7.0 Natural Resources

This chapter provides background information on the natural resources associated with the Fernald site and summarizes the activities in 2003 relating to these resources. Included in this chapter is a discussion of the following:

- Threatened and endangered species
- Impacted habitat areas
- Ecological restoration activities
- Cultural resources.

Much of the 1,050 acres (425 hectares) of the Fernald site property is undeveloped land that provides habitat for a variety of animals and plants. Wetlands, deciduous and riparian (stream side) woodlands, old fields, grasslands, and aquatic habitats are among the site's natural resources. Some of these areas provide habitat for state and federal endangered species. Cultural resources, such as prehistoric archaeological sites, can also be found at the Fernald site. Monitoring of these natural and cultural resources is addressed in the Natural Resource Monitoring Plan, which is included in the IEMP. This document presents an approach for monitoring and reporting the status of several priority natural resources in order to remain in compliance with the pertinent regulations and agreements.

7.1 Threatened and Endangered Species

Sloan's Crayfish - The state-listed threatened Sloan's crayfish (*Orconectes sloanii*) is found in southwest Ohio and southeast Indiana. It prefers streams with constant (though not necessarily fast) current flowing over rocky bottoms. A large, well-established population of Sloan's crayfish is found at the Fernald site in the northern reaches of Paddys Run.

Indiana Brown Bat - The federally listed endangered Indiana brown bat (*Myotis sodalis*) forms colonies in hollow trees and under loose tree bark along riparian (stream side) areas during the summer. Excellent habitat for the Indiana brown bat has been identified at the Fernald site along the wooded banks of the northern reaches of Paddys Run. The habitat provides an extensive mature canopy of older trees and water throughout the year. One Indiana brown bat was captured and released on property in August of 1999.

Running Buffalo Clover - The federally listed endangered running buffalo clover (*Trifolium stoloniferum*) is a member of the clover family whose flower resembles that of the common white clover. Its leaves, however, differ from white clover in that they are heart-shaped and a lighter shade of green. Running buffalo clover has not been identified at the Fernald site; however, because running buffalo clover is found nearby in the Miami Whitewater Forest, the potential exists for this species to become established at the site. The running buffalo clover prefers habitat with well-drained soil, filtered sunlight, and limited competition from other plants and periodic disturbance. Suitable habitat areas include partially shaded grazed areas along Paddys Run and the Storm Sewer Outfall Ditch.

Spring Coral Root - The state-listed threatened spring coral root (*Corallorhiza wisteriana*) is a white and red orchid that blooms in April and May, and grows in partially shaded areas of forested wetlands and wooded ravines. This plant has not been identified at the Fernald site; however, suitable habitat exists in portions of the northern woodlot.

The Endangered Species Act requires the protection of any federally listed threatened or endangered species, as well as any habitat critical for the species' existence. Several Ohio laws mandate the protection of state-listed endangered species as well. Since 1993 a number of surveys have been conducted to determine the presence of any threatened or endangered species at the Fernald site. As a result of these surveys, the federally endangered Indiana brown bat and the state-threatened Sloan's crayfish have been found at the Fernald site. In addition, suitable habitat exists at the site for the federally endangered running buffalo clover and the state-threatened spring coral root. Neither of these species has been found on the property, but their habitat ranges encompass the site. Figure 7-1 shows the habitats and potential habitats of these species. Based on provisions set forth in the IEMP, any threatened or endangered species habitat will be surveyed prior to any remediation or restoration activities. If threatened or endangered species are present, appropriate avoidance or mitigation efforts will be undertaken. No surveys were conducted in 2003.

