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Preliminary Biodiversity Assessment of the Winston Farm Property, Town of Saugerties, Ulster County, New York

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Report to **Catskill Mountainkeeper**

30 September 2022

Executive summary

Hudsonia conducted a preliminary biodiversity assessment of the Winston Farm property in the Town of Saugerties, Ulster County. The goals of the assessment were to catalogue the ecologically significant habitats on the site, assess which animal and plant species are likely to be using them, and evaluate potential impacts to species and habitats of conservation concern of a large development project proposed for the site. This project is a massive mixed-use development, which as currently envisioned would disturb roughly 400 acres (ac) (160 hectares [ha]) of natural vegetation, including 274 ac (111 ha) of forest clearing, and would create roughly 200 ac (80 ha) of new impervious surfaces.

We mapped 18 types of ecologically significant habitats, comprising 782 ac (317 ha), or 97% of Winston Farm (WF), with only 3% already developed. 65% of the site—518 ac (210 ha)—is forested, mostly with upland hardwood forest (450 ac [180 ha]). 177 ac (72 ha) of meadows cover 22% of the study area. Wetlands are numerous across the site and account for at least 13% of WF—106 ac (43 ha). Our most significant findings included extensive, unbroken forest, most of which is part of a regionally significant, 1,200-ac (500-ha) forest block; rocky areas that harbor rare plants and animals; two large meadows of > 50 ac (20 ha); 17 woodland pools; two buttonbush pools; large and diverse wetlands, including extensive 100-year floodzone wetlands; a large great blue heron rookery; and roughly 1.25 miles (2 kilometers) of a major perennial stream, the Beaver Kill, that may support a population of wood turtles, a Species of Special Concern in New York.

The proposed development project at Winston Farm, or any project of its scale, would be devastating to the ecosystems, wildlife, and plants of the site and the surrounding region. It would destroy large areas of significant habitat, much of it forested, and fragment much of the remaining forest. This would severely reduce the capacity of that forest to support numerous wildlife species that require large areas or areas distant from human disturbance—e.g. many songbirds and certain raptors, snakes, and large mammals—likely reducing or extirpating their populations on and around the site. The two regionally important, large meadows would be filled with roads, buildings, parking areas, and landscaped vegetation, ending their ability to support rare grassland-breeding birds and wintering raptors, and drastically reducing habitat for pollinators, nesting turtles, and other meadow-associated species. Many wetlands unmapped by the state or federal government would likely be filled, drained, excavated, dumped in, or polluted, and others cut off from surrounding forest to animals that require multiple habitat types, namely pool-breeding amphibians as well as turtles and birds of conservation concern. Water quality in the Beaver Kill, its perennial and intermittent tributaries, and the streams it flows into may be impacted by increased runoff, flooding, siltation, and pollutant loading caused by extensive forest clearing and impervious surfaces, high vehicular traffic, chemical-heavy vegetation management, and large volumes of wastewater effluent. A map of recommended, least-impact development areas is in Appendix 1.

A preliminary bird survey of the large eastern meadows in March 2022 (Appendix 2) indicated breeding by eastern meadowlark, raptor activity (red-tailed hawk, bald eagle, American kestrel), and potential for winter foraging by Threatened and Endangered raptors.

Introduction

At the request of Catskill Mountainkeeper, Hudsonia conducted a preliminary biodiversity assessment of the Winston Farm property in the Town of Saugerties, Ulster County, New York. The purpose of the assessment was to provide basic information about ecologically significant habitats, plants, wildlife, streams, wetlands, and other features of the site, to evaluate the potential impacts of a proposed development project on those elements, and to make recommendations for future surveys during the growing season.

Saugerties Farms LLC owns the 800+ -acre (ac) (320+ -hectare [ha]) (Winston Farm (WF) property and proposes a massive mixed residential-entertainment-commercial-business- recreation development of the site, which as currently envisioned would result in roughly 400 ac (160 ha) of disturbance to natural vegetation, including 274 ac (111 ha) of forest clearing, and would create roughly 200 ac (80 ha) of new impervious surfaces (Winston Farm 2021a).

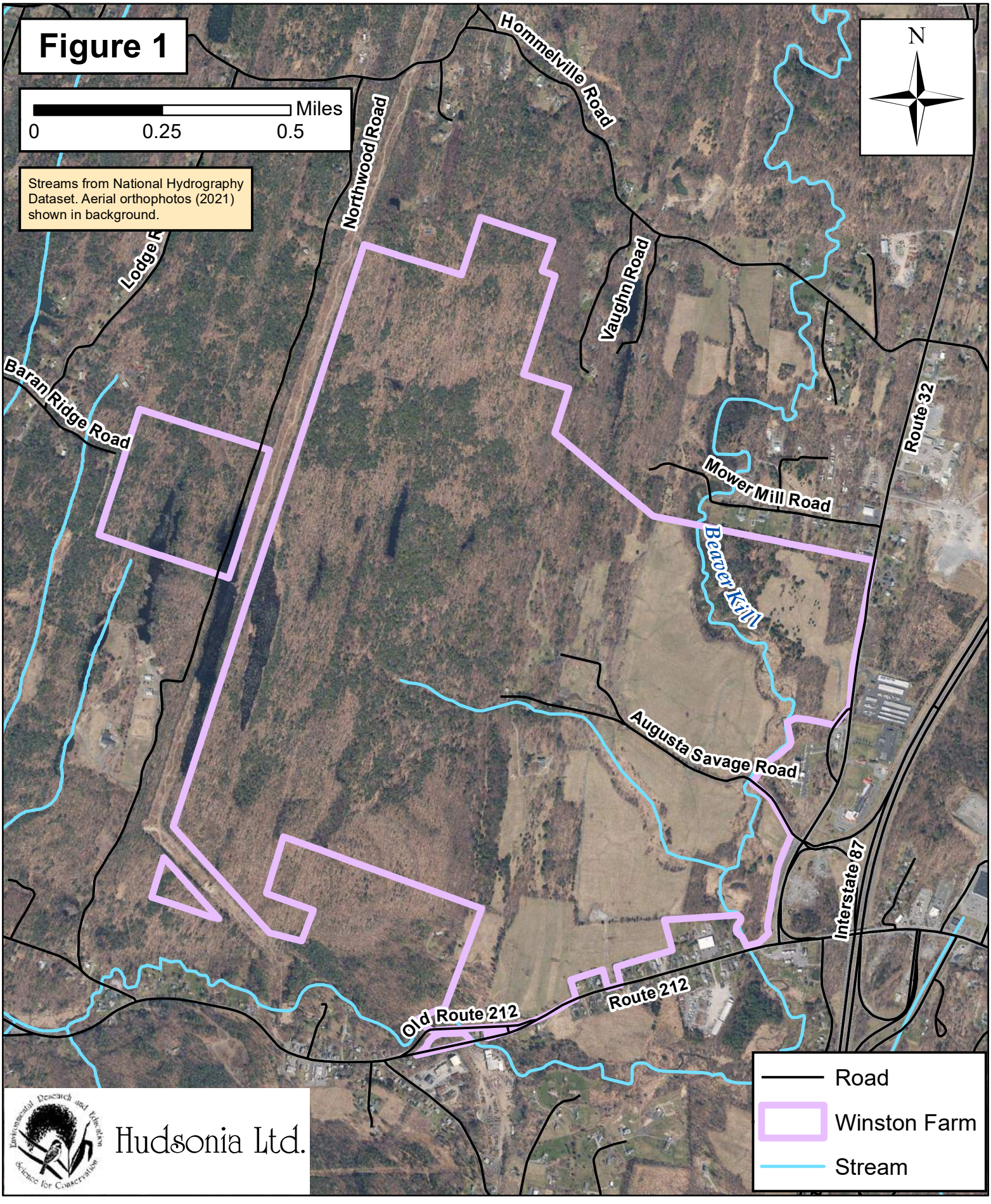
Hudsonia is a non-advocacy, non-profit institute for ecological research and education. We conduct scientific studies to assess biological resources and make recommendations for ecologically sound land management. Our findings are provided impartially to those persons and organizations involved in public decision-making and private land management.

Study area

Winston Farm is an 800+ -ac (320+ -ha) property that includes forested slopes and uplands of the Hoogeberg ridge (a north—south oriented range of hills underlain by sandstone and shale), agricultural fields on dissected a glacial lake plain at the base of the Hoogeberg slopes, the Beaver Kill and its floodplain wetlands, and fields and woods with limestone bedrock exposures east of the Beaver Kill along State Route 32. The property lies west of State Route 32, south of Hommelville Road, and north of State Route 212 (Figure 1). Most of the site is east of a utility corridor that runs mostly north-northeast—south-southwest between Hommelville Road and Rt.
212, though a square-shaped, 44-ac (18-ha) portion lies just west of that corridor. The site is accessed by Old Rt. 212 off of Rt. 212, by Augusta Savage Road off of Rt. 32, and directly from Rt. 32.

There is discrepancy in the property boundary and site area within the documents found on the developer's website (winstonfarm.com/document-center/). The developer claims that the site is approximately 815 ac (330 ha) on the 2021 Long Environmental Assessment Form (Winston

Winston Farm Property
Town of Saugerties, Ulster County, NY



Farm 2021a). However, the tax parcels listed to arrive at this total in the EAF include land occupied by the new Holiday Inn Express and the I-87 park-and-ride, both off Route 32. The Site Masterplan (Winston Farm 2021b) delineates a site boundary that excludes these two already-developed areas, and it is this site boundary that we follow. We calculate the property area for this boundary, as delineated on the 2021 Site Masterplan, to be ~803 ac (325 ha) (despite the fact that the same document states the area to be +/- 818 ac [331 ha]).

The perennial Beaver Kill flows south-to-north along the east side of the property for nearly 1.25 miles (mi) (2 kilometers [km]), forming part of the boundary, and debouches into Kaaterskill Creek, thence Catskill Creek, and finally the Hudson River. A small perennial stream feeds the Beaver Kill from the northwest, with its headwaters in the forested western part of the property; it evidently flows underground for at least part of its traverse of the large hay fields adjacent to the Beaver Kill. The Beaver Kill also flows across the property for a short distance farther upstream, near the southern WF boundary. Other streams on the site are mostly short and isolated, and probably intermittent.

The site can be divided into two distinctive compartments. The eastern half, extending to approximately 2,950-3,280 feet (ft) (900-1000 meters [m]) west of the eastern property boundary along Rt. 32, comprises a mosaic of large and small meadows (many of them agricultural), small patches of forest and shrubland, and extensive wetlands, especially in a 130-330-ft (40-100-m) - wide band on the Beaver Kill floodplain. Most of the larger meadows, west of the Beaver Kill, is flat or gently eastward sloping, draining into the Beaver Kill through hillside seeps and shallow gullies between small hills (Barbour 1991, appended). A notable exception is a high, narrow ridge in the southwestern meadow, a likely glacial drumlin (a common feature of areas with Bath soils). There are steep slopes above both sides of the Beaver Kill, above a wetland corridor centered on its perennial tributary, and along multiple north-northeast—south-southwest ridges that hem the western side of this area, some of which are partially forested. Elevations range from 446 ft (136 m), where the Beaver Kill flows out of the northeastern boundary, to ~820 ft (250 m) along the northwestern edge of the eastern agricultural half.

The western half of the property forms part of a much larger, higher-elevation area that rises steeply from lower-lying land to the east. It ranges from ~750 ft (230 m) in elevation, where steep forested slopes dip to meet meadow south of the western end of Augusta Savage Road, to 1,797 ft (548 m), the high-point of the northern end of the property, closest to Hommelville Road. This part of the site is much more rugged, with numerous hills and ridges and extensive areas of steep slopes. Topography is characterized by numerous long, narrow, parallel, north-northeast to south-southwest-trending ridges and valleys, many spanning the entire site, possibly the result of geological folding and faulting. Ravines and other low-lying areas between ridges are filled with often long, narrow wetlands, many of them apparently hydrologically isolated. A steep south-facing escarpment that drops down to the Beaver Kill valley and Rt. 212 crosses the southern boundary of WF. In the far-western, outlying parcel (west of the utility corridor), numerous small hills on either side of a lake-filled, old bluestone

quarry represent forested mounds of bluestone tailings.

A variety of soil types underlies the WF property (Tornes 1979). The forested and rugged western half of the site is chiefly underlain by Lordstown-Arnot-Rock outcrop complex (186 ac [75 ha]), Arnot-Lordstown-Rock outcrop complex (124 ac [50 ha]), and Nassau-Bath-Rock outcrop complex (88 ac [36 ha]). Arnot, Lordstown, Bath, and Nassau soils are channery silt loams, gravelly silt loams, or silt loams all derived from sedimentary rocks including acidic sandstone and shale. (*Channery* signifies the presence of many thin, flat rock fragments up to 6 inches [in] [15 centimeters {cm}] long.) Thus the soils here are mostly dry, acidic, fine loams with depth to bedrock of 10-20 in (25-50 cm) (Arnot and Nassau), 20-40 in (50-100 cm) (Lordstown), and 40-80 in (100-200 cm) (Bath). Oddly, the two large beaver pond-wetland complexes are underlain by Morris-Tuller complex, very bouldery, which is described as occurring on footslopes and summits of hills, ridges, and mountains. Thus they may represent areas of recent excavation by humans, or an unusual natural feature.

The eastern half of the site was flooded by a large lake, Lake Albany, that formed as the last Pleistocene glaciers melted back and rock debris filled the channel of the Hudson River farther south. Thin seasonal layers of clay and silt were deposited in the lake. After the debris dam breached and the lake drew down, thousands of years of erosion by water left the glaciolacustrine deposits that border much of the middle and upper Hudson River estuary. Glacial Lake Albany covered what is now the Beaver Kill and its floodplain. Silty and silty clay soils also extend farther upslope. Hudson silt loam covers the greatest area (115 ac [47 ha]), including most of the flat and gently sloping parts of the two largest meadows. Hudson and Schoharie soils generally underlie slopes of 15-25%. The Lake Albany clays are reported to contain 5.25-7.5% calcium (Hutton 2003), and Schoharie soils are derived from calcareous shale; thus all of these soils may support calcicolous (calcium- associated) plants and animals. Several other soil types occupy between 20 and 60 ac (8 and 24 ha), among them the Wayland soil complex, derived from alluvial silts and clays, which underlies most of the Beaver Kill floodplain wetlands. A noteworthy soil with a smaller area is Madalin silty clay loam, also derived from glaciolacustrine silts and clays. The Madalin soil underlies an 8-ac (3- ha) wetland, mostly marsh and wet meadow, that is biologically rich and unique on the site (see *Results*, below).

Most of the WF site is underlain by shales and sandstones of the undifferentiated lower Hamilton Group (Fisher et al. 1970). The sandstone is a fine-grained calcareous sandstone, and limestone is a minor constituent of this group as well (USGS no date), so calcium-rich soils and associated plant communities are likely on this bedrock. The eastern side of the site is underlain by Onondaga limestone, with shale as a minor constituent, and thus soils here are especially likely to support calcium-associated plant species and communities. Onondaga limestone extends 1,150-1,640 ft (350-500 m) west from the eastern boundary (Fisher et al. 1970), covering approximately half of the two largest meadows. However, these geologic maps are often not accurate at such a small scale, and the Onondaga limestone may extend farther west, underpinning much or all of the agricultural portion of WF.

Methods

We used the methods of Kiviat and Stevens (2001) to map ecologically significant habitats on the site. First we utilized aerial orthophoto imagery (2021, 2016, 2013, 2009), topographic maps, wetland maps, and a soil survey to create a map of habitats. We then used this preliminary map to conduct field work around the edges of the property, from publicly accessible points, to confirm or correct as much of the habitat mapping as possible. We also reviewed information from other sources, including the New York Natural Heritage Program (NYNHP), previous Hudsonia reports (Barbour 1991, Stevens and Graham 2018), State and Federal wetland maps, and the Site Masterplan (Winston Farm 2021b) and EAF (Winston Farm 2021a). Barbour's report (1991) is attached to this document as Appendix 3.

It should be noted that Hudsonia's biodiversity assessment (as separate from the raptor survey) was habitat-based. We mapped and described habitats, then used that information to predict which wildlife and plant species of conservation concern are likely to occur on the site. We did not conduct biological surveys (i.e., attempts to find and identify all species within particular groups of organisms), delineate jurisdictional wetland boundaries, analyze water or soils, or sample vegetation or fauna quantitatively. The biodiversity assessment provides a basis for more accurately understanding the biology of the site and predicting the likely impacts of the proposed development project, as well as identifying those further studies necessary for a full and incisive environmental analysis.

Throughout this report, we refer to federal listed status, New York State Department of Environmental Conservation (DEC) rarity ranks (2015a), and NYNHP ranks (Schlesinger 2017, Young 2021), where appropriate. Federally listed species are either Endangered (FE)—the most imperiled—or Threatened (FT). DEC ranks are, in order of decreasing rarity: Endangered (E), Threatened (T), Special Concern (SC) (animals)/Rare (R) (plants). The DEC also maintains a list of animal Species of Greatest Conservation Need (SGCN), developed for the *New York State Wildlife Action Plan* (NYSDEC 2015b). Some species on this list are ranked as *High Priority* SGCN ($SGCN^{HP}$); these species need conservation actions within the next 10 years or will at risk of extirpation in New York State. All animal species ranked as Endangered, Threatened, or Special Concern are also included in the SGCN list.

NYNHP ranks are, in order of decreasing rarity: SH (historical, i.e. historically known from New York State but not documented in the past 15 years), S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (apparently secure). For birds, the presence of *B* in a rank (e.g. S2B) indicates that the rank applies to the breeding population only, while *N* references non-breeding individuals (e.g. S3N). In double ranks (e.g. S1S2, S2S3), the first rank indicates rarity based upon current documentation. The second rank indicates the probable rarity after all historical records and likely habitat have been checked. We denote regionally rare species with the letters *RR*, but only when a species is not ranked by the DEC or NYNHP.

