion control
Sassafras albidum	sassafras	understory tree	diversity	H E	Can form pure stands
Smilax rotundifolia	greenbriar	shrub	diversity	O	Thorny.
Spiraea alba	meadow sweet	shrub	aesthetics	W	Found mostly north of FEMP
Spiraea tomentosa	steeple bush	shrub	aesthetics	O	Found mostly north and east of FEMP
Staphylea trifolia	bladdernut	shrub	diversity	B H R	Prefers shaded banks
Symphoricarpos orbiculatus	coral berry	shrub	diversity	E	Can form large patches in disturbed areas
Tilia americana	basswood	canopy tree	cover, aesthetics	B	Common in glaciated portion of Ohio
Ulmus americana	american elm	canopy tree	cover	O	Found in a variety of habitats. Impacted by dutch elm disease
Ulmus rubra	slippery elm	canopy tree	cover	H R	Found in a variety of habitats
Vaccinium corymbosum	highbush blueberry	shrub	fruit	O	Boreal relic found in wet areas within glaciated portion of Ohio
Viburnum acerifolium	mapleleaf viburnum	shrub	diversity	B	Associated with *Fagus grandifolia*
Viburnum dentatum	arrowwood	shrub	cover	O	Found mostly east of FEMP
Viburnum lentago	nannyberry	shrub	cover	O	Found mostly north of FEMP
Viburnum prunifolium	blackhaw viburnum	understory tree	cover	B H	Found in a variety of habitats singularly or in groups
Zanthozylum americanum	prickly ash	understory tree	diversity	E	Thorny. Can form large stands

Use Key:

B = beech-maple forest template
H = oak-hickory forest template
R = riparian template
W = wetland template
E = edge habitat template
S = savanna template
O = other species

Remnant wet meadow has appeared as part of a wetland restoration several miles west of the Preserve (Klein 1996). Also, since prairie grasses and forbs are tolerant of nutrient-poor soils, they are potentially ideal for re-establishing vegetation in excavated areas. A tallgrass prairie restoration has been successfully completed on an interstate borrow pit outside of Dayton, Ohio (Geiger 1997). This effort involved similar sub-soil conditions that will be present in several deep excavations at the Preserve. For these reasons, tallgrass prairie and savanna restoration was undertaken at the Preserve, primarily in disturbed areas.

Prairie restoration involves application of soil amendments (as needed), seeding of grasses and forbs, and maintenance through mowing and/or controlled burns. Research was conducted to determine the optimal use of soil amendments for prairie grass establishment. Results of the research and area-specific soil sampling guided NRRDP specifications for each area. After required soil preparation, seeding of grasses and forbs was primarily conducted with a Truax seed drill. The specific seed mix for each restoration area is specified in individual NRRDPs. The forbs interseeded into established grasses were native to southwest Ohio as described in previous NRRDPs (e.g., Area 8, Phase II Restoration Project) and by the SER (1997). Table 3-2 presents general seeding lists for wet and dry areas at the Preserve. Area specific modifications to the list were made based upon availability, local conditions and other factors.

Where specified, savannas were established by planting a sparse mix of bur oak (*Quercus macrocarpa*), along with white oak (*Quercus alba*) and shrubs such as gray dogwood *(Cornus racerosa*), hazelnut (*Corylus americana*), and smooth sumac (*Rhus glabra*) and seeding the area with the grass mix described above.

3.2.4 Wetlands/Open Water

Prior to the rise of agriculture in the region, much of the Preserve and surrounding area may have consisted of wetlands. Several areas of poorly drained soils are located on the property (DOE 1993). High-quality forested wetlands are also located just west of the Preserve (Davis 1994). In addition, DOE has a responsibility to provide approximately 17.2 acres of mitigated wetlands under Section 404 of the Clean Water Act, as described in more detail below. For these reasons, wetland mitigation was pursued in appropriate areas of the Preserve. Some open water areas were also established as a result of deep excavations within the Former Production Area. These areas will provide additional wildlife habitat.

TABLE 3-2
SEED MIX USED IN WET AND DRY AREAS FOR PERMANENT VEGETATION*

Species Name	
Dry Areas	**Wet Areas**
Big Bluestem (*Andropogon gerardii*)	Big Bluestem (*Andropogon gerardii*)
Little Bluestem (*Schizachyrium scoparius*)	Canada Wild-Rye (*Elymus candensis*)
Side-Oats Grama (*Bouteloua curtipendula*)	Switch Grass (*Panicum virgatum*)
Indian Grass (*Sorghastrum nutans*)	Blue Joint Grass (*Calamagrostis canadensis*)
Canada Wild-Rye (*Elymus canadensis*)	Porcupine Sedge (*Carex hystericina*)
Switch grass (*Panicum virgatum*)	Fox Sedge (*Carex vulpinoidea*)
Annual Rye (*Lolium multiflorum*)	Dark Green Bulrush (*Scirpus atrovirens*)
	Annual Rye (*Lolium multiflorum*)
Wildflowers:	Prairie Cordgrass (*Spartina pectinata*)
Butterflyweed (*Asclepias tuberosa*)	Wildflowers:
New England Aster (*Aster novae-angliae*)	
Smooth Aster (*Aster laevis*)	Red Milkweed (*Asclepias incarnata*)
Canada Milkvetch (*Astragalus Canadensis*)	New England Aster (*Aster novae-angliae*)
Purple Prairie Clover (*Petalostemum purpureum*)	Wild Senna (*Cassia hebecarpa*)
Ox-eye Sunflower (*Heliopsis helianthoides*)	Canada Tick Trefoil (*Desmodium canadense*)
Bergamot (*Monadara fistulosa*)	Prairie Blazingstar (*Liatris pycnostachya*)
Purple Coneflower (*Echinacea purpurea*)	Great Blue Lobelia (*Lobelia siphilitica*)
Yellow Coneflower (*Ratibida pinnata*)	Bergamot (*Monadara fistulosa*)
Black-Eyed Susan (*Rudbeckia hirta*)	Yellow Coneflower (*Ratibida pinnata*)
Spiderwort (*Tradescantia ohioensis*)	Branched Coneflower (*Rudbeckia hirta*)
Blue Vervain (*Verbena hastata*)	Blue Vervain (*Verbena hastata*)
Hoary Vervain (*Verbena stricta*)	Angelica (*Angelica atropurpurea*)
Beardtongue (*Penstemon grandiflorus*)	Sweet Joe-Pye Weed (*Eupatorium purpureum*)
Cupplant (*Silphium perfoliatum*)	
Sweet Joe Pye-Weed (*Eupatorium purpureum*)	
White False Indigo (*Baptisia leucantha*)	
Blue False Indigo (*Baptisia australis*)	
Partridge Pea (*Cassia fasciculata*)	
Rattlesnake Master (*Eryngium yuccifolium*)	
Round-headed Bush Clover (*Lespedea Capitata*)	
Stiff Goldenrod (*Solidago risida*)	

*Substitutions were made based upon availability and localized conditions.

More than 10 acres of jurisdictional wetlands have been dredged or filled as a result of remedial activities at the Preserve. In June 1995, DOE met with EPA, OEPA, USFWS, and ODNR to discuss mitigation of the impacted wetlands. DOE agreed to mitigate wetlands at a 1.5 to 1 ratio, replacing 1.5 acres of wetlands for every 1 acre dredged or filled. DOE also agreed to implement the mitigation on property if possible. Because wetland design is area-specific, conceptual design details are described in the area-specific descriptions (Sections 4.2, 4.5.3, and 4.7) (Phases I, II, and II of the mitigation). Approximately 20 acres of wetlands have been established at the Preserve. In addition, approximately 26 acres of forested jurisdictional wetlands in the Northern Pines (Section 4.5) have been preserved with an appropriate legal mechanism in place to ensure continued preservation. This combination of newly created wetlands and preserved existing wetlands satisfies DOE's wetland mitigation responsibility, subject to any requirements in Section 5.0.

In addition to the wetland mitigation process, upland and riparian forest revegetation in various areas can restore wet woods. Soil characteristics and hydrology were considered when planting areas with wetland trees and shrubs. Detailed analyses was conducted and presented in NRRDPs to determine specific planting schemes.

4.0 NATURAL RESOURCE RESTORATION PROJECTS

This section describes the restoration projects that have been completed at the Preserve. These descriptions provided conceptual components required for each project. These restoration projects are discussed below in the sequence of implementation. All of the restoration projects have been implemented consistent with their respective NRRDPs. Figure 4-1 shows the various restoration project areas on the Preserve.