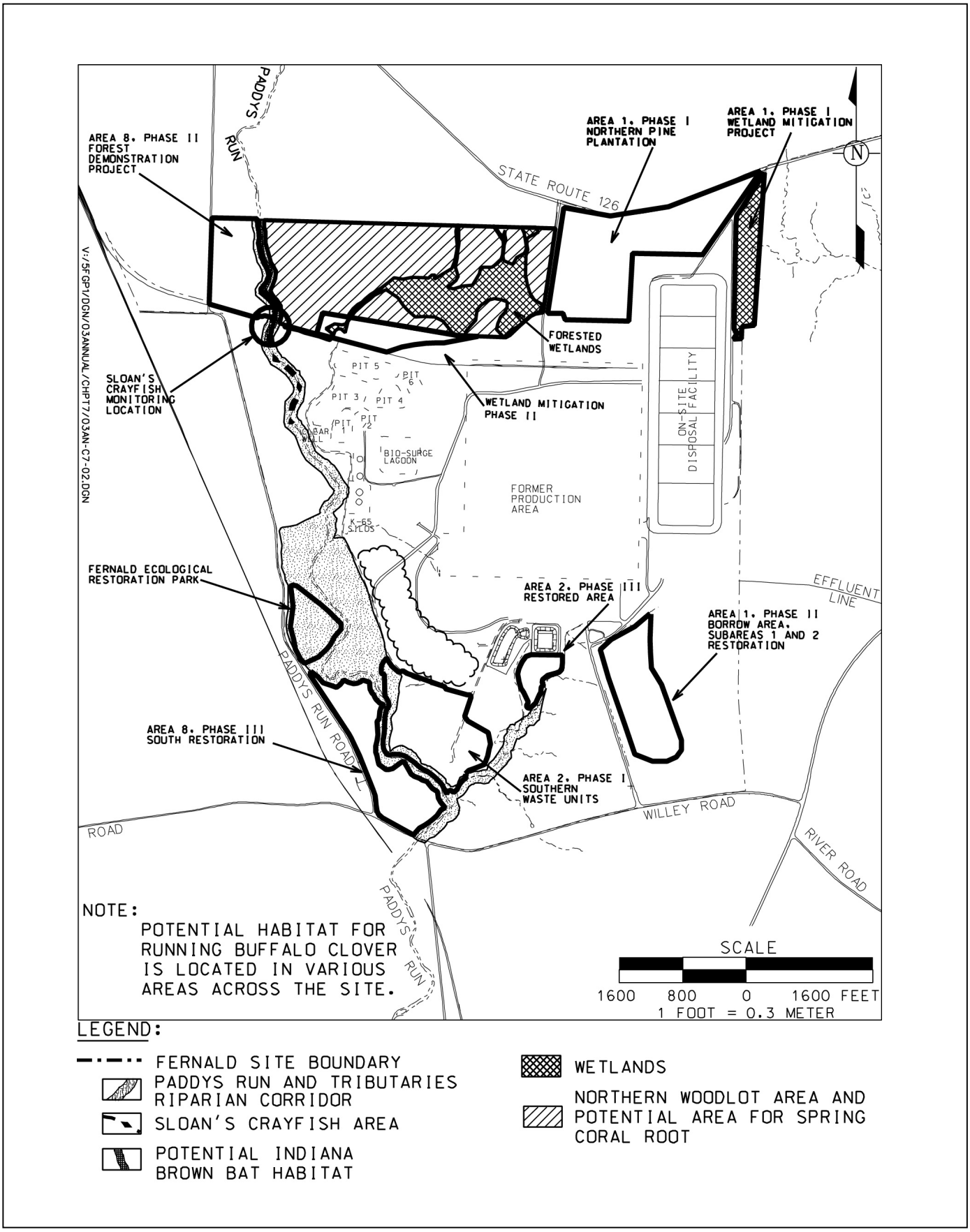

Figure 7-1. Priority Natural Resource Areas

7.1.1 Sloan's Crayfish Monitoring and Provisions for Protection

A Sloan's crayfish survey was conducted in August 2001 in order to determine if there were any impacts following debris removal near Paddys Run in Area 1, Phase III. The survey results from the 2001 sampling effort demonstrated that the Paddys Run Sloan's crayfish population was not impacted by the debris removal operation. A large number of individuals were observed both downstream and upstream of the project area. Researchers did note a general decline in the ratio between Sloan's crayfish and *Orconectes rusticus*, which is a larger, more aggressive crayfish species that often competes with the Sloan's crayfish. Similar trends are observed statewide, and are attributed to the aggressive nature of *Orconectes rusticus*.