Results

We mapped 18 types of ecologically significant habitats on the site, including 8 upland types and 10 wetland types (including open water) (Figures 2a & 2b). Ecologically significant habitats cover 782 ac (317 ha), or 97% of the site, with only 3% already developed in the form of several houses and other structures, surrounding lawns, and internal paved or graveled roads. (In recent years, many old dirt tracks in the agricultural fields have been freshly graveled and widened, and some new roads added.) The majority of the site, 60% (482 ac [195 ha]), was in upland forest, most of this upland hardwood forest (450 ac [182 ha]), the most common habitat present. Meadows covered 22% of the study area, at 177 ac (72 ha). Wetlands were numerous across the site and accounted for 13% of the study area, 106 ac (43 ha).

Upland habitats

Cultural

We define cultural habitats as those areas that are significantly altered and intensively managed (e.g., regularly mowed closely such as lawns) but not otherwise developed with pavement or structures. We identify this as a significant habitat type more for the potential (future) ecological values once (and if) management ceases than the current values, which are typically minor (with the notable exception of the use of mowed fields by breeding and wintering birds). The only substantial cultural area was a 4.5-ac (1.8-ha) lawn north of the west end of Augusta Savage Road.

Upland meadow

Upland meadows were extensive at Winston Farm, totaling 177 ac (72 ha). These were all in the eastern half of the site, which was predominantly meadow. Two meadows west of the Beaver Kill, including wet meadow inclusions, exceeded 50 ac (20 ha) each (*A* and *B* in Figure 2b). Most meadows were probably managed for hay, though we were not able to see much of the meadow on site. Part of the meadow behind the Rt. 32 park-and-ride was an infrequently mowed field, and other small meadow areas likely are as well. These may support a high diversity of butterflies, bees, and other insects.

Barbour (1991) states that the large hayfields "may provide nesting or feeding grounds for…rare [breeding] birds, such as eastern meadowlark [(SGCN^{HP})]….vesper sparrow [(SC; S3B; SGCN^{HP})], Henslow's sparrow [(T; S3B; SGCN^{HP})], grasshopper sparrow [(SC; S3B; SGCN^{HP})], and sedge wren [(T; S3B; SGCN^{HP})]," that golden-winged warblers (SC; S3B;

SGCN^{HP}) may use brushy oldfields, and that wood turtle (SC; S3; SGCN^{HP}) could forage in these meadows. (See *Methods* for rare status rank abbreviations.) Barbour also saw large flocks of eastern bluebird in Meadow A; a northern harrier (T; S3B, S3N; SGCN) flying low over Meadow B in March (possibly in migration); and a diversity of "butterflies…nectaring on wild bergamot, thistles, goldenrods, Joe-Pye-weed, milkweed, and other wildflowers."

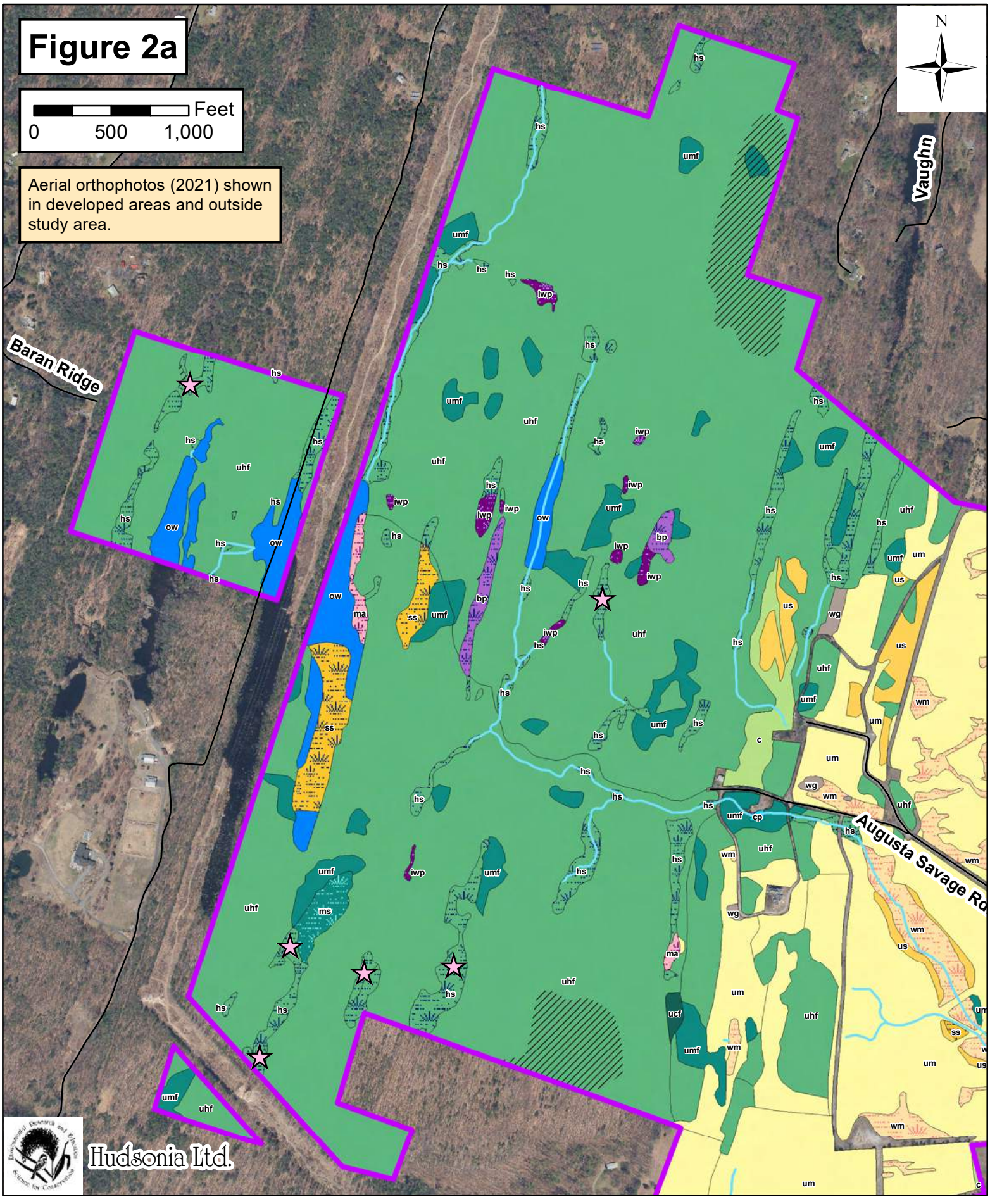
Barbour summarizes his assessment of the large meadows thus: "Large, secluded and species- rich open fields like those of the Winston Farm property are uncommon in the Town of Saugerties and surrounding towns. Fields of comparable size that I have seen in northern Ulster and southern Greene counties are less biologically diverse, more exposed to human activity, and more disturbed. The Winston Farm fields are probably of great importance to local wildlife and their destruction would represent a major loss to local habitat quality and diversity."

In view of the potential use of the upland meadow complex by both winter and breeding season birds of conservation concern, we conducted a preliminary bird survey of the meadows from neighboring public-access locations. A report and species list from this survey are in Appendix 2. The survey was performed on the cusp of the breeding season and therefore is not fully representative of either wintering birds or breeding birds. Highlights of the survey included three raptor species (a red-tailed hawk with prey, an American kestrel, and two bald eagles), singing male eastern meadowlarks, and a migrant flock of rusty blackbirds. These observations support our assessment of the habitat functions of the expansive meadows for foraging raptors in winter, breeding grassland birds (eastern meadowlark and probably American kestrel), and in addition migration stopover habitat for a declining boreal songbird (rusty blackbird).

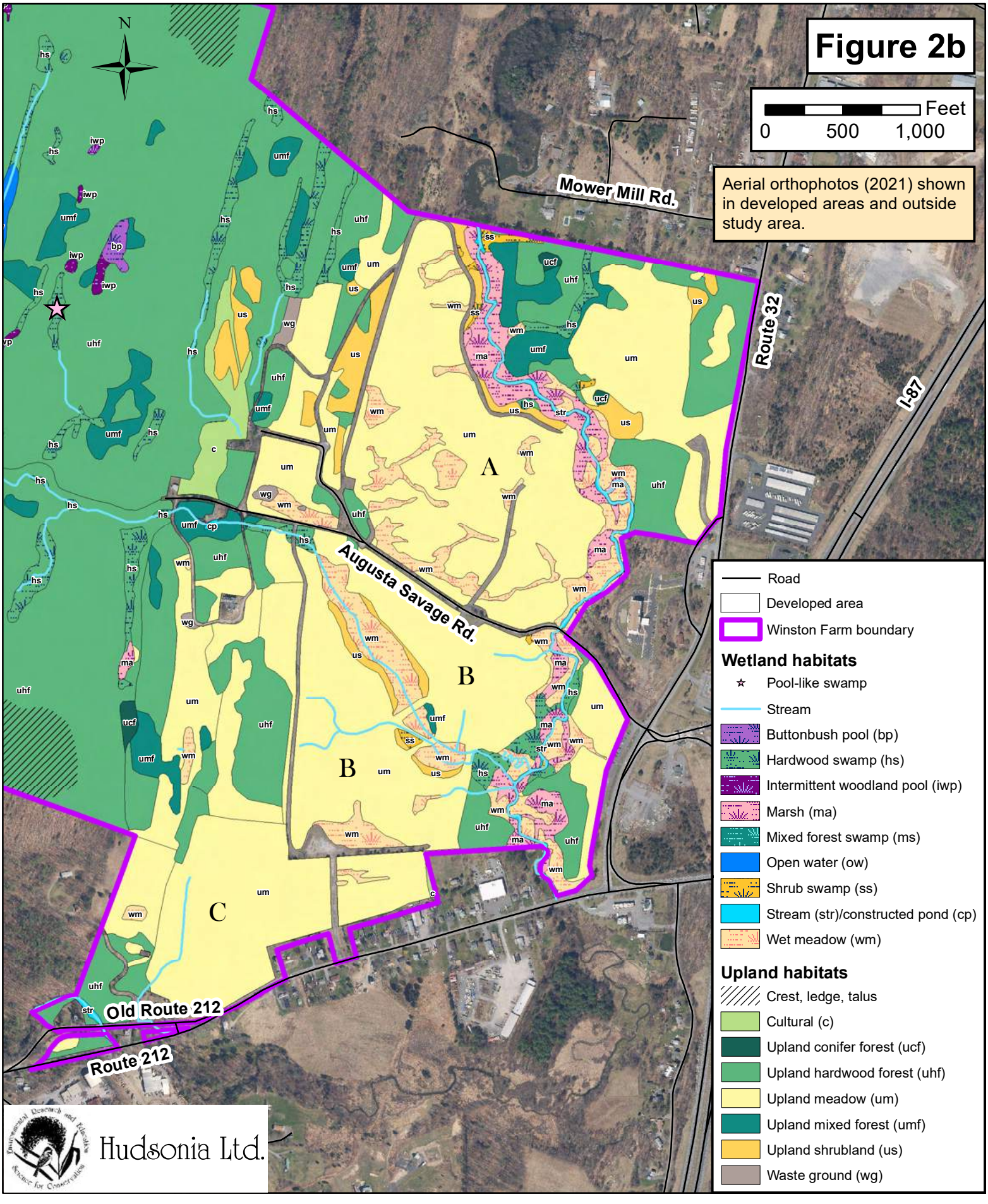
Upland shrubland

These shrub-dominated uplands appear to be, in most cases, lands in transition between meadow and young forest. Shrublands may be dominated by invasive species such as Thunberg barberry, Bell's honeysuckle, autumn-olive, and multiflora rose, or they may be more diverse, including native shrubs such as meadowsweet, gray dogwood, northern blackberry, and raspberries, and scattered seedling- and sapling-size shoots of trees. We mapped only 11 ac (4 ha) of upland shrubland, all in the agricultural landscape of the eastern half of the site. According to Barbour (1991), these shrublands could be good habitat for golden-winged warbler (SC; S3B; SGCNHP), eastern box turtle (SC; S3; SGCNHP), and other rare species.

Ecologically Significant Habitats of Winston Farm: West Town of Saugerties, Ulster County, NY



Ecologically Significant Habitats of Winston Farm: East Town of Saugerties, Ulster County, NY



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Waste ground

Waste ground is an ecological term for land that has been severely altered by previous or current human activity, but lacks pavement or structures. Most waste ground areas have been stripped of vegetation and topsoil, or filled with soil or debris, and are unvegetated or sparsely vegetated. We mapped four patches of waste ground. Two were small areas of recently dumped materials in and at the edge of a wet meadow. The largest waste ground, > 0.5 ac (0.2 ha), was west of the large meadows toward the north edge of the property, and, according to the National Wetland Inventory map, fill in a constructed pond, which may have been dug from the adjacent wetland to the north.

Crest/ledge/talus

Rocky crest, ledge, and talus habitats often occur together, so they are described and mapped together for this project. Crest and ledge habitats occur where soils are very shallow and bedrock is partially exposed at the ground surface, either at the summit or a shoulder of a hill or knoll (crest), or elsewhere (ledge). Talus is the term for the fields of large rock fragments that often accumulate below steep ledges and cliffs. The crest/ledge/talus habitats we identified on the site occur under well-developed forests, and thus are mapped as an overlay atop forest habitat. We mapped 19 ac (8 ha) of crest/ledge/talus based on areas mapped by Barbour (1991). These rocky habitats must usually be seen in the field to be identified, thus we expect there to be other areas of crest/ledge/talus, possibly extensive, as yet unmapped.

Barbour (1991) found a shale crest and slope and associated xeric (dry) habitat at the southeastern corner of the large western forest block. He found falcate orangetip butterfly (S3S4) there, as well as Venus' looking glass, a regionally rare plant. Along the northern edge of the property, he found green rock cress (T; S2) on a small ledge. NYNHP last surveyed this population in 2001 and found approximately 60 plants. As Barbour noted, green rock cress "could occur on other ledges on the site [as it is] very inconspicuous and easily overlooked."

Upland hardwood forest

Much of the site—450 ac (182 ha)—supported upland hardwood forest. Common trees of upland hardwood forests in the region include oaks (black, red, scarlet, white, chestnut), maples (sugar, red), hickories (shagbark, pignut), eastern hemlock, eastern white pine, American beech, white ash, black birch, black locust, and black cherry. Common understory and ground-layer species include maple-leaved viburnum, witch-hazel, downy serviceberry, Thunberg barberry, common buckthorn, Bell's honeysuckle, brambles, black huckleberry, lowbush blueberries, and a wide variety of wildflowers, sedges, ferns, and mosses.

According to a neighboring landowner, most of the western forest is mature chestnut oak—red oak forest, which comports with the forest we saw along the northern property edge and

with the evident age and topographic setting of the forest. NYNHP maps two sizeable chestnut oak forests at WF totaling 169 ac (68 ha). They described these as being in "moderate" condition, with evidence of past logging in some areas. Estimated stand age was 20-90 years in 2001.

Barbour (1991) described a *mesic cove* west of Augusta Savage Road, a "steeply dissected…hollow" on the intermittent reach of the perennial stream that flows to the Beaver Kill. Here the ravine slopes were forested with eastern hemlock, American basswood, and sugar maple. This is evidently a heavily shaded, cool habitat that could support several rare animals and plants, the latter including Canada yew, mountain maple, American fly honeysuckle, and spikenard (all regionally rare). Birds such as Acadian flycatcher (S3B), Louisiana waterthrush (SGCN), and Blackburnian warbler (RR) could nest here. Barbour found northern dusky salamander (RR), which is vulnerable to flood scouring (Orser and Shure 1972) that occurs with development of a watershed. He also noted that the small, cool, unpolluted stream is potential habitat for spring salamander (RR), as are springs, seeps and other headwater streams at WF (spring salamander occurs at least as close as Plattekill Mountain [Kiviat, pers. obs.]).

In addition to their habitat functions and hydrological functions, all forests are important for capturing and storing carbon in live and dead plant mass and soil.

Upland conifer forest

We mapped only three small patches of conifer-dominated forest. These are likely dominated by a combination of eastern hemlock and eastern white pine, and perhaps eastern red cedar.

Upland mixed forest

These forests, totaling 31 ac (13 ha) at WF, are co-dominated by hardwoods and conifers. They were common in the western half of the site, but mostly small. Hemlock and white pine likely account for the conifer component, and hardwoods may be similar to those of the hardwood forests. Aerial photo analysis evinces a substantial decline of hemlocks on the site in recent years, likely caused by hemlock woolly adelgid, a widespread non-native insect that attacks, weakens, and kills hemlocks.

Wetland habitats

We mapped 106 ac (43 ha) of wetlands on the site (including open water areas) (Figures 2a-2b), far more than found on either the New York State or National Wetland Inventory (NWI) wetland maps. (It is typical that both wetland maps underrepresent wetlands, and we have usually found that Hudsonia's habitat maps portray wetlands more fully and accurately than the state or federal wetland maps notwithstanding that we do not perform formal wetland

boundary delineations.) The EAF (Winston Farm 2021a), using the the maps just cited, wrongly states that there are 26 ac (11 ha) of wetland on-site. The NYS map only shows one state-regulated wetland on the site, a 25-ac (10-ha) wetland straddling the utility corridor. The NWI map shows parts of 24 wetlands on the site, but still vastly underestimates wetland coverage. It portrays 13 ac (5 ha) of wetland along the Beaver Kill, for example, where we mapped 26 ac (11 ha). It does portray several of the isolated wetlands, including two intermittent woodland pools, two pool-like swamps, the heath swamp, the mixed forest swamp, and both buttonbush pools, although the boundaries are inaccurate and the wetland sizes often greatly underestimated.

A neighbor reports an active great blue heron rookery of at least 14 nests in one large wetland near the utility corridor. This is a large and important heron rookery for the Hudson Valley, and would be potentially impacted by human disturbance (see below).

