

7.0 Natural Resources

This chapter provides background information on the natural resources associated with the Fernald Preserve and summarizes the activities in 2009 relating to these resources. Included in this chapter is a discussion of the following:

- Ecological restoration activities.
- Fernald Preserve site and OSDF inspections.
- Affected habitat areas.
- Threatened and endangered species.
- Cultural resources.

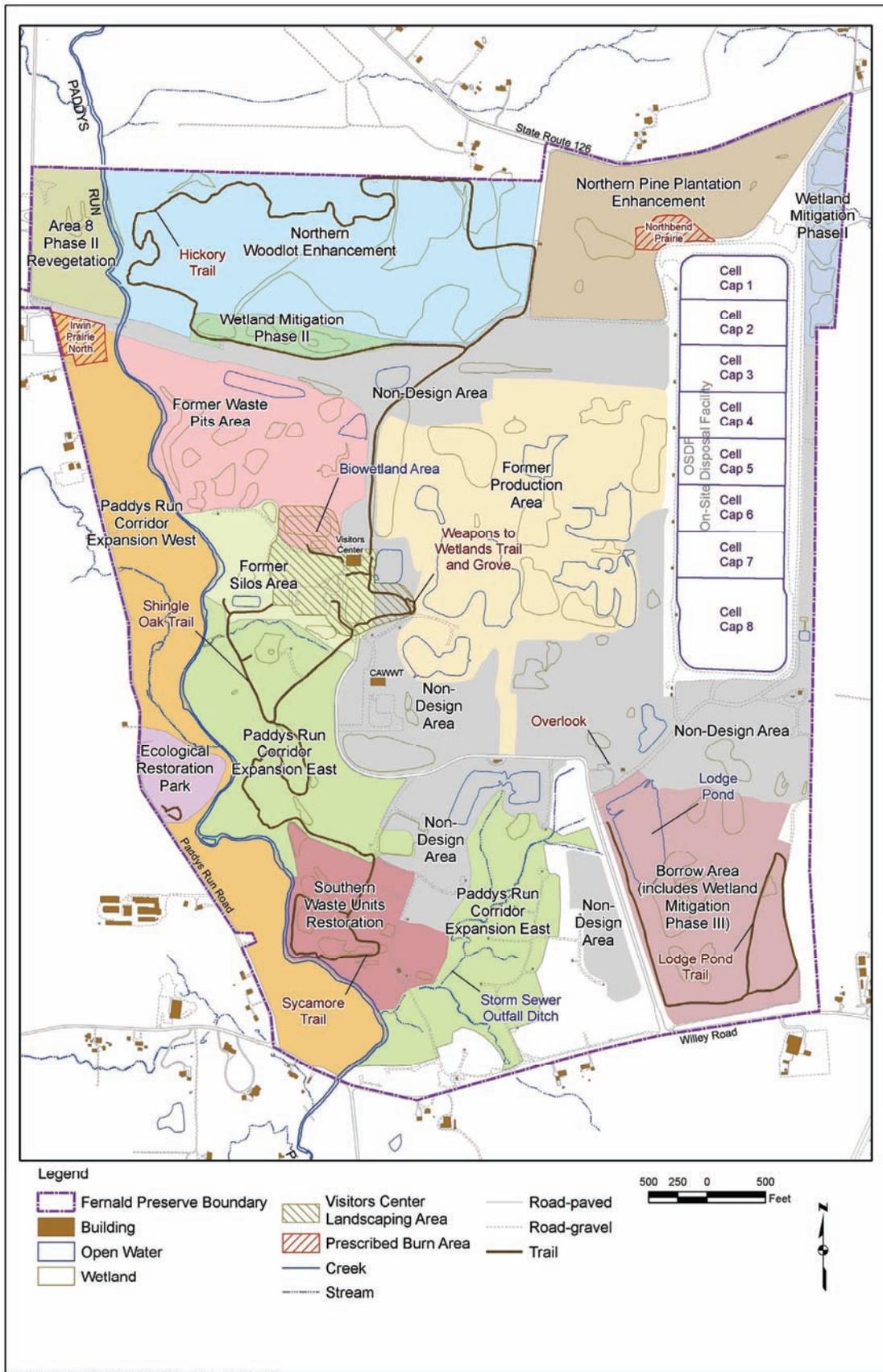
Much of the 1,050 acres (425 hectares) of the Fernald Preserve property is undeveloped land that provides habitat for a variety of animals and plants. Wetlands, deciduous and riparian (streamside) woodlands, old fields, grasslands, and aquatic habitats are among the site's natural resources. Over 900 acres of the site have undergone ecological restoration. Figure 7–1 shows the restoration project areas that have been completed. 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 Preserve.

