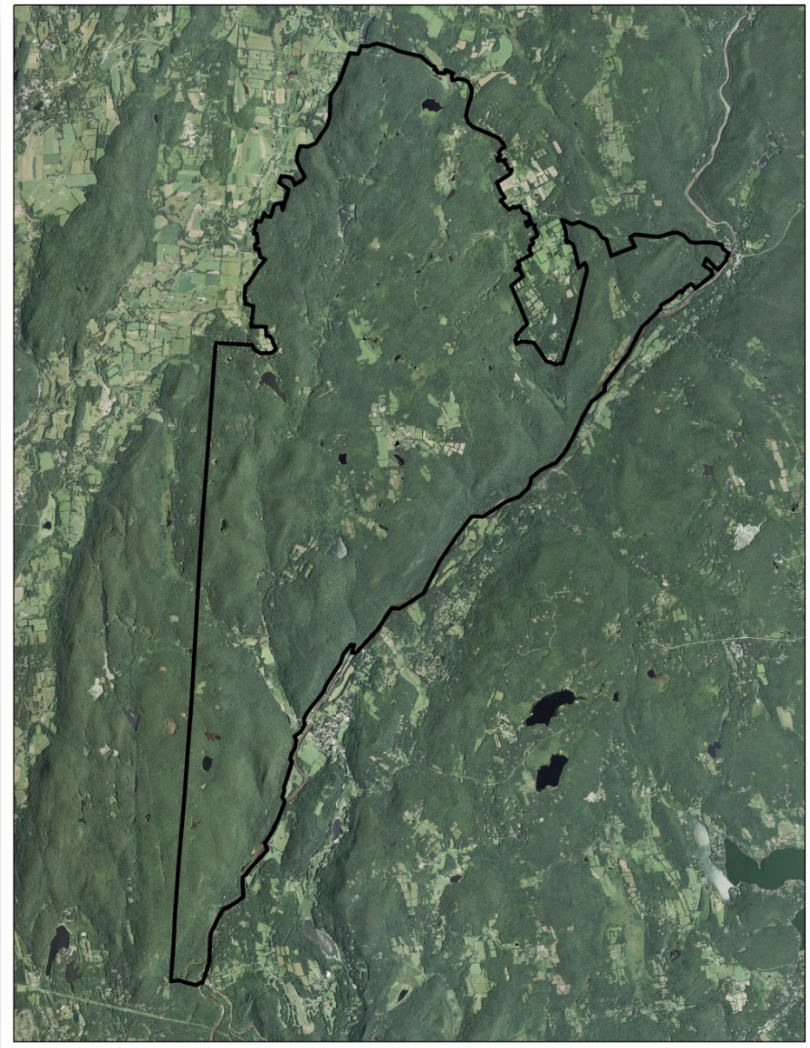
# Important Bird Area Conservation Plan
# Macedonia Forest Block
# Kent and Sharon, Connecticut



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on behalf of Audubon Connecticut
June 2019

DAVISON ENVIRONMENTAL

Audubon CONNECTICUT

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## 1.0 Introduction

This Important Bird Area Conservation Plan was developed by Eric Davison of Davison Environmental, LLC and Hunter Brawley of Brawley Consulting Group, LLC on behalf of Audubon Connecticut. The 22,580± acre Macedonia Forest Block Important Bird Area (hereinafter "IBA") is located on the Connecticut/New York border in western Litchfield County, Connecticut. The IBA encompasses a portion of two Connecticut towns: the northwest half of Kent and the southwest corner of Sharon (See Figure 1). Route 4 defines the northern boundary of the IBA and the Housatonic River Valley and Route 7 run parallel to the southeastern boundary.

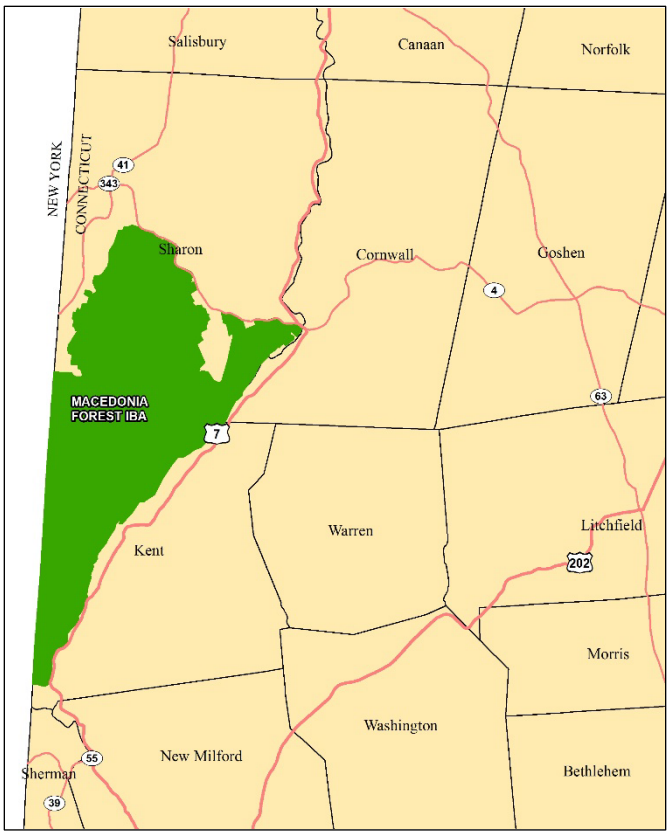



*Figure 1: Overview of IBA area encompassing northwest half of Kent and southwest Sharon.*

The IBA includes several large blocks of protected open space, including Macedonia Brook State Park, Audubon Sharon, the Skiff Mountain Wildlife Management Area and Pond Mountain Trust, Inc. The Appalachian Trail corridor and numerous parcels conserved by local land trusts abut these large land holdings. The IBA provides critical habitat for several bird species of global concern, particularly the forest-interior nesting species Cerulean Warbler (*Setophaga cerulea*) and Wood Thrush (*Hylocichla mustelina*). To a lesser extent, the IBA also contains habitat for shrubland birds including Golden-winged Warbler (*Vermivora chrysoptera*). The Natural Diversity Database (NDDB) has records of eight State-listed bird species as well a number of rare amphibian and reptiles within the IBA.

Conservation planning is a critical component of the IBA program, providing Audubon, landowners, land managers and other stakeholders with a strategic, science-based approach for future conservation and habitat management activities. This plan is not intended to be a comprehensive habitat or recreational management document, but is designed to identify avian resources present within the IBA, summarize strategies to protect and enhance those resources and outline opportunities to engage local land trusts and other stakeholders in conservation, monitoring and outreach activities. This document can be used to supplement and guide a detailed habitat management plan should one be developed, or, in the case of a recreational management plan, can serve to identify

critical avian habitats that might be negatively affected by recreational activities and suggest ways to enhance birdwatching opportunities.

## 2.0 Important Bird Area Designation

*Cerulean Warbler mist-netted by Laurie Doss at Marvelwood School, Kent*

National Audubon Society's Important Bird Area Program began in 1995 and is a partnership between Audubon and BirdLife International. The program is part of a global effort to identify sites that are most important for maintaining populations of birds and to focus conservation efforts toward protecting these sites. Important Bird Areas are sites that provide essential habitat for one or more species of birds of conservation concern. IBA's may include public or private lands, and may or may not include areas currently designated as protected land. The Macedonia Forest Block area was identified as a "forest focal area" in the *Atlantic Flyway Priority Forest Mapping Initiative* conducted by National Audubon Society which utilized the Wilderness Society's "Wilderness Index" methodology to identify areas in the U.S. portion of the Atlantic Flyway that are critical to the survival of forest-interior birds.

To qualify as an IBA in Connecticut, sites must satisfy at least one of the following criteria:

1. Important to species of global concern;
2. Important to species of continental or regional concern;
3. Important to Endangered, Threatened or Special Concern species in Connecticut;
4. Contain rare or unique habitat within the state/region or an exceptional representative of a natural habitat, and that hold important species or species assemblages largely restricted to a distinctive habitat type;
5. Sites where significant numbers of birds concentrate for breeding, during migration, or in winter; and
6. Important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education.

The Macedonia Forest Block was identified as a Landscape Scale IBA due to the following factors:

1. It is one of the largest high-integrity forest blocks remaining in Connecticut which supports large populations of most of the forest-interior nesting birds;
2. Importance to species of global concern, including Cerulean Warbler, Wood Thrush and Golden-winged Warbler;
3. Importance to species of continental or regional concern, including numerous forest-interior, shrubland and grassland bird species;
4. Importance to endangered or threatened species in Connecticut; and
5. Importance for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education, particularly the on-going mist-nesting projects at Audubon Sharon and Marvelwood School.

## 3.0 Stakeholders

The IBA contains large tracts of protected open space which are owned and managed by a diverse group of stakeholders. This includes the National Park Service, the State of Connecticut, Rock River Realty Corporation (d/b/a Eversource), Audubon Sharon, Pond Mountain Trust, Marvelwood School and three local land trusts. Additional lands within or contiguous to these areas have been protected by private landowners who have granted conservation easements on their properties. Several of these stakeholders, particularly Audubon Sharon and Laurie Doss at Marvelwood School, have for many years collected mist-net and point count data for birds within the IBA. The primary stakeholders and their contact information is listed in Table 1.

Table 1. List of primary stakeholders within the IBA

| Stakeholder | Association | Email | Phone |
|---|---|---|---|
| Josh Rimany | Unit Manager at Macedonia Brook State Park | Joshua.Rimany@ct.gov | (860) 927-3238 |
| Chris Martin | State Forester | Christopher.Martin@ct.gov | |
| Laurie Doss | Marvelwood School, Kent Land Trust. Inc. board member | laurie.doss@marvelwood.org | (860) 927-1528 |
| Connie Manes | Kent Land Trust, Inc. Executive Director; Litchfield Hills Greenprint | connie@manes-consulting.com | (860) 488-6320 |
| Melissa Roth Cherniske | Kent Conservation Commission, alternate | cherniskem@kenthistoricalsociety.org | |
| Wendy Murphy | Kent Land Trust, Inc. and on the Kent Conservation Commission | | |
| Steve Pener | Pond Mountain Trust, Inc. | stevepener@yahoo.com | (203) 470-0393 |
| Eileen Fielding/Mike Dudek | Audubon Sharon Director and Land Manager | efielding@audubon.org | (860)-364-0520 |
| Alexandra Peters | Audubon Sharon Board Chair, Jackson Peck Landowner | alexandrapeters@gmail.com | |
| Maria Grace | Sharon Land Trust, Inc. Executive Director | info@sharonlandtrust.org | (860)-364-5137 |
| Patricia Rowell | Vice President, Sharon Land Trust, Inc. | info@sharonlandtrust.org | |
| Jamie Lintner | Real Estate & Property Manager, Eversource | jamie.lintner@eversource.com | (203) 313-6584 |
| Paul Elconin | Weantinoge Heritage Land Trust, Inc. Director of Land Conservation | paul@weantinoge.org | (860) 927-1927 |
| Catherine Rawson | Executive Director, Weantinoge Heritage Land Trust, Inc. | catherine@weantinoge.org | (860) 927-1927 |

## 4.0 Regional Characteristics

The IBA is located within the Northwest Uplands Ecoregion of Connecticut (Dowhan and Craig, 1976). The landscape is characterized by variable hilly topography with localized areas of rugged topography, generally above 1,000 feet in elevation (See Maps 1-3). The bedrock consists primarily of metamorphic gneisses and schists and the soils are predominately derived from glacial till with localized deposits of alluvial sand and gravel within river and stream valleys. A primary feature of the IBA is the Housatonic River, which flows from central Massachusetts to the Long Island Sound along the scenic Route 7 corridor and defines the southeastern boundary of the IBA. The agricultural fields bordering the river provide some of the best soils for farming in Litchfield County. On its way to Long Island Sound, the Housatonic River winds through Connecticut's marble valley, which is underlain by metamorphic limestone and supports a rich diversity of plants and animals. Sub-regional watersheds within the IBA that feed the Housatonic River include Macedonia Brook, Bog Hollow Brook, Guinea Brook and Mill Brook.

Kent and Sharon are small residential towns located within the "Northwest Hills" of Connecticut. Kent is a rural community of about 3,000 residents generally clustered in several small hamlets such as Bulls Bridge, Kent Hollow, South Kent and The Cobble. The population of Sharon is also approximately 3,000 people, and the town remains largely an agricultural community. Both towns have fairly large seasonal, non-resident populations and are popular tourist destinations particularly during fall foliage season. Schaghticoke Road and River Road, two unimproved roads on the west side of the Housatonic River, are popular hiking and birding destinations. There are two college preparatory schools within the IBA, the Kent School and Marvelwood School.

