Ecological Analysis of Hudson Highlands Gateway Park, Cortlandt, New York

by

Metropolitan Conservation Alliance/
Wildlife Conservation Society

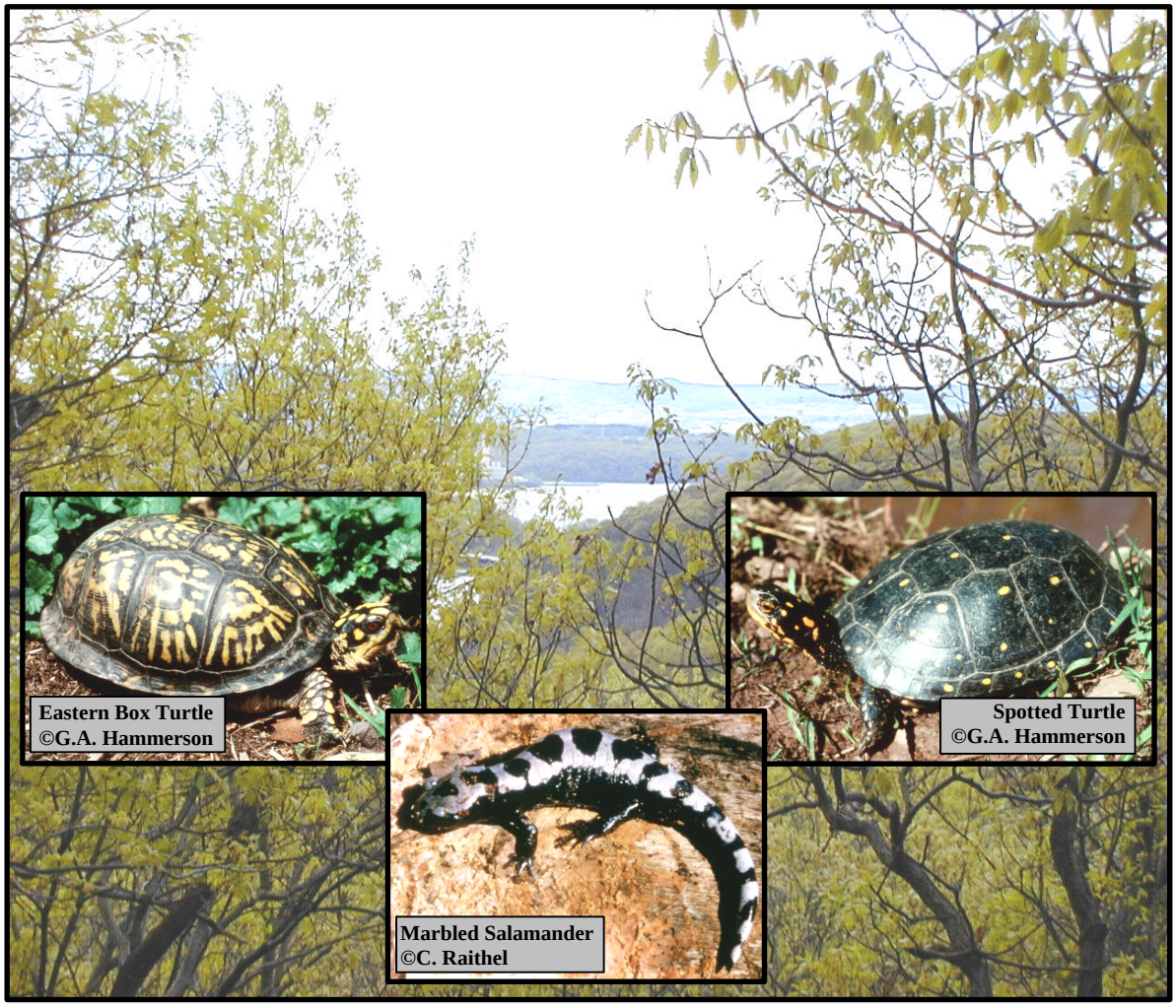
for

Town of Cortlandt, NY

and

Scenic Hudson, Inc.

December 2002



View of Hudson River from Hudson Highlands Gateway Park
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Metropolitan Conservation Alliance

MCA Site Reports: No. 2

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Introduction

The following report provides recommendations for the development and management of Hudson Highlands Gateway Park (HHGP), located in the Town of Cortlandt (Westchester County, NY) and recently acquired by the Town and Scenic Hudson, Inc. These recommendations are based upon field investigations by the Metropolitan Conservation Alliance (MCA), a program of the Wildlife Conservation Society (WCS). Nine separate surveys were conducted during spring and summer 2002 (three focusing on birds and six focusing on reptiles and amphibians). This is a significantly greater time commitment than initially anticipated, and goes well beyond the scope of the MCA/WCS proposal—at no additional cost to the Town or Scenic Hudson. In addition, data from this field season were combined with data collected during previous surveys by MCA/WCS at the site as part of a larger, regional project. MCA/WCS invested more time in this project than budgeted because preliminary surveys indicated exceptional biodiversity at the site. More intensive surveys were therefore required in order to produce a quality report containing comprehensive recommendations.

Hudson Highlands Gateway Park contains some of the greatest herpetological diversity in Westchester County. Its high quality habitats and varied terrain support wildlife populations (described in greater detail below) that are rapidly disappearing from the rest of the County. In preserving the park, the Town and Scenic Hudson have already taken the most important step in maintaining this area of regionally exceptional biodiversity. The goal of MCA/WCS was to take a closer look, at a finer scale, at the locations and habitat requirements of these species. By considering details at this scale, it will be

possible for the Town to ensure the park's continued role as a major biodiversity hub linking Westchester County to the Hudson Highlands.

Based on discussions with the Town and Scenic Hudson, it is apparent that there is a strong desire to develop this park to make it more accessible to visitors. Development alternatives that have been considered include construction of a parking lot and creation/maintenance of a trail system. There have also been indications that the park may be used for environmental education purposes, and that construction of an interpretive center is a possibility in the future. This report considers various options for these development alternatives and will also briefly discuss multiple uses of the park's resources—in terms of conflicts and compatibilities.

The report has been divided into two major sections, as detailed in the original proposal. The first section presents findings from our investigations, which were based on three primary sources of data: (1) the 1996 report prepared by Jay Fain for the Ginsburg Development Corporation, entitled "Preliminary environmental analysis and impact assessment for the Hillpoint site," (2) data collected previously from the site by MCA/WCS biologists as part of our Croton-to-Highlands project, and (3) new data collected during the spring and summer of 2002. The second section discusses the findings in greater depth, and interprets them into specific recommendations for striking a balance between development of park infrastructure and maintenance of biodiversity.

