Red-tailed hawk at the Nature Center at Shaker Lakes. Photograph by L. C. Gooch.

While quite small I went with my father and other men from the village to shoot pigeons from the bank or ridge overlooking what is now the Art Garden and lake. This ridge, opposite Wade Park Manor, was at that time rather an open grove with some very fine chestnut and other forest trees upon it. This was when those beautiful birds, the passenger pigeons, still flew in countless millions, at times shutting out the sunlight, as they sometimes flew in strata, seven or eight deep, thus causing midday twilight, while the sound of their myriad wings was like surf on the shore.

— Charles Asa Post

Doans Corners and the City Four Miles West

4 Who Else Lives Here? The Natural Environment of the Brook

As we have seen, the nearly impenetrable forest interspersed with impassable swamps of the natural Doan Brook watershed did not please the first settlers. They did their best to tame the land as quickly as possible. By the mid 1800s, much of the forest was gone, along with much of the wild community that had inhabited it. By the early twentieth century, the urbanization of the area was complete. The watershed's original explorers would hardly have recognized it.

In the midst of the urban development, the philanthropists and park planners preserved a bit of open land in the line of parks that extends along Doan Brook from Lake Erie to Horseshoe Lake (see Figure 2-8). Some of these parks were landscaped and have been intensively managed; other areas were either left relatively undisturbed or have drifted back to an unmanaged condition. The ribbon of park land along the brook forms its riparian corridor — the strip of undeveloped land immediately adjacent to the stream that buffers it from the surrounding city. Doan Brook's riparian corridor is the watershed's only link to its original wilderness. Some of the watershed's native vegetation still survives there, and the corridor is home to a surprising variety of wildlife. The vegetation and wildlife that make their homes along the brook and in the stream itself are the subject of this chapter.

4.1 Vegetation Along the Brook and in the Watershed

The Doan Brook riparian corridor hosts a variety of plant associations, including woodlands, marshes, landscaped picnic areas, manicured cultural gardens, decaying orchards, turf, and riparian and aquatic vegetation. Vegetation in the urban areas that surround the brook is similar to vegetation in the riparian corridor, but the urban plant communities are even more heavily influenced by deliberate planting and landscaping.

The watershed's vegetative communities can usefully be divided into three areas that correspond to its topographic regions: the upper watershed, or Plateau; the Escarpment; and the lower watershed, or Lake Plain.[1] Even in the least disturbed parts of the brook's riparian corridor, clearing, planting, and the invasion of naturalized *exotic species*[2] have changed the vegetation. However, the dominant vegetation in any area is still heavily influenced by the basic environmental conditions that vary with the topography: climate, soil, and the types of native vegetation that colonized the area after the retreat of the last glaciers 15,000 years ago. The plants found in each vegetative region under current conditions and when Moses Cleaveland arrived are discussed briefly here. Detailed results of a number of vegetation surveys are included in Appendix G.

- **Vegetation of the upper watershed** — In the upper watershed, the Doan Brook riparian corridor is home to dense, tall-treed forest, the marshes associated with the Shaker Lakes, and the extensively planted areas around the lakes. In the forested areas, two general vegetative associations dominate: forests of drier, upland areas, and forests of wetter, lowland areas.

1 The watershed's topographic regions are discussed in Chapter 3, and their locations are shown on Figures 3-3 and 3-4.

2 A variety of non-native species (called exotic species) have been imported to the area either deliberately or accidentally. Some of these have become nuisances, spreading quickly and crowding out native plants. Such rapidly spreading, aggressive, non-native species are generally referred to as invasive exotics.

The Pre-Settlement Forest

In the 1940s, Arthur B. Williams of the Cleveland Museum of Natural History surveyed historical records and the remaining old-growth trees of Cuyahoga County to develop a picture of what the forests of the county would have looked like when Moses Cleaveland arrived in 1796. This discussion of the original forests of the Doan Brook watershed is based on Williams' research (Williams 1949), with some input from naturalists from the Nature Center at Shaker Lakes.

Upper Watershed

In the drier parts of the upper watershed, the forests that Moses Cleaveland found consisted of a beech-sugar maple climax forest, in which these two species made up almost ninety percent of the trees. Red maples, tuliptrees, white ashes, cucumber-trees, and tupelos were found scattered among the dominant species. The forest that now lies along the brook between Horseshoe Lake and the Nature Center most closely resembles the native upland forest.