Wet meadow

These herbaceous (non-wooded) wetlands, which probably retain little or no standing water during most of the growing season, were the second most extensive wetland type on the property, covering 27 ac (11 ha). All wet meadows were in the eastern, agricultural half of WF. Wet meadows, along with marshes, were the major wetland types in the Beaver Kill floodplain corridor, where they were dominated by arrow-leaved tear-thumb, reed canary-grass, Canada bluejoint grass, purple loosestrife, willow-herb, and goldenrods. A regionally rare wildflower, northern wild senna, also grew here. There were also a few scattered patches of densely growing common reed, totaling approximately 1 ac (0.4 ha). Much of these wet meadows and associated marshes along the Beaver Kill was evidently forested swamp not long ago, but in recent years the trees have died, likely a result of flooding. Now scattered, standing, dead trees are visible across much of the Beaver Kill wetlands. It is in one such area along the north side of Augusta Savage Road that NYNHP reported red-headed woodpecker (SC; S2?B; $SGCN^{HP}$) foraging in July 2020.

Wet meadows were also common as inclusions within the large agricultural fields, including one of 4.5 ac (1.8 ha) through which the perennial tributary to the Beaver Kill flows. Many of the other agricultural wet meadows, however, were difficult to identify from aerial photos due to agricultural management, and need to be field-verified. Large parts of the fields have been ditched and tiled in the past (Barbour 1991), a fact that is still evident in current aerial photographs. Therefore wet meadows would have been historically much more extensive in these fields than they are today.

Barbour (1991) described one particular wet meadow of biological importance: the large wet meadow (broken into three patches by hayfield management) south of Augusta Savage Road that straddles the perennial tributary to the Beaver Kill, part of the large Meadow B. He noted a profusion of flowering forbs providing nectar for butterflies and stated that this wet meadow

is potential habitat for Appalachian azure butterfly (S1S3), which he saw along the Beaver Kill north of WF. Barbour stated: "Nestled between the higher fields, this is an especially secluded biological oasis, and in its plant species composition and aesthetic attributes unlike any other wetland I have seen in the region.

Marsh

A marsh is a wetland that has standing water for most or all of the growing season and is dominated by herbaceous (non-woody) vegetation. The great majority of the 13 ac (5 ha) of marsh on the property lined the Beaver Kill in a complex of multiple wetland types, often grading into wet meadows. These floodplain marshes contained lush herbaceous vegetation even in January 2022. Hudson Valley marshes often contain marsh fern, sensitive fern, cattails, bur- reeds, woolgrass, tussock sedge, rice cut-grass, reed canary-grass, purple loosestrife, Joe Pye- weed, tearthumbs, and smartweeds, among many other species.

Barbour (1991) found "a dense population of winged monkeyflower (R; S3)…in a flood channel on the east side of the Beaver Kill." He believed hackberry emperor butterfly (S3S4) to be a likely inhabitant of the Beaver Kill floodplain, since he found its host plant, northern hackberry, growing there. Barbour also found, on 7 August 1991, "an adult male wood turtle [(SC; S3; $SGCN^{HP}$)] about to enter the Beaver Kill south of [Augusta Savage] Road." Wood turtles cover large home ranges and use wetlands and uplands neighboring their home stream (in this case, the Beaver Kill) extensively for basking, foraging, and nesting; see *Priority habitats: Beaver Kill*, below, for a more detailed discussion of wood turtle habitat use and conservation. Barbour also stated that "Winston Farm's seclusion and distance from heavily travelled roads helps to protect its turtle population from decimation by vehicles."

Shrub swamp

Most shrub-dominated swamps were small and part of the Beaver Kill wetlands complex, though two occurred in the western part of the site and were 1.5 ac (0.6 ha) or larger. Shrub swamps in our region are often dominated by a combination of highbush blueberry, swamp azalea, winterberry holly, silky dogwood, alders, and willows, with scattered trees mixed in.

Hardwood swamp

Hardwood swamps, dominated by hardwood trees, were numerous on the site and occupied 33 ac (13 ha) in total. They ranged in size from very small to 3.5 ac (1.4 ha), with ten exceeding 1 ac (0.4 ha). Several are actually much larger, as they continue off-site. Common species of hardwood swamps include red maple, slippery and American elms, green ash, yellow birch, pin oak, and swamp white oak (trees); winterberry holly, highbush blueberry, swamp azalea, spicebush, alders, Thunberg barberry, and multiflora rose (shrubs); and skunk-

cabbage, marsh- marigold, beggar-ticks, false-nettle, common jewelweed, yellow iris, tussock sedge, wood reedgrass, cinnamon fern, sensitive fern, and royal fern (herbaceous plants).

NYNHP maps two red maple-blackgum swamps, an S2-Imperiled natural community, on the property, although one of those, just east of the utility corridor, has since been altered by beaver flooding. The other red maple-blackgum swamp lies along the southern boundary and is the same swamp that Barbour (1991) identified as a *rosebay swamp*, a regionally rare community, with numerous large rosebays (*Rhododendron maximum*), a regionally rare rhododendron.

Among the hardwood swamps we mapped, we noted a particular type worth distinguishing (denoted by pink stars in Figure 2a), which we call a *pool-like swamp*. Pool-like swamps have woody vegetation characteristic of swamps, but are pool-forming and isolated from other surface waters, and may partially or completely dry out in summer, and thus may maintain a fish-free environment with ecological roles for amphibians and invertebrates similar to those of intermittent woodland pools (see *Discussion*, below). We identified six of these pool-like swamps based on aerial photo interpretation. These swamps are best identified in the field, so the pool-forming character should be field-verified. Additional such swamps may be found during field work.

Mixed forest swamp

We identified a single mixed forest swamp, of ~2 ac (0.8 ha), in the southwestern corner of the site. Likely a hemlock-hardwood swamp, this community is rare in the Hudson Valley, being much more common in the cooler, higher elevations of the Catskills. The NYNHP maps known examples of hemlock-hardwood swamp among its Significant Natural Communities, a dataset that includes rare community occurrences of exemplary size or quality, though it does not include this occurrence in its database.

Intermittent woodland pool

An intermittent woodland pool (a type of vernal pool) is a small wetland partially or entirely surrounded by forest, usually with sparse or no vegetation within the pool itself. Typically these pools have no surface water inlet or outlet (or an ephemeral one) and contain standing water during fall, winter, and spring that dries up by mid- to late summer during a normal year. We mapped ten intermittent woodland pools scattered around the western half of the site. Two of them were quite large for woodland pools, around 0.5 ac (0.2 ha). Woodland pools are difficult to map remotely, and we expect there are more pools that can only be identified in the field.

NYNHP maps three vernal pools—ranked as S3-Vulnerable—all in “apparent good condition.” We mapped one of these as a heath swamp and another as a pool-like swamp,

with ecological functions similar to those of vernal pools.

Buttonbush pool

A buttonbush pool is a deep, seasonally or permanently flooded, shrubby pool. The pool is normally dominated by buttonbush, though buttonbush may appear and disappear over the years in a given location. Other shrubs such as highbush blueberry, swamp azalea, winterberry holly, and willows may also be abundant. In some cases, an open water moat entirely or partly surrounds a shrub thicket in the middle of the pool. Conversely, the shrub stands may occupy the outer portions of the area with open water in the middle. These pools are typically isolated from streams. Standing water is normally present in winter and spring but may disappear by late summer or remain only in isolated puddles. We identified two sizeable buttonbush pools in the western half of the site from aerial orthophotographs, including one of >1.5 ac (0.6 ha). These pools are much easier to identify in the field, and thus there may be more on the property.

Open water

Open water habitats include naturally formed ponds and lakes, large pools within marshes and swamps, and unvegetated ponds originally constructed by humans that have since reverted to a more natural state surrounded by unmanaged vegetation. There were several open water bodies at WF totaling 13 ac (5 ha). One was a 2-ac (0.8-ha) human-dammed pond now deep within forest. Another water body of 6 ac (2.4 ha) (half of which is outside the study area), in the isolated western parcel, is likely an old bluestone quarry pit, now filled with water. Finally, two other large water bodies, one on either side of the utility corridor, are former swamps now dammed by beavers into open water bodies (neighboring landowner, pers. comm.).

Constructed pond

There was only one “constructed pond” on site, a term we use to refer only to waterbodies that are intensively managed or surrounded by intensively managed vegetation. This was a small impoundment on the perennial tributary to the Beaver Kill south of Augusta Savage Road, which was evidently partially filled in during the last five years.

Stream

The Beaver Kill is the main stream on the property, flowing near the eastern edge for nearly 1.25 miles (2 km). It is a large, sinuous, and dynamic perennial stream within a 40-100-m (130-330-ft) - wide band of floodplain wetlands. It has a single perennial tributary on the property, which originates in the forested wetlands of the western half of the site and flows east and southeast, across the agricultural fields, before joining the Beaver Kill.

Priority habitats

Large forest

Selected conservation issues

Upland forests of all kinds provide habitat for a large array of wildlife, including many species of conservation concern. Eastern box turtle (SC; S3; $SGCN^{HP}$) spends most of its time in upland forests and meadows, finding shelter under logs and organic litter. Spotted turtle (SC; S3; $SGCN^{HP}$) uses upland forests for aestivation (summer dormancy) and travel. Many snake species, such as eastern ratsnake (SGCN), northern black racer (SGCN), and red-bellied snake, forage widely in upland forests and other habitats, and many amphibians, such as Jefferson salamander (SC), blue-spotted salamander (SC; $SGCN^{HP}$), slimy salamander, marbled salamander (SC; S3: SGCN), and wood frog, spend much of their lives in upland forests. Upland hardwood forests provide important nesting habitat for raptors, including Cooper's hawk (SC), sharp-shinned hawk (SC), broad-winged hawk, and great horned owl, and many species of songbirds. American woodcock (SGCN) forages and nests in young hardwood forests, swamps, and shrublands. Hardwood trees larger than 5 in (12.5 cm) dbh—especially those with loose, platy bark such as shagbark hickory, those with deeply furrowed bark such as black locust, or snags with peeling bark—can be used by Indiana bat (FE; E; S1; $SGCN^{HP}$), northern long-eared bat (FT; T; S1; $SGCN^{HP}$), and other bats for summer roosting and nursery colonies.

Conifer and mixed conifer-hardwood stands are used by many species of owls (e.g., barred owl, great horned owl, long-eared owl (S2S3; SGCN) and other raptors (e.g., northern goshawk (SC; S3S4B, S3N; SGCN), Cooper's hawk [SC], sharp-shinned hawk [SC]) for roosting and nesting. Red-breasted nuthatch (RR), purple finch, black-throated green warbler, and Blackburnian warbler (RR) nest in conifer and mixed stands, and pine siskin (RR) and evening grosbeak (RR) may winter in them. American woodcock (SGCN) sometimes uses conifer stands for nesting and foraging.

The forest on the western side of WF forms an unbroken block of 459 ac onsite, and is part of a much larger, unbroken *core* forest block of 1,186 ac, as mapped by the NYSDEC Hudson River Estuary Program. Large forests, especially those unbroken by long driveways, can support many forest species that do not thrive in smaller forest fragments. Loss and fragmentation of forests are the two most serious threats facing forest-dwelling organisms. The decline of extensive forests has been implicated in the declines of numerous *area-sensitive* species, which require hundreds or thousands of acres of contiguous forest to sustain local populations. These include large mammals such as black bear, bobcat (Godin 1977, Merritt 1987), and fisher; some raptors, such as barred owl, red-shouldered hawk (SC; SGCN) (Bednarz and Dinsmore 1982, Billings 1990, Crocoll 1994), and northern goshawk (SC; S3S4B, S3N; SGCN); and many migratory songbirds (Robbins 1979, 1980; Ambuel

and Temple 1983, Wilcove 1985, Hill and Hagan 1991, Lampila et al. 2005). Large forests with rocky crests also provide foraging habitat for reptiles of conservation concern that range widely, such as northern copperhead (S3; SGCN), timber rattlesnake (T; S3; SGCN^{HP}), and northern black racer (SGCN).

In addition to reduced total area, fragmented forest has a larger proportion of edge habitat. Temperature, humidity, and light are altered near forest edges, and the edge environments favor a set of disturbance-adapted species, including several nest predators and a brood parasite (brown-headed cowbird) of forest-breeding birds (Murcia 1995). Large forests support forest species that are highly sensitive to disturbance and predation along forest edges. Acadian flycatcher (S3B), wood thrush (SGCN), cerulean warbler (SC; S3?B; SGCN), Kentucky warbler (S2B, SGCN^{HP}), and scarlet tanager (SGCN) are some of the birds that require large forest- interior areas to nest successfully and maintain viable populations in the long term. A study of forest breeding birds in mid-Atlantic states found that black-and-white warbler, black-throated blue warbler (SGCN), cerulean warbler, worm-eating warbler (SGCN), and Louisiana waterthrush (SGCN) were rarely found in forests smaller than 250 ac (100 ha), and that the minimum forest area these birds require for sustainable breeding ranges from 370 ac (150 ha) for worm-eating warbler to 2,500 ac (1,000 ha) for black-throated blue warbler (Robbins et al. 1989).

Forest fragmentation can also inhibit or prevent animals from moving across the landscape, and can result in losses of genetic diversity and local extinctions in populations from isolated forest patches. For example, some species of frogs and salamanders are unable to disperse effectively through non-forested habitat due to desiccation and predation (Rothermel and Semlitsch 2002). Road mortality of migrating amphibians and reptiles can result in reduced population densities (Fahrig et al. 1995) or changes in sex ratios in local populations (Marchand and Litvaitis 2004).

Potential impacts

The development of WF as currently planned would eliminate outright approximately 275 ac (111 ha) of forest (Winston Farm 2021a). It would severely fragment at least 313 ac (127 ha) of the on-site, 459-ac (186-ha) forest block and of the regional 1,200-ac (500-ha) forest block, reducing it to one of 700 ac (283 ha) or less (plus smaller patches of ≤100 ac [40 ha]) (calculated from Winston Farm 2021b).

Local populations of many species would be adversely affected. Bobcat and fisher would have far less forest to live in and roam across. Certain raptors and many songbird species that are sensitive to human disturbance would find the fragmented forest much less attractive for nesting, and might stop nesting there altogether. Alternatively, some songbirds may attempt to nest but have their eggs or chicks eaten by raccoons, house cats, and other predators that accompany humans into wilderness areas, or parasitized by brown-headed cowbirds, which

also follow human activity. Frogs, salamanders, and turtles are more subject to desiccation and predation while moving across non-forested habitats (like lawns and driveways), and many are likely be killed by vehicles while trying to cross the extensive road and driveway network planned under this project (see *Intermittent Woodland Pools*, below, for more on amphibian ecology and movements).

The forest fragmentation would affect not only the local wildlife, but would further fragment landscape-scale south-to-north and low-to-high-elevation corridors that are increasingly important as the regional climate warms. Many species of animals and plants will have more trouble dispersing across the landscape should the currently proposed WF development plan be carried out.

In addition to their tremendous values for wildlife, forests are perhaps the most effective type of land cover for sustaining clean and abundant surface water and groundwater and maintaining in- stream habitat quality. Forests also moderate local air temperatures, and store large amounts of carbon in their soils and vegetation, which can ameliorate climate change. The proposed forest clearing would reduce all of these ecosystem services. Potential effects include increased frequency and severity of flooding along the Beaver Kill and the streams it feeds; reduced groundwater recharge; siltation of local streams and reduction of in-stream habitat quality; and increased pollutant loads in both groundwater and surface streams. The abundance of new impervious surfaces proposed would exacerbate all of these water-related issues.

Crest/ledge/talus

Selected conservation issues

Crest, ledge, and talus habitats can support a high diversity of uncommon and rare plants and animals. Some species, such as mountain spleenwort (T; S2S3), clustered sedge (T; S2S3), reflexed sedge (T), stiff-leaved aster (RR), and northern slimy salamander, are found only in and near rocky places in the region. Calcareous (calcium-rich) crest/ledge/talus can support numerous rare plant species including walking fern (RR), purple cliffbrake (RR), wall-rue (RR), smooth cliffbrake (T; S2), yellow corydalis (R; S3), and Carolina whitlow-grass (T; S2).

Rocky habitats with larger fissures, cavities, and exposed ledges may provide shelter, denning, and basking habitat for timber rattlesnake (T; S3; $SGCN^{HP}$), northern copperhead (S3; SGCN), eastern hog-nosed snake (SC; S3; $SGCN^{HP}$), and other snakes of conservation concern. These snakes range far into the surrounding landscape to forage and find water, so protection of large areas is necessary to conserve populations (Brown 1993; Fitch 1960). Northern slimy salamander usually occurs in wooded ledge and talus areas. Breeding birds of crest habitats include Blackburnian warbler (RR), worm-eating warbler (SGCN), and cerulean warbler (SC; S3?B; SGCN). Bobcat and fisher use crests and ledges for travel, hunting, and cover. Porcupine and bobcat use ledge and talus habitats for denning, and eastern

small-footed bat (SC; S1S3; SGCN) roosts in talus habitat. Rare butterflies of crest and ledge habitats in our region include Edward's hairstreak (S3S4), northern oak hairstreak (S2S4), frosted elfin (T; S1S2), Henry's elfin (SC; S1), Horace's duskywing (RR), silvery blue (SH), and southern grizzled skipper (E; SH).

Potential impacts

The northern of the two mapped crest/ledge/talus areas spans several house lots. Given the topography and the currently proposed layout of house lots, multiple houses would likely be built on crest habitat on hilltops, and driveways would cut through rocky areas. In addition to directly destroying crest and ledge habitat, such development would fragment the habitat complexes used by rare animals of rocky habitats. Construction in this area could isolate, e.g. snake populations, by preventing migration, dispersal, and genetic exchange. This, in turn, can limit the ability of these populations to adapt to changing climatic or other environmental conditions and make them more prone to local extinction. Snakes and birds associated with rocky habitats would also be vulnerable to predation by human-subsidized predators, e.g. raccoon, and birds to nest parasitism by brown-headed cowbird.