Findings

Overall Significance of Hudson Highlands Gateway Park

Hudson Highlands Gateway Park plays an integral role in maintaining biodiversity within Westchester County. This is due to a number of factors, including:

(1) **The aptly-named park is an extension of the large and relatively unfragmented Hudson Highlands into Westchester County**. As a result, many of the wildlife species associated with the Highlands—species that are declining or absent in most of Westchester—occur within the park.

(2) **The park is relatively large** (> 350 acres). Total area of available habitat is important for many species of wildlife. For example, many of the Neotropical migrant warblers that breed in the park are designated as area-sensitive, forest-interior species; their breeding attempts will only be successful in the core area of larger, intact forests. In its current condition, HHGP provides sufficient habitat for a number of these species.

(3) Although effectively isolated from most nearby habitats by roads and development, **the park is contiguous with relatively intact Highland habitats to the north**. Maintaining this connectivity to the north is vital for the continued viability of the park's wildlife populations.

(4) **The park is hydrologically diverse**. It contains several minor and ephemeral (seasonal) streams, a number of different wetland types with varying water regimes, and is bounded by two larger watercourses—Annsville Creek to the west and Sprout Brook to the east. Diverse hydrologic (water) regimes translates into diverse, structurally complex habitats that can, in turn, provide a variety of niches and maintain high levels of wildlife diversity.

(5) **The park is topographically diverse**. The many ridges, rocky outcrops, slopes, and vales result in an intricate mosaic of habitat types. The park's diversity of habitats results in a diversity of wildlife.

(6) **The park has not been heavily manicured**. Many town and county parks consist of forest canopies that are devoid of understory vegetation, which has been cleared and replaced by lawns. HHGP has a complex, natural understory and a rich layer of duff (leaf litter) that supports a diverse food web. Removal of these elements—as is the practice in many of this region's parks—results in rapid declines in biodiversity and overall ecosystem health. Most of HHGP has, to date, been left in its natural condition; therefore its understory vegetation continues to provide numerous niches for wildlife.

(7) **All of the above factors are important for the citizens of Cortlandt and surrounding communities**. Through preservation of this sizable portion of quality habitat, citizens not only gain access to an aesthetically-pleasing area that is rich with environmental education opportunities, they also benefit from other ecological functions provided by the park. For instance, because the park is not covered by impervious surfaces (i.e., pavement, as would have occurred if the area had been developed), its wetlands and uplands continue to absorb and slowly release stormwater; this ameliorates flooding problems for the surrounding and downstream communities.

Geologic Setting

HHGP lies atop the extension of the Hudson Highland's geology into northwestern Westchester County. The park is topographically diverse, which is due, in large part, to its bedrock and surficial geology. This in turn gives rise to a variety of habitat types.

For the most part, the park is underlain by metamorphic bedrock. Much of the bedrock is exposed in a series of rocky outcrops along ridgelines throughout the park. The central ridgeline of the park (running north – south) consists primarily of granitic materials. The gravel mines along the eastern portion of the park (along the Sprout Brook corridor) are underlain by calcitic and dolomitic marbles.

Where bedrock is not exposed, it is overlain by poorly sorted glacial till of variable texture. The thickness of these till deposits varies across the site. Gravel mining operations along the eastern and the western perimeters of the park have extracted much of the glacial till.

Wildlife Species and Habitats

The presence and abundance of wildlife species is inextricably linked to the presence, extent, type, and quality of habitats. Therefore, the following discussion of HHGP's wildlife species is provided within the context of specific habitats on site. Habitats of concern are discussed, and a list of wildlife species is provided for each. Areas are labeled alphabetically and indicated on a map (Figure 1). For a complete list of species, see Appendices A - C. Appendix D provides a list of additional reptile species that, although not detected during any of the surveys, are highly likely to occur at HHGP. This list was prepared based on (1) the availability of appropriate habitats at HHGP, (2) the biogeographical setting of the park, and (3) proximity of the park to known occurrences of these species. Further surveys would likely reveal the presence of most of these reptiles.

The data and discussions provided below are a result of MCA/WCS field investigations conducted during 2002 and previously, as part of MCA/WCS's Croton-to-Highlands project. Data from the 1996 report by Jay Fain for the Ginsburg Development Corporation, entitled "Preliminary environmental analysis and impact assessment for the Hillpoint site," have also been considered. During MCA/WCS surveys, almost all of the amphibian, reptile, and avian species detected during surveys for the 1996 Fain report were observed; in addition, MCA/WCS biologists observed many species that had been listed by Fain as "probable" *and* numerous species that had not been reported. Although the wildlife data in the 1996 report are deficient, the plant and habitat data are much more complete. Therefore, MCA/WCS surveys focused on wildlife populations (in particular, amphibians, reptiles, and birds) and on those habitat aspects that directly relate to wildlife presence and abundance. For a more complete presentation of botanical data, we recommend referring to the 1996 Fain report. The more robust wildlife data set that we have compiled is a result of conducting surveys during peak activity periods (i.e., peak seasons and peak times-of-day). Biological reports for proposed development projects are rarely based on sufficient wildlife data; in addition, such reports seldom draw meaningful conclusions and recommendations from those limited data. MCA/WCS data can serve as a foundation for park management and development recommendations, detailed later in this report.

<u>Amphibians and Reptiles</u>

Herpetological surveys began in April of 2002 and continued through July. In addition, some herpetological data were collected during site orientation on 24 April by three biologists from MCA/WCS, Richard DiSanza of the Town of Cortlandt, and Walt Daniels of the NY/NJ Trails Conference. Survey methods included visual searches, dip-netting, turning of cover objects, road-running (i.e., observing animals along road corridors), and turtle-trapping.