The IEMP originally required that visual field inspections of sediment loading be conducted within one day of a "significant rain event," which is considered to be 0.5 inch (1 cm) or more of rain in one 24-hour period. The purpose of this field-inspection monitoring is to determine if there is an increase of sediment in the northern reaches of Paddys Run due to remediation activities. Sediment loading can adversely impact the Sloan's crayfish by restricting its ability to "breathe" in water. If remediation activities cause sustained (four to five days) increased sediment loading to Sloan's crayfish habitat in Paddys Run, alternatives such as crayfish relocation are considered. Figure 7-1 identifies the Sloan's crayfish monitoring location.

The Sloan's crayfish monitoring program was suspended in 2002 because construction activities in the area decreased and episodes of increased sediment loading were rare. However, the program was resumed briefly in February 2003 due to railyard expansion activities and again in November 2003 when grading activities for the Wetland Mitigation Project (Phase II) commenced. Monitoring has continued since November 2003. No instances of increased sediment loading were observed during 2003 monitoring efforts.

7.2 Impacted Habitat

DOE and the Natural Resource Trustees tentatively agreed that it would not be necessary to quantitatively assess habitat impacted through remediation because DOE will be conducting natural resource restoration on approximately 884 acres (358 hectares) of the site. Therefore, a summary of the year's habitat impacts is presented here.

A small (less than one acre [0.4 hectare]) forested area was disturbed in order to remove contamination in Area 2 (Phase II). Several trees were cleared to accommodate access and excavation. This area was reseeded and stabilized with coir matting after remedial activities were completed. Additionally, several small areas (less than 1 acre [0.4 hectare]) of grasses and pine plantation were cleared in support of extraction well installation activities. Where possible, disturbed areas were reseeded with native grasses and wildflowers.

7.3 Ecological Restoration Activities

Ecological restoration of the Southern Waste Units was completed, while restoration of the Northern Pine Plantation continued in 2003. Several additional projects were initiated in 2003, including Area 8 (Phase III) South Restoration, Phase II of the Wetland Mitigation Project, and Subareas 1 and 2 of the borrow area restoration. These projects are described in more detail below and are identified on Figure 7-1. Figure 7-1 also shows the location for previous restoration projects implemented at the Fernald site. Ecological restoration monitoring activities for several projects also continued in 2003.

The Area 2 (Phase I) Southern Waste Units Restoration Project encompasses approximately 25 acres (10 hectares) in the southwest portion of the Fernald site property. The area consists of the former active and inactive flyash piles, the South Field, and the Carolina area. The ecological restoration objectives for this project are to expand the riparian corridor along Paddys Run, create several open water and wetland areas, and establish the early stages of forest communities in upland areas. Several of the open water areas provide additional recharge to the Great Miami Aquifer. The project involves extensive soil amendment and seeding, and planting over 4,300 trees and shrubs. Soil amendment is the process of improving compacted, low-nutrient soils that remain following remediation. Organic matter, such as woodchips and compost, is incorporated into the ground with a disk or plow. These amendments improve growing conditions by loosening the soil, retaining moisture in the soil, and adding nutrients to the soil.