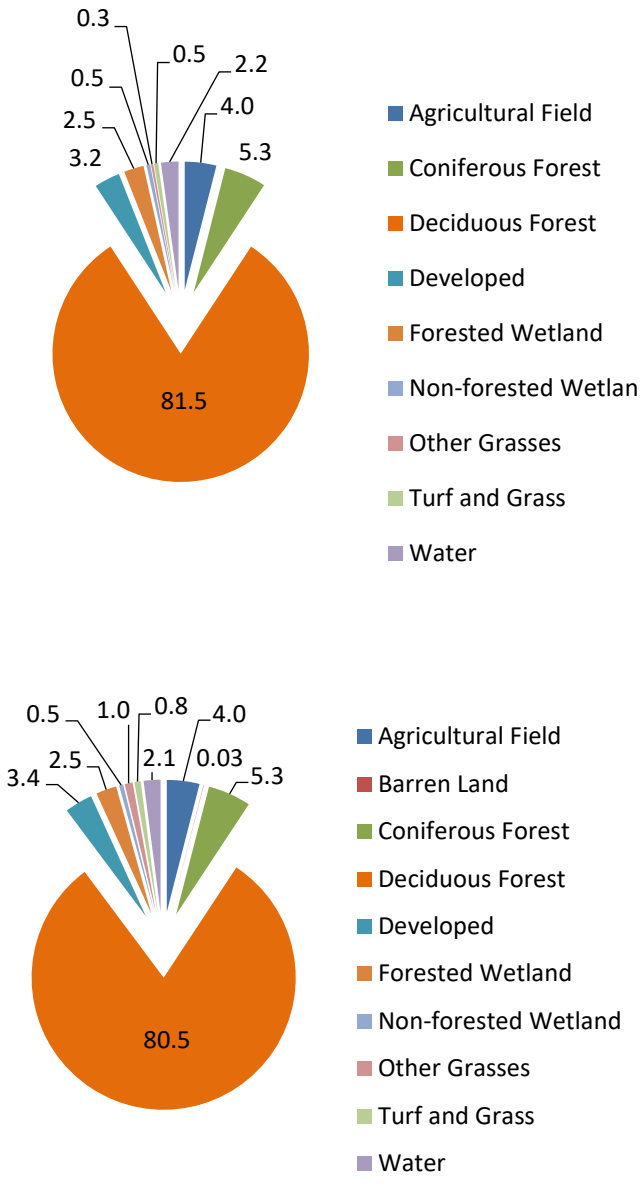



*Fig. 2 - Change in land use/land cover within IBA between 1985 (top) and 2010 (bottom)*

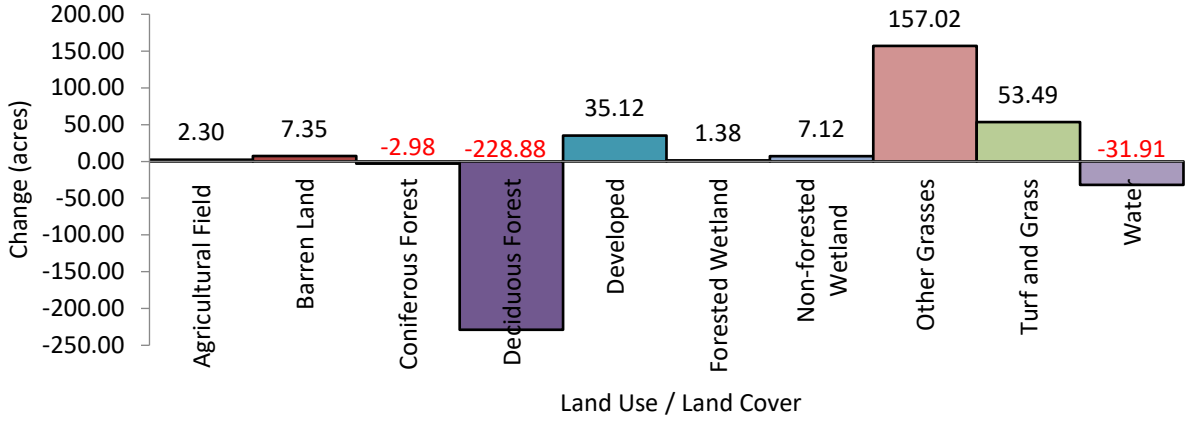
### *4.1 Land Use / Land Cover*

The IBA was chosen as a landscape-scale IBA due to the extent of unfragmented forest it contains and the number and relative abundance of avian species of concern that occur there. A Geographic Information Systems (GIS) analysis of land use/land cover data available from the UConn *Center for Land Use Education and Research* (CLEAR) indicates that the forest cover within the IBA has historically been exceptionally high. As of 2010 (the latest year data is available from CLEAR), total forest cover (including deciduous, coniferous and forested wetland types) was 19,933 acres or approximately 88% of the IBA.

Not only is forest cover extensive, but the percentage of forest cover has remained relatively constant over the past 25 years (See Figure 2). In 1985, the land use/land cover was 81.5% deciduous forest, 5.3% coniferous forest, approximately 5% wetlands and water resources and 4% agricultural lands/open field. At that time, developed areas were a nominal 3.2% of the total land cover. As of 2010, the land use/land cover had changed very little (See Land Use / Land Cover, Map 4). Deciduous forest was 80.5%, a loss of approximately 230 acres or -1%. Most other cover types remained largely unchanged with the exception of open field habitats (labeled

"Other Grasses" and "Turf and Grass") which increased by 1%. Developed areas increased by 35± acres or 0.2% over a 25-year period (See Fig. 2).

*Fig. 3 - Land Use / Land Cover Change in IBA between 1985 - 2010*




### *4.2 Core Forest Areas*

Studies have shown that total forest cover, forest composition and forest fragmentation can affect the abundance and distribution of migratory, forest-nesting birds (Mortberg, 2001; Villard *et al.* 1999; Andren 1996). In the 2015 *Connecticut State of the Birds,* Connecticut College professor and noted ornithologist Robert Askins concluded that "in order to sustain a diversity of specialized forest birds, we need to protect some large areas of continuous or nearly continuous forest." In addition to maintaining land use/land cover data, UConn CLEAR has conducted an analysis of forest fragmentation[1] in Connecticut based on GIS models developed over the past several decades. In the CLEAR fragmentation study, their standard land use/land cover categories (See Fig. 2) are merged into five forest categories: non-forested, core forest in three size categories: small (< 250 acres); medium (250-500 acres); and large (>500 acres), perforated, edge and patch forest. Tracts designated as "core forest" are greater than 300 feet from non-forested areas and represent optimal breeding habitat for forest-interior birds. The 300-foot zone bordering the core forest is referred to as the "edge width" and represents sub-optimal breeding habitat for forest-interior birds.

The CLEAR study utilizes findings from *The Environment Canada* report (2004) which suggests that 250 acres should be considered the *absolute minimum* forest patch size needed to support area-sensitive edge-intolerant species, with a recommended minimum forest patch size of 500 acres. At that scale, a forest is presumed to provide suitable habitat for most interior forest species. As our analysis of land use/land cover indicates, the IBA was over

[1]CLEAR's Forest Fragmentation Study can be found at:
http://clear.uconn.edu/projects/landscape/forestfrag/forestfrag_public%20summary.pdf

88% forested as of 2010 which is far greater than the 59% total statewide forest cover as of 2006 reported in Connecticut's Forest Research Assessment and Strategy (Hochholzer, 2010).

Using the methodology described in the CLEAR Forest Fragmentation Study, core forest areas within the IBA were identified (See Map 5). The goals were to identify areas which are optimal nesting habitat for forest-interior birds and potential connections between these core forest blocks which can be targeted for conservation. The results of our GIS analyses indicate that almost 65% of forest cover within the IBA (14,602 acres) is in core forest blocks greater than 500 acres, which far exceeds the total statewide core forest cover of 46% reported by Hochholzer (2010). There are no forest blocks in the 250-500 acre size class, and 2.2% (487 acres) of the IBA consists of small core forest that are less than 250 acres (see Figure 4). The conclusion from these analyses is that the IBA contains a high percentage of optimal habitat for forest-interior birds based both on the percent forest cover (>88%) and predominance of large core forest blocks.

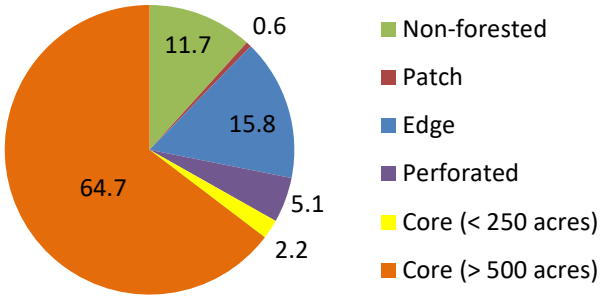



*Fig. 4 – Percentage of core forest and other cover types within the IBA*

Notable contiguous unfragmented forest blocks include[2]:

- 3,000 acres including and surrounding Sharon Audubon;
- 2,300 acres on Skiff Mountain, south to Caleb's Peak
- 2,300 acres including the Schaghticoke Reservation and Preston Mountain Club[3]
- Two 1,500-acre forest blocks including and surrounding Macedonia Brook State Park

### *4.3 Existing Protected Open Space*

Existing protected open space within the IBA has been comprehensively mapped by the *Litchfield Hills Greenprint Collaborative,* a regional conservation partnership that helps identify and prioritize land protection opportunities of regional significance in Northwest Connecticut (See Maps 6 & 7). According to their GIS data of protected open space[4], approximately 51% of the 22,580± acre IBA is permanently protected, including 9,500± acres owned in fee and an additional 1,865± acres protected by conservation easements. These land holdings range from smaller land trust preserves to the 2,500 acre Federal Appalachian Trail Corridor. The land protected by each of the primary stakeholders is summarized on the following page (See Figure 5 and Map 7).

[2] Acreages are approximate, as measured using ArcMap
[3] While these properties are not technically protected open space, they represent lands intended for non-development and natural area usage with low development pressure
[4] Note that the open space data used in this report is largely based on data provided by Housatonic Valley Association, but several additional parcels were added from the CT DEEP open space data layer

LAND OWNERSHIP BY PRIMARY STAKEHOLDER

**The National Park Service** owns a 2500± acre corridor bordering the Appalachian Trail along the eastern edge of IBA. The IBA encompasses 18± miles of the AT and a key riparian corridor along the Housatonic River (River Road) that is situated within a much larger undeveloped landscape consisting of primarily steep, forested habitat.

**Connecticut Department of Energy & Environmental Protection (DEEP) -** *Macedonia Brook State Park* (2,300± acres) on the Connecticut/New York border is entirely forested and includes a section of the Connecticut Blue Trail system which traverses Cobble Mountain and several other forested peaks. The park also offers season camping. In addition, DEEP partners with the U.S. Forest Service to implement the Connecticut Forest Legacy Program, which protects forest lands via conservation easements held by the DEEP. There is a large block (625± acres) of conservation easements on Skiff Mountain which were protected through this program.

**Preston Mountain Club** - is a 1300± acre private hunting club which straddles the Connecticut/New York border along the southwest boundary of the IBA. The Club has done some timber management and there are numerous records of State Endangered timber rattlesnake on the site.

**Audubon Sharon** - is a 1,147-acre National Audubon Society sanctuary that is situated in the northwest corner of the IBA in the town of Sharon. The Center's grounds consist of arid hill tops, 2 ponds, a marsh, a large mix of coniferous and deciduous woodlands and 11 miles of trails and woodland roads. The Center is used for passive recreation and environmental education.