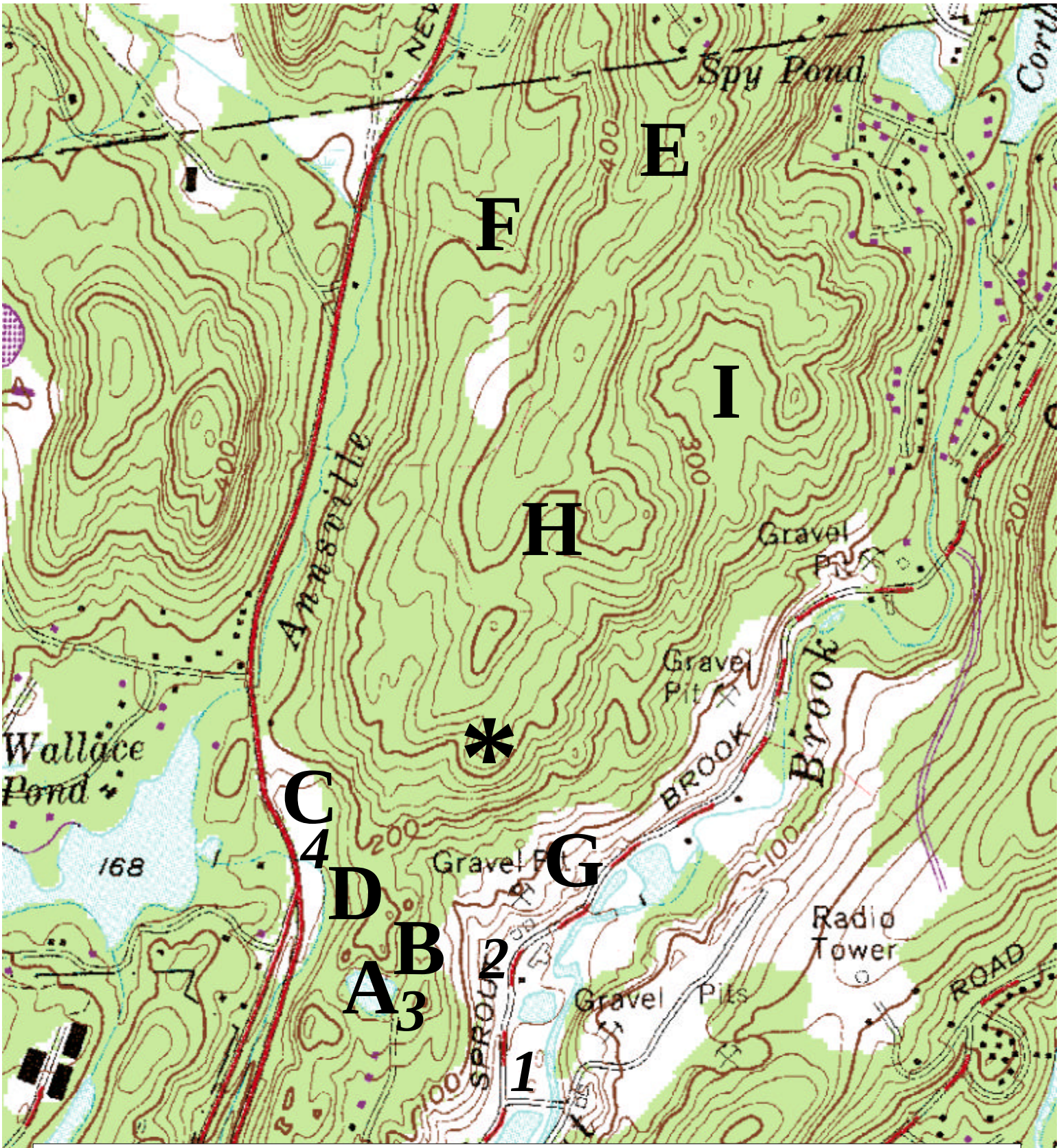

Figure 1. Major locations referenced in the text.

Letters correspond to text in the section entitled "Wildlife Species and Habitats." Numbers indicate areas considered for parking lots, as discussed in the section entitled "Park Infrastructure Development." The asterisk indicates the ideal location for a scenic overlook.

A. Buttonbush (Cephalanthus occidentalis) wetland; north end of Doris Lee Drive

Representative species (confirmed observations):

- Spotted salamander (egg masses)
- Red-spotted newt
- Spring peeper
- Bullfrog
- Green frog
- Pickerel frog
- Snapping turtle
- Painted turtle
- Spotted turtle
- Blanding's turtle

In Westchester County, buttonbush wetlands are an uncommon wetland type. Buttonbush is the most flood-tolerant of the scrub-shrub species; it will establish and grow in pond-like conditions. This particular wetland functions as habitat for important vernal pool-dependent species, including spotted salamanders and spotted turtles (State-listed as Special Concern). The presence of spotted salamander egg masses is evidence that this wetland provides good breeding habitat. High-quality vernal pool breeding habitats are rapidly disappearing from our region as they are degraded or altered for development. It is imperative that the upland forest surrounding this wetland, which is currently intact and provides habitat for pool-dependent species during the non-breeding season, remain unaltered—further discussion is provided in the section entitled, "Park Infrastructure Development."

The presence of the Blanding's turtle (State-listed as Threatened) is also noteworthy. However, it should be noted that HHGP is located outside of the known range of this species, and that the individuals observed could be formerly captive animals (pets) that have been released. Verification of the status of this observation would require that the animals be captured and inspected by a herpetologist specializing in turtles.

B. Vernal pool north of buttonbush wetland (described in A, above)

Representative species (confirmed observations):

- Spotted salamander (egg masses)
- Green frog
- Wood frog
- Box turtle

This vernal pool is very important for several species that rely on such habitats. The presence of young wood frogs and of spotted salamander egg masses—two vernal pool indicator species—indicates that this pool provides high-quality habitat that contributes to the local and regional maintenance of amphibian biodiversity. As with

the buttonbush wetland (see A, above), the upland habitat surrounding this pool is of critical importance for adult amphibians during the non-breeding season. The box turtle—listed by the State as a Special Concern species—also uses this pool as part of its required mosaic of upland and wetland habitats.

C. Gravel pit adjacent to Route 9 (southwest portion of park)

Representative species (confirmed observations):

- Box turtle
- Eastern worm snake
- Black racer

The park has a number of gravel mines dispersed around its perimeter. These gravel mines have, in general, disturbed the existing forest cover and degraded existing habitats. They also contain populations of invasive species (e.g., *Phragmites australis*, *Rosa multiflora*, etc.) that threaten the more healthy habitats within the park's interior. However, the gravel mining operations have also uncovered sandy/gravelly substrates and opened up the forest canopy—key habitat parameters required by certain reptile species for successful nesting.

The gravel pit in the southwest portion of the park (adjacent to Route 9) provides very important nesting habitat for box turtles (State-listed as Special Concern), black racers, and worm snakes (State-listed as Special Concern). Northern copperheads (County-listed as Special Concern) also use this habitat.