Monitoring of these natural and cultural resources is addressed in the Natural Resource Monitoring Plan, which is included in the IEMP. The Natural Resource Monitoring Plan presents an approach for monitoring and reporting the status of several priority natural resources to remain in compliance with pertinent regulations and agreements. The site and OSDF inspection process, which is defined in the LMICP, also helps to evaluate the condition of natural resources at the Fernald Preserve.

The approach for monitoring and maintenance of ecologically restored areas was revised in 2009. DOE and OEPA signed a Consent Decree in November 2008 that settles a long-standing natural resource damage claim under Section 107 of CERCLA. As a result, the Fernald Natural Resource Trustees (DOE, OEPA, and the U.S. Department of Interior) have finalized the Natural Resource Restoration Plan (NRRP), which is Appendix B of the *Partial Consent Decree Resolving Ohio's Natural Resource Damage Claim against DOE* (State of Ohio 2008). The NRRP specifies an enhanced monitoring program for ecologically restored areas at the site. These new monitoring activities were started in 2009, with extensive vegetation monitoring across site wetlands. The Natural Resource Trustees also collectively evaluated restored areas by conducting field walkdowns in the summer of 2009. This effort led to the development of a path forward for additional maintenance and repair in some areas.

7.1 Ecological Restoration Activities

The Fernald Preserve's mission of long-term stewardship under LM involves the establishment, management, and monitoring of ecologically restored areas across the site. In 2009, approximately five miles of new trails were added to the site trail system. In addition, a vehicle turnaround and overlook were constructed along the site access road. This overlook provides a different perspective of the former production area. Maintenance in ecologically restored areas



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Figure 7-1. Restoration Project Areas

included continued control of noxious weeds and invasive plants, and limiting impacts due to nuisance animals (e.g., deer and geese). In addition, the use of prescribed fire was initiated at the Fernald Preserve in 2009.

7.1.1 Trails and Overlook Construction

Several new trails have been constructed to promote wildlife viewing and recreational opportunities at the Fernald Preserve. Figure 7–1 shows the location of trails at the site. The Hickory Trail is a three-mile loop that originates at the Visitors Center. It provides access and viewing to a variety of restored habitats, including prairie, constructed wetland, and forest communities. The Hickory Trail also travels through a relatively mature forest and several former pastures, which are in the process of naturally converting to woodlots.

The Sycamore Trail is a 1.9-mile loop that originates at the south end of the Shingle Oak Trail. This trail crosses through a forest restoration project, young woods, and the Southern Waste Units Restoration Project. Hikers can expect to see several different types of grassland, wetland, and forest habitats.

The Former Production Area Overlook provides a view of the former production area from the south. It is a paved, one-way loop that is located along the site access road, heading towards the Visitors Center.

7.1.2 Restored Area Maintenance Activities

Spot spraying with a broad-leaf herbicide, in conjunction with mowing and manual cutting, was continued in 2009 to control Canada thistle and other noxious weeds across the site. Manual cutting, followed by herbicide application to the stumps, was also used to remove bush honeysuckle from the understory of a wooded section along the Shingle Oak Trail. This species is a non-native invasive shrub that crowds out more desirable native species.

The primary nuisance animals on site are white-tailed deer and Canada geese. Existing deer-exclosure fencing was maintained sitewide. As a result of the Natural Resource Trustee walk downs discussed earlier, several deer fences have been targeted for removal. The density and size of the trees within the fenced area should be able to withstand pressure from deer browsing and rubbing. A portion of fencing along the Visitors Center Access Road was removed for this reason. This also allowed for expansion of the new Sycamore Trail into the restored forest area.

Canada geese are an ongoing concern at the Fernald Preserve. The goose hazing program that was initiated in 2007, using trained border collies to harass the geese, was continued in 2009. The dogs, which are brought onto the Fernald Preserve by their handlers, actually try to herd the geese, but the geese see the dogs as predators and fly off, from both land and water. The goal is to keep the geese out of areas that have been seeded so that the vegetation has time to become established. Once the grasses become tall, the geese will no longer be attracted to those areas. A second goal is to make the geese too uncomfortable to want to nest at the Fernald Preserve.