The southern crest/ledge/talus area is proposed to have trails, a ropes course, and rock climbing. Such high-intensity recreation can disturb breeding birds of crest/ledge/talus, driving them away. It can lead to increased human-snake encounters, which might result in harassment, malicious killing, or collection of snakes. And it can severely degrade the fragile vegetation of such rocky habitats, which can include rare plant species.

The extent of crest/ledge/talus habitats at Winston Farm will remain unknown until thorough field investigation is performed. Much more could be present, and subject to development impacts.

Large meadows

Selected conservation issues

While there can be significant habitat value in small patches of upland meadow (e.g., for plants, invertebrates, and small mammals), large grassy meadows are especially important for many rare grassland-breeding birds such as upland sandpiper (T; S3B; $SGCN^{HP}$), bobolink ($SGCN^{HP}$), eastern meadowlark ($SGCN^{HP}$), grasshopper sparrow (SC; S3B; $SGCN^{HP}$), savannah sparrow (RR), Henslow's sparrow (T; S3B; $SGCN^{HP}$), vesper sparrow (SC; S3B; $SGCN^{HP}$), and sedge wren (T; S3B; $SGCN^{HP}$). Although area requirements for grassland birds in the Northeast vary by species, the consistent finding is that these species require relatively large, unfragmented grasslands. Fences, hedgerows, and tree lines can reduce nesting success by providing cover and perching sites for raptors and other species that prey on the birds or their eggs (Wiens 1969). Winston Farm contains two large meadows of > 50

ac (20 ha) that, if managed appropriately, could serve as suitable nesting habitat for several of the above species (*A* and *B* in Figure 2b). A third meadow of 24 ac (10 ha) (meadow *C*), adjacent to the southern site boundary, contains a long, tall hill that could be good for nesting bobolinks.

Certain raptors such as short-eared owl (E; S2; SGCN^{HP}), northern harrier (T; S3N; SGCN), rough-legged hawk (RR), and golden eagle (E; S1N; SGCN) use large, open meadows as winter hunting or roosting grounds. Indeed, Barbour (1991) observed northern harrier flying low over Meadow B, and a WF neighbor reports winter use by northern harrier of large meadows on an adjacent property. Several species of rare butterflies, such as dusted skipper (S2S3), Leonard's skipper (RR), swarthy skipper (RR), and striped hairstreak (RR) use upland meadows that support their particular host plants. Upland meadows can be used for nesting by wood turtle (SC; S3; SGCN^{HP}), spotted turtle (SC; S3; SGCN^{HP}), and eastern box turtle (SC; S3; SGCN^{HP}), and for foraging by smooth green snake (SGCN) and northern copperhead (S3; SGCN).

Such large meadows are in steep decline throughout the northeast as they are converted to residential and other development, allowed to develop into shrubland and forest, or subjected to intensified agricultural practices. The dramatic decline of grassland-breeding birds in the Northeast has been attributed to the loss of large patches of suitable meadow habitat; many of these birds need large meadows that are not divided by fences or hedgerows, which can harbor predators (Wiens 1969).

See Appendix 2 for the results of the preliminary late winter bird survey of the meadows.

Potential impacts

Because most of the largest meadows would be filled with impervious surfaces, stormwater ponds, and other human alteration and disturbance, the large meadows required by grassland- nesting birds and wintering raptors would be effectively destroyed, leaving, at best, meadow fragments too small to support these sensitive species. Other grassland organisms, including nesting turtles and rare butterflies, would find far less appropriate habitat; if remaining meadow vegetation is converted to close-cropped, fertilized lawn, they would find none. Furthermore, development near large meadows, such as residential areas proposed in some of the smaller meadows, can promote increased predation on grassland-breeding bird nests by human-subsidized predators such as raccoon, striped skunk, and house cat. Clearly the meadows are important habitat for birds of conservation concern, and additional bird surveys are indicated.

A noteworthy characteristic of the soils in these meadows is their potential instability. The Lake Albany clays are notoriously unstable on steep slopes (Dunn and Bannino 1977) where the soils gully, slump, and slide during and after heavy rains. We expect some of the other

silty soils to demonstrate a significant degree of instability. As we have seen with some of the old estate roads and trails, and some ill-fated 1970s buildings across the Hudson River in the Town of Red Hook, these soils can be hazardous for construction. The increasing precipitation and intensifying storms and runoff due to ongoing climate change will increase these hazards.

Intermittent woodland pools, pool-like swamps, and buttonbush pools

Selected conservation issues

Due to their seasonal drying and lack of a stream connection, intermittent woodland pools lack fish predators of amphibian eggs and larvae. Thus they provide crucial breeding and nursery habitat for several pool-breeding amphibian species that cannot successfully reproduce in other wetlands, namely Jefferson salamander (RR), marbled salamander (SC; S3; SGCN), spotted salamander, and wood frog, and important habitat for blue-spotted salamander (SC; $SGCN^{HP}$) as well. Buttonbush pools and pool-like swamps, both of which are isolated, pooled wetlands that may partially or completely dry up seasonally, can provide similar habitat values as intermittent woodland pools for pool-breeding amphibians.

Outside of their breeding season and developmental stages, pool-breeding amphibians spend the rest of the year foraging, resting, and wintering in upland forest surrounding the pools. At minimum, preserving most of the upland forested area within a 750 ft (230 m) radius of the vernal pool is considered critical to maintaining populations of pool-breeding amphibians (Calhoun and Klemens 2002), although many of these amphibians travel much farther.

Reptiles such as spotted turtle (SC; S3; $SGCN^{HP}$) and eastern ribbon snake (SGCN) use all of these pools for foraging, rehydrating, and resting. Wood duck and American black duck (S3B; $SGCN^{HP}$) use them for foraging, nesting, and brood-rearing. The invertebrate communities of these pools can be rich, providing abundant food for songbirds such as yellow warbler, common yellowthroat, Louisiana waterthrush (SGCN), and northern waterthrush. Large and small mammals use them for foraging and as water sources. Certain rare plants, such as false hop sedge (T; S2), cattail sedge (E; S2), and American featherfoil (T; S2), grow in vernal pools. All kinds of intermittent or temporary pools support significant invertebrate diversity.

Potential impacts

Twelve of the known vernal pools and both buttonbush pools are within the area proposed for residential development; two more vernal pools are within 750 feet (230 m) of the proposed development; and other pools offsite may be close enough to the development to be affected. Because most vernal pools do not come under state or federal regulation, they are subject to filling, paving, draining, and dumping at will. Another common fate of vernal pools in

residential areas is conversion to ornamental ponds, which nullifies most of the biodiversity values of the vernal pools. If not destroyed outright, they are likely to be cut off from surrounding forest by roads, driveways, and house sites, which are significant impediments to amphibians, turtles, and snakes migrating between pools and surrounding, critical forest habitat. Ducks and songbirds may no longer use pools if they are too close to noise sources, cleared forest, or other disturbance. Runoff from roads and driveways could pollute the pools with road salt, petroleum hydrocarbons, heavy metals, and sediment, and lawn runoff could send fertilizers and pesticides into them, rendering pools unsuitable or harmful to pool-breeding amphibians, turtles, and other wildlife that attempt to use them. The proposed forest clearing would also reduce the non-breeding habitat available to pool-breeding amphibians, which depend on upland forest during most of the year.

Wetland complexes

Selected conservation issues

A wetland complex is any group of adjacent and nearby swamps, marshes, wet meadows, ponds, streams, and other wetlands and waterbodies. Many animals move among several types of wetland and upland habitats throughout the year as water levels and other factors change. The spotted turtle (SC; S3; $SGCN^{HP}$) exemplifies highly mobile wildlife species that depend on a mosaic of wetland and upland habitats and require safe travel routes between those habitats. It is known to use marshes, wet meadows, hardwood and shrub swamps, buttonbush pools, intermittent woodland pools, and open water habitats within a single year (Fowle 2001). Furthermore, although it depends on many kinds of wetlands, spotted turtle may spend up to three-quarters of its time during the active season in upland habitats such as hardwood forests and meadows. Thus whole complexes of wetland and upland habitats are required to support spotted turtle populations, as well as those of numerous other animal species (Joyal et al. 2001, Milam and Melvin 2001). Wood turtle (SC; S3; $SGCN^{HP}$) is another species that uses large habitat complexes consisting of various streams, ponds, wetlands, and uplands: see *Beaver Kill*, below.

Each wetland type within a complex, or as an isolated occurrence, is important for numerous species of wildlife and plants. Wet meadows with diverse plant communities, for example, may have rich invertebrate faunas. Blue flag and certain sedges and grasses of wet meadows are larval food plants for regionally-rare butterflies. Smooth green snakes (SGCN) inhabit wet meadows. Wet meadows provide nesting and foraging habitat for songbirds such as sedge wren (T; S3B; $SGCN^{HP}$) and wading birds such as American bittern (SC; SGCN). Wet meadows in the eastern portion of the site may support organisms commonly associated with calcium-rich soils, such as eastern ribbon snake (SGCN) and a variety of rare plants, owing to the presence of calcium- containing Lake Albany clays and Onondaga limestone bedrock.

Several rare plant species are known from marshes in the region. Marshes are also important

habitats for reptiles and amphibians, including northern water snake, eastern painted turtle, spotted turtle (SC; S3; SGCN^{HP}), eastern newt, northern cricket frog (E; S1; SGCN^{HP}), and several other frog species. Numerous bird species, including pied-billed grebe (T; S3B, S1N; SGCN), marsh wren (RR), common gallinule (RR), American bittern (SC; SGCN), least bittern (T; S3, S1N; SGCN), great blue heron, Virginia rail (RR), king rail (T; S1B; SGCN^{HP}), American black duck (S3; SGCN^{HP}), and wood duck use marshes for nesting or as nursery habitat. Marshes are often the best habitat for the common muskrat, a declining species.

Swamp cottonwood (T; S2) is a rare tree of deeply-flooding hardwood swamps and woodland pool margins. Hardwood and shrub swamps along the floodplains of low-gradient streams can be an important component of wood turtle (SC; S3; SGCN^{HP}) habitat. Other turtles such as spotted turtle (SC; S3; SGCN^{HP}) and eastern box turtle (SC; S3; SGCN^{HP}) frequently use swamps for summer foraging, drought refuge, overwintering, and travel corridors. Pools within swamps are used by some pool- breeding amphibian species, and are the typical breeding habitat of blue-spotted salamander (SC; SGCN^{HP}). Four-toed salamander (SGCN^{HP}) uses swamps with abundant, moss-covered, downed wood or woody hummocks. Eastern ribbon snake (SGCN) forages for frogs in swamps. Red-shouldered hawk (SC; SGCN), barred owl, great blue heron, wood duck, American black duck (S3; SGCN^{HP}), red-headed woodpecker (SC; S2?B; SGCN^{HP}), Canada warbler (SGCN^{HP}), and white-eyed vireo (RR) nest in hardwood swamps.

Open water areas sometimes support submerged aquatic vegetation that can provide important habitat for aquatic invertebrates and fish. Spotted turtle (SC; S3; SGCN^{HP}) uses ponds and lakes during both drought and non-drought periods. Northern cricket frog (E; S1; SGCN^{HP}) is known to use circumneutral ponds. Wood duck, American black duck (S3; SGCN^{HP}), pied-billed grebe (T; S3, S1N; SGCN), osprey (SC; SGCN), bald eagle (T; S2S3; SGCN), American bittern (SC; SGCN), and great blue heron may use open water areas as foraging habitat. Red-headed woodpecker (SC; S2?B; SGCN^{HP}) breeds and forages in open water areas with numerous standing dead trees, like the beaver-impounded wetland east of the utility corridor that contains the great blue heron rookery. Bats, muskrat, mink, and river otter (RR) also forage at open water habitats.

Potential impacts

The proposed development would isolate wetlands from other nearby wetlands and surrounding uplands, thus impeding or preventing movement of organisms that must travel among these habitats. We mapped 106 ac (43 ha) of wetlands on the site; the EAF (Winston Farm 2021a) wrongly states that there are 26 ac (11 ha). In the Site Masterplan (Winston Farm 2021b), at least 14 distinct wetlands are crossed by new roads, including a buttonbush pool and three intermittent woodland pools. Other wetlands, including part of the Beaver

Kill complex (along its perennial tributary), have buildings and parking areas constructed upon them. Still others occupy large or strategic portions of proposed house lots. Thus many wetlands on the site are likely to be partly or entirely filled for construction of roads, driveways, parking areas, lawns, houses, and other buildings. In other wetlands, wildlife may be disturbed by too-near houses, lawns, and driveways, including the great blue herons of the regionally important heron rookery, which is near a proposed stormwater pond and residential development. Wetland mitigation, to compensate for any permitted loss or degradation of existing wetlands, is unlikely to replace many lost habitat functions.

The great blue heron is sensitive to disturbance by people during the nesting season. Buffer zones around nesting colonies have been recommended to avoid human impacts on nesting success. Vos et al. (1985) recommended an 820-ft (250-m) -wide buffer. Vennesland (1996) recommended a 540-ft (165-m) buffer between nests and pedestrian activity, and stated that a wider buffer would be needed for larger disturbances. Given that these buffer recommendations were developed for other American regions, and great blue heron tolerance to humans in the Hudson Valley has evidently not been documented, we believe caution requires a buffer of at least 820 ft (250 m). Many other animals are also sensitive to noise and visual disturbance from human activity, although this is not always as well documented as for great blue heron. Regarding construction and operation noise impacts on wildlife, Shannon et al. (2016), in a worldwide review of noise impacts, stated, "This literature survey shows that terrestrial wildlife responses begin at noise levels of approximately 40 dBA, and 20% of papers documented impacts below 50 dBA." These are very modest noise levels.

Beaver Kill

Selected conservation issues

Low-gradient, perennial streams are essential core habitat for the wood turtle (SC; S3; $SGCN^{HP}$), which Barbour (1991) found at Winston Farm. Wood turtles use streams with overhanging banks, muskrat burrows, submerged logs, or other underwater shelter for mating and overwintering. In late spring and summer, wood turtles move into and beyond the adjacent riparian zone to bask and forage in a variety of wetland and upland habitats, and females may travel long distances from their core stream habitat to find open upland nesting sites. Thus conserving wood turtle populations requires protecting not only their core habitat (the perennial stream), but also their wetland and upland foraging habitats (including both meadows and forests), upland nesting areas, and the migration corridors between these habitats. The wood turtle habitat complex can encompass the wetland and upland habitats within 820 ft (250 m) or more of a core stream habitat (Carroll and Ehrenfeld 1978, Foscarini and Brooks 1997, Tingley et al. 2009).

Potential impacts

Development of the upland portions of the Winston Farm wood turtle habitat complex, as well as development so close to the riparian wetlands and core stream habitat, could have substantial adverse effects on the turtles and their habitats. These effects include habitat degradation from stream alteration (if Augusta Savage Road is widened at the crossing); degraded water quality from siltation, pesticides, fertilizers, petroleum hydrocarbons, salt, and other toxic compounds in site runoff; increased nest predation by human-subsidized predators; and substantial road mortality and collecting of nesting females and other individuals migrating between habitats. The currently proposed project would also result in the direct loss of large areas of nesting habitat (meadows) and other upland and wetland habitats that are likely used by wood turtles, to buildings, stormwater ponds, impervious surfaces, and landscaped vegetation.

In general, water and habitat quality in the Beaver Kill and its riparian wetland complex could be substantially degraded. In some places, impervious surfaces are proposed to come within 10 m of the Beaver Kill wetlands, and in other locations on both sides of the stream, building and parking areas would be built upon the wetlands. There would be stormwater ponds immediately adjacent to the wetlands, and large volumes of wastewater effluent entering the Beaver Kill. Unbuilt areas would abut much of the west side of the Beaver Kill corridor, but these might be cleared of native vegetation and converted to manicured, fertilized, lawns. Water quality in the Beaver Kill and the streams it feeds could be substantially degraded by wastewater effluent, lawn chemicals and fertilizers, petroleum hydrocarbons, other toxic compounds, and siltation from the hundreds of acres of disturbed soil, new impervious surfaces, water infrastructure, and landscaped areas proposed for the meadows, shrublands, and woodlands on both sides of the Beaver Kill corridor.

<u>Other habitats</u>

Quarries

According to the Ulster County soil survey (Tornes 1979), there are approximately 25 ac (10 ha) of abandoned quarries, comprising about 3% of the site, in the isolated western parcel. We believe the quarries were historic bluestone workings for the building stone trade, similar to widespread quarrying elsewhere in the Catskill region. The quarry floors, rock rubble, and other non-forested habitats of abandoned quarries generally contain warm spots on the landscape. As such, abandoned bluestone quarries can be important habitats for certain reptiles, higher plants, mosses, and lichens. These include species of southern affinities and warmth-seeking species, potentially including species of conservation concern. At Winston Farm, we would expect to find eastern box turtle (SC; S3; $SGCN^{HP}$), eastern ratsnake (SGCN), northern black racer (SGCN), and possibly northern copperhead (S3; SGCN). Birds of conservation concern likely to use the quarries include whip-poor-will (SC; S3; $SGCN^{HP}$),

hermit thrush (RR), and worm-eating warbler (SGCN). Piles of quarry rock contain spaces, some of which may be of sizes suitable for denning by bobcat or porcupine. Rocks with cracks or crevices about 0.4 in (1 cm) wide may be suitable for roosting by small-footed bat (SC; S1S3; SGCN), and larger crevices by certain other bats.

Temporary pools

On flat areas in the meadows, clayey soils would pond water frequently. Temporary pools in depressions or vehicle ruts can support clam shrimps, including the globally rare species Mattox's clam shrimp (a data-deficient SGCN). (There is a population of Mattox's clam shrimp in ATV-created pools in Bristol Beach State Park, also in the Town of Saugerties.) Temporary pools that form on quarry floors, old haul roads, and ATV trails are also likely to support clam shrimps. Such pools are also used by box turtle (SC; S3; $SGCN^{HP}$), *mud-puddling* (sodium-seeking) butterflies, and potentially by breeding frogs and salamanders, if the pools hold water through spring and early summer.