D. Vernal pool south of gravel pit (described in C, above)

Representative species (confirmed observations):

- Jefferson salamander (egg mass)
- Spotted salamander (egg masses)
- Marbled salamander (larvae)
- Red-spotted newt
- Spring peeper
- Wood frog

The presence of a diverse suite of vernal pool amphibians in this area is very encouraging. However, much of the area has been invaded by *Phragmites*; in addition, the pool has been degraded by ATV activity (i.e., rutting and erosion). If *Phragmites* expansion continues (which is highly probable, unless restoration attempts are made), the pool will no longer be able to provide the microhabitat required by these species. Likewise, if the pool continues to be degraded by ATV activity, amphibian reproductive efforts are likely to fail. The future of this pool is uncertain, but the rich assemblage of species indicates that this habitat was once very productive. The presence of marbled salamanders (State-listed as Special Concern) is

particularly noteworthy. This species requires long-hydroperiod pools; their presence indicates that HHGP pools have diverse hydroperiods that can meet the requirements of a rich assemblage of pool-dependent amphibians.

The presence of Jefferson salamanders at HHGP is uncertain; MCA/WCS biologists observed one egg mass that exhibited characteristics typical of a Jefferson salamander egg mass. Further investigations are recommended to ascertain the status of this species (State-listed as Special Concern) at HHGP.

E. Ridge top and associated vernal pool (north-central portion of park)

Representative species (confirmed observations):

- Spring peeper
- Gray treefrog
- Bullfrog
- Green frog
- Wood frog
- Snapping turtle
- Eastern worm snake
- Black rat snake

In addition to the vernal pools of the southern portion of the park (described above), an important vernal pool occurs in the northern portion. As with all productive vernal pools, management considerations should extend to the surrounding uplands, which provide critical habitat for amphibians during the non-breeding season. In this case, management concerns are extended to include a large portion of the surrounding ridge.

The presence of the gray treefrog indicates a structurally complex understory (of tall shrubs and other low vegetation). If trails are routed past or through this habitat, it is important to maintain this structural complexity within the vegetation, in order to ensure that this species will continue to use the area. We recommend that no vegetation clearing occur in or around this, or any other, vernal pool—regardless of viewability.

Worm snakes (State-listed as Special Concern) were also observed on this ridge top. Worm snake populations are disappearing from the Westchester landscape due to suburban sprawl. HHGP provides an important refuge for these snakes.

F. Slope wetlands, ephemeral streams, and seeps along west-facing slope

Representative species (confirmed observations):

- Red-spotted newt
- Slimy salamander
- Spotted salamander
- American toad
- Wood frog
- Black rat snake
- Box turtle

Because this area discharges groundwater, it is important not only for wildlife, it is also important for maintenance of base flow in Annsville Creek during dry seasons and droughts. The mature forest contains a number of wetland-associated shrub species (e.g., spicebush and arrow-wood); the forest floor is dominated by skunk cabbage and *Sphagnum* moss in the wetter portions.

Several of the amphibian species present (e.g., spotted salamander, wood frog) are indicative of vernal pool habitats, which is not surprising, given the ephemeral nature of the wetlands. The slimy salamander (listed in Westchester as Special Concern) requires moist slopes under a mature forest canopy; the presence of this species, which is relatively rare in Westchester County, indicates a healthy habitat. Box turtles (State-listed as Special Concern) were observed in many portions of the park; the slope forested wetlands in this area serve as excellent habitat for foraging and hibernation.

Birds

Breeding bird surveys were conducted between mid-May and late June. Bird surveys conducted during this time period increase the likelihood of detection (because birds are actively and audibly defending territories), and enable determination of habitat suitability and the relative importance of the park to regional avian populations (because birds are producing offspring during this period). Surveys were conducted during early morning hours—between 5:30 am and 10:00 am—which is the peak daily activity period for most bird species. Survey methods consisted of transect surveys; all birds seen or heard by ornithologists were recorded as they walked routes that traversed all habitats within the park.

The main goal of the bird surveys was to detect birds that utilize the park for breeding territories. However, during the first bird survey, which was conducted fairly early in the season, a number of migrants were detected. These birds were using the park as stopover habitat, as they made their way to breeding grounds further north. Stopover habitat is critical for migrating birds, as this is where they rest and refuel. HHGP provides high

quality stopover habitats that facilitate bird migrations. This is a very important function of the park.

As has been stated previously, the primary concern for wildlife at this site has already been addressed—the site has been preserved and is no longer under threat of residential development. This is particularly true for many of the bird species onsite, which require large expanses of mature forest. The hilly, mixed evergreen/deciduous forest contains a variety of niches for species that are far less likely to occur in the less diverse and smaller, fragmented woods of other parks in the county.

The following discussion of birds and bird habitats within the park is broken down into fewer components than for the reptiles and amphibians. This is because many bird species are wider-ranging and more mobile than the reptiles and amphibians; their home ranges often span a larger area and a greater diversity of habitats. As with the previous section, bird habitats are labeled alphabetically and indicated on the map (Figure 1).

G. Young second-growth forest and scrub-shrub habitat of gravel mines, southeastern and southwestern portions of park

Representative species:

- Eastern Kingbird
- Eastern Phoebe
- Blue Jay
- American Crow
- Brown-headed Cowbird
- Baltimore Oriole
- Common Grackle
- American Goldfinch
- White-throated Sparrow
- Chipping Sparrow
- Northern Cardinal
- Indigo Bunting
- Northern Parula
- Yellow Warbler
- Yellow-rumped Warbler
- Blue-winged Warbler
- Common Yellowthroat
- Gray Catbird
- White-breasted Nuthatch
- American Robin
- Eastern Bluebird

The gravel mines along the southeastern and southwestern edges of the park have, for the most part, succeeded into young, second-growth woods and scrub-shrub habitat. Although this young habitat harbors invasive plants that could threaten the more intact, mature forest in the park's interior, it also serves as excellent habitat for a number of species that require more open conditions. For example, the chipping sparrow, indigo bunting, common yellowthroat, and blue-winged warbler all require earlier-successional habitats; none of them utilize mature forests.

The same open habitats are suitable for avian nest predators and parasites. For example, brown-headed cowbirds were observed in the former gravel mines. This species lays its eggs in the nests of forest birds (e.g., warblers), thereby compromising the host species' ability to successfully reproduce. If these wooded areas were allowed to mature (i.e., succeed into mature forest), the threat of brown-headed

cowbird parasitism would be somewhat reduced. However, such succession would also eliminate habitat for the desirable scrub-associated birds listed above (e.g., blue-winged warblers and indigo buntings); critical amphibian habitat would also be eliminated. A more thorough discussion on this topic is provided in the recommendations section.

