

7.0 Natural Resources

This chapter provides background information on the natural resources associated with the Fernald site and summarizes the activities in 2002 relating to these resources. Included in this chapter is a discussion of the following:

- Threatened and endangered species
- Impacted habitat areas
- Ecological restoration activities
- Ecological restoration research projects
- 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 Fernald site's natural resources. Some of these areas provide habitat for state and/or federal endangered species. Cultural resources, such as prehistoric archaeological sites, can also be found at the Fernald site. These resources are considered in the Natural Resource Monitoring Plan, which is included in the IEMP. The IEMP 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 Fernald 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 which 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 several 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 property, but their habitat ranges encompass the Fernald 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. The Indiana brown bat was surveyed in 2002. No individuals were identified, but suitable habitat remains along the northern reaches of Paddys Run.

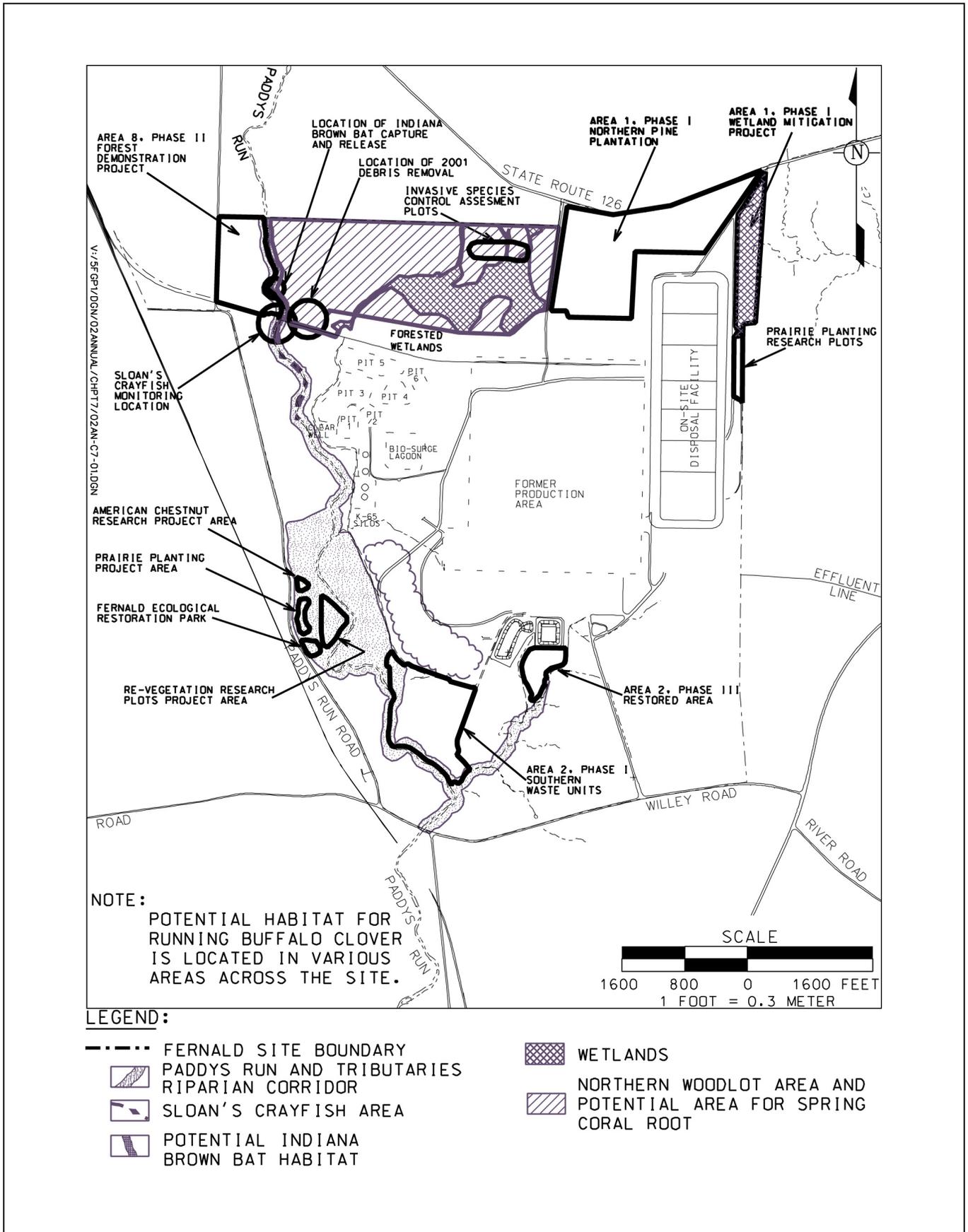


Figure 7-1. Priority Natural Resource Areas

7.1.1 Sloan's Crayfish Monitoring and Provisions for Protection

No surveys for the Sloan's crayfish were conducted in 2002. A 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 monitoring effort in the first five months of 2002 yielded similar findings to previous years. Results of visual field inspections indicated that sediment loading from remediation activities in the vicinity of the northern drainage ditch has not impacted Sloan's crayfish habitat in Paddys Run. No increased sediment loading was observed in 2002, and only one isolated instance was observed in 2001. Based on these findings, sediment loading observations were suspended in May 2002 with approval from EPA and OEPA. Monitoring will resume when construction activities near the northern drainage ditch are undertaken.

7.2 Impacted Habitat Areas

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.

Two separate projects were conducted in Area 2, Phase II, resulting in the clearing of approximately 2 acres (1 hectare) of successional woodlot and pine plantation. The projects were undertaken to remove contaminated soil and debris south of the Pilot Plant Drainage Ditch. Tree removal was minimized to the extent possible, and field personnel were successful in saving several mature oaks. Ecological restoration of these areas will be incorporated into the design for the eastern portion of Paddys Run.