Planting activities were focused mainly on enhancing vegetation within the biowetland surface flow wetland basin. The surface flow wetland is designed as a “zero discharge” system, meaning that water is removed either through evaporation, plant transpiration, or infiltration into the soil. Because of the heavy clay content of the area, soil infiltration is very slow. Therefore, a dense

stand of vegetation is needed to maximize the amount of plant transpiration that takes place. Some erosion repair work was conducted in spring 2009 along the northern edge of the basin and the associated emergency spillway. Following these repairs, about 4,500 wetland plants were installed across the basin. These herbaceous “plugs” are the quickest way to get vegetation established in some wetland areas.

Several small prairie patches were seeded in 2009. Field personnel applied yard waste compost and seeded approximately two acres north of the biowetland area and in the northern portion of the Waste Pits. These efforts were used to evaluate different methods for ground preparation prior to seeding.

Prescribed burns were conducted at the Fernald Preserve for the first time in 2009. The use of prescribed fire is the preferred tool for prairie management. The tallgrass prairie species that have been seeded at the Fernald Preserve are well adapted to periodic fires. Most prairie species are deep-rooted. They have an extensive root system that is developed before the stem and leaf clump form above the surface. The root system allows them to be burned, eliminating the above-surface plant clump, without killing the plant. After a burn, when prairie plants grow back from the roots, they are vibrant. The burns convert the plant material to ash, reducing the accumulation of thatch. The ash breaks down quickly, since it is in contact with the soil, and the nutrients in the ash become available in the soil. Also, the blackened ash-covered ground absorbs more heat from sunlight and warms the soil. As a result, the soil reaches a temperature conducive to germination and native plant growth earlier in the spring. The growing season for the grasses and wildflowers is increased, and the sunlight on the soil surface promotes the growth of new plants and increases the productivity of existing plants.

Two areas were burned in 2009. Figure 7-1 shows the location of the Irwin Prairie North Burn and the North Bend Prairie Burn. Both burns were conducted safely with no incidents and within the parameters of the approved Prescribed Burn Plan.

7.1.3 Ecological Restoration Monitoring

Vegetation Monitoring Parameters

There are a number of ways to evaluate the type and quality of vegetation within an area. At the Fernald Preserve, vegetation monitoring is focused around determining the extent of native species composition, along the data that are collected to determine the Floristic Quality Assessment Index (FQAI), which is one of the parameters used to determine the score for VIBI. The FQAI process is described in the FQAI for vascular plants and mosses for the State of Ohio (Andreas 2004). The specific parameters used at the Fernald Preserve include the following:

Total Species: The total number of species sampled within a given area.

Native Species: The total number of species that are native to Ohio. The Ohio Vascular Plant Database is used to determine whether a species is native (Andreas 2004).

Percent Native Species: This is the number of native species divided into the total number of species. Relative frequency of native species has also been used in the past. This is calculated by dividing the frequency (or number of times a species is observed) into the total number of observations for a given area.

Average Coefficient of Conservatism (CC): The CC is a number from 0 to 10 that has been assigned to virtually every species that may be found in Ohio. The CC value is related to how "tolerant" a species is and what its habitat requirements are. Non-native plants have a CC of 0. Common species that can grow in a wide variety of habitats are considered "tolerant," and are scored a CC between 0 and 3. Native plants with very specific habitat requirements are scored high CC values, in the 7 to 10 range. Again, The Ohio Vascular Plant Database lists the CC for each plant found in Ohio.

Floristic Quality Assessment Index (FQAI): The CC values described above are used to calculate the FQAI. The FQAI is the sum of CC values divided by the square root of the total number of species for a given area.

Percent Hydrophytic: This parameter is specific to wetland functional monitoring. A hydrophytic plant thrives in wet conditions. The percent hydrophytic parameter is calculated by dividing the number of wetland species into the total number of species observed within a given area.

wetland habitat have been created as part of ecological restoration activities, DOE needs to demonstrate that at least 17.85 acres of these meet the definition of a "jurisdictional" wetland. A wetland is considered "jurisdictional" if it meets specific criteria regarding vegetation, hydrology (water), and soils. To accomplish this, the *Fernald Preserve Wetland Mitigation Monitoring Plan* (DOE 2009c) was developed to establish performance standards and monitoring requirements for wetland mitigation projects at the Fernald Preserve. The plan adopts existing OEPA performance standards and monitoring protocols for emergent wetlands. A series of parameters will be evaluated between 2009 and 2011, including the shape and size of wetlands, water elevations, soil and water chemistry, vegetation, amphibians, and other wildlife. This new process takes the place of previous efforts that included a one-time vegetation survey and annual water quality sampling.