H. Mature forest, interior portions of the park

Representative species:

- Cooper's Hawk
- Broad-winged Hawk
- Red-tailed Hawk
- Hairy Woodpecker
- Downy Woodpecker
- Red-bellied Woodpecker
- Yellow-shafted Flicker
- Eastern Wood-Pewee
- Blue Jay
- Baltimore Oriole
- Slate-colored Junco
- Eastern Towhee
- Northern Cardinal
- Rose-breasted Grosbeak
- Scarlet Tanager
- Cedar Waxwing
- Red-eyed Vireo
- Warbling Vireo
- Black-and-White Warbler
- Worm-eating Warbler
- Northern Parula (migrant)
- Black-throated Blue Warbler (migrant)
- Magnolia Warbler (migrant)
- Bay-breasted Warbler (migrant)
- Blackpoll Warbler (migrant)
- Black-throated Green Warbler
- Ovenbird
- Louisiana Waterthrush
- Canada Warbler
- American Redstart
- White-breasted Nuthatch
- Eastern Tufted Titmouse
- Black-capped Chickadee
- Ruby-crowned Kinglet (migrant)
- Blue-gray Gnatcatcher
- Wood Thrush
- Veery
- American Robin

The mature forests represent the bulk of the habitat at HHGP. This habitat actually contains a variety of individual forest types (e.g., chestnut oak along the ridgelines, eastern hemlock on cooler slopes, black/red oak on dry to mesic sites, red maple in the lower areas, and other types). These forest types are highly interdigitated and, as stated previously, the home ranges of birds often span several forest types. For that reason, they are synthesized here into one unit.

The Cooper’s hawk (State-listed as Special Concern) is particularly noteworthy; it chases down songbirds under forest canopies. The presence of this hawk indicates a healthy community of forest songbirds. The warbler population is also noteworthy. Canada warblers (County-listed as Special Concern) are rapidly disappearing from Westchester County; this area-sensitive, forest-interior species requires dense shrublayers found in wetlands and on moist slopes. The Louisiana Waterthrush (also a warbler) nests and forages along forested streambanks. Scarlet tanagers prefer drier forests, as do worm-eating warblers, which tend to occur on dry, steep wooded slopes.

There are two aspects to maintaining this suite of forest-interior, area-sensitive birds at HHGP. The first aspect has already been addressed: the forest has been preserved. The second aspect involves the long-term maintenance of microhabitats in all of the parks forested areas. Minimization of the impact of recreation activities within the park is a major part of this second aspect. More details are provided in the recommendations section.

I. Forested and scrub-shrub wetlands, and forested stream corridors

Representative species (partial list):

- Yellow-billed Cuckoo
- Hairy Woodpecker
- Downy Woodpecker
- Eastern Wood-Pewee
- Blue Jay
- Black-and-White Warbler
- Great Crested Flycatcher
- Common Yellowthroat
- Louisiana Waterthrush
- Canada Warbler
- Veery

As with reptiles and amphibians, birds flourish in and near wetlands. Research has demonstrated that even those birds considered to be upland species occur more frequently, and in greater abundance, near wetlands. This is likely due to the greater availability of cover and foraging opportunities. In addition to the wetlands discussed in the "Amphibians and Reptiles" section, above, there is an additional important wetland. This is the largest of the wetlands in the park, a forested and scrub-shrub swamp located in the northeastern portion of the park. This seasonally-flooded swamp is dominated by red maple and contains spicebush, sweet pepperbush, royal fern, skunk cabbage, and *Sphagnum* moss, among other species.

The list above contains some of the bird species found in this large swamp and also in other wetland and forested stream corridors on the site. As stated previously, the presence of Canada Warblers in this park is significant; this species is declining in Westchester and throughout the region as its forested habitats are fragmented by development. Because of the park's size and habitat types, Canada warblers may be able to maintain a foothold in the County. The yellow-billed cuckoo is known to nest in shrub swamps; it was observed in the large swamp in the northeast.

Recommendations

Habitat Management

Invasive Species

The site is fringed by invasive species (e.g., Japanese barberry, common reed, multiflora rose), which have established in the disturbed substrates of the former gravel mines. Invasives (especially multiflora rose) can also be found along the trail that starts at Route 9, in what are probably former home sites. As invasive plants become established, they tend to exclude native species. This results in a simplified habitat consisting of no more than a few plant species, most of which are of limited use to wildlife. After becoming established in disturbed areas, many of these species are capable of radiating outwards into native habitats.

The mature, intact forest canopy that comprises the bulk of HHGP appears able, for the most part, to exclude invasives. Healthy habitats tend to resist invasive plants. The mature upland forests therefore buffer the wetlands within them, which would otherwise be highly susceptible to invasion by *Phragmites* and purple loosestrife. For most of the site, we recommend that no action be taken to remove invasive species. The process of removing invasive plants results in disturbed, compacted, bare substrates—conditions that favor re-invasion by the same species that have just been removed. Often, the ecological costs of removing invasives outweigh the benefits to the native plant and animal communities.

In the wetlands that are currently free of invasives, we recommend annual monitoring to identify incursions by invasives—*Phragmites* and purple loosestrife in particular. This monitoring could be done by a biologist, or by volunteers trained to identify these species. If caught at an early stage, it may be possible to remove the invading plants by hand before they become well-established. Careful monitoring can result in the maintenance of healthy habitats and, therefore, the maintenance of the park's biodiversity.

The only wetland that has been invaded by *Phragmites* is the vernal pool along Annsville Creek in the southwestern portion of the park (indicated as "D" in Figure 1). This wetland was formerly disturbed by mining activities; disturbance continues as a result of ATV activities. Because of (1) the continued disturbance, (2) the proximity of this wetland to a probable seed source for invasive species (i.e., Annsville Creek), and (3) the presence of sensitive species within this wetland, we recommend that this area be maintained in its current condition. Although its condition is not perfect, removal of invasives could compromise existing wildlife resources. We do recommend that the site be monitored closely. If the *Phragmites* appears to be spreading, it may be advisable to hand-cut the *Phragmites* stems and apply (through careful "drip" or "painting" methods) a glyphosate to the cut stems. If this management technique is attempted, it should be done twice in each growing season; the *Phragmites* will definitely require monitoring and repeated applications in subsequent years. By stopping the spread of *Phragmites*, it may be

possible to bolster marbled salamander populations, which have apparently been declining in this pool in recent years.

Managing the Park's Native Vegetation

Maintaining structural complexity. Beyond invasive species issues, discussed in the previous section, very little habitat management needs to occur. The park provides excellent wildlife habitat in its current condition, and requires little alteration. In fact, we strongly advise against altering the existing habitat structure. In the forests and wetlands, dead vegetation should be left on the ground, dead trees should be left standing (or left where they fall), and thick shrubs should be left untrimmed. Of course there are exceptions to these recommendations; removal of debris from trails and the parking lot can be accomplished with minimal impact. However, overall, alterations that reduce the structural complexity of forests and wetlands lead to simplified environments—environments that cannot support the biological diversity found in more complex habitats. In most urban and suburban parks, intensive management of natural vegetation (i.e., landscaping or "clean-up") has led to the loss and decline of many wildlife species.