4.1 AESTHETIC BARRIER ALONG WILLEY ROAD

This restoration project involved establishment of an aesthetic barrier, approximately 50 feet wide, using densely planted trees to provide a visual screen and aesthetic appeal between Willey Road and construction activities. The FCAB recommended that DOE provide screening of remedial activities as feasible and appropriate (Recommendation #97-1). Immediate, effective visual screening was achieved through dense planting of evergreens (eastern white pine, Norway spruce) and deciduous trees (red maple, green ash, American crabapple, tulip poplar, hawthorn, oak, and redbud). Aesthetic appeal is provided by using spring flowering trees (e.g., American crabapple, redbud) and trees with vivid yellow and red foliage (e.g., red maple). By designing the barrier to include a mixture of evergreens and deciduous trees, the barrier will provide year-round screening and quality habitat for wildlife species.

Safety hazards that can be created by restricting visibility or creating additional deer habitat too close to the road were considered during the design. As a result, the barrier was set back 50 feet from the road. This project was implemented and completed in the fall of 1998.

4.2 WETLAND MITIGATION – PHASE I

This restoration project was conducted in approximately 12 acres of Area 1, Phase I, from March 1999 to November 1999. As a result of remedial activities at the Preserve, approximately 10 acres of jurisdictional wetlands were dredged or filled. As stated in Section 3.2.4, DOE negotiated a 1.5 to 1 wetland mitigation ratio with regulatory agencies (EPA, OEPA, ODNR, and USFWS). Phase I wetland mitigation was performed to address a portion of the required mitigated acres of wetlands.

The Phase I wetland mitigation performed in Area 1, Phase I was designed to produce more than 6 acres of constructed wetlands, with the remaining portions of the site functioning as upland forest and

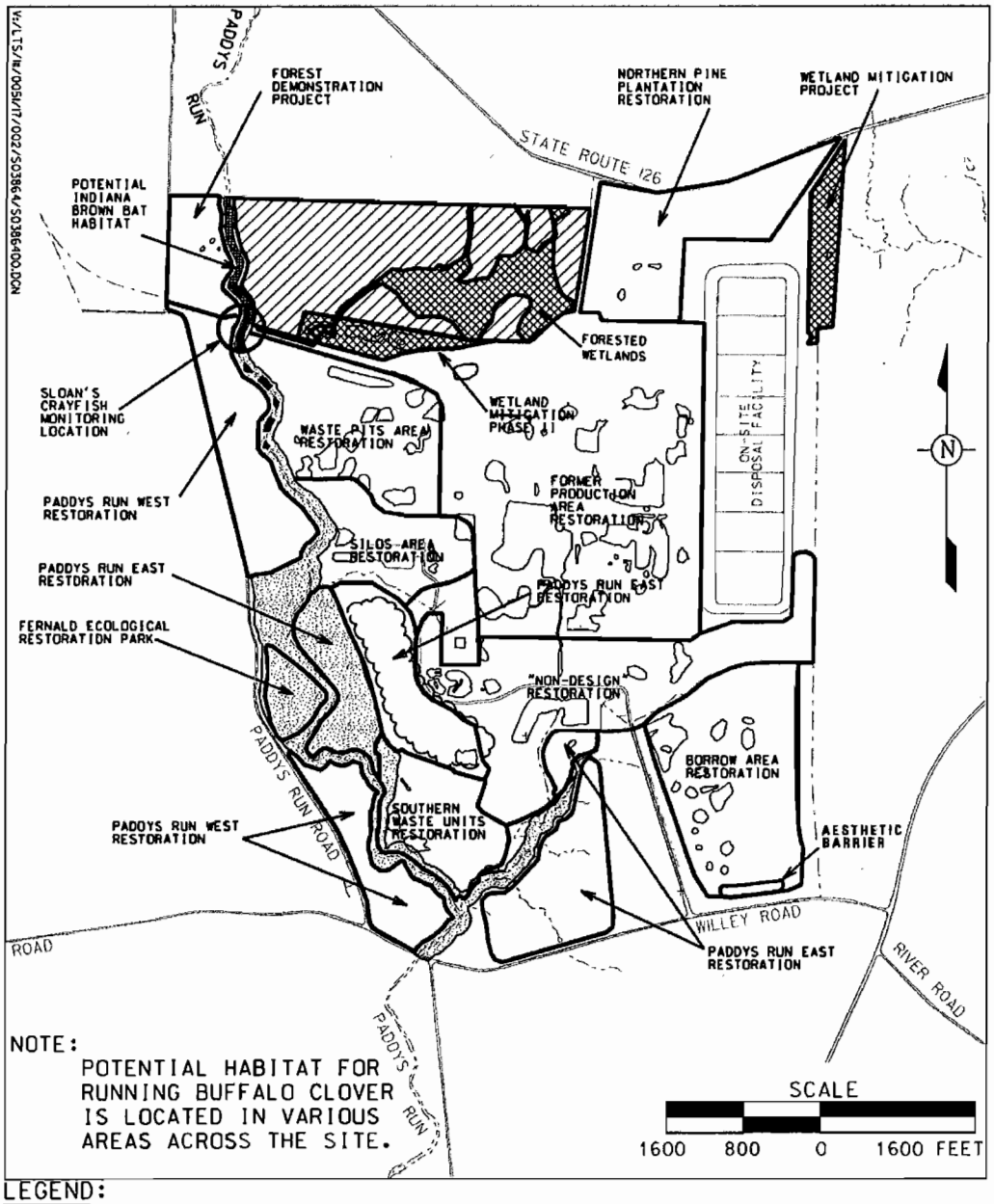

FIGURE 4-1 RESTORATION PROJECT AREAS

grassland. The plantings consisted of native plant vegetation of sufficient species diversity to provide a variety of food and habitat for various species of wildlife.

Design considerations included grading, hydrology, planting, wildlife features and erosion control. Grading was performed using naturally occurring curves and shapes to provide a natural appearance and considered specification and details related to topsoil requirements and placement. Some earth moving was necessary to create the eight depressions and berms over the 12-acre project. Earth moving occurred from March to May 1999. Topsoil, supplemented with wood chips, was applied across 8 acres of the project area.

The hydrologic regime of the mitigation site and the surrounding landscape was assessed to efficiently use available water sources to maximize wetland conditions. Outfall structures with stop boards were required between three of the basins. Open water areas have specified depths designed for specific biological needs and choices of habitat.

The planting of vegetation included species native to Hamilton, Butler, and/or nearby counties and was conducted during the months of April and May, and October and November 1999. All woody plants were mulched with wood chips following planting. Various wildlife habitat requirements and features for species of birds, mammals, reptiles, and amphibians were also included. A total of 17 wildlife structures are located within the project area. To the extent possible, herbaceous and woody plant species were selected and specified based on their ability to provide food or cover for selected wildlife species. Natural materials (coconut logs and coconut fiber matting) were used to control erosion as part of the planting specifications.

4.3 AREA 8, PHASE II REVEGETATION

This demonstration project involved the creation of native forest cover in the grazed pasture located in the northwestern corner of the Preserve, west of Paddys Run. The purpose of this project was to provide an area of finished reforestation early in the overall restoration process that would effectively demonstrate to the public the feasibility and advantages of restoring natural habitats. The demonstration forest provides upland and riparian forest, wetland, and prairie habitats and various habitats for many forms of wildlife. In addition, the flood storage capacity of Paddys Run may be increased. The grazing lease for this area was terminated as part of the continued phase-out of grazing lease agreements at the Preserve. The

project was implemented in fiscal year 2000.

This project consists of both upland and riparian forest. The upland forest is located along a portion of the north property boundary and the west property boundary, extending southward to the rail spur. The riparian forest extends along the existing riparian corridor of the west bank of Paddys Run from the northern property line southward to the rail spur. This project is part of the required restoration for impacts to the Paddys Run Corridor. It consists of approximately 20 acres of restored vegetative community.

Earthwork was carried out in the fall of 1999 to create a new gravel access roadway and turnaround area. Approximately 2 acres of the project area are used as a handling area for organic material, such as wood chips. Drainage channels, leading to a small catch basin, were cut around both sides of the material handling area. The catch basin feeds a filter wetland before the water is discharged toward Paddys Run. The basin and filter wetland was sized to meet storm water requirements. Approximately 4 acres of the project area along Paddys Run has existing, mid-early successional trees that can contribute to a beneficial riparian corridor.

The upland forest is typical of a mid-western upland successional forest, consisting of a canopy and shrub layer by randomly planting hardwood trees and shrubs. Within Area 8, Phase II, a large number of native trees already exist. The existing vegetation was taken into consideration while designing the planting plan for Area 8, Phase II. Approximately 8 acres of the area were restored as a Beech-Maple, Oak-Hickory or Mesophytic forest community, planted at a target density of approximately 450 plants per acre. The plantings included 160 saplings, 90 shrubs (in half of the patches), and 400 seedlings, per acre, assuming only 50 percent survival of the seedlings. The upland and riparian forests were planted, in a random patch design, toward the goal of 450 plants per acre within a specified area. The existing riparian corridor was enhanced with additional understory and shrub species at a density of approximately 60 plants per acre (i.e., 40 trees and 20 shrubs). The pasture areas that were established as forest plots were sprayed with roundup to kill existing vegetation in the fall of 1999 and again in the spring of 2000. The forest plots were seeded with a prairie seed mix after the planting was complete.