The Area 1 (Phase I) Northern Pine Plantation Restoration Project involves the conversion of the planted pine plantation in the northern portion of the Fernald site to the early stages of a deciduous forest with interspersed areas of wetlands and grasslands. The overall restoration objective is to enhance the Northern Pine Plantation by increasing the diversity of vegetation in the area through planting over 4,600 trees and shrubs, and creating new wetland and vernal pool features. Native deciduous trees and shrubs are to be planted between remnant patches of pines. The existing stand of deciduous trees in the northwestern portion of the Northern Pine Plantation is to remain unchanged except for continued efforts to eliminate invasive and aggressive species (e.g., honeysuckle, wild grape, garlic mustard, multiflora rose) during project implementation and monitoring. In 2003 all grading and planting activities were completed. Existing drainage swales and depressions were expanded, creating new wetland features. Vegetative cover of the wetland areas was accelerated by planting grasses, sedges, rushes, and wildflower plugs within the wetland footprints. Additional aquatic vegetation and organisms were transferred in muck that was obtained from existing wetlands. Drainage swales were also planted with dormant willow cuttings. In upland areas, all remaining trees and shrubs were planted and seeding of access paths was completed. Access corridors for deer movement were interspersed throughout the project area, and deer exclusion fencing was installed around plants susceptible to browsing. All cleared areas of the Northern Pine Plantation project area were seeded with native prairie grasses.

In Area 8 (Phase III) South, restoration objectives involve converting former pastures into tallgrass prairies and expanding the forested corridor along Paddys Run. The first phase of this project was initiated in the fall. Approximately 700 trees and shrubs were planted within an 8-acre (3.2-hectare) pasture adjacent to Willey Road. Workers also prepared two pastures for seeding with native grasses and wildflowers. In addition, invasive bush honeysuckle was cleared from existing forested areas. Work will continue in 2004 with additional tree and shrub plantings, and seeding prairie areas.

The Wetland Mitigation Project (Phase II) involves the restoration of an 8-acre (3.2-hectare) former borrow area north of the waste pits. Three shallow basins will be constructed and planted with a variety of wetland grasses, sedges, rushes, and wildflowers. Water will enter the basins from adjacent wetlands of the Northern Woodlot. Water control structures will be used to regulate the depth of water within each basin. The Wetland Mitigation Project (Phase II) will contribute about 5 acres (2 hectares) toward the site wetland mitigation requirements. In 2003 grading of the basins and spillways was initiated, and the water control structures were installed. Construction activities will continue in 2004, including the completion of berm construction, spillway installation, addition of topsoil, wetland plug planting, and seeding. Clearing of invasive plants in the Northern Woodlot will be conducted to prepare for tree planting and seeding. "Invasive" plants are non-native species that can quickly overtake an area by out-competing native vegetation for available resources. For instance, bush honeysuckle aggressively invades semi-shaded woodlands and forest edges. These shrubs grow so dense that native wildflowers, shrubs, and tree seedlings cannot get enough light to survive. As a result, native plant diversity is severely reduced and secondary succession (the process of natural habitat regeneration) is permanently altered. Field personnel use several methods to clear invasive species, such as mowing, cutting, pulling, and/or spraying with herbicide.

Borrow area restoration involves the creation of wetlands and tallgrass prairies across the southeast portion of the Fernald site. Subareas 1 and 2 of this project were completed in 2003. Activities included the construction of several shallow ponds and swales, and the seeding of wetland vegetation across the project area.

Ecological restoration monitoring has been divided into two phases: the Implementation Phase and the Functional Phase. Implementation Phase monitoring is conducted to ensure that restoration projects are completed as intended in their designs. This effort involves the mortality counts and herbaceous cover estimates that are conducted after a project is completed. Functional Phase monitoring is more general and considers projects in terms of their contribution to the ecological community as a whole. This is accomplished by comparing projects to pre-remediation baseline conditions and to ideal reference sites. Mortality and herbaceous cover thresholds are described in the 2002 Consolidated Monitoring Report for Restored Areas at the Fernald Closure Project (DOE 2003a). Generally, additional planting is needed if vegetation survival drops below 80 percent or herbaceous cover drops below 90 percent. However, each project is evaluated on a case-by-case basis, and consideration is given to factors such as deer browsing impacts.

In 2003 implementation monitoring continued for the Area 1 (Phase I) Wetland Mitigation Project and was initiated for the Southern Waste Units. In the Wetland Mitigation Project, monitoring was limited to photo observations of each wetland basin. Comparison with earlier photos documents that the project is maturing as planned.