Other biological considerations

Hudson River Valley Significant Biodiversity Area

The entire WF site is within the *Hudson Valley Limestone and Shale Ridges* Significant Biodiversity Area (SBA), mapped by the NYSDEC Hudson River Estuary Program. According to Penhollow et al. (2006), "This area is a regionally significant geologic feature that contains habitats that support several rare mammal, amphibian, reptile, bird, and plant species," as well as "wide variety of diverse communities, many of which are rare in New York State." They remarked that the SBA contains some of the best examples of shale cliffs and talus slopes in the Hudson Valley. This would likely include those found by Barbour (1991) and potentially others not yet discovered at WF. Penhollow et al. reported that sedge wren (T; S3B; $SGCN^{HP}$), least bittern (T; S3B, S1N; SGCN), blue-spotted salamander (SC; $SGCN^{HP}$), wood turtle (SC; S3; $SGCN^{HP}$), smooth cliffbrake (T; S2), and American ginseng (RR) occur in the SBA; all are possible (or already known) at WF. The authors concluded that

Habitat conversion as a result of suburban expansion is of greatest concern in the largely unprotected lands of this significant area. Exploring opportunities for conservation agreements (easements or acquisition) that ensure the continued existence of the least disturbed and unfragmented examples of the state-rare communities…is recommended.

Climate change resilience

In 2018, Hudsonia conducted an analysis of conservation priorities for climate change resilience in the service area of the Woodstock Land Conservancy, which includes the WF site (Stevens and Graham 2018). The analysis considered landscape characteristics closely related to ecosystem function, habitat connectivity, and biodiversity—such as sizes of habitat blocks, elevations and topographic complexity, stream corridors, known locations and habitats for rare or sensitive species, and potential movement corridors for wildlife—and weighted each according to its relative contribution to a climate-resilient landscape. The weighted values of all such characteristics were summed at every location; the highest total scores were classified according to "high," "higher," and "highest" priorities for conservation; and the areas achieving those priority ranks—the *Climate Resilience Priority Areas*—were mapped throughout the service area.

Winston Farm is fully within one of the greatest concentrations of Climate Resilience Priority Areas in the WLC service area, which includes all of Woodstock, most of Saugerties, and parts of several other towns adjacent to Woodstock. Thus it is a critical property for maintaining climate change resilience for biodiversity—based on the presence of an ecologically intact, complex, and functioning landscape—in our region. Of Winston Farm's 803 ac (325 ha), 636 ac (257 ha), or 79%, ranked as areas of high (158 ac [64 ha]), higher (91 ac [37 ha]), or highest (387 ac [157 ha]) priority for conservation (Figure 3). A confluence of numerous climate resilience factors at the site renders this critical importance: a large forest block (≥ 1,000 ac [400 ha]), a large, low-elevation habitat block (≥ 1000 ac [400 ha]), a landscape corridor for animal movement, two large meadows (50-99 ac [20-40 ha]), a FEMA floodplain, large and small perennial streams, cool areas, NYNHP Important Areas for plants, animals, and natural communities, and a Significant Biodiversity Area. Many of these elements have already been discussed in this report. Landscape corridors include south-to-north and low-to-high-elevation corridors in key parts of the landscape that are substantially unprotected. The corridor that passes through WF, shown in Figure 3, encompasses important connections along the Beaver Kill in Saugerties and may serve as a major south-to-north dispersal and migration corridor. The corridor boundaries were delineated to capture areas of complex topography and/or high connectivity that allow for safe movement of wildlife, and thus facilitate a landscape and biota more resilient to the effects of climate change.

Appendix 1 is a map showing areas of the WF site where development would have the relatively least impact on biodiversity and ecosystem functions.

Recommended surveys

A variety of biological surveys should be conducted early in the planning process for any large- scale development proposed at the Winston Farm site. Surveys should be conducted

by competent, independent biologists with substantial experience working with each study group. Surveys for each group should take place across multiple days during the appropriate season, and should be repeated during at least two years. The following species and groups of organisms should be surveyed for:

- Breeding birds of conservation concern, including
    - Waterfowl, pied-billed grebe, common gallinule
    - Ruffed grouse
    - Rails
    - American woodcock
    - Wading birds, e.g. American bittern
    - Breeding raptors—osprey, northern goshawk, red-shouldered hawk
    - Red-headed woodpecker
    - Black-billed cuckoo
    - Grassland breeding songbirds—sedge wren, grasshopper sparrow, vesper sparrow, eastern meadowlark, bobolink
    - Forest songbirds including Acadian flycatcher, black-throated blue warbler, cerulean warbler, Kentucky warbler, Canada warbler, Louisiana waterthrush, worm-eating warbler
    - Shrubland songbirds including brown thrasher, golden-winged warbler, prairie warbler
    - Breeding bird surveys should focus on the appropriate habitats (e.g., open water and marsh for waterfowl, pied-billed grebe, common gallinule, and wading birds). Breeding surveys must be tailored to the seasons of peak breeding behavior for the target species which, for example, include early spring for waterfowl and raptors, and late spring for most songbirds. In general, surveys of each habitat should occur on ten days during the breeding season. The surveyor must be familiar with the vocalizations of the target species.

- Wintering raptors—short-eared owl, northern harrier, rough-legged hawk, golden eagle, bald eagle, American kestrel, peregrine falcon. See Appendix 2 for winter raptor methods.

- Snakes—timber rattlesnake, northern copperhead, eastern hog-nosed snake, eastern ribbon snake, smooth green snake. Snakes are best surveyed by visual encounter in early spring on warm sunny days, and by turning cover objects (rocks, logs, bark slabs, refuse). Artificial cover objects are potentially useful but must be deployed a year or more in advance of surveys. Some species can also be surveyed in late summer – early fall.

- Turtles—wood turtle, spotted turtle, eastern box turtle. Spotted turtle may be trapped and spotted through binoculars in April. Wood turtle may be found by wading streams in early spring or late summer; the latter may be more efficient due to generally lower flows. Box turtles can be found at field-forest edges and crest habitats by visual encounter, listening for movement in leaf litter, and trapping at drift fences.

- Bog turtle and northern cricket frog: habitat assessments and, if warranted, surveys. Habitat assessments should use U.S. Fish and Wildlife Service standard procedures and forms. Surveys require state permits; bog turtle surveys must be conducted by a recogized, qualified bog turtle surveyor.

- Pool-breeding amphibians—marbled salamander, blue-spotted salamander, Jefferson salamander, four-toed salamander, and other more common species including eastern newt and wood frog. Pool amphibian surveys should be performed in approximately March and should include identification of egg masses and, in some cases, minnow trapping or night-lighting surveys for breeding adults of all species and marbled salamander larvae. Four-toed salamanders may be found by lifting moss mats on woody plant hummocks in woodland pools and swamps in about April.

- Butterflies and odonates of conservation concern. Surveys should be performed at intervals through the spring and summer to intersect the flight periods of different species.

- Rare plants (NYNHP S1, S2, and S3 species, as well as regionally rare plants). Rare plant surveys must be conducted when the target species is identifiable; different species require surveying at different seasons ranging from mid-spring to late summer. A surveyor should ideally be familiar with the vegetative stages of the target species as well as flowering or fruiting material.

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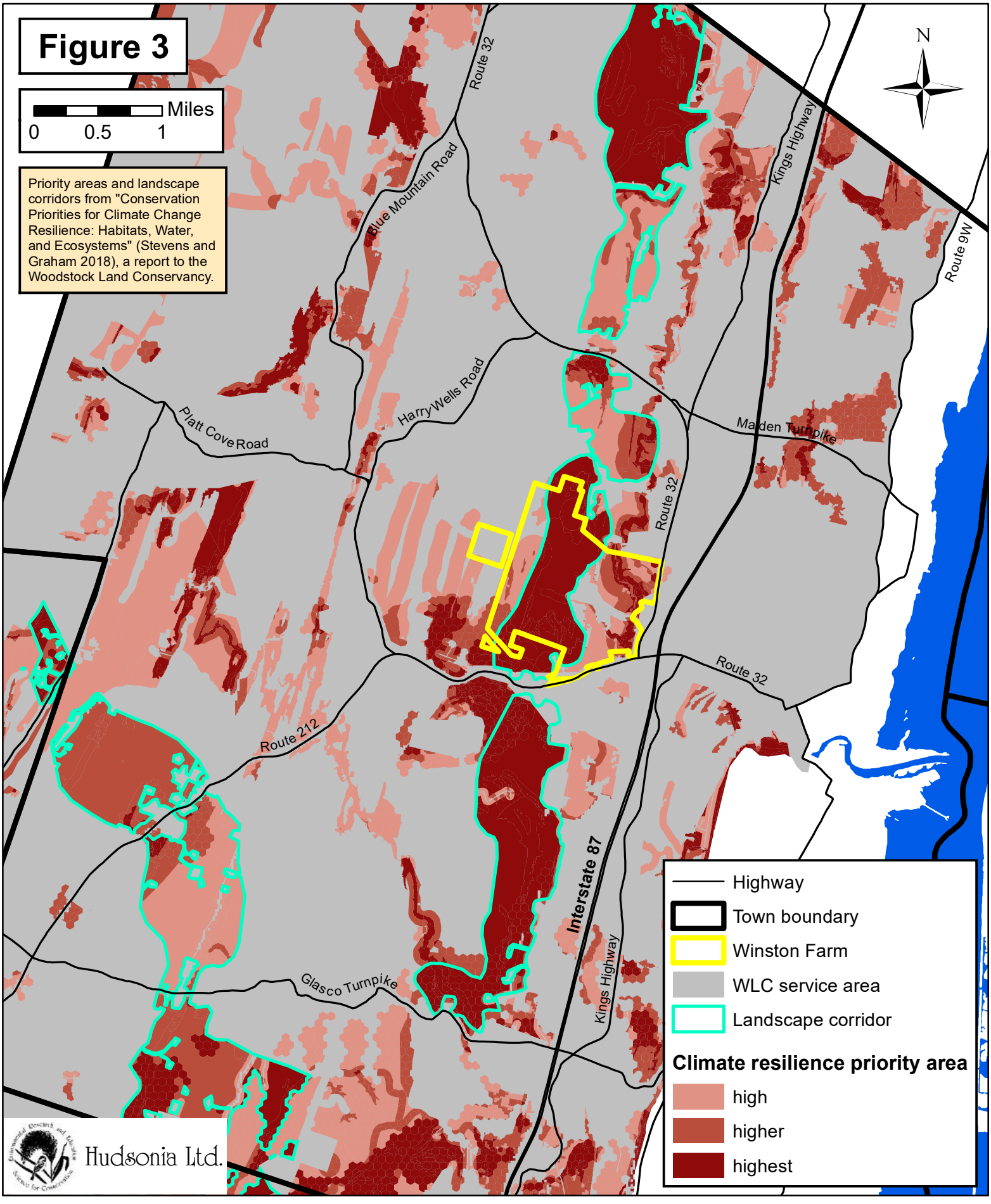
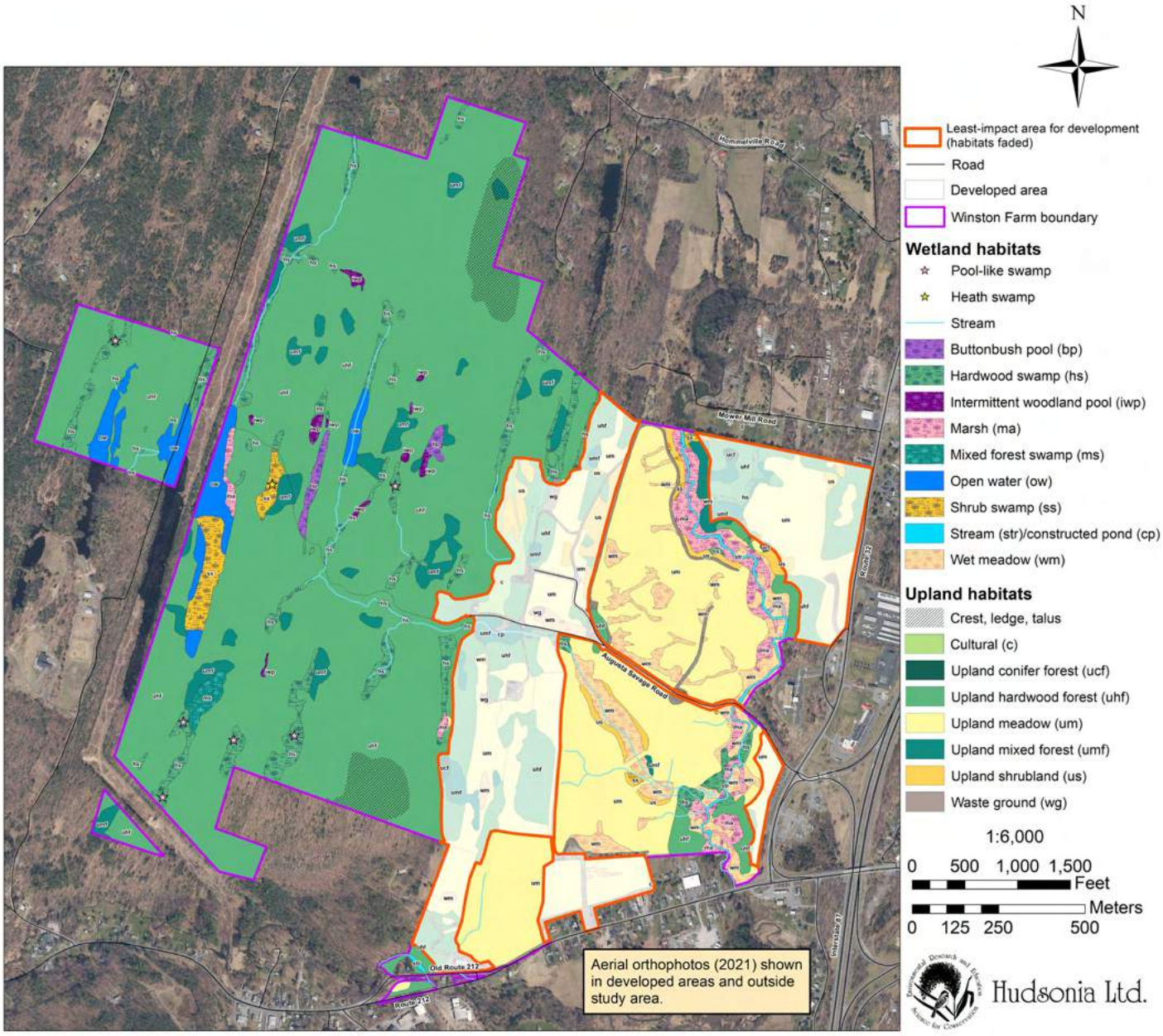
Conservation Priority Areas for Climate Resilience
Winston Farm region, Ulster County, NY



Appendix 1. Map of least-impact areas for potential development, based on the assessment of habitat functions and other ecosystem services likely to be supported. Delineated areas total 20% of the site, about 160 acres. This analysis recommends preserving those areas currently in large forest, extensive meadow, wetlands, and other significant habitats in respect of the values described in the current report.



Appendix 2. Late winter bird survey of Winston Farm meadows, by Larry Federman for Hudsonia.

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Winston Farm Bird Survey Results – March 15, 16, and 23, 2022

Bird surveys were conducted from off-site locations adjacent to the site – from the northern Holiday Inn Express parking lot on 3/15/2022 and 3/23/2022 and at the Park and Ride across from the NYS Thruway Southbound access on SR 32 on 3/16/2022. Observations were made from ground-based viewing and by drone flights conducted by licensed drone pilot, Sonja Stark, over meadows on both sides of Augusta Savage Rd. Observations were conducted between 4:45pm and 7:30pm.

The drone was flown at heights between 30 and 100 feet, coursing the fields as would be conducted by a hunting Northern Harrier. The drone afforded us views of lower elevations of the fields that otherwise would not be seen from the parking lots, as well as areas beyond our direct line of sight. Based on analysis of the drone footage, it appeared that both fields had been mowed late in 2021, indicated by very low vegetation growth. Several posts, round hay bales, and large trees in the middle of the fields were closely scrutinized for perching birds, as well as the perimeters along the Beaver Kill.

No Northern Harriers or Short-eared Owls were observed during the surveys. A Red-tailed Hawk carrying a meadow vole supported the potential of the site for foraging by Short-eared Owls, Northern Harriers, and other birds of prey which are principally vole-feeders in winter. Birds of note include American Kestrel (a female was observed perching on several dead snags along the Beaver Kill Creek, adjacent to the North Meadow; Bald Eagles (2) – an adult flew south over the Holiday Inn parking lot at approx. 150ft high, and a 1yr old flying north approx. 750ft west of the Holiday Inn parking lot at approx. 50ft off the ground; Eastern Meadowlarks (4) were seen and heard singing in the North Meadow; Rusty Blackbirds (6) were observed in a dead snag adjacent to the Beaver Kill; American Woodcock (4) were heard from the Holiday Inn parking lot. See the complete list below.

Review of the drone footage didn't reveal any foraging or perched raptors. One bird that was captured on video in flight was determined to be a Mallard. Two drone observations are still being analyzed.