The riparian forest is typical of a plant community found in somewhat poorly drained soils, consisting of a canopy and shrub layer of plant materials that have root systems that are tolerant of prolonged moisture.

Sections 3.2.1 and 3.2.2 provide characteristics of upland and riparian forest. Wetland creation/restoration was also integrated into the riparian forest design, as described in Section 3.2.4.

Approximately 2.5 acres were planted as savanna with a total of 84 trees, 74 shrubs (five saplings and 30 shrubs per acre). The savanna also required a specific seed mix for native prairie grass and forbs that were seeded after the plantings were completed.

4.4 SOUTHERN WASTE UNITS RESTORATION (AREA 2, PHASE I)

The Southern Waste Units (SWU) encompasses approximately 30 acres. The remediation of Area 2, Phase I significantly changed in the topography of this area. The Inactive Flyash Pile and Active Flyash Pile have been removed, resulting in a decrease in the existing elevation. The primary restoration objective for the SWU was to expand the riparian corridor by creating several open water areas and an upland forest. Enhancement of the riparian corridor provides a native vegetative community, terrestrial wildlife habitat, increased water quality, and reduced erosion. In low-order streams such as Paddys Run, riparian vegetation provides shading that reduces water temperature, discourages eutrophication, and provides organic material in the form of detritus, which is important for the health of the stream. Higher elevation areas will be restored to an upland forest and tied into existing adjacent vegetation. This effort will meet the ecological restoration goals of restoring native vegetative communities and promoting wildlife habitat.

Restoration of the SWU was initiated in 2001 and completed in 2002. Grading of the SWU was completed in a manner designed to promote flooding of the SWU by Paddys Run during a two-year storm event or greater.

Installation of outfall structures was completed at the discharge point to Paddys Run and at a second discharge point into a groundwater infiltration basin adjacent to Paddys Run. An emergency overflow was also constructed into Paddys Run. Berms of depressions were stabilized with coir fabric and willow staking during interim restoration to stabilize areas prior to final restoration.

Soil in the project area was amended through a mechanical application of wood chips on the soil surface. Revegetation of upland and riparian areas was conducted pursuant to Section 3.2.1 and 3.2.2. Planting in the project area included patches of Beech-Maple, Oak-Hickory, mesophytic, and riparian forest plots. Total plant material installed in the project included 2,805 saplings, 1,564 shrubs, and 6,800 seedlings.

Three acres of the project consists of restored retention basins. The "southern portion" of the project referred to as the "Carolina" area remained largely undisturbed after remediation. The remaining project area was seeded with permanent prairie seed mix and cover crop during restoration. All areas designated as prairie were seeded with the seed drill in combination with the appropriate application of organic matter and soil inoculants. Approximately 20 wildlife structures were installed in the project area as determined appropriate.

4.5 NORTH WOODLOT

The North Woodlot was divided into three separate projects: the Northern Pine Plantation Enhancement, the Northern Woodlot Enhancement, and the Wetland Mitigation, Phase II. Restoration activities were initiated in the winter of 2001 and completed in the fall of 2005. The primary objective of the North Woodlot Restoration Project was to increase wetland acreage, expand native woodlots and improve the quality of existing woodlots.

4.5.1 Northern Pine Plantation Enhancement (Area 1, Phase I)

The project area covers approximately 70 acres. The pine plantation covers approximately 50 acres and the existing deciduous forest covers approximately 20 acres. This restoration project was initiated in the winter of 2001 and completed in the spring of 2003. Restoration included the enhancement of the Northern Pine Plantation by interplanting deciduous trees and shrubs among thinned pines. The existing stand of deciduous trees in the northern portion of Area 1 remained unchanged other than the removal of invasive species (e.g., honeysuckle). Deciduous planting sites were formed by complete removal of the Austrian pine (*Pinus nigra*), and removal of blocks of the White pine (*Pinus strobus*). In total, approximately 20 acres of Austrian and White Pines were removed from the project area. Upland forest species were interplanted among the remaining pines. In addition, openings were made to diversify habitat and allow brush piles and snags to be created in the Area 1, Phase I woodlots. Openings were enhanced with brush piles using cut trees.

Due to the hydrology of the project area, seven new wetland areas were constructed as part of the project. In some cases, drain tiles present in the project area were broken or plugged to promote the development of wetlands. In other cases, minor changes in drainage patterns were made through fine grading to support new wetland areas. Wetland vegetation was installed in the basins and associated drainage channels in the form of native plant plugs and dormant willow cuttings. Pond muck was added to each wetland basin to introduce aquatic species and additional wetland plant seeds.

The early stages of the forest communities were established by interplanting the pine plantation into an upland forest association, which will transition into the existing upland forest to the north. Plant species selected for planting among the pines were typical of those found in gently sloping areas with deep, rich, mesic soils. Plant species selected for the transition portion were typical of drier slopes and ridges. Planting was completed over 18 acres of the site and included Beech-Maple and Oak-Hickory plots. The total plants installed in the project area include 2,970 saplings, 1,656 shrubs, and 7,200 seedlings.

A deer exclusion fence was constructed in a portion of the Northern Pine Restoration Project as a test case. The installation and maintenance of the exclusion fence has proven to be minimal. The fence has proven to be extremely effective in keeping deer away from planted vegetation. Initial monitoring results show a significant increase in plant survival and general health inside the fence when compared to areas outside the fence. Deer exclusion fence was integrated into all subsequent restoration designs.

4.5.2 Northern Woodlot Enhancement

This restoration project included the removal of invasive species from existing woodlots and the conversion of former pasture to native grasses to promote additional habitat diversity. The Northern Woodlot is nearly 100 acres in size. Approximately 30 acres of the woodlot is former pasture and the remainder is early to mid-successional forest.

Seeding of the Northern Woodlot was initiated in the Fall of 2003 and completed in the Spring of 2004. Herbicide applications occurred before and after seeding to reduce competition for the native grasses. The 30 acres of former pasture was seeded with native grasses using a seed drill.

The removal of invasive species primarily focused on bush honeysuckle, but also included multiflora rose and wild grape vines. Mechanical removal using a bobcat with a sheer attachment was initiated in the

Fall of 2003 and continued through the winter of 2004. Removal was resumed in the Fall of 2004 and completed by the end of the calendar year. In total, approximately four months were spent removing invasive species from the project area. It is estimated that approximately 20,000 cubic yards of invasive plants were removed, staged on the old North Construction access road and chipped by subcontractors using a tub grinder on two separate occasions. All areas where invasive plants were removed were reseeded with a native woodland mix.

Approximately 20 wildlife structures were installed throughout the project area during the winter of 2005.

4.5.3 Wetland Mitigation Phase II (Area 1, Phase III)

A wetlands system was developed on 10 acres of the southern portion of the project area. Grading on the wetland was initiated in the Fall 2003 and was completed in the Spring of 2004. As stated in Section 3.2.4, DOE agreed to mitigate wetlands at a 1.5 to 1 ratio, replacing 1.5 acres of wetlands for every 1 acre dredged or filled. DOE also agreed to implement the mitigation on property if possible. To partially meet those two commitments, DOE proposed the expansion of the northern forested wetland (Area 1, Phase III). The 1996 watershed study indicated that some wetland expansion is possible, contributing to a portion of the required wetland mitigation.

The objective for the Wetland Mitigation - Phase II Project included the creation of new shallow marsh wetland system with surrounding, diverse upland habitat across the 8-acre site. The Wetland Mitigation Phase II Project created approximately four additional acres of wetlands required under the June 1995 DOE mitigation agreement with the OEPA, USFWS, and ODNR.

Construction activities included the creation of three depressions with berms over 4 – 5 acres of the 8-acre project area. Topsoil was reapplied to the project area or imported to the project area as needed in approximately 7 of the 8 acres. Water control structures were installed at three locations in the project area. The water control structures installed have the ability to increase and decrease the water levels in each of the three basins.

Approximately 750 wetland grass and forb plugs were planted around the perimeter of the wetland basins at approximately the normal water level. The project area was seeded with species that are indigenous to wet meadow habitats and provide value to wildlife as specified in the NRRDP. A total of 1,155 Saplings

and 644 shrubs were planted with the intent to establish forest cover and add species diversity. Water collection areas were inoculated with pond muck from healthy ponds. Approximately 20 wildlife structures were installed in the wetland project.