Implementation monitoring continued for the Southern Waste Units as vegetation survival and herbaceous cover were evaluated. Overall vegetation survival is approximately 78 percent. Mortality appears to be due primarily to mammal browsing on shrubs. Deer pressure continues to be an issue within restored areas at the Fernald site. However, the results of the monitoring effort are encouraging because new techniques for controlling deer browsing proved very effective. Restoration personnel began fencing selected shrub patches within the Southern Waste Units. The fencing was successful at preventing mammals from browsing on planted shrubs. As a result, the use of fencing around shrub patches will be increased in future restoration projects.

Herbaceous cover surveys demonstrated typical progress for seeded areas that are in their first year of growth. Native grasses and wildflowers were successfully established across the project area. However, these species spend most of their energy growing a deep root system in their first year or two; therefore, much of the seeded vegetation was still small in size.

Functional Phase monitoring at the Fernald site involved the characterization of restored wetland communities. Wetland vegetation in the Area 1 (Phase I) Wetland Mitigation Project, the Area 8 (Phase II) Forest Demonstration Project, and the restored area in Area 2 (Phase III) were compared to baseline and reference sites. Each of these areas showed considerable progress. In general, the diversity and quality of native vegetation present in these restored areas was very near the levels measured in established referenced sites. In 2004 several restored prairie and savanna areas will be evaluated.

*The common arrowhead (*sagittaria latifolia*) thriving in the restored wetlands on site.*

7.4 Cultural Resources

The Fernald site and surrounding area are located in a region of rich soil and many sources of water, such as the Great Miami River. Because of its advantageous location, the area was settled repeatedly throughout prehistoric and historic time, resulting in richly diverse cultural resources. In summary, 148 prehistoric and 40 historic sites have been identified within 1.24 miles (2 km) of the Fernald site.

Several laws have been established to protect cultural resources during remedial activities at the Fernald site. The National Historic Preservation Act requires DOE to take into consideration the effects of its actions on sites that are listed or eligible for listing on the National Register of Historic Places. The Native American Graves Protection and Repatriation Act requires that prehistoric human remains and associated artifacts be identified and returned to the appropriate Native American tribe.

To comply with these laws, DOE conducts archeological surveys prior to remediation activities in undeveloped areas of the Fernald. Figure 7-2 shows that the majority of the site has been surveyed. These surveys have resulted in the identification of six sites that may be eligible for listing on the National Register of Historic Places. None of these sites was impacted by remediation activities and no additional surveys were needed in 2003.

DOE also keeps track of unexpected discoveries of cultural resources during remediation activities at the Fernald site. Table 7-1 lists the artifacts that were encountered in 2003. None of the findings was significant, and no impacts to cultural resources occurred.

TABLE 7-1
UNEXPECTED CULTURAL RESOURCE DISCOVERIES FOUND IN 2003

Unexpected Discovery[a]	Time Period	Location of Discovery[b]
Ceramic earthenware	Historic (1770-1880)	Area 2 (Phase II)
Ceramic whiteware	Historic (1820-1900)	Area 2 (Phase II)
Ceramic yellowware	Historic (1830-1900)	Area 2 (Phase II)
Skeletal Remains (animal)	Historic	Area 1 (Phase II)
Metal (iron-steel)	Historic	Area 1 (Phase II)
Projectile point	Prehistoric (Early Archaic 6300-5800 BC)	Area 9 (Phase II)
Projectile point	Prehistoric (Adena 800-300 BC)	Area 9 (Phase II)
Blade	Prehistoric (Fort Ancient Madison Phase 1450-1660 AD)	Area 8 (Phase I)
Projectile Point	Prehistoric (Fort Ancient Schomaker Phase 1250-1450 AD)	Area 9 (Phase II)

[a]No further excavation is warranted.
[b]Identified by soil remediation area. Refer to Figure 2-1.