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 and the Northern Pine Plantation began in 2002. 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. Monitoring activities for several projects also continued in 2002.

The Area 2, Phase I Southern Waste Units Restoration project encompasses approximately 25 acres (10 hectares) in the southwest portion of the Fernald site. 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 may provide additional recharge to the Great Miami Aquifer. The project involves extensive soil amendment and seeding, and the planting of over 4,300 trees and shrubs in 2002 and 2003. All soil amendments and roughly half of the tree and shrub plantings were completed in 2002.

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, and creating new wetland and vernal pool features. Native deciduous trees and shrubs are to be planted between remnant patches of pines. Over 4,600 trees and shrubs will be planted within four large plots. 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. Existing drainage swales and depressions are to be expanded, creating new wetland features. Access corridors for deer movement are to be interspersed throughout the project area. All cleared areas of the Northern Pine Plantation project area are to be seeded with native prairie grasses. In 2002 approximately 19 acres (8 hectares) of pines were cleared, the majority of grading and seeding was completed, and about one third of the trees and shrubs were planted.

The restored area within Area 2, Phase III encompasses approximately 2 acres (0.81 hectares) south of the Stormwater Retention Basin. The post-remediation excavated area has been seeded with wetland grasses, sedges, and wildflowers. In 2002 portions of the project area were planted with about 2,100 wetland shrubs in response to reduced survival in the wetland mitigation project. DOE decided against planting additional trees and shrubs in the mitigation project due to concerns about damaging established vegetation and continuing issues relating to drought and deer impacts. The shrubs installed in the restored area are easily transplanted from cuttings or seeds, so they will serve as a potential source of plant material for future restoration projects.

Monitoring of ecological restoration projects 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 for several years 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 kind of monitoring is new to restoration projects at the Fernald site. It compares restoration projects to pre-remediation baseline conditions and to ideal reference sites.