4.6 PADDYS RUN CORRIDOR

Restoration of the Paddys Run Corridor involves the expansion and enhancement of the riparian (i.e., wooded) corridor along Paddys Run Stream. Restoration activities include a combination of planting woody vegetation and seeding former pastures with native grasses. Restoration activities were initiated in Paddys Run West in the spring of 2004 and were completed in the fall of 2005.

4.6.1 Paddys Run Corridor Expansion East (Area 2, Phase II)

The corridor east of Paddys Run is located in Area 2, Phase II. The Paddys Run riparian corridor was restored pursuant to the long-term management plan for Paddys Run, as described in Section 2.3.4. Also included with Paddys Run East is the expansion of the riparian corridor along the SSOD.

Part of this project involved clearing 40 percent (approximately 20 acres) of the Southern Pine Plantation and converting it to an upland forest. The clearing will promote pine canopy openings for the planting of hardwoods, as described for the Northern Pine Plantation. Upland forest species were planted among the remaining pines.

The first restoration objective for the east corridor of Paddys Run is to expand the riparian corridor along Paddys Run. This objective was accomplished by clearing approximately 40 percent of the southern pines to convert the area to an upland forest. The edges of wooded areas were seeded to prairie. This objective meets the Paddys Run restoration and native vegetation goals established in Section 2.1.

The second objective for this project is to expand the riparian corridor along the SSOD. Revegetation of both of these corridors will promote habitats typical of southwest Ohio. This meets the goal of enhancing wildlife habitat by establishing a contiguous corridor along the length of both Paddys Run and the SSOD.

This project will compensate for impacts to the Paddys Run corridor and the Great Miami Aquifer. Restoration of the Paddys Run corridor protects an important recharge area for the Great Miami Aquifer. The ecological restoration of the corridor east of Paddys Run encompasses approximately 80 acres of

restored vegetative communities, 50 acres of which include the southern pines. The riparian corridor along the SSOD encompasses approximately 36 additional acres.

Clearing focused on the rows of Austrian pines with some select cutting of the White pines. Approximately 40 percent of the pine plantation was cleared starting in the winter of 2005. Two large open areas, approximately 3 to 5 acres in size, were created after the removal of the pines. Roughly 5 percent of the trees were used to create brush piles. The remaining trees were chipped and stockpiled in open areas to be used as mulch during restoration. Surplus wood chips were transported to the Wetland Mitigation Area south of the Northern Woodlot and stockpiled for use in soil amendments and mulch during restoration. Any surplus wood chips were moved to Area 8, Phase II for storage or transported to an upcoming restoration project for use as soil amendment and mulch. A vernal pool was installed in each of the two open areas. The open areas were seeded with prairie grass.

Any drain tiles from past agricultural activity were broken and/or crushed in an effort to retain more water in the restored area.

Planting of forest plots along Paddys Run occurred over 14 acres and included Beech-Maple and Oak-Hickory plots starting in 2006. Section 3.2.2 provides further detail regarding the selection of plant species for floodplain areas. Total plant material required included 2,240 saplings, 1,260 shrubs, and 5,600 seedlings.

A vernal pool, approximately 0.25 acre in size, was installed in each of the two open areas in the southern pines. Open areas are approximately 5 acres in size and were seeded with prairie grass after vernal pools are created and wood chips were removed.

The riparian corridor along the SSOD in Area 2, Phase III was planted with an additional 1,584 saplings, 828 shrubs and 4,000 seedlings. Approximately 38 acres of riparian corridor remnants along the SSOD were restored with a lower density of trees and shrubs to enhance existing vegetation. All disturbed areas were seeded with wet meadow or prairie seed mix as appropriate.

4.6.2 Paddys Run Corridor Expansion West (Area 8, Phase III)

Expansion of the corridor west of Paddys Run occurred in Area 8 Phase III. This project is similar in

scope to the eastern corridor expansion described above, with the exception of a few additional considerations. Area 8 is a perimeter area addressed under Appendix E in the SEP, and limited excavation was required. The project consisted of three distinct components: the restoration of a forest/savanna community in the northern portion of Area 8, Phase III; restoration of a forest community in the southern portion; and restoration of floodplain in the former Paddys Run stream channel. Restoration of Paddys Run West resulted in 15 acres of new forest and approximately 11 acres of savanna. The remainder of former pastures in the Paddys Run corridor was converted to prairie through seeding.

A primary objective of this project is to expand the riparian corridor along Paddys Run through forest restoration plantings. A secondary objective is to convert grazed pasture to early stages of a forest with wet prairie, upland prairie, and savanna interspersed. A third objective is to restore the floodplain in the former Paddys Run stream channel by removing an existing soil berm, that was installed when the stream channel was altered in the past, to allow flooding of the floodplain during a two year storm event.

In an effort to retain more water in the area that was to be restored, any drain tiles from past agricultural activities were broken and/or crushed. Some drain tiles in the Northern portion of Paddys Run West were broken in the summer of 2004.

Approximately 200 feet of an existing soil berm was removed starting in 2005. The soil berm is approximately 15 feet high by 25 feet wide. Soil removed from the berm was used to create a stable, gradually sloping berm that will allow overflow from Paddys Run during a two- to four-year storm event. Coir matting and aggregate (as needed) was used to stabilize approximately 250 feet of relocated stream bank to control erosion of the newly created berm. Approximately 50 feet of soil berm in the southern portion of the stream channel was removed to allow storm water to flow out of the former stream channel. Bioengineering techniques were implemented in other areas on the west bank of Paddys Run where erosion is problematic.

The northern portion of Area 8, Phase III was restored in 2005 in the following manner. Herbicide was applied to the existing grass in the pasture. Planting included 12 acres of Beech-Maple and Oak-Hickory plots. The total number of plants required was 1,920 saplings, 1,080 shrubs, and 4,800 seedlings. Approximately 8 acres in a lower pasture of Area 8, Phase III was restored as an oak savanna with a total

of 324 saplings and 167 shrubs. The remaining acres were seeded as wet meadow or prairie.

The southern portion of Area 8, Phase III was restored in the following manner. Herbicide was applied to the existing grass in the pasture. Planting included 3 acres of Beech-Maple and Oak-Hickory plots. Total plants required were 466 saplings, 270 shrubs, and 1,200 seedlings. The remaining acres were seeded as wet meadow or prairie.

Approaches for seeding and installation of trees and shrubs were modified in areas where seeps are present or wetland conditions were encountered. Planting approaches were also modified in areas where soil conditions were consistently sandy.

Approximately 20 wildlife structures were added as appropriate throughout the project area.

4.7 BORROW AREA RESTORATION (AREA 1, PHASE II)

Excavation of the Area 1, Phase II borrow area was used to form a wetland system, with upgradient areas revegetated as a tallgrass prairie transitioning to areas of savanna. Approximately 90 acres were restored. Grading and seeding to support restoration of Subareas 1 & 2 of the Borrow Area were completed in the fall of 2002. Planting activities in Subareas 1&2 and on the perimeter of Borrow Area were completed in the fall of 2005. The remainder of the restoration work in the Borrow Area was completed in 2005.

Restoration work in Subareas 3, 4, and 8 was also completed in 2005. Subareas 3, 4, and 8 were completed as the third phase of Wetland Mitigation Projects.

The main restoration objective for this area is to restore the borrow area, in phases, to a predominantly wet prairie, marsh and upland prairie ecosystem with a surrounding buffer of upland savannas. Open water will also remain in the northwest corner of the project.

The restoration project will meet ecological restoration goals by restoring native vegetative communities and protecting wildlife habitat. Wildlife habitat was provided by establishing a variety of ecosystems and edge habitat. Wetland construction may be used to partially fulfill regulatory wetland mitigation requirements. This restoration project provides compensation for impacts to grasslands.

Final grading and seeding of the borrow area occurred in a phased approach as sections of borrow activities were completed. Each phase of the borrow area was graded using excess soil so that depressions are created near the center of each phase. Drainage channels move water from the depressions during storm events or high flow conditions toward an open water feature in the northwest corner of the borrow area (former sedimentation basin). As grading in each phase was completed, some excavated areas required the addition of wood chips to increase organic matter in the existing soil. A layer of chips were spread across the soil and tilled in as the final step in interim restoration.

Seeding was conducted using a combination of wet prairie and prairie mix. The wetland features created in the borrow area were planted with approximately 1,530 shrubs in and around water features during 2005. The vegetation of seasonally inundated wetlands consists of vegetation typical of pond/edge habitats tolerant of regular to permanent inundation that are indigenous to southwestern Ohio in shallow open waters 3 feet in depth. These plant species include a mixture of species that produce submerged growth, emergent growth, and floating leaves that will maximize habitat diversity. Pond muck was placed in open water areas to establish flora and fauna within the water. An additional 165 saplings were planted around the perimeter of the borrow area to establish a savanna community. Approximately 30 acres have been established as an Oak savanna.