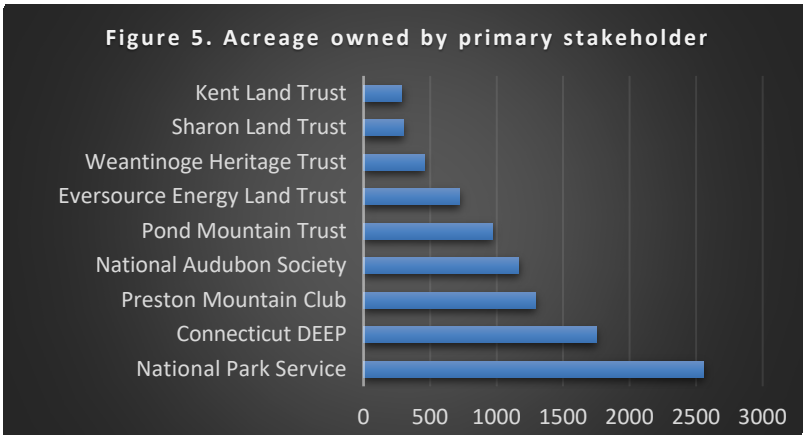
**Pond Mountain Trust** - is a 740-acre private natural area with expansive forestland and trails surrounding several post agricultural fields and Fuller Pond. Pond Mountain Trust current has an EQIP grant from NRCS to remove invasive species from the area east of the pond.

**Eversource Energy Land Trust** - The *Skiff Mountain Wildlife Management Area* is a 720-acre property owned by Eversource. The property contains a mixture of managed forestland and open fields that are periodically mowed to maintain old field habitats. Peck's Pond, a 27-acre water body, is a central feature of the property. Eversource has a cooperative agreement with the DEEP Wildlife Division to manage Skiff Mountain as a Wildlife Management Area (WMA) that includes public hunting and fishing. Eversource Energy Land Trust in 2012 which encompasses the Skiff Mountain WMA.

**Weantinoge Heritage Land Trust** - is the largest land trust in Connecticut, protecting more than 10,000 acres in 18 communities throughout Northwest Connecticut. Their mission is to protect and restore the region's natural areas, fish and wildlife, and working farmland. Weantinoge owns or has easements on 450± acres with the IBA.

**The Sharon Land Trust** is non-profit organization dedicated to preserving the rural heritage of Sharon, Connecticut. Their mission is to protect and preserve lands of special scenic, natural, environmental, recreational, historic, or agricultural value to the rural atmosphere of the town of Sharon. The land trust owns or has a conservation easement on a number of parcels within the IBA including the 197-acre Skiff Mountain North Preserve.

**The Kent Land Trust** is Kent's local land trust that has protected numerous parcels in fee and via conservation easements. Kent Land Trust's 245-acre Skiff Mountain South Preserve is bordered by Marvelwood School where avian populations have been studied on the property annually since 2001 by Marvelwood School students and faculty.



### *4.4 Important Unprotected Lands*

The CLEAR estimates that 85% of forestland in Connecticut is in private ownership. Despite the abundance of protected land, there are still large blocks of unprotected forest within the IBA that are privately owned. In order to identify important or "key" unprotected lands that have high conservation value as habitat for forest-interior birds, a third GIS-based analysis was conducted using the parcel data for the Towns of Kent and Sharon and the CLEAR's forest fragmentation data. These "key" parcels meet one or more of the following criteria: they are currently undeveloped and largely forested; they fall within a large core forest block (>500 acres); and/or are contiguous to existing open space. Map 8 illustrates the results of this analysis. The key parcels were divided into four levels of importance:

- Level 1 - Adjacent to existing open space and containing greater than 50% large core forest
- Level 2 - Non-adjacent to existing open space and containing greater than 50% large core forest
- Level 3 - Adjacent to existing open space and containing less than 50% large core forest
- Level 4 - Non-adjacent to existing open space and containing less than 50% large core forest

The Level 1 parcels represent the top conservation priority. Conservation efforts in these areas would minimize fragmentation and build upon existing large core forest blocks, and should be included in the strategic conservation plans for local land trusts and other stakeholders. In Kent, much of the large, undeveloped forest is owned by either the Preston Mountain Club, Eversource or the Kent School Corporation bordering the school's campus and faculty housing areas along the Housatonic River. However, in Sharon there are several large unprotected core forest blocks that remain in private ownership.

## 5.0 Avian Species Information

Audubon Connecticut has been educating private forest land owners within the IBA about the importance of managing forestlands for birds through their *Forest Bird Initiative*. This Initiative *"*is integrating science, education, public policy, and land management expertise to ensure the continual existence of high-quality breeding habitat for forest songbirds throughout our region. One of the primary ways we work toward achieving this goal is to collaborate with and provide technical assistance for landowners, land managers, and communities who wish to conserve and enhance habitat for breeding forest birds on the properties they own and/or manage by providing habitat assessments and forest stewardship workshops." As part of this Initiative, Forest Bird Habitat Assessments have been conducted at several properties within the IBA, including Pond Mountain Trust and Kent Land Trust's Skiff Mountain South Preserve. These reports have documented many of the species that occur within the IBA.

The Skiff Mountain South Report details the importance of private lands to the future of bird populations. "Breeding bird surveys have shown that the forests of New England are globally important for bird populations. Connecticut's forests are home to some of the highest concentrations of bird species breeding in the continental United States; they are a 'nursery' for approximately 70 species of neo-tropical migratory birds. Although some of

these birds are still common in our area – many are experiencing long-term population declines and have been identified by Audubon Connecticut as *Priority Species*…Since 85% of our region's forests are privately-owned, large blocks of forest may be owned by hundreds of individual landowners with different priorities. Even the smallest properties can be critical parts of large forested landscapes that provide high-quality habitat for breeding birds. Small actions by individual forest landowners can have a significant impact on maintaining large blocks of high quality habitat for future bird populations."

Many of the species documented within the IBA throughout the year have been identified by Partners-in-Flight and Audubon Connecticut as a conservation priority. The Connecticut Natural Diversity Database (NDDB review conducted January 2017) has records for eight state-listed bird species within the IBA: Golden-winged Warbler; Bald Eagle; Alder Flycatcher, Bobolink, Broad-winged Hawk, Northern Parula, Purple Martin and American Kestrel. Additional State-listed species, including Brown Thrasher, Savannah Sparrow and Cerulean Warbler have been recorded within the IBA on land trust properties along Skiff Mountain Road.

Marvelwood School Science Department Chairperson Laurie Doss and her students have been documenting and photographing resident and migratory birds on Skiff Mountain since 2001 as part of the MAPS[5] program. Thus far they have documented 144 species which can be viewed on their iNaturalists account at https://www.inaturalist.org/guides/2296. Their list includes breeding season records of many forest-interior species, including Cerulean Warbler, Wood Thrush, Ovenbird, Veery, Hooded Warbler, Canada Warbler, Worm-eating Warbler, Scarlet Tanager, Yellow-throated Vireo and Black-throated Blue Warbler. Laurie Doss' work has also documented significant migratory stopover habitat at Marvelwood School as well as the Skiff Mountain South Preserve. Her banding work has documented 69 species during migration within just a small (2-acre) area of early-successional habitat.

Several grassland and shrubland habitat specialists have also been recorded, including Bobolink, Savannah Sparrow, Eastern Towhee, Golden-winged Warbler and Blue-winged Warbler (and hybrids), Prairie Warbler and Indigo Bunting (See Table 2). Ms. Doss recently documented Brown Thrasher, which is a declining shrubland specialist and State-listed species of special concern. The rare Golden-winged Warbler was captured in shrubby fields near Marvelwood School in 2003, but has not been recorded since.

Connecticut Warbler and Tennessee Warbler have also been recorded. These two species breed in the extreme northern U.S. and Canada but rely on the IBA as a critical migratory stopover site. Ms. Doss and her students have also been actively involved in establishing breeding Purple Martin populations in Kent, and are now monitoring three increasing colonies.

[5] The MAPS program, or Monitoring Avian Productivity and Survivorship, is a continent-wide collaborative effort to assist the conservation of birds and their habitats through demographic monitoring (http://www.birdpop.org/pages/maps.php).

### *5.1 Priority Bird Habitats*

Priority bird habitats within the IBA include:

- Core Forest (deciduous, mixed deciduous and coniferous)
- Early-successional (meadow, grassland, forest patch-cuts)
- Aquatic / Wetlands (rivers, pond, forested wetlands and vernal pools)

The most abundant habitat with the Macedonia Forest Block, and the purpose for its designation as an IBA, is upland forest. Early-successional habitats and aquatic habitats, while important for many species, are considered of secondary importance in this analysis.

Core Forest

The critical habitat for priority species within the IBA is unfragmented upland forest, which encompasses over 20,000 acres (88%) of the land cover in the IBA. Approximately 65% of that cover is in core forest blocks of >500 acres. According to *The Vegetation of Connecticut, A Preliminary Classification* (Metzler & Barrett 2006), the IBA falls within the "Hudson Highlands" ecoregion of Connecticut, where "northern hardwoods such as sugar maple, beech, and yellow birch along with eastern white pine and eastern hemlock replace the dominance of oaks on well-drained soils."

*Brown Thrasher, a shrubland specialist and CT Species of Special Concern, was recently documented within the IBA.*

Early-Successional Habitat

This declining habitat type, which includes shrublands and abandoned agricultural fields, contains a variety of grasses, forbs, shrubs and trees which provide excellent food and cover for wildlife but need disturbance to be maintained. Early successional habitats can also include powerline rights-of-way, grasslands, pastures, shrub thickets (e.g. dogwood or alder) and young forest. If these habitats are not actively maintained by mowing, brush hogging, prescribed burns, etc., they will revert to old fields and become forest over time. Although this habitat is relatively uncommon within the IBA, open field areas within Pond Mountain Trust and on Skiff Mountain support declining species such as Brown Thrasher, Chestnut-sided Warbler and Indigo Bunting.

Bordering the IBA to the west and the north is an extensive corridor of open agricultural lands (See Map 2, Aerial Photograph). The U.S. Fish and Wildlife Service recently created the *Great Thicket National Wildlife Refuge* to conserve declining wildlife species that are dependent on shrubland habitats including New England Cottontail (*Sylvilagus transitionalis*). The Great Thicket NWR encompasses a six-state area in southern New England and

eastern New York with two focus areas in Connecticut. More information on the NWR and efforts to protect the New England Cottontail are available at:

http://www.ct.gov/deep/cwp/view.asp?a=2723&q=514596&deepNav_GID=1655.

Aquatic/Wetland Habitats

There are numerous priority species that utilize the IBA throughout the year that depend on aquatic habitats for their survival. The primary aquatic habitats are the Housatonic River and the matrix of ponds that extend from northern Kent into Sharon including Peck Pond (Skiff Mountain WMA), Fuller Pond (Pond Mountain Trust), the small un-named pond on Kent Land Trust's Skiff Mountain South and the Ford and Bog Meadow Ponds within the Sharon Audubon property. Several small ponds on Skiff Mountain support breeding populations of Purple Martins, where nest houses have been erected. Peck Pond and Fuller Pond supports migrant waterfowl and waterbirds including Pied-billed Grebe, Wood Duck, American Black Duck, Ring-necked Duck, and Common and Hooded Mergansers. The Housatonic River may be an important migratory corridor for landbirds and receives significant usage by waterfowl during migration. In addition, the numerous wooded wetlands and vernal pools provide important breeding habitat for birds and other wildlife.

### *5.2 Priority Bird Species*

The IBA supports breeding populations of Cerulean Warbler, which is a species of global significance and a focal species for this IBA. Cerulean Warbler are frequently reported along River Road and Schaghticoke Road in Kent and have been captured and banded at MAPS stations run by Laurie Doss near Marvelwood School. Two other species recorded within the IBA, Wood Thrush and Golden-winged Warbler, are experiencing steep population declines and are listed as a conservation priority by the State of Connecticut, Partners-in-Flight and the International Union for the Conservation of Nature (IUCN). The IUCN *Red List of Threatened Species* is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. Cerulean Warbler is listed as *Vulnerable* (VU) by the IUCN due to its steep population decline of 72% in the past 44 years in North America. Wood Thrush has also experienced steep population declines and in 2014 was upgrade from *Least Concern* to *Near Threatened* (NT). Golden-winged Warbler is also listed as *Near Threatened* (NT) due to declines across its range of over 22% per decade for the past forty years.

Map 9 illustrates known breeding sites for two of the IBA's focal species, the Cerulean Warbler and Wood Thrush. Data sets include surveys conducted by Sharon Audubon in 2011 and 2012, as well as surveys conducted as part of the Audubon Forest Bird Initiative program in 2015 and 2016. While these surveys were not comprehensive across the IBA, the data illustrates an abundance of known breeding sites at Sharon Audubon, Pond Mountain Trust lands, Macedonia Brook State Park and the Skiff Mountain Wildlife Management Area.