In 2002 Implementation Phase monitoring continued for the Area 1, Phase I Wetland Mitigation Project and the Area 8, Phase II Forest Demonstration Project. In the Wetland Mitigation Project, planted vegetation continued to be impacted by deer and drought, but herbaceous vegetation was much improved. Pond and subsurface water levels were determined in each of the eight wetland basins. Water quality samples were also collected and analyzed for pH, dissolved oxygen, conductivity, temperature, turbidity, odor, and color. Over time, this information will be used to assess the health of the wetland system. Results in 2002 show that the wetland is healthy and progressing as planned. As the wetland system has matured, the management goals for the project have evolved to focus on expansion and enhancement of herbaceous vegetation. The original 80 percent tree and shrub survival requirement is no longer applicable. Nevertheless, a replanting effort is planned adjacent to the Fernald Ecological Restoration Park, among the former re-vegetation research plots. About 270 trees and shrubs will be planted around the research plots, expanding the forested riparian corridor along Paddys Run.

In the Area 8, Phase II Forest Demonstration Project, deer and drought also had an impact in 2002. However, overall tree and shrub survival across the project remained near 80 percent. Also, a number of volunteer trees were observed throughout the project area. Herbaceous vegetation remained in good shape. Some limited replanting was undertaken in the fall of 2002, and 165 additional plants will be installed in 2003. These efforts will complete the Implementation Monitoring Phase for the Forest Demonstration Project.

Functional Phase monitoring involved the characterization of baseline conditions and reference sites for restoration projects at the Fernald site. Functional Phase monitoring of restoration projects will not begin until 2003, when wetland systems will be evaluated within 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.



Area 1. Phase I Northern Pines Plantation Restoration Project

7.4 Ecological Restoration Research Projects

Several ecological restoration research projects have been conducted under an ecological research grant as part of the 1996 Operable Unit 4 dispute resolution agreement. The Invasive Plant Control Research Project and the Prairie Plots Project were completed in 2002. Results from these efforts will be used in the development of ecological restoration designs at the Fernald site. Researchers have made several interesting findings. For the Invasive Plant Control Research Project, herbicide injection appears to be the quickest and most effective method for controlling honeysuckle. Results from the Prairie Planting Research Project indicate that a thin surface layer of wood chip mulch accelerates prairie establishment and retards weed growth.

The last ongoing restoration research at the Fernald site is the American Chestnut Research Project. This project is part of the nationwide effort to restore disease-resistant populations of the American chestnut (*Castanea dentata*) tree. American chestnuts were once a dominant species in the eastern deciduous forest. In the past century, a fungal blight has killed virtually all mature chestnuts across the country. The research is testing the blight resistance of American chestnuts that have been bred with blight-resistant Chinese chestnuts (*Castanea mollissima*). In 2002 efforts focused on growing the chestnut seedlings in the field.

7.5 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. A thorough overview of the cultural history at the Fernald site was provided in the 2001 Site Environmental Report. This report showed that there are 148 prehistoric and 40 historic sites 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 site. Figure 7-2 shows that the majority of the Fernald 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 2002.

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 2002. None of the findings was significant, and no impacts to cultural resources occurred.

TABLE 7-1
UNEXPECTED CULTURAL RESOURCE DISCOVERIES FOUND IN 2002

Unexpected Discovery ^a	Time Period	Location of Discovery ^b
Pottery	Historic	Area 8, Phase I
Pottery	Historic	Area 2, Phase II
Projectile Point	Prehistoric	Area 2, Phase II
Skeletal Remains (animal)	Historic	Area 2, Phase II
Bone (animal)	Historic	Area 1, Phase I
Bone (animal)	Prehistoric	Area 7
Skeletal Remains (animal)	Historic	Area 2, Phase II
Bone (animal)	Historic	Area 2, Phase II
Pottery	Historic	Area 2, Phase II
Bone Knife	Prehistoric	Area 1, Phase I

^aNo further excavation is warranted.

^bIdentified by soil remediation area. Refer to Figure 2-1.