In swampy areas of the upper watershed, the forest was dominated by American elms, black ashes, and red maples, with swamp white oaks, basswoods, and bitternut hickories in smaller concentrations. Willows were found along stream banks where enough light filtered through the trees.

Escarpment and Gorge

Near the Escarpment edge, where the soil becomes drier, the pre-settlement beech-maple forest of the upper watershed was replaced by white oaks and chestnuts, with red, scarlet, and chestnut oaks, shagbark and pignut hickories, and sassafras in smaller numbers. Near the bottom of the Escarpment slope, where moisture increases again, the old forest regained a character closer to that of the beech-maple forest on the Plateau. Hemlocks dominated the cool, dark ravine of the Doan Brook gorge. Yellow and black birches, tuliptrees, basswoods, and some beeches or maples were also found in the ravine.

Lower Watershed

The native forests in the lower watershed were mixed, with drier areas such as old beach ridges and valley slopes resembling the Escarpment forest and moist bottomlands resembling the forests of the upper watershed swamps. Silver maples, black walnuts, and butternuts were also present, as were stands of pin oaks with occasional tupelos. Beech-maple forest could be found on the slopes of the brook valley.

Figure 4-1 This photograph of the Doan Brook gorge near North Park Boulevard and Delaware Road in 1894 demonstrates that the land was almost completely cleared by early settlers. Photographer unknown. From the Nature Center at Shaker Lakes collection.

The largest area of relatively undisturbed upland forest in the upper watershed lies along the brook between Horseshoe Lake and the Lower Shaker Lake. Northern red oaks, beeches, and sugar maples are the dominant trees here, with a significant number of tuliptrees and a variety of other trees.[3] This area was probably almost completely cleared for farmland and lumber by the Shakers. The current woodland thus dates from about 1900, but it nonetheless hosts some magnificent trees. The red oaks and tuliptrees found here are typical of the early development of this type of forest, while the beeches and sugar maples will dominate the forest when it becomes fully mature. If left to themselves, the trees of this area will some day resemble those found by Moses Cleaveland.

A representative stand of wet, lowland forest lies along the brook immediately south of the Nature Center at Shaker Lakes. The bottomland along the stream is dominated by

3 See the tables in Appendix G for the scientific names of the trees mentioned.

Figure 4-2 A Canada goose browses on garlic mustard near the Nature Center at Shaker Lakes. Garlic mustard is an invasive exotic plant that is now common along Doan Brook. Photograph by L. C. Gooch.

silver maples, cottonwoods, and pin oaks, while the drier slopes of the valley provide habitat for northern red oaks, hemlocks, white oaks, and hickories.

Understory trees and bushes throughout the unlandscaped parts of the upper watershed include a variety of dogwoods, American hornbeams, hophornbeams, alders, blackberries, and viburnums. The upper watershed is also home to a wide range of wild flowers and other ground covers. Exotic invasives such as Japanese knotweed, garlic mustard, and yellow iris are prominent. Native plants such as poison ivy, jewelweed, hepatica, solomon's seal, spring beauty, and trillium can also be found. The wetland areas at the upstream ends of Horseshoe Lake and the Lower Shaker Lake are dominated by cattails and are home to a variety of wetland vegetation such as invasive purple loosestrife, nightshades, hairy willow herb, and cord grass.

- **Vegetation of the Escarpment and the Doan Brook gorge** — The forest along the Doan Brook riparian corridor continues as the stream descends the Escarpment, but the character of the vegetation changes. Near the upper edge of the Escarpment (approaching from the east), the slope of the land steepens and the channel of Doan Brook begins to deepen until it becomes the gorge. The increasing slopes and the ravine create two different environments for vegetation. On the slopes of the Escarpment and the sides of the ravine, runoff is rapid, and the shallow soils have limited water-holding capacity. Here, the vegetation is characteristic of relatively dry environments. By contrast, the heart of the Doan Brook gorge is cool and relatively moist, since the gorge sides shield vegetation from sunlight and groundwater seeps from the exposed bedrock layers.

  The forest along the dry Escarpment edge and upper slopes of the gorge is dominated by red, white, and chestnut oaks, with some cucumber-trees and shagbark hickories. The forest here is quite similar to the pre-settlement forest, except that the chestnuts that were once prominent are gone, having succumbed to the blight that began in the 1920s.

  Within the ravine itself, red and sugar maples dominate, along with red oaks, tuliptrees, cherries, and yellow birches. In wetter parts of the ravine, cottonwoods, sycamores, and green ashes join the maples and cherries, while tuliptrees, birches, and oaks are generally absent. There are still remnants of the hemlocks that once dominated the ravine, but their ranks have thinned since the dense surrounding forest was cleared, reducing the deep, cool shade in which hemlocks thrive.