For 2009, monitoring activities focused on characterizing wetland vegetation. Twenty-three wetland basins were surveyed using a process called Vegetation Index of Biotic Integrity (VIBI).

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. No implementation activities were required in 2009.

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. The Natural Resource Restoration Plan, which was finalized in November 2008 with settlement of the Natural Resource Damage Claim, reinstated the use of functional-phase monitoring as a means of evaluating restored communities. The Natural Resource Restoration Plan also calls for an enhanced wetland mitigation monitoring program.

Ecological restoration monitoring in 2009 centered on the start of the expanded wetland mitigation monitoring program described earlier. DOE has the responsibility to create 17.85 acres of jurisdictional wetlands at the Fernald Preserve. While over 80 acres of

VIBI is a scoring system that uses vegetation data collected from fixed plots. Figure 7–2 shows the location of the fixed plot grids within each of the wetland basins evaluated. Table 7–1 summarizes the findings. The results from this first monitoring effort were very encouraging. As stated above, VIBI is one of a number of performance criteria outlined in the Wetland Mitigation Monitoring Plan. This plan sets a goal to achieve a VIBI of at least 48 for restored wetlands at the Fernald Preserve. Fifteen of the wetland areas evaluated met this criterion in 2009.

Table 7–1. Wetland Vegetation Monitoring Summary

Restoration Project Area	Wetland Area	Size (Acres)	Vegetation Index of Biotic Integrity
Borrow Area (BAP)	BAPW2	3.35	50
	BAPW3	0.56	32
	BAPW4	1.30	36
	BAPW7	0.36	50
	BAPW9	0.83	59
Former Production Area (FPA)	FPAW2	4.25	25
	FPAW4	1.20	50
	FPAW5	2.91	51
	FPAW7	2.47	34
	FPAW9	2.51	50
	PREW6	2.32	43
Northern Pine Plantation Enhancement (NPP)	NPPW4	2.24	51
	NPPW5	0.14	51
Wetland Mitigation Phase I (WM1)	WM1W1	1.00	40
	WM1W2	1.38	71
	WM1W3	0.93	61
	WM1W4	1.08	61
	WM1W5	0.27	26
	WM1W6	1.68	67
	WM1W7	0.77	54
Wetland Mitigation Phase II (WM2)	WM2W1	0.94	50
	WM2W2	0.94	43
	WM2W3	1.19	57

In addition to the enhanced wetland mitigation monitoring program, functional monitoring of restored areas resumed as well. This process compares restored communities to pre-restoration “baseline” conditions and high-quality reference sites. Baseline and reference sites were characterized in 2001 and 2002. From 2003 to 2005, restored areas were evaluated. Instead of a project-specific data set, broader community types (i.e. wetlands, prairie, and forest) were evaluated. Wetlands were evaluated in 2003, prairie communities in 2004, and forest habitats in 2005. For 2009, the wetland data collected as part of the VIBI process can be used to compare to the established baseline and reference site data, as shown in Table 7–2. Results show dramatic improvement in all categories over baseline conditions, with percent native species approaching reference site conditions.