Maintaining critical terrestrial habitat around wetlands. Small wetlands—vernal pools in particular—provide primary breeding habitat for many amphibian species (e.g., Jefferson salamanders, spotted salamanders, marbled salamanders, wood frogs). The structure and composition of vegetation within these wetlands should not be altered (with the possible exception of invasive species removal). However, these amphibians depend on more than just the wetlands; they also require undisturbed forested upland surrounding the wetlands during the non-breeding season. The previous paragraph states that the park's vegetation should be left unaltered. This is especially true for the upland areas surrounding wetlands, within about 750 feet (for further details and recommendations, see MCA Technical Paper #5, "Best Development Practices: Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States," 2002, by A.J.K. Calhoun and M.W. Klemens). Foot trails surrounding wetlands will not do too much damage if constructed properly; in addition, it may be desirable to route foot trails near wetlands to increase environmental education opportunities. However, trails near wetlands should be narrow (to minimize the trail's "footprint") and vegetation clearing around such trails should be minimized to the greatest extent possible.

Succession of gravel mine habitats. As stated in the previous paragraph, the majority of the park's habitats need no specific management. However, the question remains of how to manage the already degraded habitats—the areas mined for gravel. We recommend that the gravel mines along Sprout Brook Road be allowed to succeed into a more mature forest canopy. This area does not appear particularly important for amphibians or reptiles. Although early-successional habitat for certain species of birds (e.g., indigo bunting, blue-winged warbler) would disappear if the area were allowed to succeed, this would be offset by the fact that the forest cover would also be less suitable for undesirable avian nest parasitizers (e.g., brown-headed cowbirds).

Because the gravel pit in the southwest (area D, Figure 1) contains a diversity of uncommon reptiles, it should be actively maintained as open habitat. Woody vegetation should be removed, and attempts should be made to maintain a relatively bare substrate (interspersed with native grasses, at most). Any clearing activities should be done very carefully, so as not to disturb wildlife populations. Clearing should only be done from November through February, when the animals are hibernating or relatively inactive, and should only be done manually (i.e., by hand, without the use of power machinery). The use of heavy equipment would compact substrates, disturb the desirable vegetation, and potentially render the habitat unsuitable for the reptiles. Because of all of these considerations, we recommend consulting with a biologist to minimize the potential negative impacts of habitat restoration attempts.

Creating scenic overlooks. On an initial visit to the site, Cortlandt staff indicated that a scenic overlook on the proposed trail system was desired. Regardless of where this occurs, it would require clearing of vegetation. Clearing of ridge tops for scenic views should be limited to one or two places only (see Figure 1 for recommended viewshed location). Northern copperheads were observed in the gravel pit within HHGP along Route 9; the rocky outcrops and ridge tops of the park provide excellent potential hibernacula (hibernation locations). Clearing the canopy cover and bringing more people into this copperhead habitat would have significant negative impacts on this species. As surrounding unprotected areas are developed, HHGP has the potential to serve as one of the last refuges for local copperhead populations (along with Teatown Lake Reservation).

Maintaining HHGP's Wildlife

Maintaining wildlife populations can be accomplished by meeting three different criteria: habitat area, habitat quality, and habitat connectivity.

The area of the park is fixed; the Town and Scenic Hudson have already accomplished a great deal by preserving this large, significant tract of habitat.

Issues of habitat quality are addressed in other sections within this report. Most of the habitat requirements of the park's wildlife will be met if the recommendations made in the previous section ("Habitat Management") and in the following section ("Park Infrastructure Development") are followed. All of the recommendations made in those sections take into consideration the maintenance of HHGP's wildlife community.

Maintaining connectivity to the Hudson Highlands, to the north, is extremely important for the park's biodiversity. If development continues along the north edge of the park, in Putnam Valley, the existing connectivity will be severed. This will, in turn, impede the dispersal of wildlife to and from the park and could lead to wildlife population declines. Cooperative, intermunicipal efforts would be helpful in maintaining habitat connectivity.

Park Infrastructure Development

Parking

The Town of Cortlandt wishes to make HHGP more accessible to visitors. One of the primary concerns is where to site a parking lot. Siting criteria that WCS/MCA has considered include: (1) potential impacts to wildlife, (2) number of spaces needed, and (3) proximity of parking area to trails (i.e., so the parking lot can serve as a trailhead). The following potential sites are arranged in decreasing order of impacts to wildlife; discussion of the two other criteria is also included.

1. *Existing parking area east of Sprout Brook Road*. Because this area is off-site, and because it already exists, use of this area for HHGP parking would have zero impact to wildlife. The area currently provides parking for recreational activities in Sprout Brook Park. It provides far more parking spaces than could ever be constructed within the boundaries of HHGP, and thus could support the most visitors. Because it already exists, this could be the cheapest parking alternative. However, to ensure the safety of HHGP visitors, this alternative might require installation of a crosswalk or other traffic-calming devices (e.g., signage, flashing yellow lights, or "islands" in the center of Sprout Brook Road). The Town may want to consult their traffic accident records for this stretch of Sprout Brook Road to determine what types of traffic calming devices, if any, might be required.

   At this point, we are unaware of whether or not this parking area reaches maximum capacity and, if so, how frequently that occurs. If the Town considers this site to be a viable alternative (in terms of parking capacity), we highly recommend that this zero-impact option be chosen.

2. *Flat area along Sprout Brook Road (within HHGP)*. This area, originally identified by Town staff and pointed out to MCA/WCS biologists, consists of a low, wet area within the gravel mine along the southeast perimeter of HHGP. Normally, we would argue for avoiding all impacts to any wetlands—at all costs. However, this human-made wetland was created as a result of gravel mining operations. It is the only flat area in this heavily-impacted portion of the park, and therefore the only area suitable for parking lot construction. In terms of vegetative complexity, it is very simple. It also contains invasive species. For all of these reasons, the site has very low biodiversity value. During our surveys, no amphibian or reptile species were found in this area, though some almost certainly would occur here. A few relatively common bird species, such as song sparrow, were found on the fringes of this site; however, appropriate habitats for these species can be found in other portions of the park and in nearby areas.