Respectfully submitted,
Larry Federman

Species	Holiday Inn 3/15/2022	Park and Ride 3/16/2022	Holiday Inn 3/23/2022
American Kestrel			1 female perching on dead snags along Beaver Kill Creek
American Goldfinch		5	
American Robin			3
American Woodcock	4		
Bald Eagle			2 - adult, 1yr old
Black Vulture		2	
Black-capped Chickadee		2	
Blue Jay		2	
Canada Goose	3		1
Carolina Wren	1	2	2
Common Grackle		33	45
Common Raven		1	
Dark-eyed Junco		3	
Downy Woodpecker		3	
Eastern Bluebird	3		2
Eastern Phoebe			1
Eastern Meadowlark	4 - along Augusta Savage Rd, singing	1, along Augusta Savage Rd, singing	
European Starling	3	7	
Hooded Merganser			4 - 2 pair actively diving/fishing in Beaver Kill
Kildeer	1		1
Mallard	11	7	2
Northern Mockingbird	1	1	
Northern Cardinal	1		
Red-bellied Woodpecker	1		
Red-tailed Hawk	2	3, one with vole in talons	2
Red-winged Blackbird	369 - in several large flocks	42	20
Rusty Blackbird	6		
Song Sparrow	2	3	
Tufted Titmouse	1		
Turkey Vulture		1	
White-throated Sparrow			2
Wild Turkey			3
Wood Duck	1 male		

Appendix 3 (following page). *Rare Plants and Significant Habitats Survey on the Ulster County Alternative Landfill Site 2 (Winston Farm), Town of Saugerties, Ulster County, New York* (Barbour 1991)

Hudsonia

a non-profit institute

Rare Plants and Significant Habitats Survey on the Ulster County Alternative Landfill Site 2 (Winston Farm), Town of Saugerties, Ulster County, New York

Report to

Town of Saugerties

By

Spider Barbour

Hudsonia Ltd.

Bard College Field Station, Annandale, New York 12504

24 October 1991

Table of Contents

Abstract

In the summer of 1991, Hudsonia field ecologist Spider Barbour conducted a survey of significant habitats and rare plants at the Winston Farm site (Ulster County Alternative Landfill Site 2), in the Town of Saugerties, Ulster County, New York. He found extensive calcareous oldfield and hayfield habitats, wetlands with diverse flora including abundant wildflowers, and floodplain forests of the Beaver Kill, a deep, slow, clay-bottomed, biologically rich stream. The fields and wet meadows supported ca 200 small-flowered agrimony plants (Heritage S3) and several regionally rare sedges and forbs: squarrose sedge, crested sedge, wild germander and sneezeweed. He found winged monkeyflower (Heritage S2) on the Beaver Kill floodplain and a wood turtle (DEC Special Concern) just entering the Beaver Kill near Niger Road. During previous visits to the site he has found northern dusky salamander (regionally rare), migrating and apparently nesting eastern bluebirds (DEC Special Concern), and northern harrier (Heritage S3). In areas of the Winston Farm candidate site outside the landfill footprint he has found a rosebay swamp (regionally rare), and crest habitats with falcate orange-tip butterfly (Heritage S3) and green rock cress (Heritage S2). Just offsite along the Beaver Kill he has found Appalachian blue butterfly (Heritage S3); there is suitable habitat for this species and other uncommon and rare animals and plants on the Winston Farm property. Most areas at Winston Farm are isolated and buffered from human activity by hedgerows, fields and forests. The seclusion, the rich floral diversity, and overall habitat quality make this an exceptional site in this region.

1 INTRODUCTION

At the request of the Town of Saugerties, Hudsonia conducted surveys for significant habitats and rare plants on proposed Ulster County landfill sites 2 (Winston Farm), 3 (Mount Marion), and 6 (Asbury), and along the Beaver Kill from NY Route 212 north to the confluence with Kaaterskill Creek. This report describes the survey and results on the Winston Farm site (USGS 7.5 minute Saugerties quadrangle).

Hudsonia Ltd. is a non-advocacy, nonprofit, scientific research and education institute based at the Bard College Field Station in Dutchess County, New York. Hudsonia does not support or oppose land use projects, but conducts scientific studies to collect and analyze data and make recommendations for environmentally sound land management. These findings are provided impartially to those persons and organizations involved in public decision making. Hudsonia's ability to do complete biological and ecological studies may be limited by season, funding, or other factors. Although Hudsonia's studies are usually biological and ecological

in focus, our observations, analyses and recommendations may range into other subject areas as determined by the site, its resources, and the potential environmental impacts upon these resources.

2 METHODS

I conducted the field work. Gretchen Stevens assisted in report preparation. Report Sections 8 (species descriptions) and 9 (criteria of rarity) were adapted from material prepared by Erik Kiviat.

I explored the Winston Farm site during several visits in August and September 1991 (total field hours: 15.5). Previous visits to the site, including a wetland reconnaissance in the spring of 1991 (Barbour 1991), provided preliminary information that helped guide this survey. I assessed habitats by direct observation for species diversity, environmental quality (lack of disturbance or pollution), rare species presence or potential, rarity of habitat type and other values.

I looked for rare plants in all habitats, but concentrated especially on wetlands and areas relatively free of disturbance. I did not bother to look in highly altered places such as lawns and parking lots. I sought to document in further detail some rare species I had found previously, and to assess their numbers and distributions in the survey area. I recorded observations of distribution, population size and health for state-listed rare plant species, and have submitted documentation to the New York Natural Heritage Program.

I made most plant identifications in the field. I collected voucher specimens of all species I believed to be rare if their local population could withstand the collecting. I also collected specimens of any plants I could not identify confidently. Laboratory identifications or verifications were made by me, by Hudsonia botanist Gretchen Stevens, or by Hudsonia Research Associate Jerry C. Jenkins (White Creek Field School). A specimen of each state-listed rare plant has been deposited with the New York Natural Heritage Program. All other specimens are in the herbarium of the Bard College Field Station.

Criteria of species rarity are described in Section 9. For species of statewide rarity, we rely on the lists maintained by the New York Natural Heritage Program. There is no official or legal list of regionally rare species. "Regionally rare" species are native plants and animals that are rare in the mid-Hudson region and in Ulster County. Usually a species we call regionally rare has been found by us at fewer than 10 localities in the county during the 1970s through 1991. For vascular plants we also refer to the Preliminary Vouchered Atlas of New York State Flora (New York Flora Association 1990) and an unpublished list compiled ca 1974 by Stanley J. Smith (New York State Museum) which indicates the number of records for each species in each DEC Region of New

York; this list was based on specimens in the State Museum and other herbaria as well as Smith's own field observations.

Alternative Landfill Site 2 is referred to in the SDGEIS as the Winston Farm site, but it encompasses lands outside of the property now held in single ownership as Winston Farm. In this report, we use Winston Farm to refer to the entire candidate site as mapped in the Supplementary Draft Generic Environmental Impact Statement (SDGEIS, Ulster County Resource Recovery Agency 1990). The site includes east-facing slopes of the Hooge Berg formation (Goldring 1943), fields and orchards at the base of the slopes, and the Beaver Kill stream corridor and floodplain (Figure 1). The proposed landfill footprint includes most of the fields on clayey soils, and the western floodplain of the Beaver Kill; it does not include the wooded Hooge Berg uplands or any lands east of the Beaver Kill. Hudsonia's survey was therefore restricted to the landfill footprint and the Beaver Kill, its floodplain, on-site tributary streams and associated wetlands. Significant habitats and rare plants of the Beaver Kill are treated separately in another Hudsonia report (Barbour, in prep).

Information on the Hooge Berg province gathered during other explorations at Winston Farm is included here because of the potential impact of a waste incinerator. The incinerator option has not been removed from the county waste plan, and early diagrams prepared by the Resource Recovery Agency's engineering consultant located the incinerator on the top of the Hooge Berg hill at Winston Farm.

Metric units of measurement are used in this report. English equivalents are:

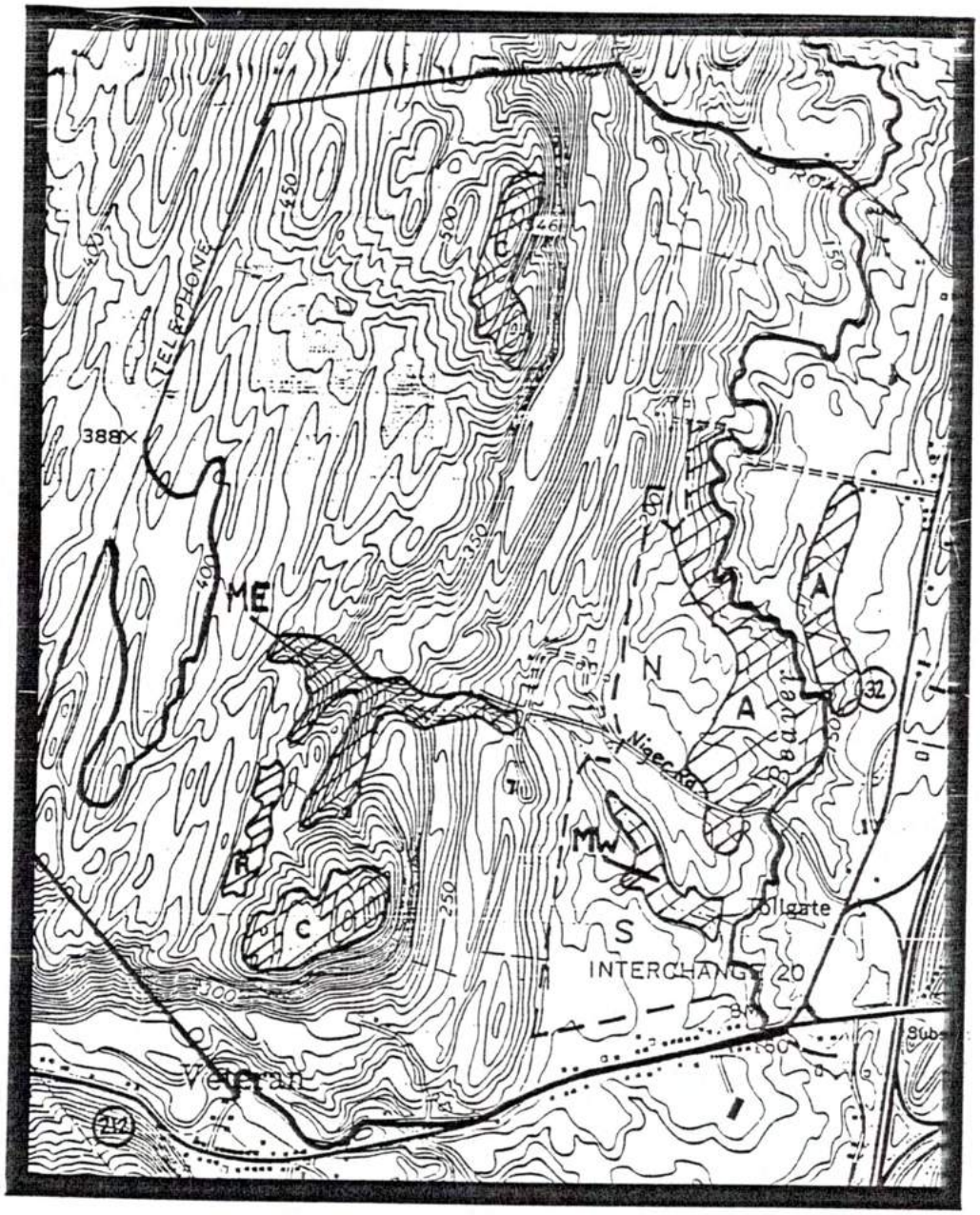
1 cm (centimeter)	=	0.39 inch
1 m (meter)	=	3.28 feet
1 km (kilometer)	=	0.62 mile
1 ha (hectare)	=	2.47 acres

3 RESULTS

3.1 SITE DESCRIPTION

Winston Farm is an approximately 324 ha (800 ac) property that included wooded slopes and uplands of the Hooge Berg formation (a north-south oriented range of hills underlain by sandstone and shales), old orchards, oldfields and hayfields on dissected glacial lake plains at the base of the Hooge Berg slopes, the Beaver Kill stream and its mostly wooded floodplain, and fields and woods on shallow soils with limestone bedrock exposures east of the Beaver Kill along State Route 32. The fields were divided by an east-west running, unpaved driveway known as Niger Road, and are called the north field and south field in this report (Figure 1).

The Winston Farm topography was rolling, with slopes dropping



0 1 kilometer

0 1 mile

KEY

A	Small-flowered agrimony	N	North field
C	Crest habitat	S	South field
R	Rosebay swamp	- - -	Field edge
ME	Mesic cove	-----	Boundary of Site 2
MW	Madalin wetland		

Fig. 1. Significant habitats at Ulster County alternative landfill Site 2.

eastward and draining into the Beaver Kill through hillside seeps and shallow gullies between small hills. Lowland soils were mostly calcareous silt loams with a high clay component [Hudson and Rhinebeck soils (Tornes 1979)]. One large wetland was underlain by Madalin silty clay loam, and is referred to here as the Madalin wetland. Wetlands on this site were described and their general location mapped in Barbour (1991).

Vegetation within the proposed landfill footprint consisted mostly of common oldfield and hayfield herbs and shrubs [multiflora rose (*Rosa multiflora*), gray dogwood (*Cornus foemina*), and northern blackberry (*Rubus allegheniensis*)] in drier locations, and common wetland herbs (mainly sedges and rushes) in moist places. The Madalin wetland differed from other wetlands in having abundant shrubs and forbs (broad-leaved, flowering herbs). Trees [mostly shagbark hickory (*Carya ovata*) and sugar maple (*Acer saccharum*)] were large, few and scattered, except in hedgerows (primarily along Niger Road) and on the banks of the Madalin wetland. Trees were most numerous along the western edge of the fields.

3.2 SIGNIFICANT HABITATS

Oldfields and Hayfields

The Winston Farm fields were buffered on all sides from highway traffic and other human activity. They were bordered on the west by the Hooge Berg forested slopes, on the north by fields and hedgerows of another farm, on the east by the wooded Beaver Kill floodplain, and on the south by a hedgerow, fields of the Snyder farm and long back yards of houses along NY Route 212.

These fields offer high-quality habitat for many animals of open and shrubby habitats. They may provide nesting or feeding grounds for uncommon and rare birds, such as eastern meadowlark and eastern bluebird (DEC Special Concern). They may support rare breeding birds such as short-eared owl (Heritage S2), northern harrier (Heritage S3), vesper sparrow, Henslow's sparrow, grasshopper sparrow (all DEC Special Concern) and sedge wren (Heritage S2). Brushy oldfields can be good habitat for golden-winged warbler (regionally rare), box turtle (regionally rare), and other rare animals. Wood turtle (DEC Special Concern) could use these fields for foraging. The juxtaposition of hayfields with forested areas is an important habitat combination for wild turkey, which feeds on seeds and insects in fields, and uses forests for roosting and escape cover. Hayfields provide grazing and foraging habitat for numerous species of large and small mammals. Hayfields where pesticides are absent or minimal may support a high diversity of butterflies attracted to the variety of field-edge and oldfield flora. As farming continues to decline, there will be fewer early-stage oldfields with potential to support rare species.

In spring and autumn I have seen eastern bluebirds in the Winston Farm north fields: in October 1989 and October 1990 I saw flocks

of about two dozen bluebirds, presumably migrating; in April 1991 I saw two pairs. In March 1991 I saw a northern harrier (possibly a migrant) flying low over the south field. In the summer of 1991 I observed butterflies of many kinds nectaring on wild bergamot, thistles, goldenrods, Joe-Pye-weed, milkweeds and other wildflowers.

The Winston Farm fields contained stands of small-flowered agrimony (*Agrimonia parviflora*, Heritage S3), and wetland patches with the regionally rare squarrose sedge (*Carex squarrosa*), crested sedge (*Carex cristatella*), wild germander (*Teucrium canadense*), and sneezeweed (*Helenium autumnale*) (see rare plants discussion, Section 3.3).

Large, secluded and species-rich open fields like those of the Winston Farm property are uncommon in the Town of Saugerties and surrounding towns. Fields of comparable size that I have seen in northern Ulster and southern Greene counties are less biologically diverse, more exposed to human activity, and more disturbed. The Winston Farm fields are probably of great importance to local wildlife and their destruction would represent a major loss to local habitat quality and diversity.

Madalin Wetland

The long, low-lying Madalin soil wetland in the south field contained a very diverse flora, but plants were arranged in patches of just a few species each. For example, patches were variously dominated by a sedge complex (squarrose sedge and other sedges); blue vervain (*Verbena hastata*); boneset (*Eupatorium perfoliata*), square-stemmed monkeyflower (*Mimulus ringens*), and swamp milkweed (*Asclepias incarnata*); Joe-Pye-weed (*Eupatorium maculatum*) among silky dogwood (*Cornus amomum*); and flat-top goldenrod (*Euthamia graminifolia*) and wild bergamot (*Monarda fistulosa*).

The Madalin wetland and field edges are potential habitat for Appalachian blue butterfly (Heritage S3). Summer-blooming dogwoods, which I believe are its host plants in lowland areas in this region, are common here. I saw Appalachian blues along the Beaver Kill north of Winston Farm in June and July [see Beaver Kill report, Barbour (in prep.)]. At the time of this survey (August), however, Appalachian blues are no longer flying, and the caterpillars are very hard to find.

I found no Heritage-listed plants in the Madalin wetland. The absence of small-flowered agrimony is puzzling, considering its presence in the small but similar wetland less than 300 meters distant. Despite the absence of statewide rare plants, the plant species composition, diversity and structural arrangement in this wetland makes it very unusual and beautiful. The prolific flowers provide nectar for butterflies, the shrubs and sedges nesting habitat for birds. Nestled between the higher fields, this is an especially secluded biological oasis, and in its plant species composition and aesthetic attributes unlike any other wetland I

have seen in the region.

Beaver Kill

The Beaver Kill and its floodplain habitats are described in another report (Barbour, in prep.).

I found a dense population of winged monkeyflower (*Mimulus alatus*, Heritage S2) in a flood channel on the east side of the Beaver Kill. The Beaver Kill floodplain here and downstream supports one of the largest winged monkeyflower populations in the state (Barbour, in prep.).

Hackberry butterfly (Heritage S3S4) is a likely inhabitant of the Beaver Kill floodplain. Its host plant, hackberry (*Celtis occidentalis*), grows here and there in limestone areas along the Beaver Kill at Winston Farm.

On 7 August 1991 I found an adult male wood turtle (DEC Special Concern) about to enter the Beaver Kill south of Niger Road. Wood turtles can cover fairly large home ranges (to 115 ha in one Ontario study, Quinn and Tate 1991) and forage extensively away from their home streams in neighboring woods and fields. Field margins and wetlands are probably the most important habitats for wood turtles. The Winston Farm's seclusion and distance from heavily travelled roads helps to protect its turtle population from decimation by vehicles.