4.8 OSDF PERIMETER BUFFER RESTORATION (AREA 1, PHASES I AND II)

A buffer has been established around the OSDF with appropriate topography and vegetation, including areas of native grasses and nest boxes for wildlife species. This project was completed in 2006 and compensates for required restoration for impacts to grasslands. The OSDF buffer encompasses approximately 100 acres of restored wildlife habitat.

The primary restoration goal of this project is to restore the perimeter of the OSDF as a predominantly prairie area. The perimeter buffer accommodates OSDF storm water drainage, monitoring wells and access, all of which were considered during the design.

The project includes primarily seeding areas around the perimeter of the OSDF. The 80 acres receiving 1-inch of wood chips (or suitable alternative) were seeded with a seed drill. The seeded areas around the OSDF will provide restored prairie habitat that will function as a buffer to the OSDF. Trees and shrubs will not be planted adjacent to the OSDF to minimize introduction of woody vegetation on the OSDF cap.

4.9 SILOS AREA (AREA 7)

The Silos Area was restored similar to the corridor east of Paddys Run. Interim restoration at the conclusion of remediation established several acres of new floodplain along Paddys Run. Approximately 5 acres along the Pilot Plant Drainage Ditch transition into an upland forest. The total project encompasses approximately 10 acres and was completed in 2006.

The primary restoration objective for this area is to restore the riparian corridor along the eastern edge of the Paddys Run and along the Pilot Plant Drainage Ditch.

Wetland/pond habitat was established in excavated areas by grading to encourage water retention. Drainage patterns were adjusted to support the creation of wetlands and vernal pools. Disturbed areas around the silos required soil amendment and tilling prior to planting and seeding. Project areas that are prone to erosion required the installation of coir matting or jute.

Trees and shrubs were planted to expand the wooded corridors along the Pilot Plant Drainage Ditch and Paddys Run in 2005. The remaining areas were seeded with native prairie grasses and forbs that are contiguous with the prairie areas established in the Former Production Area and the Waste Pit Area. Total number of plant material for the Silos area includes 825 saplings, 450 shrubs, and 2,000 seedlings.

Pond muck was placed in open water areas that were created to establish flora and fauna within the water. Willow cuttings were placed in the matting adjacent to the streams. Wildlife structures were installed as appropriate.

4.10 PRODUCTION/WASTE PIT AREA

The Production and Waste Pit Area was restored in phases. The Production Area was restored starting with Area 3B. The first phase of the Production Area Grading was initiated in the fall of 2004. Restoration of the remaining portions of the Production Area continued throughout 2005. Restoration of the Waste Pit Area was addressed as an independent design and was completed in 2006.

4.10.1 Former Production Area Restoration (Areas 3, 4 and 5)

Restoration of the Former Production Area utilized the postexcavation topography to establish a series of

open water/wetland systems surrounded by tallgrass prairie. A transition to upland forest and connection with the expanded riparian corridor occurs in the west portion of the Former Production Area. The restored Former Production Area encompasses approximately 160 acres of restored wildlife habitat and was completed in 2006.

This project involved the formation of wetlands and open water areas and as such required an assessment to determine the type of aquatic habitats. A water availability study has been conducted. This study showed that the formation of open water and/or wetlands is feasible. Also, soil types were assessed to characterize the soil profile underlying the proposed final grade. The properties of these soils were examined to support the design of a topsoil and soil amendment program. Specific sources of suitable topsoil or other amendments were identified.

The primary restoration objective of this project is to convert the remediated production area into a combination of open water, wetland and prairie ecosystems with some perimeter forest buffer. The Former Production Area now consists of several deep excavations and areas of exposed subsoil. The postexcavation topography has been converted to open water and/or wetland habitat to meet the goal of providing wildlife habitat. This approach minimized the amount of backfill and regrading, resulting in cost savings. Prairie revegetation stabilized the exposed soil.

Restoration of the Former Production Area compensates for impacts to grassland and to the Great Miami Aquifer. Since this area contributes to the Paddys Run watershed, restoration activities provide protection of an aquifer recharge zone.

At the conclusion of remediation of an excavation area, interim restoration took place to establish stable slopes and topography to support potential wetland and open water areas and to establish appropriate prairie grasses. Slopes of the deep excavations were graded to 5 to 1 from top to bottom during interim restoration. Slopes of 5 to 1 allow for the formation of a littoral zone on the waters' edge and provide a safe configuration for people who may need to access the area. The gentle slopes facilitate revegetation, reduce the likelihood of gully erosion, and are more compatible with the surrounding landscape. The perimeter of the deep excavations was graded to establish depressions, and compacted to ensure water retention in areas where the topography and clay material was suitable.

Approximately 88 acres surrounding the deep excavations, designated for a prairie community, was covered with a 1-inch thick layer of wood chips (or suitable alternative) that was tilled into the top layer of soil. Clay liners at least 3 feet thick were installed in the bottom of the deep excavations as part of interim restoration. The deep excavations cover approximately 35 acres of the project area. The above process was repeated as remediation was completed in each portion of the Former Production Area.

If hydrological conditions permit, certain depressions may contain a transition from shallow open water to seasonally inundated wetlands. The vegetation of seasonally inundated wetlands will consist of vegetation typical of pond edge habitats and tolerant or regular to permanent inundation up to 1 foot.

Non-persistent plant species selected were noninvasive plant species that are indigenous to southwestern Ohio in shallow open waters 3 feet in depth. These plant species include a mixture of species that produce submerged growth, emergent growth, and floating leaves, which maximize habitat diversity.

The tallgrass prairie and upland forest restoration around the open water areas was conducted in accordance with Section 3.2.1 and 3.2.3. Although prairie grasses and forbs are tolerant of the poor soil conditions after excavation, additional amendments were needed to optimize growth. On-site research as part of the OU4 Ecological Research Grant Program provided further information as to the type of amendment for optimal plant growth.

Planting in the Former Production Area includes the installation of 1,631 shrubs. Shrub patches are concentrated in and around wetland and open water features. The remaining areas were seeded with prairie mix. Approximately 30 wildlife boxes were installed throughout the project area as appropriate.

4.10.2 Waste Pit Area Restoration (Area 6)

The Waste Pit Area was restored similar to the corridor east of Paddys Run. The results of the Paddys Run floodplain modeling determined the extent of riparian habitat that was established. Interim restoration at the conclusion of remediation established several acres of new floodplain along Paddys Run. The riparian habitat transitions into an upland forest. This project encompasses approximately 30 acres. Five acres were restored as forest to enhance the riparian corridor.

The primary restoration objective of this project is to expand the floodplain of Paddys Run and restore the riparian corridor along the eastern edge of the stream channel and floodplain. Floodplain restoration meets the goals of native vegetation, Paddys Run restoration, and wildlife habitat. Other portions of the Waste Pit Area were restored as a prairie ecosystem.

Deep excavations were graded to retain water and establish stable side slopes and seeded to establish native prairie vegetation. Clay liners and drainage control structures were installed. If necessary, drainage patterns may be adjusted to support the creation of wetlands and vernal pools. Remediated areas required soil amendment and tilling prior to planting or seeding. Coir matting or jute was installed in areas that are prone to erosion.

Wetland features were established over 5 acres in shallow depressions around the deep excavations to the degree possible. Wetland and wet prairie vegetation was established along the waters edge and swales. Native prairie grasses and forbs were established in both wet and upland portions of the project area. The total number of plants included approximately 825 saplings, 450 shrubs, and 2,000 seedlings. Pond muck was placed in open water areas to begin the establishment of flora and fauna in the water. Willow cuttings were placed in the matting that was placed along the stream.

Expansion of the floodplain on the western side of the Waste Pits area (eastside of Paddys Run) occurred to the degree possible. Wildlife structures were installed as appropriate.

4.11 PADDYS RUN RESTORATION APPROACH

Floodplain expansion occurred in the Waste Pit Area and the Southern Waste Units as a result of remediation activities. Additional floodplain expansion also occurred in the former stream channel in Area 8, Phase III. The concept for floodplain expansion in all three areas is to provide a combination of additional floodplain with open water/wetland components in combination with surrounding riparian forest.

5.0 MONITORING AND MAINTENANCE

5.1 MONITORING

Monitoring of restored areas has taken place within all restoration projects at the Preserve. For most projects, it has involved two phases. First, Implementation Phase Monitoring has been conducted to ensure that restoration projects are completed pursuant to their NRRDPs. The second phase of monitoring is termed Functional Phase Monitoring or Functional Monitoring. This effort considers projects in terms of their system-specific contribution to sitewide ecological communities. The text below describes the specific requirements that have been or will be evaluated for each phase.