   Trail access from this site may be an issue. Our understanding is that the Town wishes to construct three trail networks ranging from short/easy to long/difficult. This site is surrounded by steep slopes and is fairly distant from points-of-interest (e.g.,

wetlands, scenic views). Therefore, it might be difficult to construct a short and easy trail that originates from this site.

This site probably has the lowest biodiversity value of a relatively level (i.e., buildable) area within the park. Therefore, if the Town feels that the parking lot must be built within the bounds of the park, this is the best location. However, the area is small and could only accommodate a few vehicles. Due to its low potential parking capacity, and due to the fact that the previous option (Option 1) would have zero impact to wildlife, we continue to strongly recommend that the Town pursue Option 1 to meet visitors' parking needs.

3. *End of Doris Lee Drive*. At the end of Doris Lee Drive, some parking opportunities already exist—the lane terminates in a graveled area that can accommodate a few cars. This area is separated from the park by fencing. Continued use of the existing parking spaces would not negatively impact the park's wildlife populations. However, we strongly recommend against expansion of this parking area. The wetlands immediately to the north of this site (see areas A and B in Figure 1) contain a diversity of rare and significant reptiles and amphibians.

   If the parking area were expanded, this wildlife community would be negatively impacted by the close proximity of cars to breeding habitat and by increased foot traffic around the wetland. If stormwater from an expanded parking area was allowed to run off into the wetland, the increased pollutant levels in the pond would also negatively impact plants and animals. Conversely, attempts to divert stormwater away from the wetlands would also cause negative impacts by influencing the hydrologic regime (the duration and extent of inundation).

   For all of these reasons, we recommend that no additional parking areas be constructed at this site. However, it would be appropriate to maintain the few existing parking spaces. This may be desirable, because the site is close to points-of-interest (i.e., the biologically diverse wetlands), it already serves as a trailhead, and that trail is relatively easy to traverse. Therefore, it is suitable for access to the short/easy trail system that the Town intends to maintain.

   If the Town determines that Option 1 (i.e., using already-available offsite parking) is not feasible, perhaps the next best alternative would be to combine Options 2 and 3. A few parking spaces could be provided in the site described in Option 2; these would provide access to the longer moderate and difficult trails. Existing parking at the end of Doris Lee Drive could serve as trailhead for the easy/shorter trail. It is up to the Town to determine whether or not it is desirable to have two separate access points.

4. *Gravel pit along southwest side of HHGP (off of Route 9).* Although this site is level, and it could accommodate a number of cars, and the habitat appears to be degraded (and all of these elements, at first glance, appear to be ideal for siting a parking lot), we strongly recommend against using this area for parking. Despite its degraded appearance, this area serves as nesting habitat for worm snakes, black racers, and box

turtles—all of which are declining in our region. Construction of a parking lot would destroy this fragile habitat. In addition, access to the site is off of Route 9; parking lot construction along this busy road would undoubtedly cause congestion problems and may increase accident rates. Construction would also involve a stream crossing, which would raise further environmental and permitting issues. For these reasons, we recommend that the Town avoid construction of parking areas anywhere along the west side of the park.

Regardless of where parking for HHGP is sited, we recommend that construction adhere to "Low Impact Development" (LID) techniques. These innovative stormwater management techniques remove most pollutants from runoff and reduce the impact on the hydrology of surrounding streams and wetlands. Traditional stormwater management for parking lots is often detrimental to surrounding habitats and wildlife populations. Further details about LID technology can be found on the following websites:

http://www.lid-stormwater.net/

http://www.lid-stormwater.net/intro/background.htm#9

http://www.lowimpactdevelopment.org/

Trails

HHGP is currently traversed by a complex network of trails. Most of these trails appear to be used for foot traffic, but others are used for mountain biking and all-terrain vehicles (ATVs). Rather than building new trails, the Town is faced with the dilemma of choosing which of the many existing trails to develop and maintain. We recommend that no new trails be built; we also recommend that most of the existing trails be blocked off. Some of these closed trails may need to be restored (e.g., fixing erosion problems near streams and wetlands). Trail closures would reduce impacts to wildlife, simplify trail maintenance, reduce maintenance costs, and clarify routes for park visitors.

We understand that the Town wishes to maintain three trail systems that range in difficulty from (1) easy and short to (2) moderate and mid-length to (3) difficult and long. With only a few caveats (discussed below), the Town can select from any of the existing trails. The Town has already been in contact with personnel from the New York/New Jersey Trail Conference, who have mapped many of the trails using GPS technology. We recommend that the Town continue to consult with trail experts at the NY/NJ Trail Conference to determine which trails should be maintained and which should be closed off.

The selection of trail locations depends, to a great degree, on the location of potential trailheads. Therefore, the selection of trails is closely linked to the siting of a parking lot. See the previous discussion about parking for more details.

Although hiking is categorized as a "passive" form of recreation, it can still result in some impacts to wildlife. For example, trail substrates can run off into wetlands during

storm events, degrading wetland habitats through sedimentation. In addition, the sound and movement of humans in sensitive habitats can cause stress for some wildlife species, resulting in impacts to reproductive attempts. HHGP is extremely important for biodiversity. Although hiking at the park can result in increased environmental awareness, consideration should be given to wildlife habitat conditions by routing trails to avoid sensitive areas.

Trails should be kept out of wetlands. There is always a tradeoff between environmental education opportunities and aesthetics on the one hand, and impacts to wildlife on the other. As a compromise, we recommend that at least one of the trails be routed near a wetland, but that all trails should be set back from wetland edges by at least 50 feet. This should enable viewing of wetland habitats and at the same time should minimize impacts to the wetlands. The one exception to this recommendation involves stream crossings, which may be necessary at various points throughout the park. Stream crossings should not use pressure treated lumber. Vegetation clearing around wetlands (to enhance viewing opportunities) should be minimized. Such clearing simplifies the habitat, reducing its ability to support biodiversity.

To the greatest extent possible, trails should avoid the rocky outcrops along the ridge tops (with the exception of the area marked as a scenic overlook in Figure 1). As stated previously, worm snakes occur in these areas, and it is very likely that copperhead snakes also occur in these habitats.

It is important to carefully select the materials used to construct and maintain the trails. The trails should not be paved because impermeable surfaces negatively impact surrounding habitats. However, the trail substrate should also be erosion-resistant (especially near wetlands) to reduce the amount of sedimentation during storm events. For the easy trails, a consistent, even substrate may be desirable, but for the moderate to difficult trails we recommend adding no additional substrate (e.g., design like the Appalachian Trail). Finally, we recommend consulting with trail-building experts (i.e., continue conversations with the New York/New Jersey Trail Conference personnel).