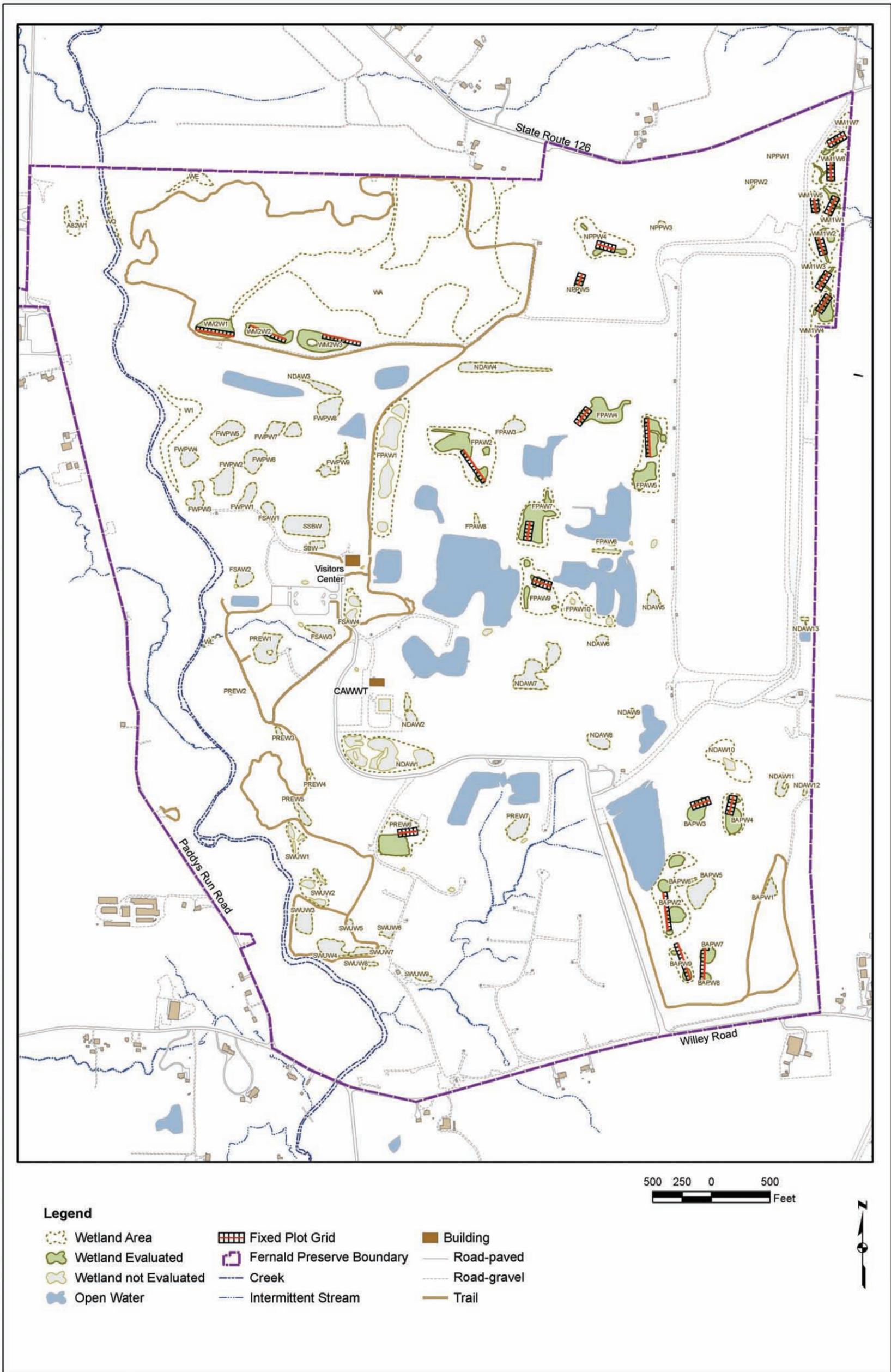


Figure 7-2. Wetland Mitigation Areas Evaluated

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Table 7–2. Wetland Functional Monitoring Data Summary

Parameter	Restoration Project Area					Wetland		
	WM1	WM2	BAP	FPA	NPP	Baseline	Reference	2003 Summary
Total Species	141	67	101	101	78	33	61	62
Native Species	101	53	76	81	62	17	55	49
Percent Native	72	79	76	80	79	48	90	79
Average CC ^a	1.90	2.03	1.92	2.17	2.14	1.12	3.49	2.21
FQAI ^b	14.11	13.10	13.53	14.80	15.71	6.44	27.27	17.40
Percent Hydrophytic	58	49	44	44	45	24	51	64

^aCC = Coefficient of Conservatism

^bFQAI = Floristic Quality Assessment Index

The 2003 summary data are from the WM1 wetland area. While the percent native and average Coefficient of Conservatism (CC) values are higher than the 2009 WM1 data, this is primarily due to sampling technique. Pursuant to the *Fernald Preserve Wetland Mitigation Monitoring Plan* (DOE 2009c), fixed plot grids were used to collect vegetation data. In 2003, transects were established around the perimeter of wetland basins. This may have biased the 2003 results in terms of species identified. The fixed plot method provides a more comprehensive inventory of plants within wetland areas, as evidenced by the greater total number of species observed in 2009.



Prescribed fire is a new prairie management tool at the Fernald Preserve. The North Bend Prairie was successfully burned in March, 2009.