*Table 2: Priority Bird Species – the following species are a conservation priority globally, in the continental US, state-wide and locally based on information from Partners-in-Flight, the Connecticut DEEP, the IUCN red list, Audubon Connecticut and local resources. Primary habitats are: FI = Forest Interior; FE = Forest Edge; ES = Early successional; GR = Grassland; A = Aquatic. Species breeding codes are: confirmed within IBA = C; probable within IBA = P; occur during migration = M. Codes from the Wildlife Action Plan (WAP) are: 1 – Most Important; 2 = Very Important; 3 = Important. IUCN codes are: VU = Vulnerable; NT = Near Threatened; LC = Least Concern.*

| ***Common Name*** | ***Primary Habitat*** | ***Breeding Status*** | ***State Status*** | ***WAP Status*** | ***IUCN Status*** |
|---|---|---|---|---|---|
| *Site Importance to Species of Global Concern* | | | | | |
| Cerulean Warbler | FI | C | SC | 2 | VU |
| Golden-winged Warbler | ES | ? | E | 1 | NT |
| Wood Thrush | FI | C | | 1 | NT |
| *Site Importance to Species of Continental or Regional Concern* | | | | | |
| Baltimore Oriole | FI / A | C | | 3 | LC |
| Black-and-white Warbler | FI | C | | 2 | LC |
| Black-throated Blue Warbler | FI | C | | 2 | LC |
| Bobolink | ES / GR | C | SC | 2 | LC |
| Chestnut-sided Warbler | ES | C | | 2 | LC |
| Eastern Towhee | ES | C | | 2 | LC |
| Eastern Wood-Pewee | FI | C | | 3 | LC |
| Least Flycatcher | FE | C | | 2 | LC |
| Ovenbird | FI | C | | 3 | LC |
| Rose-breasted Grosbeak | FI | C | | 3 | LC |
| Scarlet Tanager | FI | C | | 2 | LC |
| Veery | FI | C | | 3 | LC |
| *Site Importance to State-listed and Audubon Priority Species* | | | | | |
| Alder Flycatcher | FE | P | SC | 1 | LC |
| American Kestrel | GR | P | SC | 1 | LC |
| American Redstart | FI | C | | | LC |
| American Woodcock | ES / A | C | | 1 | LC |
| Bald Eagle | | | T | 3 | LC |
| Barred Owl | FI | P | | | LC |
| Black-billed Cuckoo | FI | C | | 2 | LC |
| Blackpoll Warbler | FI | M/P | | | LC |
| Blackburnian Warbler | FI | M | | 3 | LC |
| Black-throated Green Warbler | FI | C | | | LC |
| Blue-gray Gnatcatcher | FE | C | | | LC |
| Blue-headed Vireo | FI / FE | C | | | LC |

*Table 2 Continued*

| ***Common Name*** | ***Primary Habitat*** | ***Breeding Status*** | ***State Status*** | ***WAP Status*** | ***IUCN Status*** |
|---|---|---|---|---|---|
| Blue-winged Warbler | ES | C | | 1 | LC |
| Broad-winged Hawk | FI | C | | 2 | LC |
| Brown Creeper | FI / FE | C | | 3 | LC |
| Brown Thrasher | ES | C | SC | 2 | LC |
| Canada Warbler | FI | C | | 2 | LC |
| Eastern Kingbird | ES | C | | | LC |
| Eastern Screech owl | FI | P | | | LC |
| Eastern Whip-poor-will | | P | | 1 | LC |
| Field Sparrow | ES / GR | C | | 2 | LC |
| Gray Catbird | ES / FE | C | | | LC |
| Great-crested Flycatcher | FI / A | C | | | LC |
| Hairy Woodpecker | FI | C | | | LC |
| Hermit Thrush | FI | C | | | LC |
| Hooded Warbler | FI | C | | | LC |
| Indigo Bunting | ES | C | | | LC |
| Louisiana Waterthrush | A | C | | 2 | LC |
| Northern Flicker | FI / FE | C | | 2 | LC |
| Northern Goshawk | FI | P | | 1 | LC |
| Northern Parula | FI | C | SC | 3 | LC |
| Orchard Oriole | ES | P | | | LC |
| Pied-billed Grebe | A | | E | 2 | LC |
| Pileated Woodpecker | FI | C | | | LC |
| Pine Warbler | FI | C | | | LC |
| Prairie Warbler | ES | P | | 1 | LC |
| Purple Finch | ES | C | | | LC |
| Purple Martin | A | C | SC | 1 | LC |
| Red-eyed Vireo | FI / FE | C | | | LC |
| Red-shouldered Hawk | FI / A | C | | | LC |
| Ruby-throated Hummingbird | | C | | | LC |
| Ruffed Grouse | FI | C | | 2 | LC |
| Savannah Sparrow | GR | C | SC | 3 | LC |
| Sharp-shinned Hawk | FI | P | | | LC |
| Traill's Flycatcher | ES | C | | | LC |
| Willow Flycatcher | ES | | | 3 | LC |
| Winter Wren | FI | C | | | LC |
| Worm-eating Warbler | FI | C | | 2 | LC |
| Yellow-billed Cuckoo | FI | C | | 2 | LC |
| Yellow-throated Vireo | FI | C | | | LC |

WAP code description:

(1) Most Important - Species of high regional of state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

(2) Very Important - Species of high regional of state conservation responsibility and have populations that are at high risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

(3) Important - Species of high regional of state conservation responsibility, or there is a lack of adequate life history information to make management decisions, and have populations that are at high risk of declining in the absence of long-term (ten years or more) conservation effort to address the threats they face.

The Connecticut Department of Energy & Environmental Protection's 2015 *Wildlife Action Plan* (WAP), which is an update to their earlier *Comprehensive Wildlife Conservation Strategy*, has identified priority habitats and the declining species that are of Greatest Conservation Need (GCN) in the state. Species considered to be a conservation priority within the IBA are listed in Table 2 along with their status in the WAP, under the Connecticut Endangered Species Act (i.e., state-listed species) and on the IUCN Red List. As noted previously, this IBA plan focuses on three priority habitats – core forest, early successional and aquatic habitats. Therefore, while all bird species known to occur (or potentially occurring) within the IBA are not listed in the table, the recommendations herein are intended to address all priority groups of species.

## 6.0 Non-avian Species

The IBA also provides habitat for sensitive, non-avian species which are a conservation priority. In 2006, the U.S. Fish and Wildlife Service (USFWS) designated the New England cottontail (*Sylvilagus transitionalis*) as a candidate for threatened or endangered status due to the severe population decline and widespread habitat loss experienced since the 1960s. The species' range had been reduced by about 86%, with only 5 smaller populations remaining across New England and eastern New York (Source: Fish & Wildlife Service Fact Sheet). The CT DEEP, and Natural Resources Conservation Service and U.S. Fish and Wildlife Service have been working on a Conservation Strategy for the restoration New England cottontail, and in 2015 it was determined that the species would not be given threatened or endangered status. The IBA falls one of the focal areas in Connecticut for New England Cottontail.

The IBA also supports populations of statewide importance for the two State-listed reptiles, the Endangered timber rattlesnake (*Crotalus horridus*) and the Threatened five-lined skink (*Plestiodon fasciatus*). The timber rattlesnake is one of only two venomous species found in Connecticut. Once considered relatively common statewide, this snake is now limited to isolated populations in the central and western portions of the state. Timber rattlesnake populations have declined, mainly because of human activity and persecution, which includes illegal pet trade, intentional killing, habitat degradation and fragmentation, and human development. Protection of this snake's specialized habitats, both winter den and summer foraging/breeding grounds, is a priority. In Connecticut, timber rattlesnakes inhabit deciduous forests (often second growth) in rugged terrain with steep ledges, rock slides, and a nearby water supply. Populations are known to occur along the eastern side of Schaghticoke Mountain, on Mount Algo and within the ridges that border Macedonia Brook.

The five-lined skink is known to occur on the rugged east-facing ledges that border the west side of the Housatonic River Valley where they inhabit sparsely vegetated bedrock exposed ledges (Klemens, 1993). Other notable reptile and amphibian species occurring within the IBA include the eastern box turtle (*Terrapene c. carolina*), Jefferson salamander (*Ambystoma jeffersonianum*), eastern ribbon snake (*Thamnophis sirtalis*), spotted turtle (*Clemmys guttata*) and wood turtle (*Glyptemys insculpta*), all of which are State-listed species.

## 7.0 Conservation Threats

According to the WAP, the most significant threats to Connecticut's land and waterscapes include habitat loss, degradation, and fragmentation from development; changes in land use; and competition from non-native, invasive species. The largest threat to forest-dwelling species is the loss of large forest blocks due to forest fragmentation and the lack of stand age, structural diversity and understory diversity in upland forests. Other studies including Buchanan *et al.* (2016) have also identified the role of forest composition and structural diversity as primary factors influencing habitat suitability. The loss or degradation of the relatively small amount of early-successional and/or grassland habitat within the IBA is also a threat to the specialized birds and other wildlife, insects and herps that use these non-forested areas.

The following are the primary threats to the priority bird species and their habitats within the IBA:

1. Forest fragmentation
2. Lack of habitat floristic diversity & structure
3. Loss of early-successional habitat

### *7.1 Forest Fragmentation*

As discussed in Section 4.2, at present the total forest cover is high and forest fragmentation is relatively low in comparison to statewide data. Presently, 65% of the IBA is core forest with the remaining 35% consisting of developed land or fragmented forest. Based on the available literature, forest fragmentation remains the single largest threat to the suite of priority birds that occur within the IBA. Forest-interior birds have experienced population declines in small nature preserves throughout the northeastern United States and are considered to be extremely sensitive to human disturbance (Butcher et al. 1981; Bushman and Therres 1988; Askins et al. 1990; Friesen et al. 1995). Most of the songbirds showing these declines share two characteristics: they are long-distance migrants that breed in the north temperate zone and spend the winter in the tropics, and they are specialized forest species that typically do not nest in non-wooded habitats (Askins 1995). The two primary causes of these declines are habitat fragmentation on the temperate breeding grounds and destruction of wintering habitat in the tropics (Robbins et al. 1989; Askins et al. 1990; Penhollow and Stauffer 2000). These species are "area sensitive" meaning they are less abundant in smaller woodlands than in large, unfragmented forests (Robbins et al. 1989; Wilcove and Robinson 1990; Askins 1994).

The reproductive success of area-sensitive species may be lower in fragmented forests because brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) and nest predation are more prevalent near forest edges (Askins et al. 1990; Paton 1994; Rich et al. 1994). These species include neotropical migrants such as Worm-eating Warbler and Ovenbird that build nests on the ground and are particularly vulnerable to predation by raccoons, skunks, and domestic cats, which hunt on the forest floor (Askins et al. 1990). The Brown-headed Cowbird lays its eggs in the nests of other birds. As a result, forest birds often raise cowbird young instead of their own young.

Cowbirds feed in pastures, stockyards, grain fields, and suburban neighborhoods, but they frequently penetrate nearby forests hunting for nests in which to lay their eggs (Robinson et al. 1995). When predators and cowbirds penetrate the forest from surrounding habitats, birds nesting near the edge of the forest may have particularly low rates of nest success, and in small woodlots, virtually all nests are vulnerable. When larger forests are fragmented into isolated patches surrounded by suburban or agricultural lands, even the center of the stand is close to the forest edge, providing breeding birds little refuge from cowbirds or predators (Askins 2000).

In their analysis of the effects of residential development on neotropical migrant songbirds in Ontario, Friesen et al. (1995) concluded that neotropical migrants were significantly more abundant in larger forest tracts, and that "neotropical migrants consistently decreased in diversity and abundance as the level of adjacent development increased, regardless of forest size". For example, a 4-hectare (10-acre) woodlot without any houses on its perimeter is likely to support more Neotropical migrants than a 25-hectare (62.5-acre) suburban woodlot. In addition, Neotropical migrants have varying sensitivities to development pressures. Red-eyed Vireo and Great-crested Flycatchers were least affected by the presence of houses within 100 meters of the forest edge. In contrast, Eastern Wood-Pewee exhibited a clear preference for undeveloped forest tracts. Scarlet Tanager, Rose-breasted Grosbeak and Northern Oriole were also less common in highly developed sites. Wood Thrush was the most sensitive to urban development and was completely absent from woodlots in most high-density housing areas.