  Understory saplings and shrubs generally consist of honeysuckles, viburnums, and cockspur thorn on the Escarpment. In the ravine, these species are joined by dogwoods, hornbeams, buckthorn, cranberry, poison ivy, and similar species. Herbaceous

Pre-Settlement Wildlife

When the first Europeans arrived in the Doan Brook watershed, they found abundant wildlife, including deer, bear, wildcat, wild turkey, and passenger pigeons, as well as a few elk and bison. Rattlesnakes were evidently common, since they figure prominently in almost every early account. In 1797 the surveyors found that grilled rattler was quite tasty, at least when other food ran short. Smaller and less disconcerting animals were undoubtedly also abundant, although early settlers rarely found them worthy of mention. Melinda Russell remembered bears, wolves, and rattlesnakes from 1813:

…the bears killed a nice shoat in harvest time… the wolves came into enclosures for four winters but the sheep fold was built so high that they could not get over it…Rattlesnakes were common, and surprised us often, but only one ever came within six feet of the house.

— Melinda Russell, 1880

Reports of large wildlife ceased by the mid 1800s. However, the brook continued to support abundant fish life well into the nineteenth century, as remembered by Asa Post (referring to events that happened in about 1860):

In the spring, the suckers came up the brook from Lake Erie to spawn; great schools of them. How they got above the [Cozad and Crawford mill] dams, I don't know, but I saw them up near Cedar Road with men and boys by torchlight, catching them on the "riffles" in such numbers that they were carried off in gunny sacks.

— Charles Asa Post, 1930

Figure 4-3 Virginia waterleaf at the Lower Shaker Lake wildflower garden. Photograph by L. C. Gooch.

plants are found mostly in the ravine and include nightshades, avens, asters, garlic mustard, jumpseed, jewelweeds, knotweeds, etc. Where the ravine floor becomes swampy, marsh vegetation such as smartweed and swamp dock can be found.

- **Vegetation of the lower watershed** — Remnants of the lower watershed's native forest can still be found in Rockefeller Park. American elms, black ashes, silver maples, pin oaks, and tupelos make up much of the level woodland along the brook, while beeches, sugar maples, tuliptrees, cucumber-trees, white ashes, and tupelos are found in some areas on the sloping valley sides. The tops of the valley sides and the sandy remains of lake beach ridges are home to oaks (black, white, red, and scarlet) and tuliptrees. The chestnuts that were once found on the tops of slopes and on the beach ridges are gone, and many American elms have fallen to Dutch elm disease. Although there are a number of native trees along the brook in the lower watershed, Rockefeller Park has been heavily landscaped and planted since before 1900, and non-native trees have been introduced. As a result, the part of the lower watershed along the brook offers the opportunity to see interesting non-native species as well as remnant stands of native vegetation.

  Understory vegetation in the lower watershed consists of dogwoods, hornbeams, viburnums, rhododendrons, azaleas, and honeysuckles, as well as a number of other introduced plants. Non-native ground covers such as English ivy, myrtle, and pachysandra dominate the herbaceous vegetation.

4.2 Wildlife Along the Brook and in the Watershed

The riparian corridor along Doan Brook is relatively small, and it is isolated by the surrounding city. It is, nonetheless, home to a variety of birds, mammals, and reptiles. An hour's spring stroll along the brook can reveal warblers and woodpeckers among the trees, waterfowl dabbling and diving in the lakes while heron fish nearby, a bird of prey soaring overhead, muskrat and turtles in the marsh, and an occasional browsing deer. The presence of so many different species indicates that the brook is an important ecological resource. The surprising lack of some other species shows the impact of the surrounding city. The species that are present and those that are absent are explored in the following sections.

Figure 4-4 American phoebe chicks beg for food near the Lower Shaker Lake dam. Photograph by L. C. Gooch.

4.2.1 Birds

Over 161 species of birds were documented along the upper Doan Brook between 1997 and 1999; 217 species have been sighted there since 1966 (see Table G-5 in Appendix G). The Site 14 area on Lake Erie at the mouth of the brook offers an even wider variety of birds, with 266 species documented there since 1980. Many species of birds, including most of eastern North America's brightly colored warblers, use the brook's riparian corridor as a migration stop during the spring and fall. Waterfowl ranging from the ubiquitous mallard to gaudy wood ducks, three species of mergansers, gadwalls, a variety of other ducks, coots, several species of grebes, and an occasional loon pause at the Shaker Lakes in the early spring and late fall. Red-tailed hawks breed around the lakes and probably in the lower watershed as well. Other raptors ranging from sharp-shinned and Cooper's hawks to an occasional osprey and a rare bald eagle (seen in the fall of 1999) hunt along the stream corridor.