7.2 Fernald Preserve Site and OSDF Inspections

The LMICP sets out a routine inspection process for both the site and the OSDF. Inspections are conducted quarterly with joint participation from DOE and the regulators. Inspections document

evidence of unauthorized uses of the site, the effectiveness of institutional controls, and the need for repairs. Ecologically restored areas are evaluated for the presence of noxious weeds, erosion, the condition of vegetation, and signs of damage from nuisance animals. Findings in 2009 were very similar to those of 2008 and focused mainly on noxious weeds, debris, erosion, and areas of sparse vegetation.

For the OSDF inspections, the vegetated cap is walked down and evaluated to ensure that the integrity of the cap is maintained. Erosion rills, holes from burrowing animals, noxious weeds, settlement cracks, and other indications that there may be an issue with the proper functioning of the cap are flagged and repaired. In 2009, there were no signs that the integrity of the cap had been compromised in any way. Findings consisted mainly of rocks larger than 4 inches in diameter, presence of noxious weeds, and animal burrows.

7.3 Affected Habitat and Inspection Findings

With large-scale remediation complete, the potential for unanticipated habitat impacts is limited. Nevertheless, impacts may occur during construction or maintenance activities. In 2009, no large areas of restored habitat were affected. Impacts due to trail and overlook construction were minimal. Some minor erosion control work was conducted in the former Southern Waste Units area in response to inspection findings.

7.4 Threatened and Endangered Species and Species Inventories

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 Preserve 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 (streamside) areas during the summer. Excellent habitat for the Indiana brown bat has been identified at the Fernald Preserve 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 the property in August 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 those of white clover in that they are heart-shaped and a lighter shade of green. Running buffalo clover has not been identified at the Fernald Preserve; 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, limited competition from other plants, and periodic disturbances. Suitable habitat areas include partially shaded former 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 Preserve; however, suitable habitat exists in portions of the northern woodlot.

Cave Salamander—The state-listed endangered cave salamander (*Eurycea lucifuga*) is slender, red to orange with irregular black dots. It is found in caves, springs, small limestone streams, outcrops, and old springhouses where groundwater is present. It has only been documented in Ohio in Hamilton, Butler, and Adams counties. Suitable habitat within the Fernald Preserve is limited, but populations have been observed just north of the site.

Cobblestone Tiger Beetle—The state-listed threatened cobblestone tiger beetle (*Cicindela marginipennis*) is recognized by its olive-gray back, white sides, and red abdomen. It's found on large gravel bars on medium-sized rivers. Populations have been recorded east of the Fernald Preserve along the Great Miami River.

The Endangered Species Act requires the protection of any federally listed threatened or endangered species and 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 site. As a result of these surveys, the federally listed endangered Indiana brown bat and the state-listed threatened Sloan's crayfish have been

found at the Fernald Preserve. In addition, suitable habitat exists for the federally listed endangered running buffalo clover, the state-listed threatened spring coral root, the state-listed endangered cave salamander, and the state-listed threatened cobblestone tiger beetle. None of these species have been found on the site, but their habitat ranges encompass the Fernald Preserve. Figure 7-3 shows the potential habitats for these species. According to provisions in the IEMP, threatened or endangered species habitat will be surveyed prior to any construction activities. If threatened or endangered species are present, appropriate avoidance or mitigation efforts will be taken.

No specific threatened or endangered species surveys were conducted in 2009. However, several species inventories did take place. In May, the Fernald Preserve BioBlitz was held. This 24 hour event was a blend of science, celebration, education, and community. Scientists and subject matter experts from a variety of fields led families, scouts, youth groups, and others on searches for bugs, spiders, snakes, birds, mammals, flowers, and trees. This event expanded the site's biological database, but more importantly it also engaged members of the public in the methods involved in conducting field studies. A BioBlitz is an excellent way to learn about the biodiversity at the Fernald Preserve and the surrounding area and to better understand how to protect the many different species that live here.

Reptile and small mammal surveys were conducted around a number of site wetlands using coverboards, which are 2-ft. by 4-ft. pieces of corrugated sheet metal. Animals are attracted to the cover and warmth the coverboards provide. Several snakes and five small mammals were observed, including a bog lemming, which has not been previously identified at the Fernald Preserve.

DOE is continuing its participation in several bird data-collection efforts. Information on birds breeding at the Fernald Preserve is provided to the Ohio Breeding Bird Atlas. In 2009, over 100 species of birds were recorded as probable or confirmed breeding at the site, and 85 species were confirmed nesting. The large prairie areas that surround the open water and wetlands support significant numbers of breeding grassland species, including those listed as species in decline by the National and Ohio Audubon Societies. Nesting species observed include northern bobwhite, dickcissel, Henslow's and grasshopper sparrows, horned lark, and eastern meadowlark. During the National Audubon Society's 2009 Christmas Bird Count, over 1,000 birds were observed using the Fernald Preserve, representing 47 species. The site routinely holds close to 1,000 waterfowl during the spring and fall migrations.