### *7.2 Lack of Habitat Diversity/Structure*

Numerous studies have also documented the relationship between forest structure/floristic diversity and habitat suitability for forest birds. *Connecticut's Forest Resource Assessment and Strategy* (Hochholzer 2010) includes the following summary of the issue: "forest is the single largest land cover category in Connecticut. The dominant forest type group is oak/hickory, and the most prevalent species is red maple. This trend will most likely continue into the near future. Forests that contain all stand-size and age classes provide diverse habitats for wildlife, an even flow of forest products, and will be more resistant to insect and disease outbreaks. Currently Connecticut's forests are not well balanced in terms of either size or age of the forests; young forests and very old forests are under-represented. To maintain a balance of forest types, tree sizes, and ages, a greater effort needs to be invested in promoting a range of age classes within forests, especially in regards to maintaining early successional habitats. The use of forest management practices can influence the future composition of forests either positively or negatively. More emphasis should be placed on making sure management practices positively affect the environment."

The publication *Cerulean Warbler - Management Guidelines for Enhancing Breeding Habitat in Appalachian Hardwood Forests* (2013) notes that "on breeding grounds, the second growth forests that occur throughout most forested landscapes often lack the complex forest structure favored by Cerulean Warblers. Old-

growth forests naturally develop a more open and complex canopy structure, as well as multi-layered shrub and mid-story layers. Maintaining older, structurally diverse forest within cerulean breeding range may be important to sustain populations in the long-term and to support the ecosystems on which they and other organisms depend." Research cited in that report have shown that Cerulean Warblers have a clear preference for breeding habitat dominated by white oak, hickory and sugar maple over red oak and red maple and the density and nest success of ceruleans have been positively associated with understory vegetation.

Wood Thrush is another species that requires large tracts of forest for reproductive success. The Cornell Lab of Ornithology 2003 publication *A Land Managers Guide to Improving Habitat for Forest Thrushes* offers the following management recommendations: "thrushes are birds of the forest understory, requiring dense shrub or sapling layers and a well-developed layer of leaf litter on the forest floor. These conditions exist in some mature and old-growth forest types, but most often are enhanced by small-scale disturbances within forested regions. Silvicultural practices that mimic natural disturbance and promote deciduous shrubs and saplings can benefit thrush populations, as long as overall forest cover in a landscape is not permanently reduced. In all forested regions, general guidelines for thrushes and other forest species include: (1) maintaining large and unfragmented forest blocks; (2) promoting understory growth through natural disturbance or management; and (3) limiting over-browsing by deer, livestock, and other ungulates."

### *7.3 Loss of Early-successional Habitat*

According to the publication *Managing Grasslands, Shrublands, and Young Forest Habitats for Wildlife: A Guide for the Northeast*, "Grasslands, shrublands, and young forest habitats (collectively referred to as early-successional habitats) have been declining throughout the Northeast for decades as have the wildlife species associated with them. For instance, twelve of sixteen shrubland birds and seven of ten grassland birds have declining population trends in the region. Many are listed as threatened or endangered in several northeastern states. While early-successional habitat supports several declining species, it only accounts for a small percentage (6%±) of the land cover within the IBA. This habitat type is most abundant at Pond Mountain Trust and in and around the Skiff Mountain Wildlife Management area.

## 8.0 Conservation Goals & Recommendations

***The principal conservation goal for the IBA is to improve the quality of, and expand the protection of, core forest habitat***. These are habitats that support priority forest interior birds, including two keystone species – Cerulean Warbler and Wood Thrush. A secondary goal is the protection and management of early-successional habitat. Specific measures that should be pursued to achieve this goal include:

1. Encourage land protection around core forest blocks: Protect, either through fee purchase or conservation easements, key undeveloped parcels that expand the acreage of protected lands within large core forest.

Priority areas are those that lie within identified core forest habitat as discussed in Section 4.2 and illustrated on Map 8. The largest core forest blocks associated with Sharon Audubon, Skiff Mountain, the Schaghticoke Reservation and Preston Mountain Club and Macedonia Brook State Park, as discussed in Sections 4.2 and 4.4, should be priority focal areas. Work with local land trusts including Weantinoge Heritage Land Trust, Inc., the Kent Land Trust, Inc. and The Sharon land Trust, Inc. to include the priority parcels identified in this report in their strategic acquisition plans.

2. Encourage forest-protective conservation easements: Work with the Connecticut Land Conservation Council (CLCC) to develop standardized language on forest bird habitat conservation and management that can be added to their existing conservation easement template. The CLCC works with land trusts, other conservation and advocacy organizations, government entities, landowners and other interested individuals to increase the pace, quality and scale of land conservation in Connecticut while assuring the perpetual, high quality stewardship of conserved lands in the state. One of their recent initiatives was to develop *Model Documents* including a template conservation easement document with standard language that is available to all conservation organizations in the State. These documents are revised periodically based on feedback from the public and conservation organizations. More information on this initiative can be found at http://www.ctconservation.org/model-documents.

3. Encourage use of Public Act 490: Utilization of P.A. 490 (Connecticut General Statutes Sections 12-107a through 107-f) can reduce development pressure on undeveloped farm and forestland. P.A. 490 allows farm, forest, or open space land to be assessed at its use value rather than its fair market or highest and best use value (as determined by the property's most recent "fair market value" revaluation) for purposes of local property taxation. Without the lower use value assessment, most landowners would have to sell the land because they would not be able to afford the property taxes on farm, forest, or open space land.

4. Encourage and incentivize landowners and stakeholders to develop management plans for their forestlands and employ best management practices that benefit forest-interior birds: Using strategies outlined in Audubon Connecticut Forest Bird Habitat Assessments, as well as the resources cited in this report, landowners and stakeholders should be encouraged and incentivized (through financial grants) to improve forest conditions for birds, by:

    a. Improving forest tree species diversity,

    b. Improving forest vegetative structural diversity (herbaceous, shrub, midstory and canopy layers),

    c. Improving small-scale forest heterogeneity by: creating small forest openings in large unbroken forest blocks; creating snags; and softening forest edges

    d. Eradicating non-native invasive plants

More information on managing forestland for birds is available in Audubon's ***Birds with Silviculture in Mind*** document available at http://vt.audubon.org/sites/g/files/amh751/f/bird-guide.pdf

5. Maintain or expand early-successional habitat: work collaboratively with existing land owners such as Pond Mountain Trust, Eversource (Skiff Mountain WMA), Kent Land Trust, Audubon Sharon and Sharon Land Trust to identify early-successional habitats that can be maintained or expanded. Funding for habitat restoration and management of early successional habitat may be available through the NRCS Environmental Quality Incentives Program (EQIP). The Environmental Quality Incentives Program (EQIP) "is a voluntary program that provides financial and technical assistance to agricultural producers to plan and implement conservation practices that improve soil, water, plant, animal, air and related natural resources on agricultural land and non-industrial private forestland. EQIP may also help producers meet Federal, State, Tribal, and local environmental regulations." More information on this program is available at: https://www.nrcs.usda.gov/wps/portal/nrcs/main/ct/programs/financial/eqip/

## 9.0 References

Andren, H. 1996. Population responses to habitat fragmentation: statistical power and the random sample hypothesis. Oikos, Vol. 76, pp. 235-242.

Askins, R. A. 1994. Open corridors in a heavily forested landscape: Impact on shrubland and forest-interior birds. Wildlife Society Bulletin 22: 339-347.

Askins, R. A. 1995. Hostile landscapes and the decline of migratory songbirds. Science 267:1956-1957.

Askins, R. A. 2000. Restoring North America's Birds. Lessons from Landscape Ecology. Yale University Press, New Haven, CT. 320 pp.

Askins, R. A., J. F. Lynch and R. Greenberg. 1990. Population declines in migratory birds in eastern North America. Current Ornithology 7:1-57.

Buchanan, Mary L., R. A. Askins and Chad C. Jones. 2016. Response of bird populations to long-term changes in local vegetation and regional forest cover. The Wilson Journal of Ornithology. 128(4):704-718.

Bushman, E. S. and G. D. Therres. 1988. Habitat management guidelines for forest interior birds of coastal Maryland. Maryland Department of Natural Resources, Wildlife Technical Bulletin 88-1, Annapolis, Maryland.

Butcher, G. S., W. A. Niering, W. J. Barry and R. H. Goodwin. 1981. Equilibrium biogeography and the size of nature preserves: an avian case study. Oecologia 49:29-37.

Chasko, G. G., and J. E. Gates. 1982. Avian habitat suitability along a transmission-line corridor in an oak-hickory forest region. Wildlife Monographs 82. 41 pp.

Dowhan, J and Craig, R. 1976. Rare and endangered species of Connecticut and their habitats. State Geological and Natural History Survey of Connecticut. The Natural Resources Center, Department of Environmental Protection.

Environment Canada. 2004. How Much Habitat is Enough? (Second Edition), A Framework for Guiding Habitat Rehabilitation in the Great Lakes Areas of Concern.

Friesen, L. E., P.F. J. Eagles and R. J. Mackey. 1995. Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9:1408-1414.

Hochholzer, Helene, 2010. Connecticut's Forest Research Assessment and Strategy.

Mortberg, U.M. 2001. Resident bird species in urban forest remnants: landscape and habitat perspectives. Landscape Ecology, Vol. 16, No. 3, pp. 193-203.

2015 Connecticut Wildlife Action Plan. Connecticut Department of Energy and Environmental Protection. Bureau of Natural Resources.

Metzler, K.J. and Barrett, J.P. 2006. The Vegetation of Connecticut, A Preliminary Classification. CT Department of Environmental Protection. State Geological and Natural History Survey of Connecticut.

Penhollow, M. E. and D. F. Stauffer. 2000. Large-scale habitat relationships of neotropical migratory birds in Virginia. Journal of Wildlife Management 64(2): 362-373.

Rich, A. C., D. S. Dobkin, and L. J. Niles. 1994. Defining forest fragmentation by corridor width: The influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. Conservation Biology 8: 1109-1121.

Robbins, C. S., D. K. Dawson, and B. A. Dowell. 1989a. Habitat area requirements of breeding forest birds of the middle Atlantic states. Wildlife Monographs 103, 34 pp.

Robinson, S. K., S. I. Rothstein, M. C. Brittingham, L. J. Petit, and J. A. Grzybowski. 1995a. Ecology and behavior of cowbirds and their impact on host populations. Pages 428-460 in Martin, T. E. and D. M. Finch (editors). Ecology and management of neotropical migratory birds. Oxford University Press, New York.

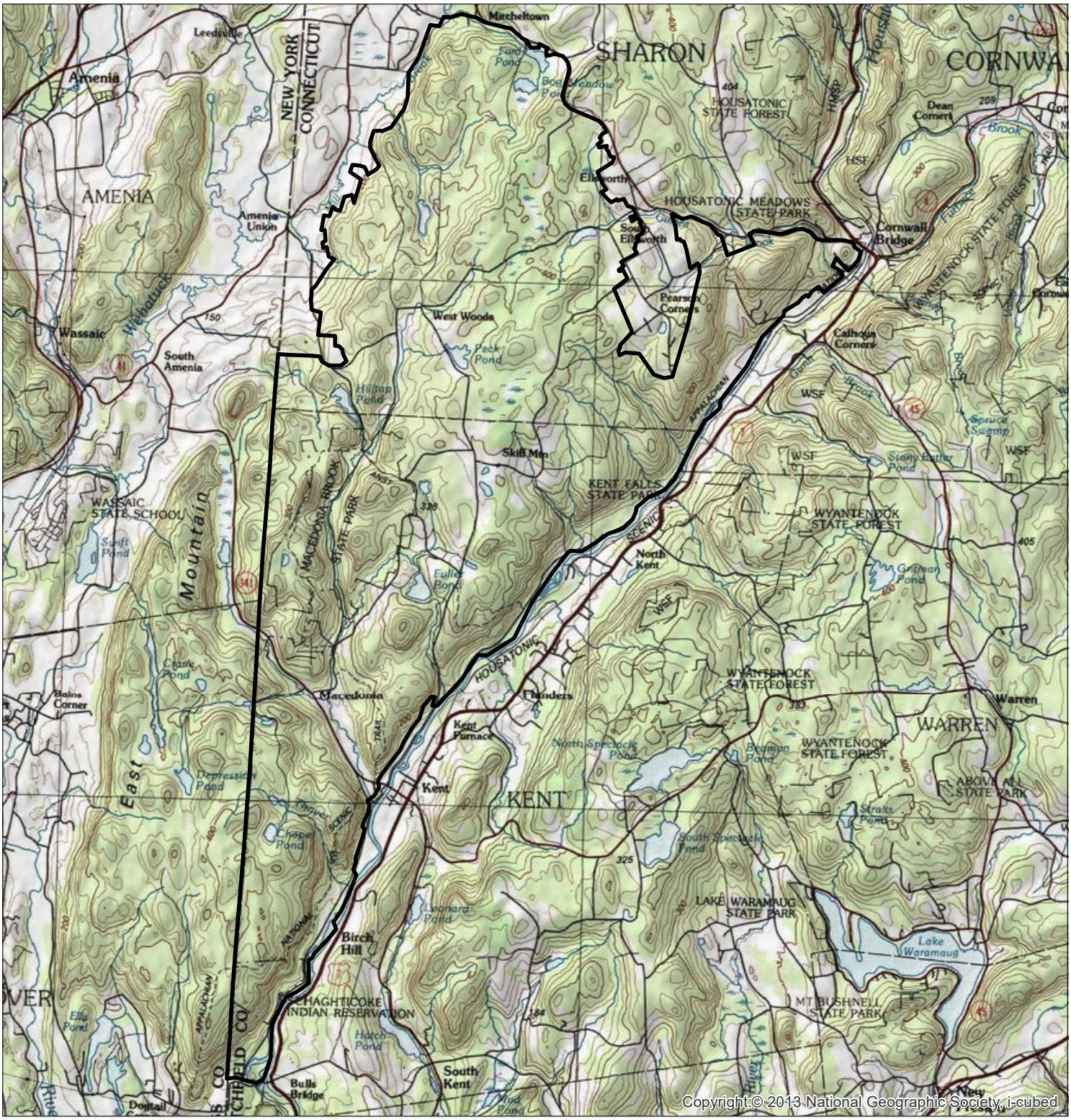
Villard, M.A., M.K. Trzcinski and G. Merriam. 1999. Fragmentation effects on forest birds: Relative influence of woodland cover configuration on landscape occupancy. Conservation Biology, Vol. 13, No. 4, pp. 774-783

Paton, P. W. 1994. The effect of edge on avian nest success: How strong is the evidence? Conservation Biology 8: 17-26.