Common birds that frequent suburban gardens, such as chickadees, nuthatches, blue jays, house sparrows, and house wrens, make up most of the birds that nest along the brook. However, some birds that require less suburban habitats can be found breeding in some parts of the watershed. In recent years green heron, killdeer, spotted sandpiper, and belted kingfisher have bred at the Shaker Lakes. Red-headed, red-bellied, downy, and hairy woodpeckers nest in snags and dead trees that are left standing in the brook corridor. Eastern wood peewees, great crested flycatchers, and red-eyed vireos also nest in the more wooded areas. Carolina wrens have joined the many song sparrows and red-winged blackbirds breeding in the marsh and scrub near the Nature Center for the past few summers. Beautiful wood ducks as well as mallards and Canada geese raise their young on the Shaker Lakes.

As more and more of the land along the migration pathways of North America's birds is developed, small areas like the land surrounding Doan Brook become increasingly important to successful bird migration. Although none of the species that are regularly seen along Doan Brook are listed as threatened or endangered, some of the warblers and other birds that make use of parks appear to be declining in numbers,[4] making it important to preserve migratory as well as breeding habitat.

4.2.2 Mammals

The riparian corridor along Doan Brook provides a small haven in an urban setting and is home to a variety of mammals (see Table G-6 in Appendix G). Many of these animals — opossum, raccoon, fox squirrel, eastern chipmunk, skunk, and woodchuck — are commonly found in the suburbs. Others are more surprising. In recent years, a small population of white-tailed deer has made its home along the brook in spring and fall, apparently breeding in the immediate area. Flying squirrels were found between the Nature Center and Lee

4 It is difficult to assess whether observed declines and increases in species numbers have long-term significance or are simply the result of periodic fluctuations in bird populations. However, northeast Ohio's habitat for migrating birds has indisputably decreased as suburban land use has increased.

Macroinvertebrates: Water Quality Canaries

Macroinvertebrates are invertebrates (animals without backbones) large enough to be seen without a microscope. Macroinvertebrate species include aquatic insect larvae, crustaceans, aquatic worms, and shellfish, among others. They live on the bottoms of lakes and in streambeds, and form an important link in the ecology of any body of water. Just as a healthy canary indicates a mine with good air quality, a healthy macroinvertebrate community indicates a stream with good water and habitat quality. As a result, macroinvertebrate surveys are often made as part of an effort to assess the health of a stream.

Road during a survey made in 1979. Three species of bat and several species of mole and shrew are also present. A careful observer can routinely see muskrat swimming in the brook and occasionally spot a red fox. Finally, coyotes are considered possible but unconfirmed along the brook.

4.2.3 Reptiles and Amphibians

A detailed survey made in 1979 revealed unexpectedly low populations of amphibians and reptiles along Doan Brook (see Table G-7 in Appendix G for survey results). Red-backed and two-lined salamanders were present in small numbers; however, the dusky salamander and spotted newt, which would be expected, were absent. A few frogs and toads were present, but numbers were again small, and those found were believed to be releases. Only small numbers of snakes were found, in contrast to the large numbers of rattlesnakes and other snakes reported by early settlers.[5] Unlike other reptiles and amphibians, turtles were abundant and varied in the Shaker Lakes. Many representatives of both native and nonnative species were found during the survey.

Although no detailed studies of the reptile and amphibian population have been performed since 1979, the findings of the 1979 study appear to remain valid. A few green frogs are audible around the Lower Shaker Lake in the spring and summer, and many turtles are visible in both lakes. Salamanders, snakes, and toads remain rare.

Several factors may account for the low numbers of reptiles and amphibians. Many of these animals lay their eggs directly in the waters of the brook. Water contamination from heavy spring salt runoff from the surrounding roadways may have a primary role in preventing them from breeding. Generally poor water quality in the brook may also have a negative impact, as may elimination of pools in the flood plain where some of these animals breed. Frequent flooding that washes out the flood plain pools may also be a factor. Finally, these species are not highly mobile, and the isolation of the Doan Brook riparian corridor, cut off from other natural areas by the surrounding suburbs, makes the recruitment of new individuals difficult once a population has been destroyed. It is possible that early clear-cutting by the Shakers eliminated the habitat for some species, and some may have been wiped out by much poorer water quality in the 1960s and 1970s. Once eliminated, reptiles and amphibians cannot readily recolonize Doan Brook without human intervention.