7.5 Cultural Resources

The Fernald Preserve 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 historical 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 Preserve.

Several laws have been established to protect cultural resources. The National Historic Preservation Act requires DOE to consider 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 (43 CFR 10) requires that prehistoric human remains and associated artifacts be identified and returned to the appropriate Native American tribe.

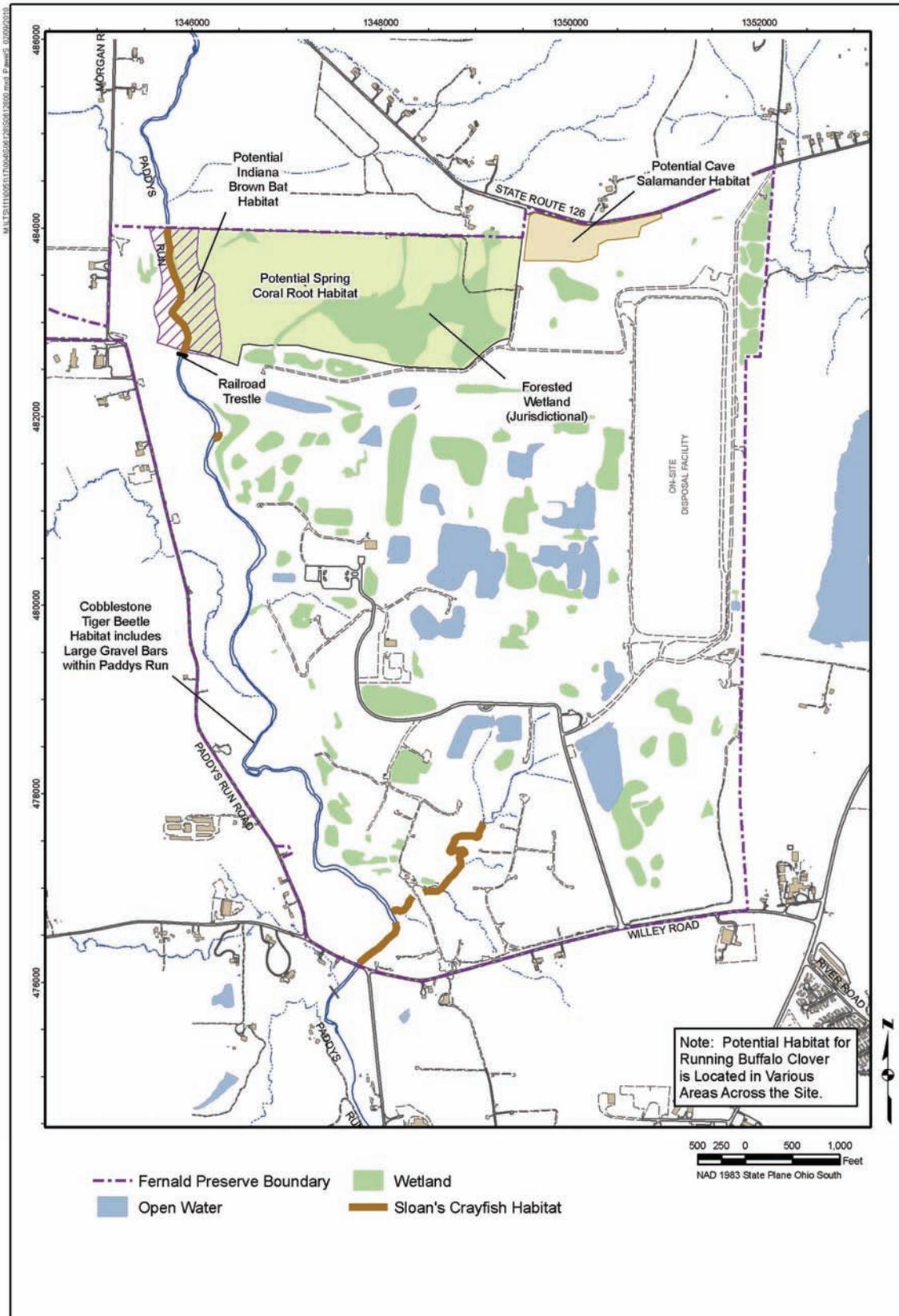


Figure 7-3. Threatened and Endangered Species Habitat Areas

To comply with these laws, DOE conducted archeological surveys prior to remediation activities in undeveloped areas of the Fernald Preserve. Figure 7-4 shows the areas of the Fernald Preserve that have been surveyed. These surveys have resulted in the identification of five sites that may be eligible for listing on the National Register of Historic Places. None of these sites were affected by construction activities, and no additional surveys were required in 2009.