Temple, S. A. 1986. Predicting impacts of habitat fragmentation on forest birds: a comparison of two models. Pages 301 – 313 in Verner, J., M. L. Morrison, and C. J. Ralph (editors). Wildlife 2000. Modeling habitat relationships of terrestrial vertebrates. University of Wisconsin Press, Madison, WI.

Wilcove, D. S. and S. K. Robinson. 1990. The impact of forest fragmentation on bird communities in eastern North America. Pages 319-331 in A. Keast, (editor). Biogeography and ecology of forest bird communities. SPB Academic Publishing, The Hague, Netherlands.

## List of Maps




MAP 1
Topographic Location Map
Macedonia Forest Block IBA
Audubon Connecticut

Map Description
USGS topographic map showing IBA boundary. This map is intended for illustrative purposes only. It contains no authoritative data.

LEGEND

IBA Boundary

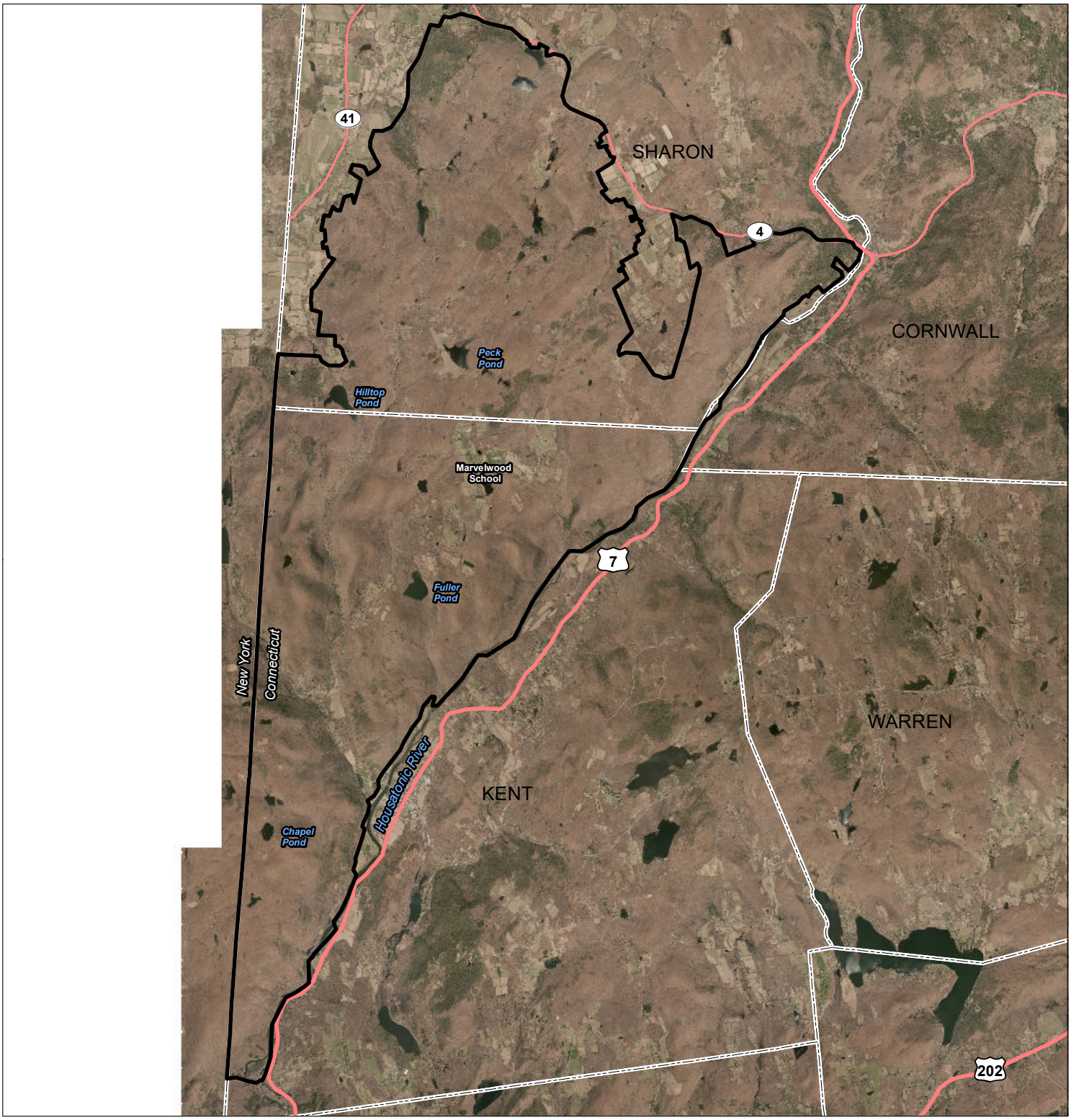
SCALE

0 4,000 8,000 Feet

N

Davison Environmental, LLC
10 Maple Street
Chester, CT 06412

DAVISON ENVIRONMENTAL




MAP 2
Aerial Location Map
Macedonia Forest Block IBA
Audubon Connecticut

Map Description
2016 aerial photograph showing IBA boundary. This map is intended for illustrative purposes only. It contains no authoritative data.

LEGEND

IBA Boundary

Town Boundary

SCALE

0 4,000 8,000 Feet

N

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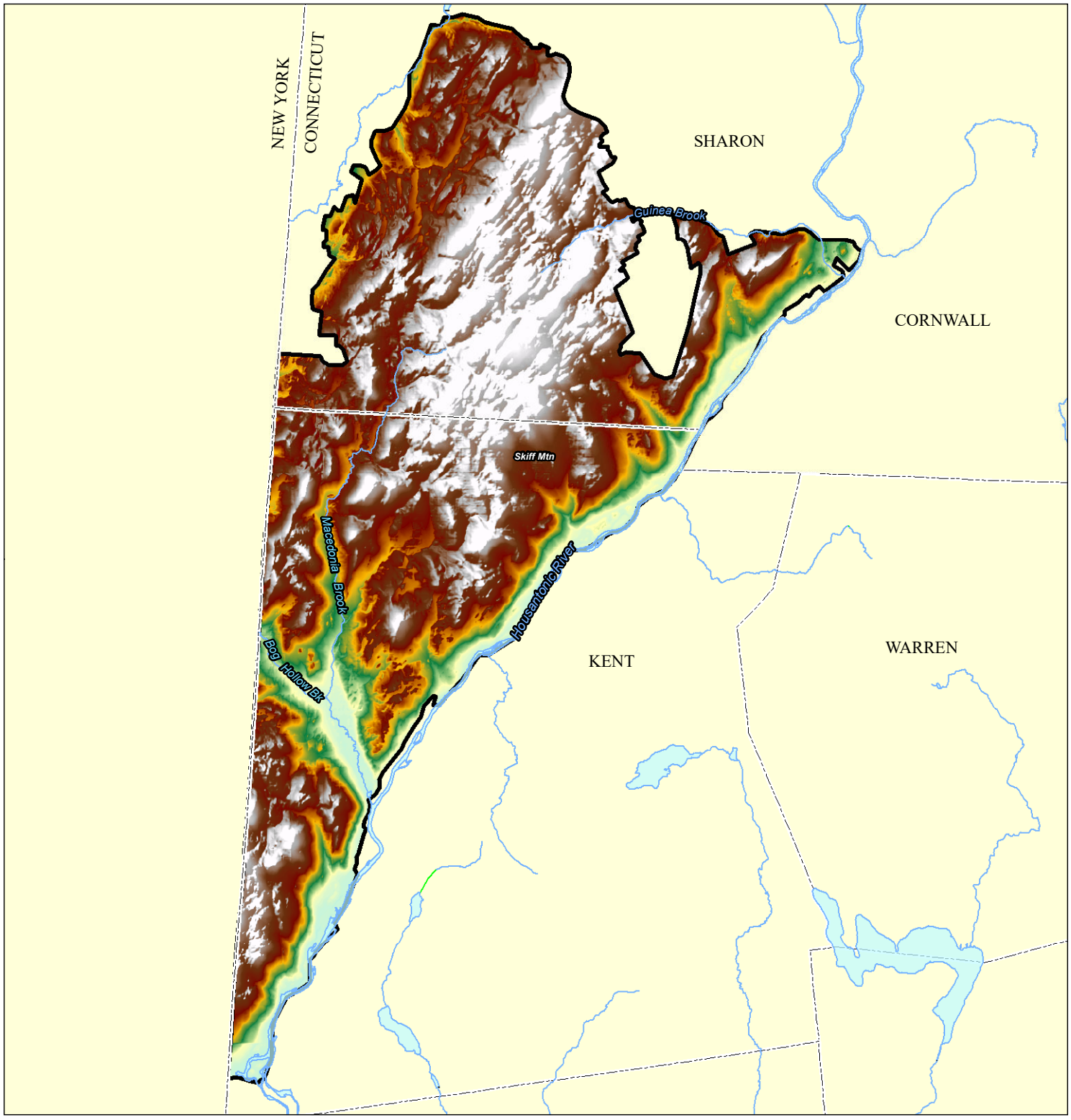


MAP 3
Hillshade (relief)
Macedonia Forest Block IBA
Audubon Connecticut

Map Description
Aerial photograph showing IBA boundary. This map is intended for illustrative purposes only. It contains no authoritative data.