Mesic Cove

West of Niger Road there was a steeply dissected mesic hollow (Figure 1) on an intermittent stream, with several fingers along small tributary streams. The ravine slopes were forested with hemlock (*Tsuga canadensis*), basswood (*Tilia americana*), and sugar maple (*Acer saccharum*). The stream courses, alluvial terraces and seeps had open spicebush (*Lindera benzoin*) swamps with scattered butternut (*Juglans cinerea*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), and hemlock. In winter I saw numerous cocoons of spicebush silk moth. This is not a rare moth, but suitable habitat is spotty in Ulster County. In January 1989 I found a dusky salamander (regionally rare) at the downstream end of the hollow. Dusky salamander is associated with unpolluted streams and could occur in other springs and streams on the Winston Farm property. Spring salamander (regionally rare) could also occur in these habitats.

Hooge Berg Crest Habitats

During explorations of the Hooge Berg crest on the Winston Farm and adjacent properties (north and south) at various times from 1982 to 1989, I found several unusual habitats and rare species.

At the southeast corner of the Hooge Berg formation at Winston Farm, I found a xerophytic (characterized by dry-adapted vegetation) shale crest and slope which I named Grassy Hill because of

the abundant graminoids (grasses and sedges) under the well-spaced oaks. I found the rare falcate orange-tip butterfly (Heritage S3) there, and the regionally rare Venus' looking glass (*Triodanis perfoliata*). (I collected no specimen, and do not know if this was the native or introduced variety.)

In 1986 I found green rock cress (*Arabis missouriensis*, Heritage S2) on a small siltstone ledge near the north end of the candidate landfill site. The plants were still there in May 1990, but I did not look for them during the 1991 survey. The species could occur on other ledges on the site; it is very inconspicuous and easily overlooked.

In July 1989, I found a swamp in the Winston Farm's Hooge Berg uplands with numerous large rosebays (*Rhododendron maximum*). Our largest wild rhododendron, rosebay is regionally rare. I have found it in only two other places in Ulster County.

Other possible inhabitants of the crest communities are eastern hognose snake (DEC Special Concern), copperhead (Heritage S3), and numerous rare butterfly species. Edward's hairstreak (Heritage S3S4), northern hairstreak (S1S3), frosted elfin (S1S3), Henry's elfin (S2S3), Horace's dusky wing, silvery blue (S2S3), and grizzled skipper (S1) are butterflies known from similar habitats in the region.

3.3 RARE PLANTS

State-listed Plants

Small-flowered agrimony

Small-flowered agrimony (*Agrimonia parviflora*, Heritage S3) is a long-lived perennial of the rose family (Rosaceae), blooming and fruiting in late summer. It is essentially a southern plant, but it may have been expanding its range northward in recent decades. In 1941 it had not been reported north of Hamptonburgh in Orange County (Svenson 1941). We know of only one other location in Ulster County, six in Dutchess County and one in Orange County, in populations ranging from 2 to ca 1000 plants. In this region, small-flowered agrimony tends to grow in somewhat calcareous wet meadows and oldfields, but we have also found it in wet semi-shaded woods. It seems to tolerate some disturbance, and perhaps requires limited disturbance to prevent the encroachment of competing shrubs.

Most of the small-flowered agrimony plants I found at Winston Farm were in the north field. All the plants I found in the south field were within 150 m of Niger Road, most in a small wetland patch at the field's northeast corner. Nearly all the plants in both fields were on the lower slopes of hills, in wetlands, or within 10 meters of woods or hedgerows. I found no agrimony plants in the broad, high centers of the fields. Approximately 30% of the small-flowered agrimony plants at Winston Farm had

been browsed by deer, but nearly all had at least a few flowers or fruit from axillary inflorescences.

Counting small-flowered agrimony plants was complicated by their growth habit; individual plants had from one to eight stalks arising from a common base, and tended to grow close together. Plants grew both in moderately dense clusters and as separate, scattered individuals. Without uprooting the plants I could not tell whether smaller single stalks near clusters were separate plants or shoots from lateral root extensions. By counting stalks and considering their arrangement and growth habit, I arrived at the following estimates of separate plants: a total of 19 at three locations in the south field, and a total of 157 at numerous locations in the north field. Allowing for missed plants, the total number is probably close to 200. I also found small-flowered agrimony on the east side of the Beaver Kill floodplain north of Winston Farm. That population is described in the Beaver Kill report.

Winged Monkeyflower

Winged monkeyflower is a rare plant of shaded wetland habitats. Hudsonia has found it primarily along the lower reaches of Hudson River tributary streams, but we have also found it on clayey soils isolated from the Hudson in Dutchess and Ulster counties. At Winston Farm I found 45 winged monkeyflower plants in a flood channel on the east side of the Beaver Kill. I have found numerous other small and large colonies of winged monkeyflower elsewhere along this lower reach of the Beaver Kill, which together constitute one of the largest known populations of this species in the state (Barbour, in prep.).

Green Rock Cress

Green rock cress (*Arabis missouriensis*) is an inconspicuous plant of circumneutral ledges or rocky woods (Fernald 1950). The Atlas of New York State Flora shows no vouchered locations for this species south or west of Albany County. I have found it at two other crest sites in the Town of Saugerties.

Regionally Rare Plants

Squarrose sedge is a plant of calcareous wet meadows, marshes and swamps (Fernald 1950). Smith (1974) listed eight records for the species in DEC Region 3. Hudsonia has found squarrose sedge at only a few sites in Dutchess and Ulster counties, usually in semi-shaded, dry-end, somewhat calcareous wetlands. At Winston Farm, I found squarrose sedge in wet meadow areas and in the Madalin wetland.

Crested sedge is a wetland plant, but we know little about its ecology. Smith (1974) listed only five records for DEC Region 3. Hudsonia has found it primarily in clayey wet meadows at a few locations in Dutchess and Ulster counties. I found crested sedge

in a wet meadow in the northeast corner of the south field at Winston Farm.

Wild germander may once have been more common in the region, but seems to have declined in recent decades. In addition to the Winston Farm occurrence, Hudsonia has seen it in 2-3 Hudson River tidal wetlands, at two locations along the Beaver Kill, and at one other Ulster County site. I found it in the Winston Farm south field.

Sneezeweed is a yellow composite that is not uncommon along the Hudson River shoreline, but is rarely found inland. I have found it in wet areas of the Winston Farm south field, on the Beaver Kill floodplain north of Winston Farm, and on perhaps 5-6 other inland sites in Ulster County.

Other rare plants of calcareous wetlands in the region that could occur in Winston Farm wetlands include small white aster (*Aster vimineus*, Heritage S1), false hop sedge (*Carex lupuliformis*, Heritage S2), and Bush's sedge (*Carex bushii*, Heritage S2). Water arum (*Calla palustris*, regionally rare) occurs in a rosebay swamp just north of the Winston Farm site, and could occur with rosebay here.

4 LANDFILL IMPACTS

Vegetation would be locally destroyed wherever landfill cells, access roads, offices, garages and other buildings were constructed. Cell-by-cell over the 20-year term of the landfill, the entire field would be stripped of vegetation. Reclamation of the field's original contours, drainage, soils and flora would be impossible. On-site soils are not suitable for landfill cover according to the Ulster County Soil Survey (Tornes 1979). It is unlikely that imported landfill cover would support plants with apparently narrow soil requirements, such as small-flowered agrimony and perhaps the regionally rare sedges and forbs. Aggressive alien weeds such as purple loosestrife, multiflora rose, ragweed, pigweed, pilewort, burdock and amaranth would almost certainly be imported with cover material or move in by other means to occupy barren land. These weeds tend to drive out native plants at the edges of undisturbed habitat and continue to encroach upon them.

An important feature of the habitat quality on Winston Farm is the isolation from heavily traveled roads and from human activity in general. Landfill construction and operation would destroy or drive out most animals now using the Winston Farm habitats, even some animals in areas outside the project footprint. Species associated with garbage, such as herring gulls and Norway rats, would occupy the site and could threaten animals (e.g. ground-nesting birds) in adjacent undisturbed habitat. There is also a potential for damage to both plants and animals from the wide variety of contaminants likely to be introduced to a landfill.

5 IMPACTS OF OTHER PROPOSED DEVELOPMENTS

Alternative plans for the Winston Farm property have been proposed informally by town and school officials, and the property owner. These have included a new school, town offices, private housing, and development of the underlying aquifer for municipal water supply. Development of the aquifer could be compatible with the conservation of important species and habitats on this site. Although the biological impacts of other municipal or residential development would be far less than those accompanying a large landfill, they would still be serious enough to warrant careful planning, site plan review, and full examination through SEQR of environmental issues, including the impact on the Beaver Kill aquatic community, wetlands, rare species, and other biological resources.

6 RECOMMENDATIONS

Hudsonia's role is not to promote or discourage any land use *per se*, but to provide scientific information and recommendations for consideration by decision makers and the public so that land use decisions may be made on a more informed basis.

We recommend that rare animal surveys be conducted at Winston Farm in the spring and summer of 1992. Surveys should include breeding birds, amphibians, reptiles, and butterflies. Breeding bird surveys should be conducted in the spring and early summer. Salamander surveys should focus on streams, seeps, and pools during appropriate times of the spring or early fall. Copperhead and hognose snake can be found basking on rocks or dry leaves in April-May or September-October; snakes are most easily observed before leaf out in the spring. Butterfly surveys should be conducted in April and May when they are active (June and July for hackberry butterfly). All biological surveys should be conducted by field biologists thoroughly familiar with the species in question. Surveys should include the uplands of the Hooge Berg formation in anticipation of possible incinerator siting.

To protect important natural areas and rare species, any use of the site should be limited to what the habitats can bear. For example, construction should be limited to parts of the site with buildings or where buildings previously stood. Existing buildings such as the old Winston mansion might be renovated or new buildings erected on the sites of old ones. Existing roads could be improved, but construction of new roads or other impermeable surfaces should be limited. Vehicle traffic can be especially detrimental to amphibian populations.

Buffer zones of undisturbed soils and vegetation should be maintained around all wetlands, streams (including intermittent streams) and rare species habitats. A buffer zone can help to protect wetlands and other important habitats from various kinds of disturbance and pollution. It can provide a visual and noise

barrier between developed areas and natural habitats, and thus reduce disturbance to wildlife. It can serve as a wildlife corridor and an area for wildlife access to natural habitats. A buffer zone can intercept sediments, nutrients, and toxicants in runoff from roads, landscaped areas, and construction sites that might otherwise degrade wetlands and downstream waters. NYSDEC regulations require a 30 m buffer zone around wetlands under their jurisdiction, but buffers should also be maintained around small wetlands, streams, and important upland habitats. Many environmental scientists believe that 30 m are inadequate to accomplish the objectives of a buffer zone. There are no standard methods for calculating adequate buffer zone widths, but they should be determined on a case-by-case basis according to steepness of slopes, permeability of soils, type and density of vegetation, sensitivity of the protected habitat, and nature of the expected impacts. Hudsonia recommends a buffer zone of at least 30 m around all wetlands, streams and known rare species habitats, and a broader zone where slopes are steep, soils permeable, vegetation sparse, or where anticipated impacts are great. (For further discussion of buffer zones, see Stevens et al. 1990.)

Old drainage tiles continue to drain a portion of the Winston Farm fields. Removal of the tiles might restore pre-existing hydrology and enlarge the wet meadow areas. Before tiles are removed or destroyed, however, hydrologic studies should be conducted to determine the likely impacts of tile removal on downstream wetlands and the Beaver Kill. Rigorous erosion and siltation control measures should be implemented for any activities involving significant soil disturbance on the Winston Farm site.

Infrequent mowing might benefit the small-flowered agrimony population by setting back encroaching shrubs, particularly multiflora rose. Diversity-enhancing mowing programs used in Nature Conservancy preserve management programs (Stephen Young, New York Natural Heritage Program, pers. comm.) may provide useful models for a mowing program for the Winston Farm fields. A mowing schedule could be designed to protect rare plants and promote native species diversity. Since any such program would be experimental and its results not entirely predictable, rigorous impact monitoring would be essential. Care must be taken to protect the existing stands of small-flowered agrimony. (Early in the survey, when I discovered the north field was about to be mowed, I flagged around stands of known or suspected rare plants and the mower agreed to leave those areas unmowed. From the pre-mowing shrub growth I estimated the field had not been mowed in three to five years.) All mowing of these areas should be prohibited during their blooming and early fruiting stages, as this could curtail their seed output for the year. Shrubs crowding out rare herbs might better be hand-pruned.

We recommend that the Town of Saugerties work with private organizations and with county and state agencies to develop a comprehensive plan for conservation of the Beaver Kill ecosystem. Such a plan could involve, for example, designation of the Beaver Kill

corridor as a Critical Environmental Area, site registry with The Nature Conservancy, preservation of a greenbelt along the Beaver Kill, and establishment of conservation easements on properties adjoining the stream and its tributaries.

We recommend that a similar conservation plan be developed for the Hooge Berg hills in the Town of Saugerties.

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8 SPECIES DESCRIPTIONS

In this section, we offer some notes on the ecology and distribution of many of the rare or sensitive species mentioned in the report.

BIRDS

Bluebird, eastern (Sialia sialis). AB SPECIAL CONCERN; DEC SPECIAL CONCERN; NY HERITAGE G5 S5. New York's state bird was formerly Blue-listed. The eastern bluebird population declined severely during the 20th century due to competition for nesting cavities with the introduced starling and other birds, to pesticide use in orchards where many bluebirds formerly nested, and possibly to predation and parasitism in the nest cavities. Since the 1970s, nest boxes have sparked a population recovery and the bluebird is increasing in large areas of the Hudson Valley. Nesting also occurs in natural tree cavities in wetlands and on hill crests distant from buildings (Kiviat 1982 and unpublished observations). Nesting in natural cavities seem to be on the upswing in the 1980s, perhaps due to pioneering by young fledged from nest boxes. Bluebirds also require open habitats (old-fields, farm fields, field edges, burn areas, barren crests, stream margins, etc.) for foraging. Adult winter stoneflies emerging from small, unpolluted streams are important food in early spring (Krieg 1971).

Harrier, northern [marsh hawk] (Circus cyaneus). THREATENED; MIGRATORY NONGAME BIRD OF MANAGEMENT CONCERN; NY HERITAGE G5 S3 T. Griscom (1933:94) stated that scattered pairs nested throughout Dutchess County, but Pink and Waterman (1967:27) noted that the last recorded nesting was near Dover Plains in 1956. The situation is probably similar in other Hudson Valley counties. Nesting would occur in extensive cattail marshes, wet meadows, oldfields, or clearcuts, near open habitats with an abundance of meadow vole prey. The northern harrier is sensitive to human disturbance around the nest (Cromartie 1982).

Owl, Short-eared (Asio flammeus). DEC SPECIAL CONCERN; NY HERITAGE G5 S2 P SC. Short-eared owls breed (or at least have bred) on Long Island and in western New York, but there are no breeding records from the Hudson Valley region. The few data on breeding habitats in New York indicate herbaceous-shrubby oldfields, stubble fields, marsh, and beach. There is no obvious reason why short-eared owls could not nest in the Hudson Valley, where they are seen occasionally in winter and early spring.

Sparrow, grasshopper (Ammodramus savannarum). DEC SPECIAL CONCERN; NY HERITAGE G4 S4 P SC. The grasshopper sparrow breeds in dry hayfields, pastures and grassy, early-stage oldfields, and is currently very rare in Dutchess County and elsewhere in the mid-Hudson region, though it was fairly common in the early 1900s (Pink and Waterman 1980, Griscom 1933).

Sparrow, Henslow's (Ammodramus henslowii). DEC SPECIAL CONCERN; NY HERITAGE G4 S4 P SC; MIGRATORY NONGAME BIRD OF MANAGEMENT CONCERN. Breeds in pastures, early-stage oldfields, and meadows, especially in moist to wet areas, where there is dense herbaceous vegetation. Although the species was found sparingly in Dutchess County in the early 1900s (Griscom 1933; Joseph Hickey, pers. comm.), the last Dutchess County sighting was in 1965. We expect the situation west of the Hudson is similar. The Henslow's sparrow is secretive and could be difficult to detect; its song is insect-like and singing may take

place at night (Paul Spitzer, pers. comm.). Recent analyses indicate a nationwide decline of 2.4% per year for the last 25 years (Faber 1989).

Sparrow, vesper (Pooecetes gramineus). DEC SPECIAL CONCERN, HERITAGE G5 S5 P SC. Breeds in extensive, dry, open fields and barrens with sparse vegetation, exposed windy pastures, and sometimes surface mines. Like the preceding two species, the vesper sparrow has virtually disappeared from Dutchess and Ulster counties during the present century (Andrle and Carroll 1988, Griscom 1933, Pink and Waterman 1980), probably due to the decline of agriculture.

Warbler, golden-winged (Vermivora chrysoptera). REGIONALLY-RARE; AB SPECIAL CONCERN (formerly Blue-listed); MIGRATORY NONGAME BIRD OF MANAGEMENT CONCERN; NEOTROPICAL MIGRANT IN JEOPARDY. A rare breeding bird in Hudson Valley oldfields. Declining due to loss of early-stage oldfields and probably also due to genetic swamping by the blue-winged warbler (Office of Migratory Bird Management 1987).

Wren, sedge (Cistothorus platensis). DEC SPECIAL CONCERN; NY HERITAGE G5 S2 P SC. This small bird occurs very rarely and unpredictably in and near the Hudson Valley, in habitats such as wet hayfields, wet pastures, and wet meadows with plant cover of sedges, grasses, composites and scattered shrubs. The sedge wren is secretive, and is found only by those field workers familiar with its vocalizations. Singing and nesting usually occur in summer, after most bird species have finished breeding. In the 1980s, singing male sedge wrens have been found in the towns of Stanford and Washington in Dutchess County. Sedge wrens have been found nesting in sedge-forb meadows in the marble valleys of westernmost Connecticut. Possibly slight differences in mowing dates, climate and water levels from year to year affect the choice of nesting areas by sedge wrens.