Visitor Center

If, in the future, an interpretive/visitor center is desired, it should be constructed along Sprout Brook Road in the area formerly mined for gravel. The rationale and constraints for siting the center here are similar to those for siting the parking lot. See the previous section about parking for more details.

Multiple Uses of Park Resources—Conflicts and Compatibilities

The use of ATVs and mountain bikes on park trails will facilitate the invasion of a number of exotic species into the heart of the park. In addition, these activities increase erosion rates on trails, leading to water quality degradation and increases in frequency of

trail maintenance. Noise levels from ATVs negatively impact wildlife; it has been demonstrated through research that many species of wildlife cannot reproduce successfully near trails and roads with vehicular traffic. In addition, ATV and mountain bike traffic can destroy the ambience that park visitors (i.e., pedestrians) seek in such a setting. Multiple use of resources is always a concern; parks should be accessible to all who can appreciate them. However, some uses are in direct conflict with others. Because of the high quality of this habitat, and because this habitat serves as a refuge for many wildlife species that are disappearing from our rapidly urbanizing landscape, we highly recommend that ATV traffic and mountain bikes be excluded, to the extent that this is possible. The site should continue to function as wildlife habitat, and it should be used by the citizens of Cortlandt and surrounding communities for its passive recreation opportunities (e.g., hiking, environmental education, wildlife watching). There are other parks in the nearby vicinity that allow more active recreation (e.g., ball games, picnicking).

ATVs should be kept out of the southwest gravel pit. ATV traffic in this area is extremely hazardous to the diverse and sensitive wildlife species in this former mine. ATVs should also be kept out of stream corridors and other wetlands; these areas also tend to be biologically diverse and particularly sensitive to such impacts. To eliminate ATV traffic, barriers could be placed at known entry points. As the park becomes more prominent in the public eye, and more heavily accessed by walkers and other park visitors, ATV traffic may dissipate.

Appendix A. Birds of Hudson Highlands Gateway Park[1]

Bird Species[2]	NY Status	Westchester Status	Source[3]
Mallard			F
Mottled duck			M
Wood duck			F
Canada goose			M
Green heron			F
Killdeer			M
Wild turkey			B
Turkey vulture			B
Cooper's hawk	SC	E	M
Red-tailed hawk			B
Broad-winged hawk			B
Barred owl			B
Yellow-billed cuckoo			M
Hairy woodpecker			B
Downy woodpecker			B
Pileated woodpecker			F
Red-bellied woodpecker			M
Yellow-shafted flicker			M
Eastern kingbird			M
Great crested flycatcher			M
Eastern phoebe			M
Eastern wood-pewee			M
Blue jay			B
American crow			B
Brown-headed cowbird			M
Red-winged blackbird			B
Baltimore oriole			M
Common grackle			M
American goldfinch			B
White-throated sparrow			M
Chipping sparrow			M
Field sparrow			M
Slate-colored junco			M
Eastern towhee			M
Northern cardinal			B
Rose-breasted grosbeak			M
Indigo bunting			M
Scarlet tanager			M
Cedar waxwing			M
Red-eyed vireo			M

[1] Compiled from MCA/WCS 2002 surveys, MCA/WCS 2000 surveys, and the 1996 Jay Fain report.
[2] Common names provided at the sub-species level.
[3] M = Species observed during MCA/WCS surveys; F = Species observed during Fain surveys; B = Species observed during both MCA/WCS and Fain surveys.

Bird Species	NY Status	Westchester Status	Source
Warbling vireo			M
Black-and-white warbler			B
Worm-eating warbler		SC	M
Blue-winged warbler			M
Northern parula			M
Yellow warbler			M
Black-throated blue warbler			M
Myrtle warbler			B
Magnolia warbler			M
Bay-breasted warbler			M
Blackpoll warbler			M
Blackburnian warbler			F
Palm warbler			F
Black-throated green warbler			M
Prairie warbler			M
Ovenbird			B
Louisiana waterthrush			M
Common yellowthroat			M
Canada warbler		SC	M
American redstart			B
Gray catbird			B
Brown thrasher			M
White-breasted nuthatch			B
Eastern tufted titmouse			B
Black-capped chickadee			B
Ruby-crowned kinglet			M
Blue-gray gnatcatcher			M
Wood thrush		SC	B
Veery			M
American robin			B
Eastern bluebird			M

Appendix B. Amphibians of Hudson Highlands Gateway Park[1]

Amphibians	NY Status	Westchester Status	Source[2]
Jefferson salamander[3]	SC	T	M
Spotted salamander			M
Marbled salamander	SC		M
Unidentified ambystoma larvae			B
Northern dusky salamander		T	F
Redback salamander			M
Northern slimy salamander		SC	M
Red-spotted newt			M
American toad			B
Northern spring peeper			B
Gray treefrog			B
Bullfrog			M
Green frog			B
Pickerel frog			M
Wood frog			B

Appendix C. Reptiles of Hudson Highlands Gateway Park[1]

Reptiles	NY Status	Westchester Status	Source[2]
Common snapping turtle			B
Eastern painted turtle			B
Spotted turtle	SC	T	M
Blanding's turtle[4]	T		M
Eastern box turtle	SC	T	M
Worm snake	SC	SC	M
Northern black racer			M
Black rat snake			M
Eastern garter snake			F
Northern copperhead		SC	M

[1] Compiled from MCA/WCS 2002 surveys, MCA/WCS 2000 surveys, and the 1996 Jay Fain report.
[2] M = Species observed during MCA/WCS surveys; F = Species observed during Fain surveys; B = Species observed during both MCA/WCS and Fain surveys.
[3] Presence of Jefferson salamanders at HHGP is uncertain; MCA/WCS biologists observed one egg mass that exhibited characteristics typical of a Jefferson salamander egg mass.
[4] Two mature Blanding's turtles were observed at HHGP. However, this site is outside of the range of this species; the individuals may have been captive animals (i.e., pets) that were released at HHGP. Because the presence of a wild population of this species at HHGP would be highly significant, further investigations are recommended.

Appendix D. Additional reptile species that are likely to occur at Hudson Highlands Gateway Park[1]

Reptiles	NY Status	Westchester Status
Northern five-lined skink		SC
Eastern fence lizard	T	T
Northern ringneck snake		
Eastern hognose snake	SC	SC
Eastern milk snake		
Northern water snake		
Northern brown snake		

[1] Although not detected during any of the surveys, these species are highly likely to occur at HHGP. This list was prepared based on (1) the availability of appropriate habitats at HHGP, (2) the biogeographical setting of the park, and (3) the proximity of the park to known occurrences of these species. Further surveys would likely reveal the presence of most of these reptiles.