LEGEND

Relief
1500ft
1000ft
300ft

IBA Boundary
Town Boundary

SCALE
0 4,000 8,000 Feet
N

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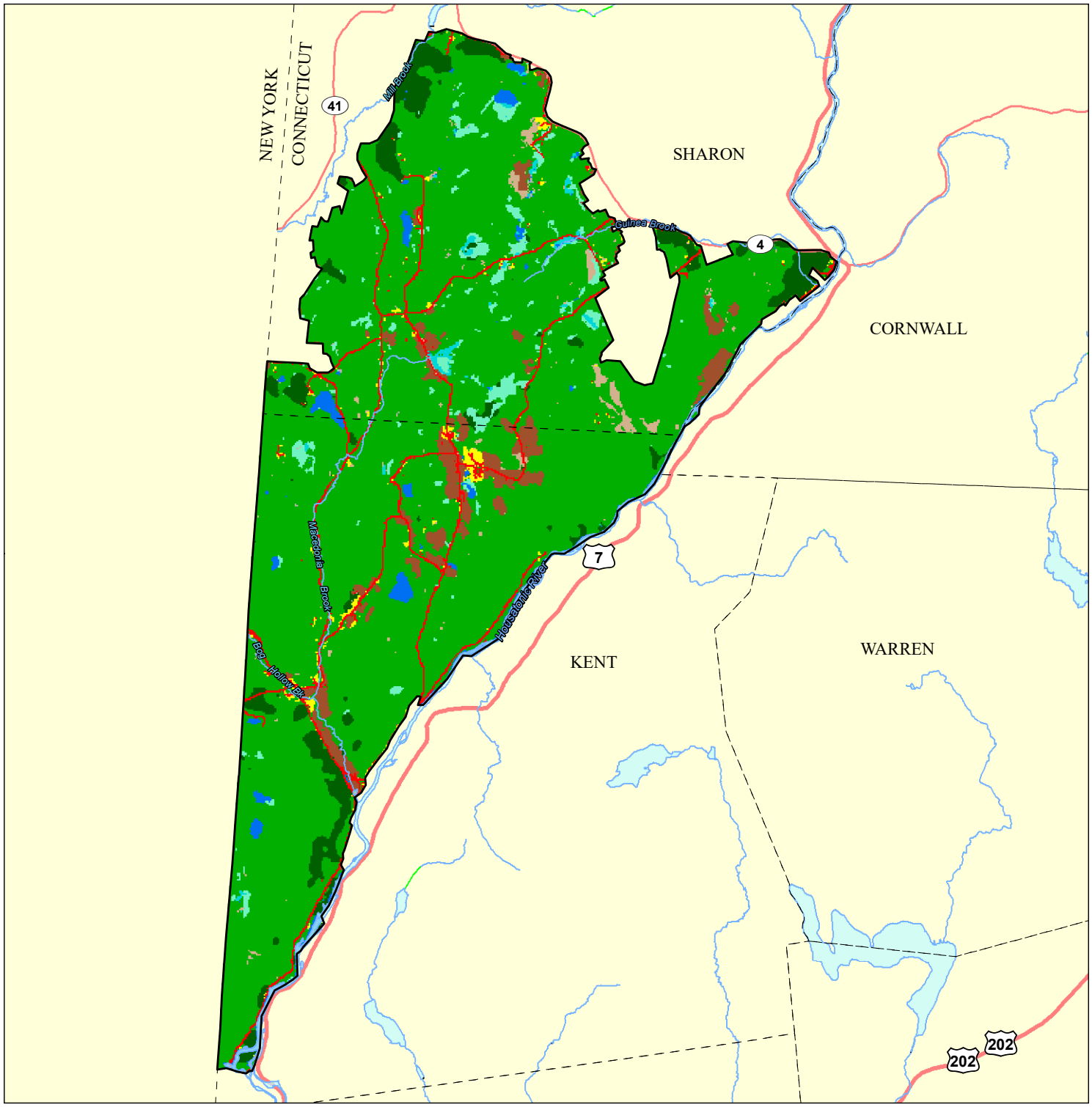


MAP 4
Land Use / Land Cover
Macedonia Forest Block IBA
Audubon Connecticut

**Legend**

- IBA Boundary
- Water
- Town Boundary
- State Route

2010 Land Use / Land Cover

- Developed
- Turf & Grass
- Other Grasses
- Agricultural Field
- Deciduous Forest
- Coniferous Forest
- Water
- Non-forested Wetland
- Forested Wetland
- Barren Land

SCALE

0 4,500 9,000 Feet

N

Map Description

Map showing 2010 Land Use/Land Cover data from UCONN CLEAR. This map is intended for illustrative purposes only. It contains no authoritative data.

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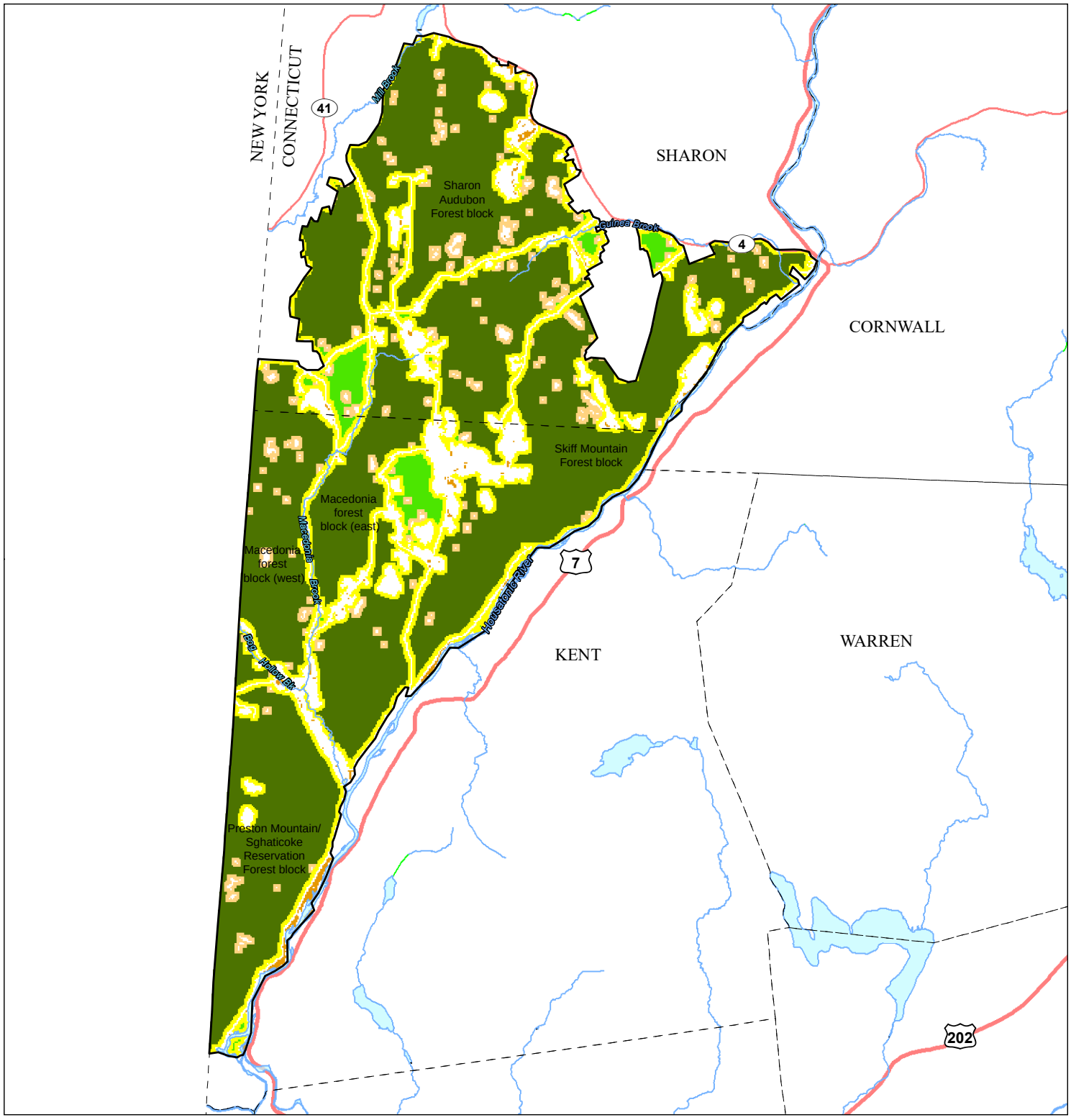


MAP 5
Core Forest Blocks
Macedonia Forest Block IBA
Audubon Connecticut

Map Description

Map showing forest fragmentation analysis data from CLEAR. This map is intended for illustrative purposes only. It contains no authoritative data.

**Legend**

- IBA Boundary
- Water
- Town Boundary
- State Route

**Forest Block Type**

- Patch
- Edge
- Perforated
- Core (< 250 acres)
- Core (> 500 acres)

*Uncolored areas are developed

SCALE

0 4,500 9,000 Feet

N

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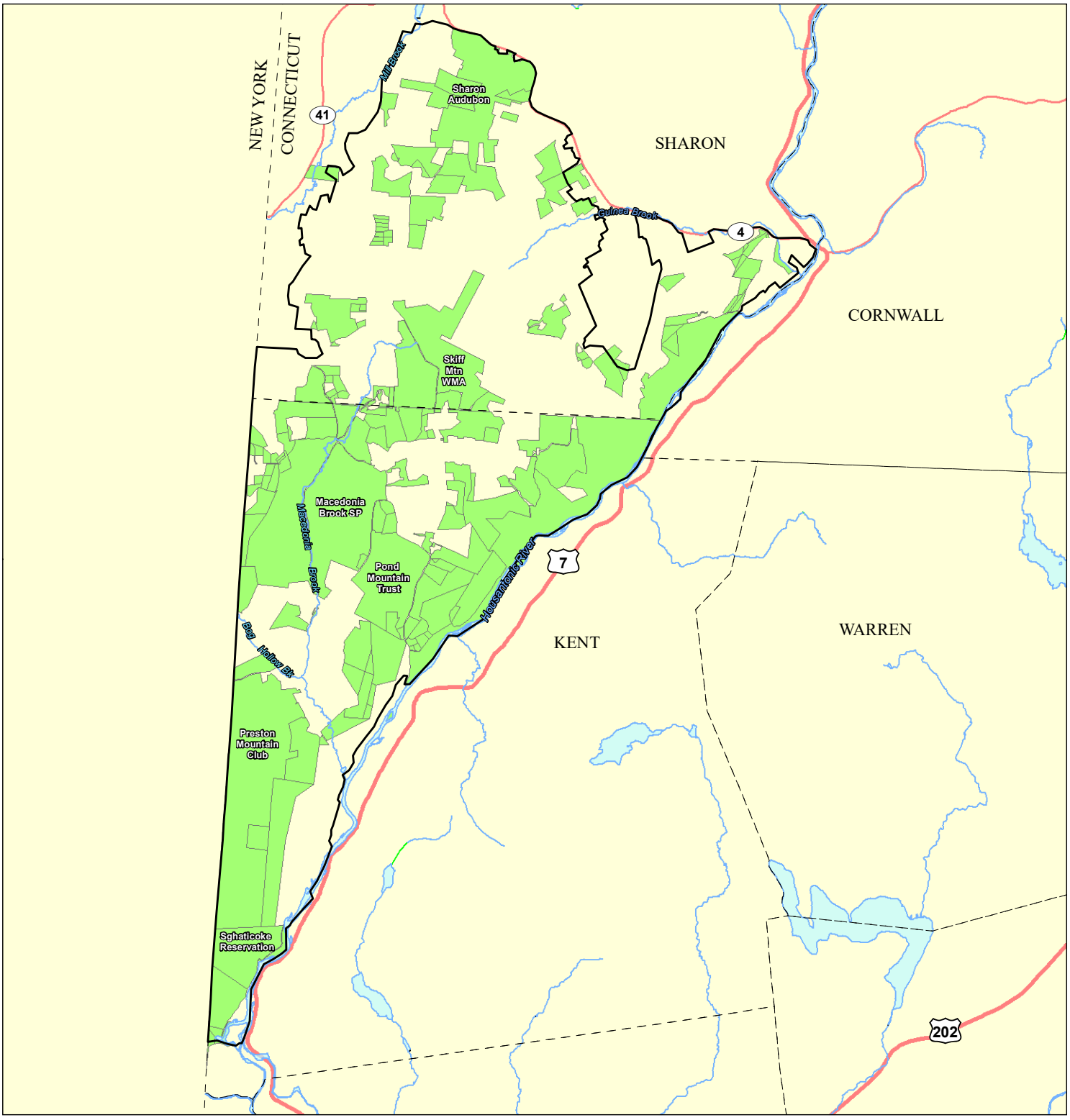


MAP 6
Protected Open Space
Macedonia Forest Block IBA
Audubon Connecticut

Map Description

Map showing existing open space parcels. Data sources include open space data provided by the HVA as well as CT DEEP open space data. This map is intended for illustrative purposes only. It contains no authoritative data.