5.1.1 Implementation Monitoring

The main focus of Implementation Phase Monitoring primarily involves vegetation survival and herbaceous cover. The NRTs agree that 80 percent survival of planted saplings and shrubs must be achieved. In addition, seeded areas must obtain sufficient cover for erosion control, as further defined below. Plant survival rates will usually be calculated on an individual "patch by patch" basis. A patch is a planting unit about 0.25 acre in size that consists of a specific habitat template. This design approach has been used for most of the NRRDPs developed at the Preserve. Implementation monitoring has been conducted for one or two years as described below.

To determine vegetation survival, mortality counts were conducted at the end of each growing season. Each balled and burlap or container-grown tree and shrub was inspected and assigned one of three categories: alive, re-sprout, or dead. Trees and shrubs were considered "alive" when their main stem and/or greater than 50 percent of the lateral stems are viable. "Re-sprout" trees and shrubs had a dead main stem, with one or more new shoots growing from the stem or the root mass. Plants were also categorized as "re-sprout" when less than 50 percent of its lateral branches are alive. Dead trees were those that have no signs of vitality at all.

All seeded areas were also evaluated within each restoration project. Depending on the size of the restoration project, seeded areas may be grouped into habitat-specific sub-areas. For each distinct area, at least three one-meter square quadrats were randomly distributed and surveyed. Field personnel estimated the total cover and listed all species present within each quadrat. The data collected were used to determine total cover, percent native species composition, and relative frequency of native species, as described below.

For total cover, the quadrat-specific cover estimates were evaluated with non-parametric statistics. Percent native species composition was calculated by dividing the total number of species surveyed into the total number of native species present. The relative frequency of native species was determined as follows. First, DOE recorded the number of times each species appears in a quadrat. This value was then divided by the number of quadrats surveyed to obtain a frequency. Next, the frequencies of all native species were summed and divided by the total of all frequencies within a given area.

By collecting the information described above, DOE evaluated implementation phase success of seeded areas based on two criteria. First, 90 percent herbaceous ground cover should be met by the end of the first growing season. Second, a target of trending toward a 50 percent native species composition or relative frequency will be used to evaluate seeded areas at the end of the implementation monitoring period. These criteria address both erosion control and native community establishment, which are the two primary goals of seeding in restored areas.

Specific NRRDPs imposed additional Implementation Phase Monitoring requirements, depending upon the specific habitat. For instance, water quality and depths have been evaluated for wetland mitigation projects. Wetland mitigation requirements must be evaluated for three to five years depending on the specific criteria being evaluated. Wetland monitoring requirements were further defined in the NRRDPs.

For areas that do not meet the 90% cover requirements for seeded areas, the NRTs will jointly determine if additional reseeding is required. For areas that do not meet the 80% vegetation survival requirement or the 50% native goal, the NRTs will jointly develop a replanting strategy consistent with the Adaptive Management approach outlined in Section 5.3.

A number of completed restoration projects have had one year of Implementation Phase Monitoring pursuant to the 2002 draft NRRP. Implementation Phase Monitoring for all the projects is complete. The NRTs will collectively conduct field evaluations of these completed projects within 90 days of the effective date of a consent decree which resolves past, present, and future natural resource impacts at the Preserve, and will collectively agree on the current status of vegetation and design implementation in the areas. Available design and monitoring data will be utilized in these field evaluations. Based on the results of the field evaluations, the NRTs will jointly determine if additional replanting, repair or restoration work is required in the areas. The NRTs will jointly develop an acceptable schedule to

address the required activities, taking into consideration DOE's available current year funding and budget cycle and other relevant factors. All rework required as a result of the field evaluations will be completed by DOE.

As part of this evaluation process, the NRTs will have the latitude to consider additional factors in assessing implementation phase success. For instance, 80% planted vegetation survival may not be achieved within a given forest restoration patch. However, if a large number of volunteer recruits and/or resprouting vegetation are present, the NRTs can decide that no replanting activities are required. For herbaceous cover, the implementation phase 90% total cover requirement has proven to be very difficult to meet using the conventional native seed mixes, especially in prairie restoration areas. The NRTs may determine to modify the total cover requirement and promote native prairie establishment in relatively level areas. On sloped areas, the NRTs may consider alternative seeding approaches that maximize slope stabilization in the near term. Thus, for areas where erosion is a concern, project goals may be revised to focus on total cover as opposed to native vegetation.

NRRP-driven restoration projects are intended to satisfy all outstanding wetland mitigation requirements. As stated above, wetland mitigation NRRDPs established additional monitoring requirements in order to evaluate the effectiveness of site wetland mitigation efforts. Section 4 summarizes the three projects that have been constructed to address compensatory mitigation requirements. These projects have taken place since 1999. The project-specific monitoring primarily dealt with vegetation and water quality. In 2004, OEPA published monitoring protocols and performance standards for wetland mitigation projects. Performance standards include acceptable ranges for mitigation project size, morphology, hydrology, biogeochemistry, vegetation, and wildlife use (e.g., amphibians), as compared to the type of wetland that was impacted.

The NRTs may use these monitoring protocols and performance standards as a framework for developing a path forward for mitigation wetlands as the Preserve. The NRTs will use the 1993 site wetland delineation to derive a baseline impacted wetland class and category. From there, performance standards can be compared. The NRTs will assess the current status of mitigated wetlands onsite during the 2008 field walkdown of restored areas. In addition, the NRTs can evaluate existing data collected for specific projects and determine what additional data needs and timeframes for monitoring will be needed for each area. However, the NRTs will also consider, in the context of compensatory mitigation, the preservation

of wetlands and upland areas before recommending any additional projects or additional performance monitoring. During the field evaluation of completed projects, potential additional wetland mitigation areas may also be identified. Several restoration projects included a component of wetland creation, but were not monitored as part of the compensatory mitigation acreage. The revision of the monitoring approach provides an opportunity to add these areas into the wetland mitigation program.

Within 120 days of the effective date of a consent decree which resolves past, present, and future natural resource impacts at the Preserve, DOE will develop and submit to the NRTs a monitoring plan to address wetlands proposed as mitigation commitments. The NRTs will jointly review and approve these modified wetland monitoring plans.

5.1.2 Functional Phase Monitoring

Functional Monitoring focuses on an entire habitat (e.g., prairie, wetland, forest) instead of an individual project. Functional Monitoring helps determine if restored habitats at the Preserve are progressing when compared to baseline conditions and established reference sites. Functional Monitoring has a longer duration (2003 to 2011) and a lower frequency of data collection(e.g., every three years). Functional Monitoring will quantitatively evaluate progress of restored habitat against a baseline and towards an established reference site.

Functional Monitoring is not a pass/fail determination like Implementation Phase Monitoring. Instead, Functional Monitoring is a means of evaluating the progress of the restored community against pre-restoration baseline conditions and target reference sites already achieving high ecological function. Vegetation indices will be used for comparisons, as well as several wildlife-based evaluations. Evaluation of woody and herbaceous vegetation is the main focus of Functional Monitoring. Floristic Quality Assessment Index (FQAI) is the primary monitoring parameter that has been and will continue to be used in Functional Monitoring.

Baseline conditions were measured at the Preserve in 2001 and 2002. To establish the needed reference site data, DOE teamed with the University of Dayton and collected the data outlined above from reference sites agreed upon by the NRTs in 2002. Restored habitats on the FCP were grouped together as wetlands, prairies/savannas, or forest/riparian. Functional Monitoring data

on site wetlands were collected in 2003, data on prairies/savannas were collected in 2004, and data on woodlands were collected in 2005.

Information collected during baseline and reference site characterizations include species richness, density, and frequency. Woody vegetation size was also recorded. From these parameters, sites are evaluated through FQAI, the extent of native species present, and the extent of hydrophytic species present (for wet areas).

DOE teamed with the University of Dayton to conduct reference site characterizations and refine sampling methodologies. From these efforts, the NRTs agreed that the final monitoring parameters summarized above will best represent the extent of native species establishment, development of hydric conditions, and quality of vegetative communities restored at the Preserve.

Several wildlife evaluations have been conducted in addition to vegetation surveys. These include amphibian and macroinvertebrate sampling, and migratory waterfowl observations. Casual wildlife observations have also been recorded in each study area. Amphibian and macroinvertebrate sampling was conducted by the OEPA and is outside the scope of the Consolidated Monitoring Report.

Specific parameters measured include species richness, density, and frequency. Woody vegetation size is also recorded. From these parameters, sites are evaluated through FQAI, the extent of native species present, and the extent of hydrophytic species present (for wet areas). The success of Functional Monitoring depends on the collection of the same data on baseline sites, reference sites and restored areas of the Preserve so that progress of the restoration can be evaluated.