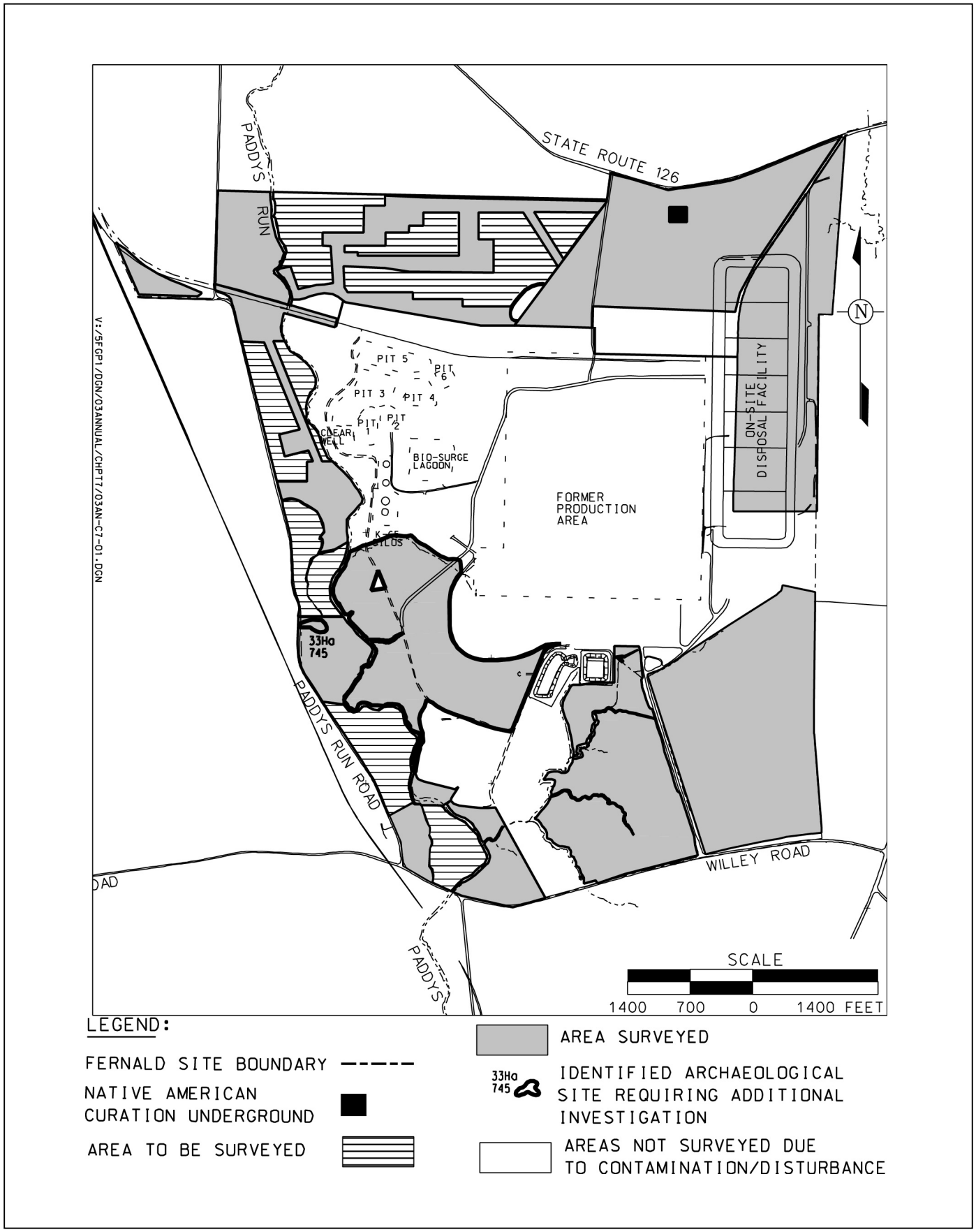

Figure 7-2. Cultural Resource Survey Areas