4.3 Who Lives in the Brook? Lake and Stream Dwellers

The primary inhabitants of Doan Brook and its lakes are a variety of turtles (discussed in Section 4.2), a few pollution-tolerant fish, and a number of small creatures called macroinvertebrates that dwell in the streambed and on the lake bottoms. Fish species that have been observed in the Shaker Lakes in recent years include green sunfish, fathead minnow, and goldfish. Shiners and common carp were noted in the brook upstream from Martin Luther King, Jr., Boulevard in 1994. Table G-8 in Appendix G lists the observed fish species. All of these fish are usually found in stressed aquatic environments. Causes of stress in Doan Brook include relatively poor water quality (discussed in Chapter 6) and very low flows

5 Rattlesnakes have been largely extirpated in northeast Ohio.

Figure 4-5 A white-tailed deer at the Nature Center at Shaker Lakes. Photograph by L. C. Gooch.

during dry periods. In addition, the physical barriers to fish migration from Lake Erie (such as the culvert at the mouth of the brook, the University Circle culvert, and the Shaker Lake dams) and the physical modifications to the stream channel, particularly in Rockefeller and Ambler Parks, make it difficult or impossible for fish to migrate into the brook from Lake Erie as they once did. Because of these barriers, aquatic species that may have been eliminated by past poor water quality cannot reestablish themselves naturally. Finally, frequent high flows make it difficult for aquatic plants and animals to become established.

The macroinvertebrate community in Doan Brook was examined at one site in 1974 and at a number of sites in 1998. Similar surveys of the Shaker Lakes were made in 1973, 1974, 1979, and 1998. The surveys of the brook found a variety of organisms, including aquatic worms, flatworms, leeches,[6] mollusks, crustaceans, sponges, and a number of insect larvae (see Tables G-10 and G-11 in Appendix G). As is discussed further in Chapter 6, the type and number of macroinvertebrates found indicate that conditions in the brook range from poor, largely in the upper watershed, to good downstream from the Lower Shaker Lake and in the lower watershed.

Samples taken in the Shaker Lakes indicate that the macroinvertebrate community in the lakes is less diverse and includes fewer organisms than the stream community, probably as a result of muddy lake bottom conditions that do not encourage macroinvertebrate success.

4.4 Who Might Live Here? Habitat Potential of the Brook and Its Surroundings

In 1977, the Institute for Environmental Education compiled a list of 31 fish species that probably inhabited Doan Brook under original stream conditions (see Table G-9 in Appendix G). A similar list compiled in 1994 identified twelve species that might once have been found in the gorge upstream from Martin Luther King, Jr., Boulevard. The Institute for Environmental Education also identified a number of frog, salamander, and reptile species that might be expected along the brook but were either absent or present only in very small numbers. Additional bird species and larger numbers of birds might be found in the lakes if the aquatic environment improved. A few additional mammals might also inhabit the riparian corridor under the best of conditions, but the capacity of the relatively small and isolated corridor along the brook to support more or larger mammals is limited.

Tapping the full habitat potential of Doan Brook will require improvement in both water quality and physical habitat. As is discussed in later chapters, restoring the urban brook will require a watershed-wide effort that involves a few large projects and a sustained program of smaller projects carried out over many years. Even after restoration, the brook will remain an urban

6 Leeches in Doan Brook and the Shaker Lakes are not primarily those that prey on mammals, but rather those that prey on other invertebrates.

The New Fish in the Brook

In 1999, researchers from John Carroll University restocked Doan Brook with three species of native fish: creek chub, blacknose dace, and stoneroller minnow. All three species were released into the stream between the Nature Center at Shaker Lakes and Horseshoe Lake. After the summer of 2000, the creek chub were thriving and the other two species were holding their own downstream from Lee Road, suggesting that Doan Brook may now be able to support fish that are slightly less pollution-tolerant than green sunfish and carp. Further restocking with other species is proposed if these three continue to thrive (Coburn 2000).

Figure 4-6 A fox squirrel along Doan Brook. Photograph by L. C. Gooch.

stream, surrounded and affected by the city. Because of this, conscious protection of existing habitats, creation of new protected habitat area, and restocking with selected species will be needed if we are to realize the ecological promise of the brook and its riparian corridor.