The schedule for Functional Monitoring at the Preserve is as follows:

- Baseline Data Collection - 2001/2002 Completed
- Reference Site Data Collection - 2002 Completed
- Wetlands - 2003 Completed
- Prairies/Savannas - 2004 Completed
- Woodlands - 2005 Completed
- Wetlands - 2009 Planned

- Prairies/Savannas - 2010 Planned
- Woodlands - 2011 Planned

The data collected during Functional Monitoring will provide a comparison of restored habitats with baseline and reference sites. Wetland data collected in 2003 demonstrate that restored wetlands on the Preserve are approaching the diversity and quality of the wetlands evaluated during the reference site evaluation. Prairies/Savannas data collected at the Preserve in 2004 suggests a positive trajectory toward the diversity and quality of the Prairies/Savannas evaluated during the reference site evaluation. Woodlands data collected in 2005 at the Preserve suggests a positive trajectory toward the diversity and quality of the Woodlands evaluated during the reference site. Functional Monitoring data will be evaluated by the NRTs to determine if any corrective action is needed. Any corrective actions identified by the NRTs will be jointly agreed upon using the "Adaptive Management" concept outlined in section 5.3 below.

The results of the implementation monitoring and of the Functional Monitoring reports issued through 2005 were reported in the annual Consolidated Monitoring reports issued between 2002 and 2006. The results of future monitoring will be reported in the annual Consolidated Monitoring report as an appendix to the annual Site Environmental Reports. Following completion of the Functional Monitoring in 2011, the NRTs will jointly determine whether to continue further monitoring.

5.2 MAINTENANCE OF RESTORED AREAS

Maintenance is critical to the success of site restoration projects. Maintenance activities that will be required include activities such as watering, deer control, invasive and noxious species control, maintenance of access points and other infrastructure and the maintenance of habitat enhancement structures. The following sections describe some maintenance to be carried out by DOE during restoration of the site and post closure. As stated in Section 3.1.8, a maintenance plan will also be developed and submitted to the NRTs.

Following approval of the maintenance plan described in Section 3.1.8, DOE will implement that maintenance plan for ten years after which time the NRTs will jointly evaluate and decide whether to continue maintenance requirements covered by the NRRP.

5.2.1 Watering

Each plant will be watered at the time of installation. Watering will also be carried out as needed during the first weeks following plant installation as required per Specification #2940. Watering of planted trees and shrubs will occur in the first growing season following project completion if persistent drought conditions occur.

For seeded areas, the planting window restrictions in Specification #2930 help to ensure that sufficient soil moisture exists for germination and survival of seeds. Weather patterns will be a contributing factor in timing of seed application. Some watering may be needed the first season if drought conditions threaten the survival of germinated seed.

5.2.2 Deer Control

Installed trees and shrubs must be protected from deer browsing and rubbing in order for forest restoration efforts to be successful. Experience from past restoration projects at the Preserve shows that exclosure fencing is the most effective means of protecting against white tail deer impacts. Shrub plantings and some tree plantings will be arranged in order to maximize the effectiveness of fencing. Field personnel will then install welded wire or deer exclusion fencing around plant material. In the event that fencing is not practical, the use of tree tubes and repellant sprays will be employed to protect trees and shrubs.

Deer fencing and individual plant exclosures will be maintained for the first four years following closure. This will include repair and replacement to maintain integrity and function of the fencing and/or exclosures. Beyond four years, fencing and exclosures will be maintained until repairs become excessive per the discretion of DOE. After four years, when maintenance has become excessive, fencing will be removed by DOE. At that point, the majority of planted material will have at least five growing seasons of protection and should be well established.

The DOE land manager at the site will have the discretion to consider a reduction of the deer population as a management tool. Any culling of the deer population on the site will require consultation and coordination with appropriate regulatory agencies and stakeholder groups.

5.2.3 Mowing and Weed Control

The forest restoration concept developed in the NRRP depends on ecological succession as the primary component. A diverse mix of native species was planted at appropriate densities so that the natural succession process will, over time, establish natural woodlots or wooded corridors. Without some control, invasive and aggressive species may impede or prevent the natural succession process by out-competing native plants and alter the intended course of maturation for restored areas. Therefore, a very important component of restoration of the site involves the removal or extirpation of invasive and aggressive species to the degree practicable. Mechanical removal or the application of glyphosate herbicide to species such as Bush Honeysuckle, Multiflora Rose, Thistle varieties, Typha spp., and Phragmites spp. will be undertaken. Weed species on the Ohio Noxious weed list will be given priority with respect to herbicide application. For example, thistle species that may impact the pastures of adjacent landowners will be given highest priority for herbicide application. The control of species such as bush honeysuckle in the understory of site woodlots will be controlled to the degree practicable to maximize the establishment of native understory plants.

Designated areas of the site will be mowed on a routine basis. The setback from Willey Road and the buffer strip in the southeast corner of the site will continue to be mowed after closure. Access points and buffer zones around facilities and structures will also be mowed and maintained in a safe and functional configuration as determined appropriate by DOE.

Restored prairies will also be managed to optimize growth of prairie grasses. Burning will be the preferred method of management for restored prairies. In the event that burning is not possible, mowing and thatch removal will be utilized as a management tool, along with the application of selective herbicides.

5.2.4 Waterways and Water Bodies

Invasive species and noxious weeds will be controlled as described in section 5.2.3. Excessive erosion and changes that create safety hazards or effect ecological function will be controlled and/or repaired. Water control structures will be maintained to retain their functionality.

5.3 ADAPTIVE MANAGEMENT

The concept of "Adaptive Management" will be used in making decisions regarding needed maintenance and management of restored areas. Adaptive Management is defined as, "a continuing process of

planning, monitoring and adjusting with the objective of improving the project implementation and outcomes." Adaptive management will allow the NRTs flexibility in making decisions regarding needed maintenance and management of restored areas. Restored areas will be very dynamic in nature and set standards or rules may not always apply to all situations in the field. The goal of restored area monitoring and the use of adaptive management will be to optimize the progress of restored areas towards functional success and eventual trending towards a mature ecosystem through the natural succession process.

6.0 STAKEHOLDER INVOLVEMENT

Stakeholder involvement has been essential to the development and implementation of this restoration plan. All meeting summaries generated from Natural Resource Trustee Meetings are made available to the public in the Public Environmental Information Center (PEIC). Stakeholders have had several opportunities to provide input. On September 21, 1998, the NRIA, NRRP and the Final Land Use Environmental Assessment were made available to the public for a 30-day review and comment period. On September 23, 1998, the NRTs conducted a public workshop to discuss the NRIA and NRRP and the proposed settlement of natural resource trusteeship issues. A separate DOE-sponsored public hearing on final land use was held at the October 13, 1998 Cleanup Progress Briefing. A fact sheet explaining the relationship of final land use, the NRTs, and the NRRP was made available to the public on September 8, 1998.

The NRRP was updated in January 2002 and made available to the public. A public meeting held in February 2002 on public use at Fernald included a discussion on the NRRP and the status of settlement negotiations. The 2002 NRRP was also made available in the PEIC at that time. In May 2003, a Fernald Citizens Advisory Board Roundtable was held specifically on natural resource impacts and restoration. The FCAB has been briefed on natural resource restoration activities at the majority of their meetings. DOE has also continuously provided updates on natural resource restoration at public meetings and has instituted a session termed the "nature Niche" at each of their public meetings during which specific plants and animals of the site are highlighted and discussed.

The 1998 NRIA and NRRP and associated attachments (e.g., HEA analysis, Water Availability Study) have been made available to the public as described above (DOE, 1998c). The NRIA and attachments do not require updating with this version of the NRRP. The final NRRP will be made available for stakeholders, and the NRTs will jointly hold an informational public meeting to discuss it. The NRRDPs are also available in the PEIC. In addition, any of the NRTs can be contacted with any questions or comments regarding restoration of the Preserve.

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Addendum 1

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE OHIO ENVIRONMENTAL PROTECTION AGENCY,

THE UNITED STATES DEPARTMENT OF ENERGY,

AND

THE UNITED STATES DEPARTMENT OF THE INTERIOR

I. INTRODUCTION and AUTHORITY

This Memorandum of Understanding (MOU) by and between the Ohio Environmental Protection Agency (OEPA), the United States Department of Energy (DOE), and the United States Department of the Interior (DOI), collectively referred to as the Natural Resource Damage Trustees (Trustees), is entered into to oversee and to assure implementation of the Natural Resource Restoration Plan (Restoration Plan) in order to restore, replace and rehabilitate natural resources injured by releases of hazardous substances at and from the Fernald Environmental Management Project (FEMP), located near Fernald, Ohio, owned by the United States of America and currently administered by DOE. The Trustees enter into this MOU pursuant to the authorities of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq. and other federal and state laws and authorities including, but not limited to, the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., as amended, and to the extent appropriate and selected for use by the Trustees, the Natural Resource Damage Assessment Regulations, 43 C.F.R., Part 11, as amended. The MOU is intended to facilitate coordination and cooperation among the Trustees regarding their responsibilities in implementing the Restoration Plan for the FEMP.