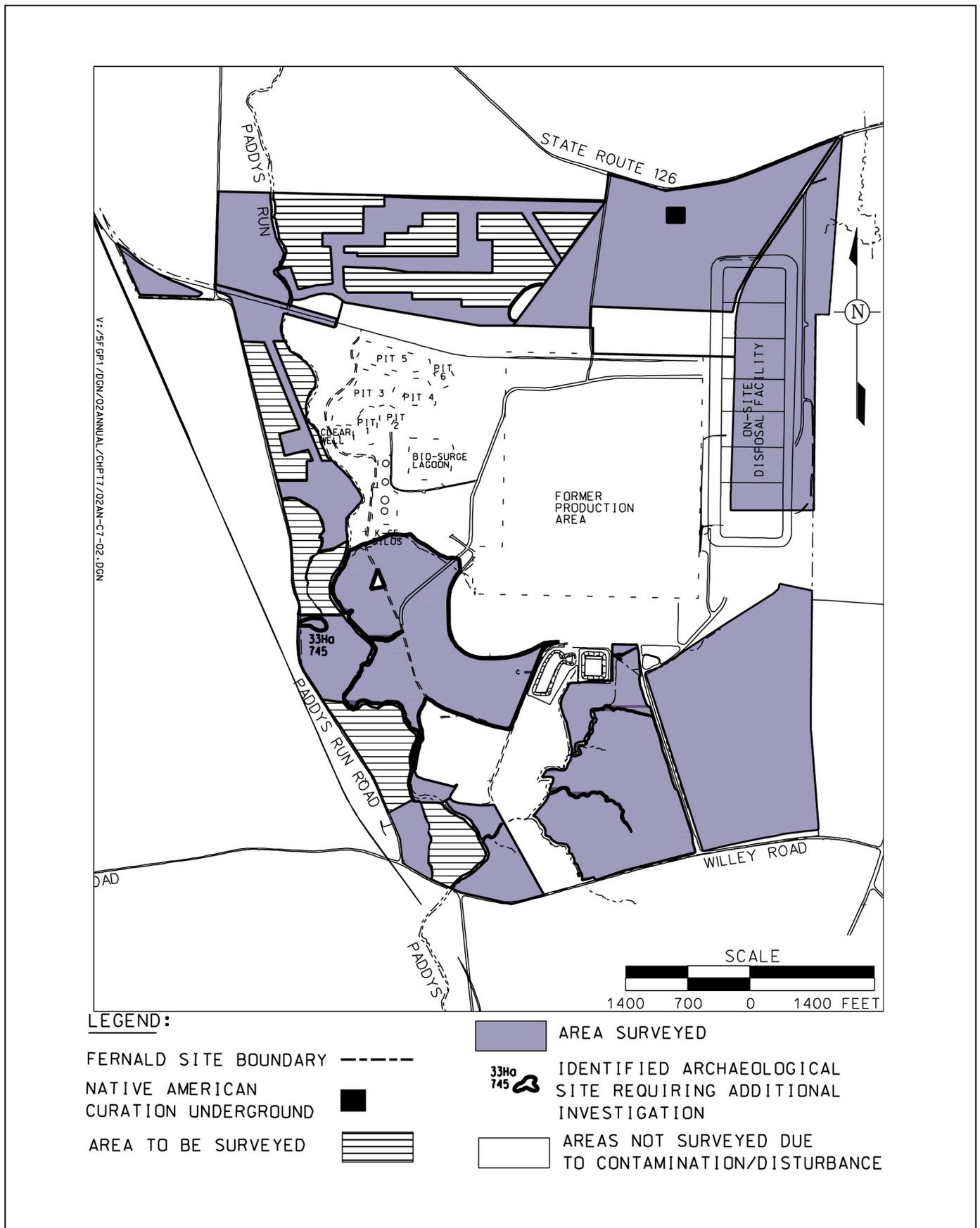


Figure 7-2. Cultural Resource Survey Areas