INVERTEBRATES

Blue, Appalachian (Celastrina neglectamajor). HERITAGE G4 S3. The range of the Appalachian blue in New York is the Hudson Valley (Shapiro 1974). Kiviat (unpubl.) has seen this species at Tivoli Bays. Its typical habitat is rich deciduous forests near streams; mapleleaf viburnum (*Viburnum acerifolium*) is its known larval host in such areas (Opler and Krizek 1984). In lowland areas of the Hudson Valley, I think its larvae, like those of its close relative the spring blue, feed on the flower buds of late-flowering dogwoods.

Orange-tip, falcate (Anthocaris midea). NY HERITAGE G5 S3S4. At its northeastern range margin in the Hudson Valley, this medium-size butterfly frequents wooded and semi-wooded bedrock ledges with warm, sunny exposures where the larval host plants, native species of rock cresses, thrive. To date, the orange-tip has been found only west of the Hudson River where it occurs in the New York Palisades, presumably in the Hudson Highlands, northward into the Catskills on the north side of the Ashokan Reservoir, and on small ridges and hills near Saugerties. Virtually all information on this species comes from Spider Barbour (unpublished).

AMPHIBIANS

Salamander, northern dusky (Desmognathus fuscus). REGIONALLY-RARE. Associated with the margins of unpolluted streams, the dusky salamander has probably declined in the Hudson Valley in the 50 years since it was collected at many streams during the 1936 Biological Survey of the Lower Hudson Watershed (DEC, unpublished data; Kiviat, personal observations). Found in stream margins, dusky salamanders are vulnerable to flood scouring associated with urbanization (Orser and Shure 1972). Wear and Schreiner (1987) rated this species as rare and declining in Westchester County; they note its occurrence in limestone wetlands as well as streams.

Salamander, spring (Gyrinophilus porphyriticus). REGIONALLY RARE. Rare to uncommon in the Catskill Mountains, and rare in the western edges of Connecticut, Massachusetts and Vermont, this species occurs in springs, seepage wetlands, and small, cool, unpolluted streams. I have found spring salamander at one location in the Town of Saugerties.

REPTILES

Snake, eastern hognose (Heterodon platyrhinos). DEC SPECIAL CONCERN; NY HERITAGE G5 S4 U SC. Rare in the Hudson Valley, this species is found in areas of sandy soils where toads, its principal prey, are abundant. Hognoses are also found at the base of dry, rocky, wooded slopes, sometimes near dens used by rattlesnakes, copperheads, or black rat snakes.

Copperhead (Agkistrodon contortrix). NY HERITAGE G5 S3 U. Copperheads occur in extensive areas of sandy soils as well as in rugged rocky areas of Dutchess County, but apparently require ledge-and-talus (sliderock) habitats for winter denning. In some areas copperheads move to stream margins and wetland edges in summer; they also use hayfields and woodlands.

Turtle, box (Terrapene carolina). REGIONALLY-RARE. Hudson Valley box turtles inhabit hedgerows, field edges, oldfields, deciduous woods, and sometimes dry, thinly wooded hills. They may sit in mud or water, especially in hot, dry weather. Nowhere in the county are there dense populations, and the species becomes rarer northward. Wear and Schreiner (1987) rated this species as locally common but declining in Westchester County. Box turtles are often found dead on roads, and highway mortality is probably a significant threat to populations.

Turtle, wood (Clemmys insculpta). DEC SPECIAL CONCERN; NY HERITAGE G5 S4 U SC. This species is widespread in the Hudson Valley, but very little information is available on its local abundance. Wear and Schreiner (1987) rated the wood turtle as rare and declining in Westchester County. The wood turtle requires a combination of fields, wet meadows, and woods edges for foraging, and unpolluted pond or sluggish stream habitats with undercut banks or muskrat burrows for hibernating. Highway mortality is common. The species will become rarer in our region as its habitats are altered through the loss of agricultural lands and other changes, and as motor vehicle traffic increases.

VASCULAR PLANTS

Agrimony, small-flowered (Agrimonia parviflora). NY HERITAGE G5 S3 R. Found at several Dutchess and Ulster County localities in the 1980s and 1990s, this species occurs in limy, moist or wet meadows, under diverse disturbances (i.e., beaver meadow, abandoned recreation park on floodplain, mowed meadow, oldfield, pasture, powerline right-of-way). Observed populations comprised from two to a thousand or more individuals.

Aster, small white (Aster vimineus). NY HERITAGE G5 S1 U. Sunny, calcareous, moist sites. Specimen records from Putnam and Rockland counties. Hudsonia has collected this species in Dutchess and Ulster Counties, but no other extant populations are known (Zaremba and Mangels 1987).

Germander, wild (Teucrium canadense). REGIONALLY-RARE. We have found this tall mint in tidal wetlands at 2-3 sites along the Hudson River, although Smith (1974) listed 12 and 16 records for DEC Regions 3 and 4, respectively. McVaugh (1958) stated of wild germander, "Edges of tidal mud along the Hudson River; there common. Otherwise infrequent, in the Hudson Valley..." There is, however, only a single, non-recent vouchered record mapped in New York Flora Association (1990) for the Hudson Valley region and that is from Orange County. Because of the paucity of the Atlas data and our own observations, we believe germander is currently rare in the Hudson Valley; this plant may have declined during the last few decades.

Monkeyflower, winged (Mimulus alatus). HERITAGE G5 S2 R. This species has been found in the 1980s and 1990s in muddy, partly-shaded spots along the lower reaches of three Hudson River tributaries as well as in habitats irregularly flooded by the Hudson's tides. Winged monkeyflower has also been found in wetlands on glaciolacustrine soils away from the Hudson in Ulster and Dutchess counties.

Sedge, Bush's (Carex bushii). NY HERITAGE G4 S2 R. This sedge occurs in limy wet meadows. Hudsonia has collected it from several wet meadow and wooded swamp habitats in Greene, Ulster and Dutchess counties.

Sedge, false hop (Carex lupuliformis). NY HERITAGE G3G4Q S2 R. A large sedge of probably mildly alkaline wetlands. One Greene County and one Dutchess County locality known to us.

9 CRITERIA OF RARITY

Rare native species are important because their disappearance or decline often warns us of environmental deterioration (e.g., water or air pollution). Any species of plant or animal is potentially useful to human society, for example, for studying human disease and other phenomena in the laboratory, as a source of pharmaceutical chemicals, as a "gene bank" for crop and domestic animal improvement, for food, fiber, etc., and as an object of study and enjoyment. Although in any region, most rare species are those species at their geographical range margins and are more common somewhere else, biological conservation must begin at a species' range margins where much genetic variability occurs and where the species is most likely vulnerable to natural or human-caused stress. In some cases, even fairly common species can be vulnerable, and severe decline or extirpation can occur rapidly if habitats are destroyed or other conditions change.

Table 1. Summary of rare species lists. A = all groups of animals; B = birds only; P = plants; listing categories are in parentheses. * indicates non-governmental lists. See text for explanation.

List	*Taxa*	*Rankings*
Federal Endangered Species	AP	Endangered, Threatened
American Birds Blue List (AB)*	B	Blue List, Special Concern
Migratory Nongame Birds of Management Concern	B	Management Concern
Migrants in Jeopardy*	B	In Jeopardy
New York Endangered Species (DEC)	A	Endangered, Threatened, Special Concern
New York Natural Heritage Program	AP	various (see below)
New York Protected Native Plant List	P	Endangered, Threatened, Special Concern, Rare, Vulnerable
Regionally-rare*	AP	Regionally-rare (see text)

The concepts of rarity and vulnerability can be more-or-less objectively and consistently defined and applied. We have used, as much as possible, lists and evaluations of rare species at the national and state geographic levels, because these lists integrate information from many sources and provide a perspective that is not available on a regional or local level. Generally speaking, we do not consider of conservation significance those species (particularly of birds) that are highly mobile and occasionally show up in our area as "accidentals" but do not use the Hudson Valley on a regular and manageable basis; examples are the sandhill crane and the western meadowlark.

The New York State Department of Environmental Conservation (DEC) prepared a list of Endangered, Threatened, and Special Concern animals that became part of the State Environmental Conservation Law in 1983. Endangered Species are those that are imminently in danger of disappearing from New York State. Threatened Species have declined significantly and may become endangered if conditions in their environment continue to worsen and successful management actions are not undertaken. Special Concern Species are believed to be declining or vulnerable and may become Threatened or Endangered in the future, but often not enough is known about population levels and the ecology of these species to reach conclusions about their actual status and vulnerability.

The "Rare Animal Status List" and "Rare Plant Status List" of the New York Natural Heritage Program (NHP) (Zika 1990, NYNHP 1990) include many animals listed as Endangered, Threatened and Special Concern by the DEC, but also include many other species considered rare or vulnerable in the state. Each Heritage-listed species has been assigned a global rarity ranking and a state rarity ranking by the Heritage program and these rankings are updated every year or so (see below). A standardized letter of inquiry to the DEC Significant Habitat Unit requesting a summary of available file data on occurrences of rare animals, rare plants, rare plant communities, and other special habitat occurrences is appropriate as part of any environmental planning for land use change. This inquiry results in a search of files originating in three DEC offices: Significant Habitat Unit, Endangered Species Unit, and Natural Heritage Program. Available data, of course, do not necessarily include all significant occurrences at a site.

Some species are rare statewide and appear to meet NHP criteria but have not been listed by NHP, because of delays in evaluating data. A few species listed by NHP are actually more common than published data indicate, and in our opinion should not be on the Heritage lists; examples are the red-breasted sunfish and mummichog. We note these species and explain the basis for our conclusions. Many groups of invertebrate animals and non-vascular plants have not been reviewed at all by NHP and thus many rare species are not on the Heritage lists. Examples of non-reviewed groups are the fingernail clams, true flies, and fungi. Hudsonia considers species in groups not reviewed by NHP only when there is salient evidence of rarity.

The New York State list of protected plants lists species as Endangered, Threatened, Rare, or Exploitably Vulnerable. These categories are defined below. Protected plants may still be picked, collected, or bulldozed with the landowner's permission.

The Blue List is published every few years by American Birds (Tate 1986) and includes those species of birds in the U.S. which are thought to be undergoing long-term declines in numbers. The Blue List is referred to as an "early warning list" for species not in serious enough trouble to have been Federally listed as Endangered. It is based on reports filed by many active birdwatchers throughout the country with reference to their observations in the previous years. The 1986 Blue List has two categories: Blue-listed, and Special Concern (the latter indicates lesser declines, often restricted to certain regions).

The U.S. Fish and Wildlife Service Office of Migratory Bird Management (1987) published a list of 30 migratory, nongame bird species evincing population decline or instability throughout a significant portion of their ranges. These birds are deemed "Migratory Nongame Birds of Management Concern". Nine of the listed species breed (or have bred) in the Hudson Valley.

Neotropical "Migrants in Jeopardy" are 57 North American breeding birds, mostly insect eaters, that winter in tropical forests of Latin America. These species are "considered by many ornithologists to be at grave risk because of rapidly accelerating deforestation in Central and South America." The list, extracted from *The Birder's Handbook*, is based on the work of John Terborgh and David Wilcove (Wille 1990). Although conserving breeding habitat for these species may not address the root problem, this action reduces an additional source of stress to populations.

"Regionally-rare" species are native plants and animals which are rare in the mid-Hudson region and in Ulster County. These judgments are based on the extensive field experience of biologists associated with Hudsonia and other biologists. Usually, a species we call regionally-rare has been found by us at fewer than 10 localities in the county during the 1970s through 1991. Although we are not aware of all of the extant populations of all rare species in the region, the regionally-rare ranking serves at least as a measure of relative rarity in our region. For vascular plants, we also refer to the *Preliminary Vouchered Atlas of New York State Flora* (New York Flora Association 1990) and an unpublished list compiled ca 1974 by the late Stanley J. Smith (New York State Museum) which indicates the number of occurrences of each species in each DEC Region of New York; this list was based on specimens in the State Museum and other herbaria as well as Smith's own field observations but the time depth of occurrences is not known and may go back many decades. DEC Region 3 includes Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester counties. Most plants with 10 or fewer occurrences for Region 3 in the Smith list can safely be considered regionally-rare, and some species with 11-20 occurrences may now be regionally-rare and must be judged in part by our recent field knowledge. The Smith list is more useful for comparing species within groups (e.g., sedges or ferns) because different groups receive different amounts of attention from collectors (Jerry C. Jenkins, pers. comm.). The definition and listing of regionally-rare species in the mid-Hudson is just beginning, and should serve as a useful but not dogmatic guide for conservation. There is no official or legal list of regionally-rare species. Most regionally-rare species depend upon habitat types which themselves are rare and vulnerable.

Plants and animals tend to be more sensitive to environmental changes at their range margins, where the species are subsisting close to the limits of their environmental tolerances. Many endangered and threatened species started out as species that were rare statewide or regionally rare and were subjected to deteriorating ecological conditions of various kinds causing eventual contraction of the geographic ranges and/or declines in population numbers. (Examples from New York and neighboring states include the peregrine falcon, the red-shouldered hawk, the timber rattlesnake, and goldenclub [an aquatic plant], and in other states many freshwater mussels and small fishes.) Furthermore, the bulk of the genetic variation in a species often occurs at its geographic range margins. Many subspecies and spe-

cies have not yet been described by biologists, thus we are not even aware of all of the major variants. It is of considerable recreational, educational, scientific, and commercial interest that the diversity of species naturally present in a region, and the conservation of representative natural communities and habitats, be maintained in the long term so these resources are available to society. These are among the reasons for concern about the conservation of regionally-rare and statewide rare (Heritage) species.

Generally speaking, Federally-listed Endangered and Threatened species are most important, followed by State-listed Endangered and Threatened species. Next in importance are State Natural Heritage Program listed species, State Special Concern species and (for birds) Management Concern and Blue-listed species. Finally, regionally-rare species are of concern in our region, though not necessarily on a statewide basis.

Explanation of Heritage Ranking System

This key is reproduced verbatim from the New York Natural Heritage Program New York Rare Plant Status List February 1989.

Each element has a global and state rank. The global rank reflects the rarity of the element throughout the world and the state rank reflects the rarity within N.Y.S. Infraspecific taxa are also assigned a taxon rank to reflect the infraspecific taxon's rank throughout the world.

Global Rank

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals, acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology.

G2 = Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.

G3 = Either very rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or vulnerable to extinction throughout its range because of other factors.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Historically known, with the expectation that it might be rediscovered.

GX = Species believed extinct.

GU = Status unknown.

State Rank

S1 = Typically 5 or fewer occurences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in N.Y.S.

S2 = Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in N.Y.S.

S3 = Typically 21 to 100 occurrences, limited acreage, or miles of stream in N.Y.S.

S4 = Apparently secure in N.Y.S.

S5 = Demonstrably secure in N.Y.S.

SH = Historically known from N.Y.S., but not seen in the past 15 years.

SX = Apparently extirpated from N.Y.S.

SE = Exotic, not native to N.Y.S.

SR = State Report only, no verified specimens known from N.Y.S.

SU = Status in N.Y.S. is unknown.

Taxon Rank (T-rank)

The T-ranks are defined the same way the Global ranks are but the T-rank only refers to the rarity of the subspecific taxon not the rarity of the species as a whole.

A "Q" indicates a question exists whether or not the taxon is a good taxonomic entity.

A "?" indicates a question exists about the rank.

New York State Plant Legal Status

The following catagories are defined in regulation 6NYCRR part 193.3 (amendment pending) and apply to New York State Environmental Conservation Law section 9-1503.

E = Endangered Species: listed species are those with
1) 5 or fewer extant sites, or
2) fewer than 1,000 individuals, or
3) restricted to fewer than 4 U.S.G.S. 7 1/2 minute topographical maps, or
4) species listed as endangered by the U. S. Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

T = Threatened: listed species are those with
1) 6 to fewer than 20 extant sites, or
2) 1,000 to fewer than 3,000 individuals, or
3) restricted to not less than 4 or more than 7 U.S.G.S. 7 1/2 minute topographical maps, or
4) listed as threatened by the U. S. Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

R = Rare: listed species have
1) 20 to 35 extant sites, or
2) 3,000 to 5,000 individuals statewide.

V = Expoitably vulnerable: listed species are likely to become threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked.

U = Unprotected: currently without state legal status.

Federal Status

The categories of federal status are defined by the United States Department of the Interior as part of the 1974 Endangered Species Act (see Code of Federal Regulations 50 CFR 17). Recent changes in federal status were published in the Federal Register on February 21, 1990 (Vol. 55(35): 6184-6229). A summary of federally listed plants is in the U.S. Fish and Wildlife Service Publication "Endangered & Threatened Wildlife and Plants" (April 15, 1990).

LE = The taxon is formally listed as endangered.

LT = The taxon is formally listed as threatened.

LELT = The taxon is formally listed as endangered in part of its range and threatened in other parts.

PE = The taxon is formally proposed for listing as endangered.

PT = The taxon is formally proposed for listing as threatened.

C1 = Candidate, category 1--There is sufficient information to list the taxon as endangered or threatened.

C2 = Candidate, category 2-- The taxon may be appropriate for listing but more data are needed.

3A = The taxon considered extinct by the U. S. Fish and Wildlife Service.

3B = The Taxon is no longer considered taxonomically distinct by the U. S. Fish and Wildlife Service and thus not appropriate for listing.

3C = The taxon has been shown to be more abundant, widespread, or better protected than previously thought and therefore not in need of official listing.

* = The taxon is probably extinct.

** = The taxon is thought to be extinct in the wild but extant in cultivation.

(blank) = No Federal Endangered Species Act status.

NHP LIST

Y = Yes, a taxon on the New York Natural Heritage Program rare plant status list.

W = Watch list, a taxon that may be rare or declining in New York, more data is needed before including it on the rare plant status list.