The Trustees' main responsibility is to oversee and to assure implementation of the Restoration Plan in order to restore, replace and rehabilitate natural resources injured by releases of hazardous substances at and from the FEMP. In overseeing and assuring implementation of the Restoration Plan, Trustees' activities include, but are not limited to, (1) the assessment, recovery, and administration of natural resources damages for injury to, destruction of, or loss of natural resources and natural resource services (hereinafter "injury" or "injured natural resources"); (2)

additional restoration planning; (3) oversight of the funding for the costs of restoration, replacement, rehabilitation, and/or acquisition of the equivalent (hereinafter "restoration" or "restore") of the injured natural resources; and (4) coordination of Trustee concerns and activities associated with removal, remedial or corrective actions, or other response actions being carried out at the FEMP in an effort to abate and/or minimize continuing and residual injury, and to achieve or enhance restoration of injured natural resources.

II. PARTIES and ADVISORS

The Trustees specified in Section I have trusteeship over certain natural resources at, or related to the FEMP pursuant to Subpart G of the National Contingency Plan (NCP), 40 C.F.R. 300.600, as amended, and other applicable laws. The Trustees have authority to act on behalf of the public to bring claims for natural resource damages against potentially responsible parties and to assure and/or undertake restoration activities. The following officials are parties to this MOU and act on behalf of the public as trustees for natural resources under this MOU:

A. Natural Resource Trustee Parties:

Director, Ohio Environmental Protection Agency or his delegated representative;

Secretary of Energy or his delegated representative;

and

Secretary of the Interior or his delegated representative(s) including:
Director, Office of Environmental Policy & Compliance (OEPC)
Regional Director, Region 3, U.S. Fish and Wildlife Service

B. Advisors:

United States Department of Justice (DOJ), the Department of the Interior Office of the Solicitor (SOL), the Ohio Attorney General (OAG), the United States Environmental Protection Agency (USEPA), and Ohio Department of Natural Resources (ODNR).

III. FEMP SITE DEFINITION

The FEMP, for purposes of this MOU, includes all areas within the property boundary of the FEMP and any other areas where natural resources have been injured by releases of hazardous substances at and from the FEMP.

IV. PURPOSE

The Trustees recognize the importance of integrating and coordinating their responsibilities regarding implementation of the Restoration Plan in order to restore injured FEMP natural resources. The purpose of this MOU is to provide a framework for coordination and cooperation between the Trustees, and for the implementation of the activities of the Trustees in furtherance of their responsibilities as trustees for natural resources.

V. ORGANIZATION OF THE TRUSTEE COUNCIL

The Trustees recognize the importance of coordinating their efforts in order to meet their respective natural resource trustee responsibilities effectively and efficiently. Accordingly, there is hereby created to implement this MOU, a Trustee Council, whose membership shall include the Secretary of Energy or his designated representative, the Secretary of the Interior or his designated representative, and the Director of the Ohio Environmental Protection Agency or his designated representative. Each Trustee shall designate a representative to the Trustee Council and shall also designate an alternate (See Appendix). Representatives to the Trustee Council shall fully coordinate Trustee activities among themselves and may seek advisory participation from the DOJ, the SOL, the OAG or other legal advisors, as well as other trustees or governmental entities such as the USEPA and the ODNR.

VI. DUTIES AND RESPONSIBILITIES OF THE TRUSTEE COUNCIL

The Trustee Council representatives shall coordinate and authorize all Trustee activities and matters under this MOU in accordance with the decision-making requirements contained in Section VII. The Trustees through their representatives may take whatever actions they determine are necessary to fulfill their responsibilities under applicable federal and state laws and policies. It is expected that the representatives, in accordance with applicable laws and policies, may take the following actions, inter alia, to address the Trustees' natural resource responsibilities.

A. Conduct scientific and technical studies, sampling, and other activities relating to trust natural resources. These activities may include, but are not limited to, the assessment of natural resources damages for injury to trust natural resources that may have been lost, injured, or destroyed and the monitoring of the progress of restoration of injured natural resources.

B. Arrange for necessary contracts with professional consultants, technical or otherwise, that the Trustees determine are best qualified to provide services to the Trustees, in accordance with applicable law.

C. Coordinate and integrate, to the extent practicable, natural resource trustee concerns and activities with removal, remedial or corrective actions, or other response actions being carried out at the FEMP in an effort to abate and/or minimize continuing and residual injury, and to achieve or enhance restoration of injured natural resources.

D. Coordinate, arrange, and participate in stakeholder involvement activities throughout the restoration process.

The duties of the Trustees' representatives to the Trustee Council shall include, but are not limited to, reviewing and participating in restoration project design, oversight and monitoring of the implementation of the Restoration Plan; scheduling meetings and preparing agendas for those meetings; acting as central contact point for their respective agencies (if applicable); and establishing and maintaining records and relevant documents. Each Trustee Council representative will be responsible for informing the other Trustee Council representatives of all pertinent developments on a timely basis.

VII. DECISION MAKING BY THE TRUSTEE COUNCIL

The Trustees agree that decisions implementing this MOU shall require unanimous approval. In the event that unanimous agreement cannot be reached by the Trustee Council representatives, the matter in dispute will be elevated to the Trustees to resolve the dispute or to establish a dispute resolution mechanism by which the dispute may be resolved. The Trustees further agree that decision making deliberations will focus upon the Trustees' mutual goal of assessing, restoring, rehabilitating, replacing and/or acquiring the equivalent of the injured natural resources, rather than upon control of respective trusteeship over those resources.

VIII. RESERVATION OF RIGHTS

The Trustees understand that this MOU is not intended to create any further legal rights or obligations between the Trustees or any other persons not party to this MOU.

IX. MODIFICATION OF MOU

Modification of this MOU must be in writing and approved by all Trustees currently parties to the MOU.

X. TERMINATION

This MOU shall be in effect from the date of execution until termination by agreement of the Trustees. In the event that any Trustee withdraws from the MOU, written notice of such withdrawal shall be submitted to the other Trustees at least thirty days in advance of the withdrawal. In the event of such withdrawal, this MOU remains in full force and effect for the remaining parties.

XI. LIMITATION

Nothing in this MOU shall be construed as obligating the Trustees to expend any funds in excess of appropriations authorized by law. Nothing in this Section or the MOU shall be construed to alter DOE's and the State of Ohio's respective positions regarding the appropriation of funding for the compliance requirements set forth in Section IX of the December 2, 1988 Consent Decree, Case No. C-1-86-0217 (U.S. District Court, Southern District of Ohio, Western Division).

XII. THIRD PARTY CHALLENGES OR APPEALS

This MOU is not intended to create or authorize a basis for any third party claims, challenges or appeals to the actions of the Trustees.

XIII. EXECUTION: EFFECTIVE DATE

This MOU may be executed in counterparts. A copy with all original executed signature pages affixed shall constitute the original MOU. The effective date of this MOU shall be the date of the signature of the Trustee who is last to sign.

OHIO ENVIRONMENTAL PROTECTION AGENCY

CHRISTOPHER JONES
Director

6-2-01
Date

U.S. DEPARTMENT OF THE INTERIOR

WILLIAM F. HARTWIG
Authorized Official
U.S. Department of Interior

2/12/01
Date

U.S. DEPARTMENT OF ENERGY

SUSAN BRECHBILL
Manager
DOE, Ohio Field Office

6/7/01
Date

APPENDIX

Section V of this MOU establishes the Trustee Council whose membership includes the Secretary of Interior or his designated representative (and alternate), Secretary of Energy or his designated representative (and alternate), and the Director of Ohio Environmental Protection Agency or his designated representative (and alternate). The designated representative and alternate of each agency are the following:

Secretary of Interior

Designated representative for U.S. Fish and Wildlife Service: appointed by the Field Supervisor, Reynoldsburg, Ohio Field Office (presently William Kurey)

Designated (alternate) representative for U.S. Fish and Wildlife Service: Field Supervisor, Reynoldsburg, Ohio Field Office

Secretary of Energy

Manager of the Ohio Field Office (currently Susan Brechbill) designates Fernald Project Director (currently Steve McCraken) as the primary representative for the Trustee Council. The Fernald Project Director is authorized to appoint a member of his staff to serve as the primary representative under this MOU.

Director of Ohio Environmental Protection Agency

Designated representative for the Director Ohio Environmental Protection Agency: Fernald Project Manager, Office of Federal Facilities Oversight (presently Thomas Schneider)

Designated (alternate) representative for the Director Ohio Environmental Protection Agency: Chief, Office of Federal Facilities Oversight (presently Graham Mitchell)