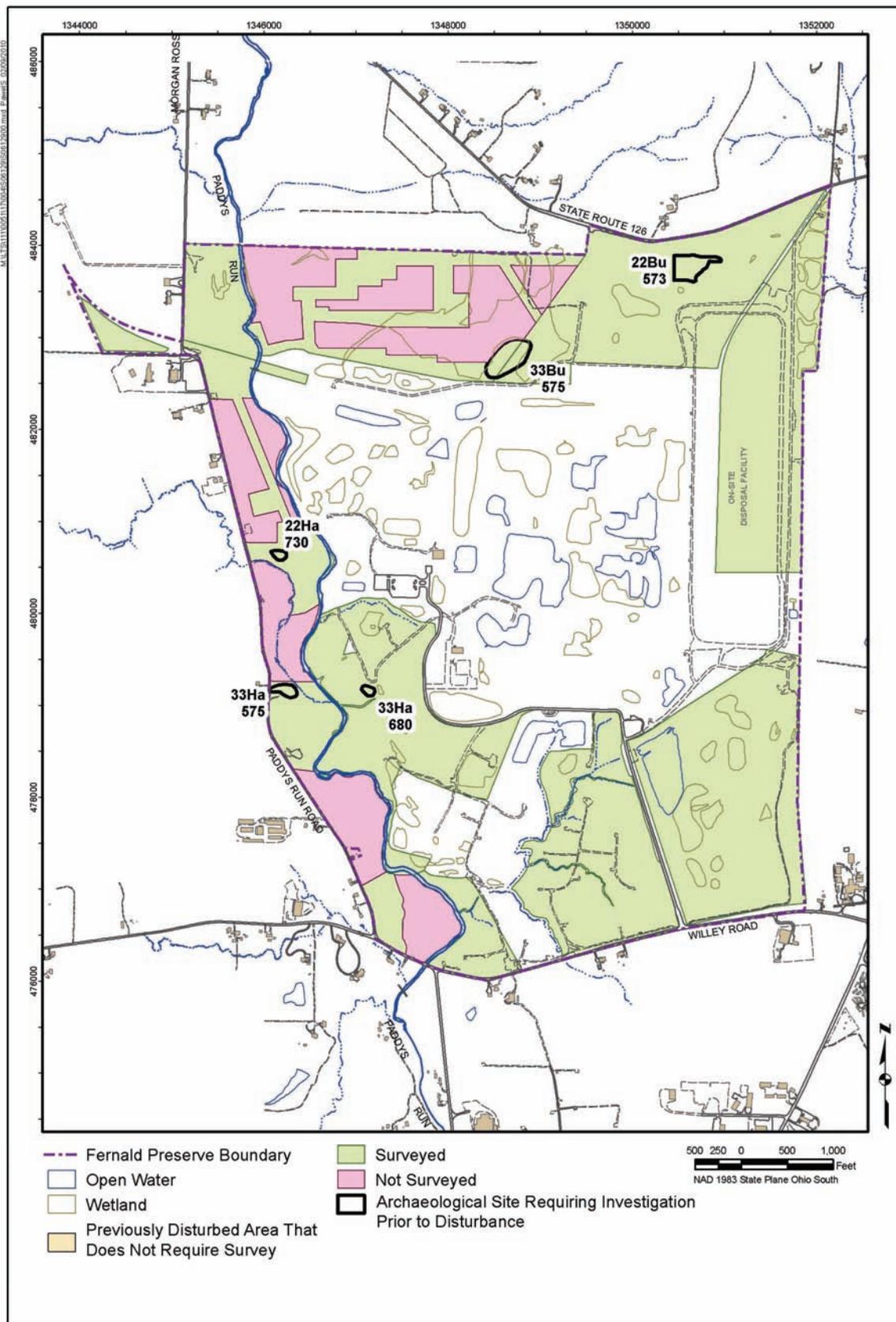


Figure 7-4. Cultural Resource Survey Areas