**Legend**

- IBA Boundary
- Existing Protected Open Space
- Water
- Town Boundary
- State Route

SCALE

0 4,500 9,000 Feet

N

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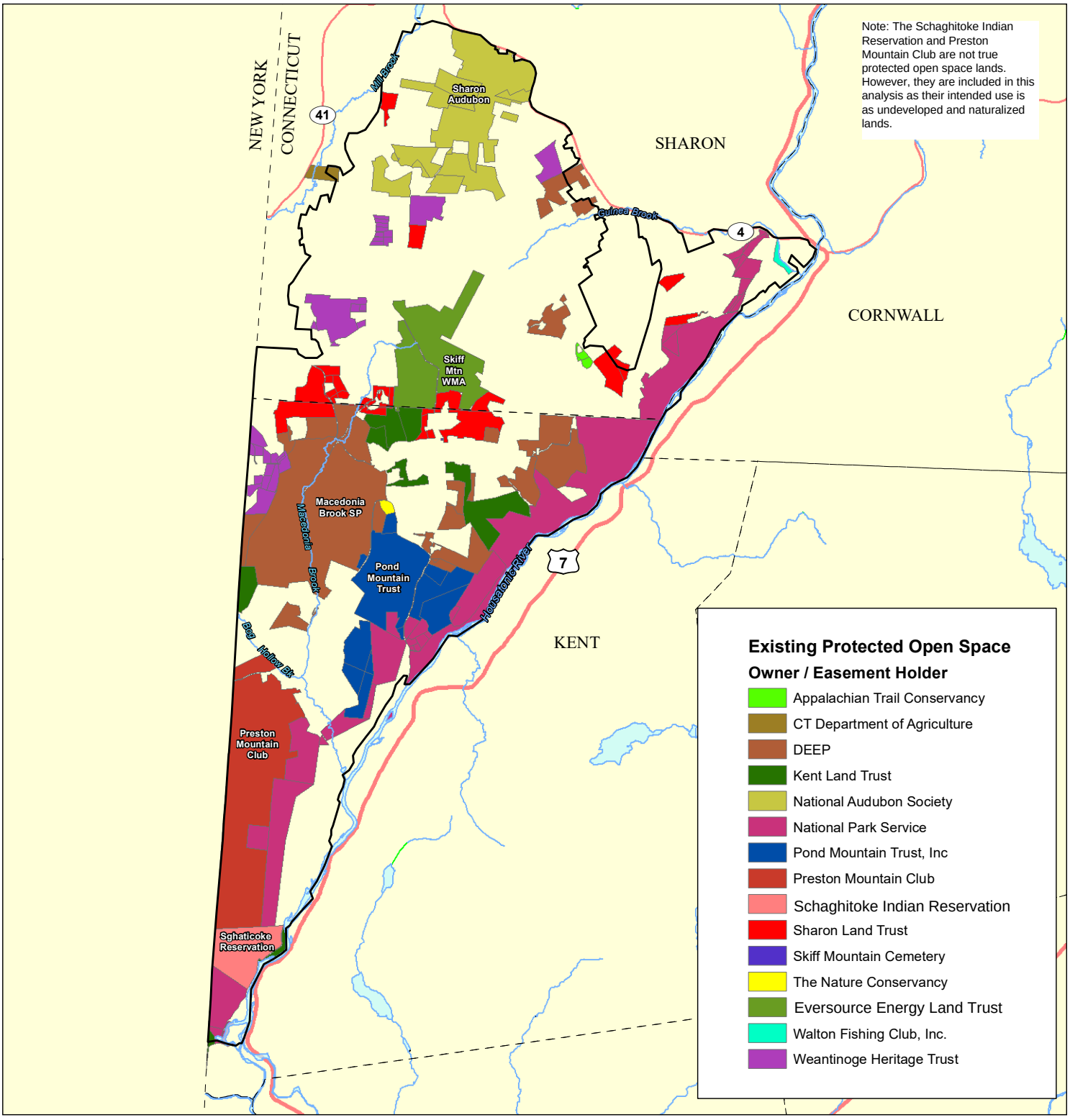
DAVISON ENVIRONMENTAL




# MAP 7
# Protected Open Space by Owner
# Macedonia Forest Block IBA
# Audubon Connecticut

**Legend**

- IBA Boundary
- Water
- Town Boundary
- State Route

SCALE

0 4,500 9,000 Feet

N

Map Description

Map showing existing open space parcels. Data sources include open space data provided by the HVA as well as CT DEEP open space data. This map is intended for illustrative purposes only. It contains no authoritative data.

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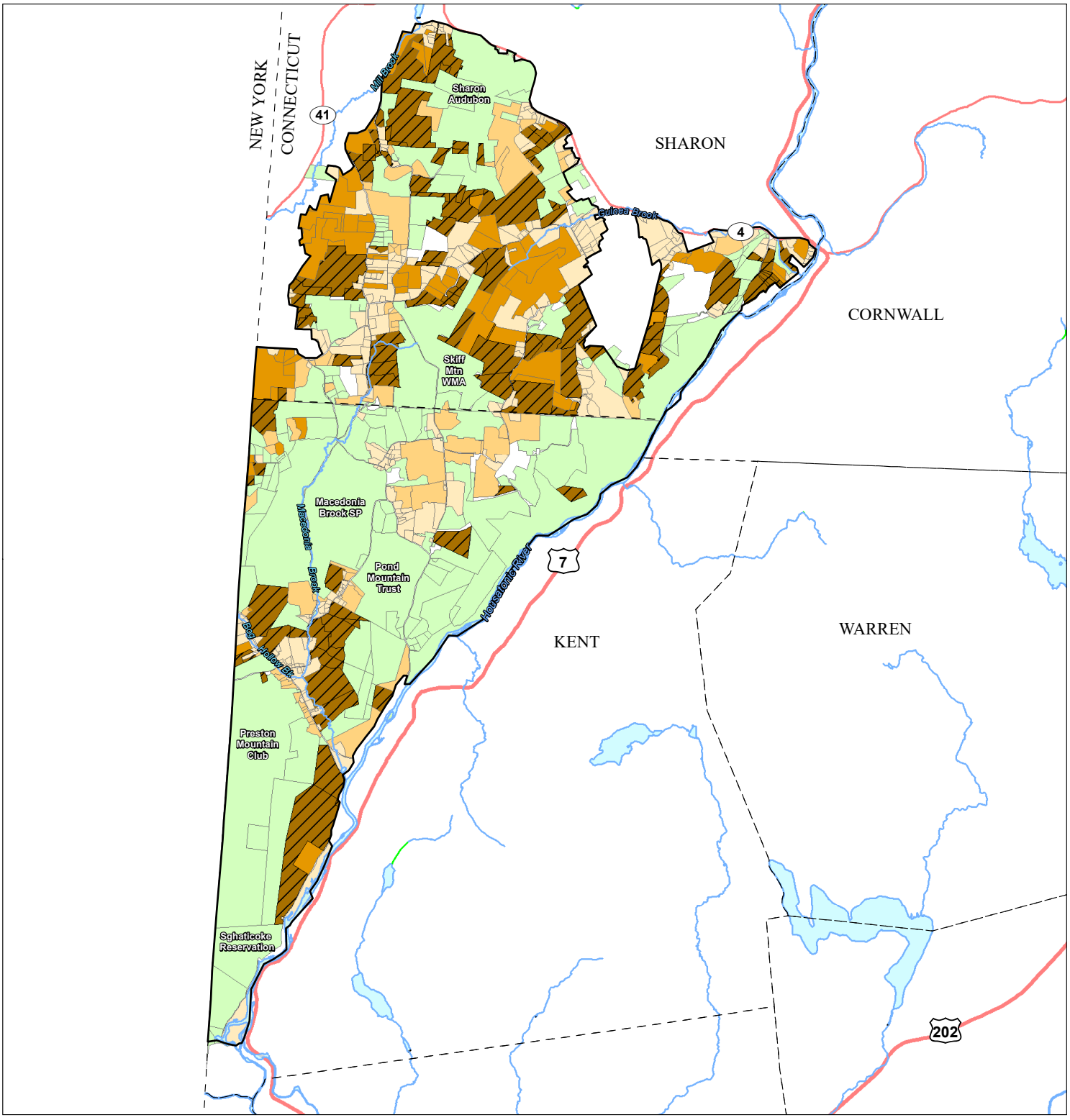
DAVISON ENVIRONMENTAL




MAP 8
Key Unprotected Forested Parcels
Macedonia Forest Block IBA
Audubon Connecticut

Map Description

Map showing existing open space parcels along with parcels identified as key unprotected forested parcels. Data sources include HVA and CT DEEP. This map is intended for illustrative purposes only. It contains no authoritative data.

**Legend**

- IBA Boundary
- Water
- Town Boundary
- State Route
- Level 1 Parcels
- Level 2 Parcels
- Level 3 Parcels
- Level 4 Parcels
- Existing Protected Open Space

SCALE

0 4,500 9,000 Feet

N

Davison Environmental, LLC
10 Maple Street
Chester, CT 06412

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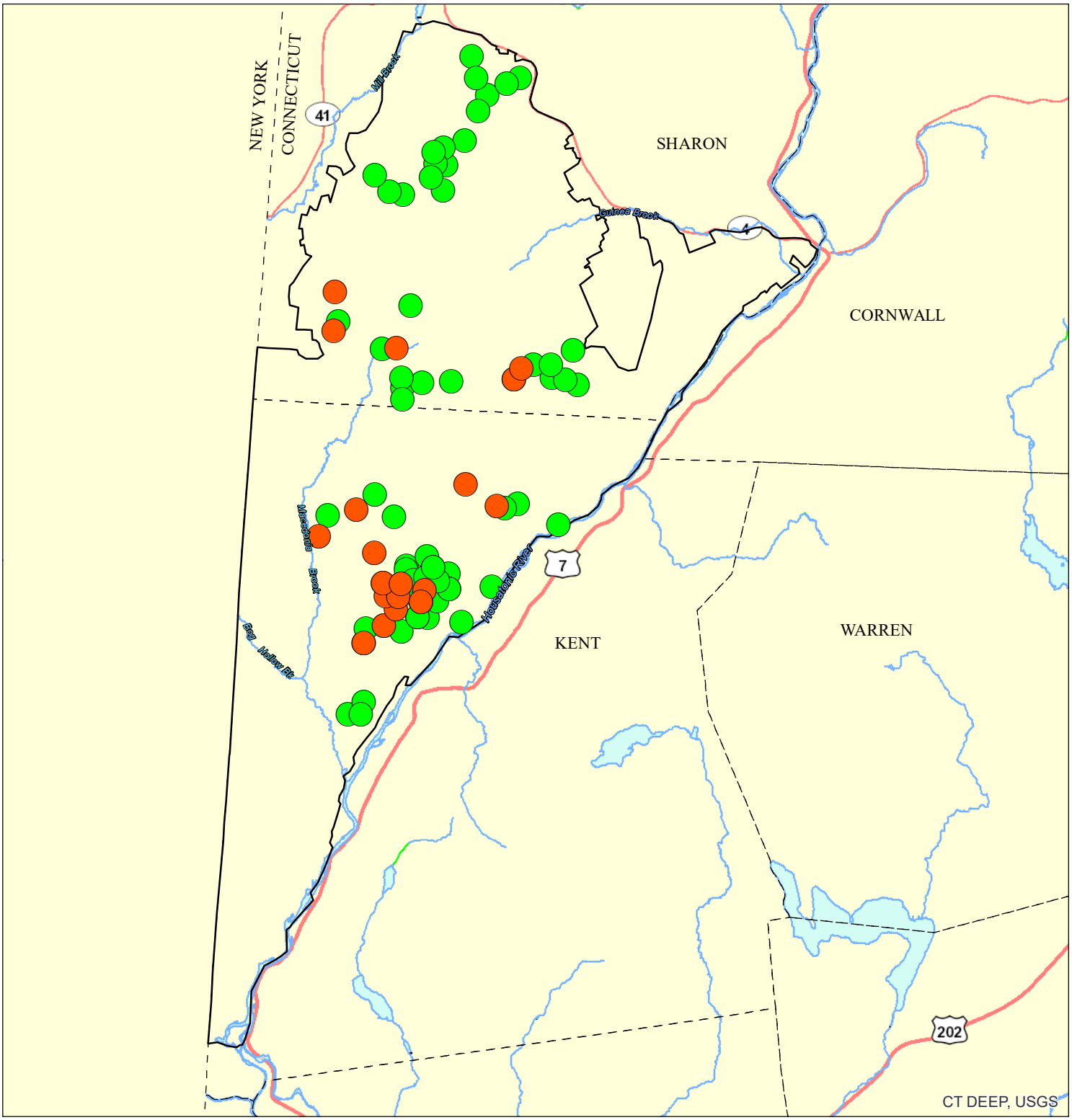


MAP 9
Breeding Locations
Cerulean Warbler & Wood Thrush
Macedonia Forest Block IBA
Audubon Connecticut

Map Description

Map showing locations of confirmed breeding locations based on surveys conducted by Audubon Connecticut. This map is intended for illustrative purposes only. It contains no authoritative data.

**Legend**

- Wood Thrush Breeding Sites (2011-2016)
- Cerulean Warbler Breeding Sites (2011-2016)
- IBA Boundary
- Water
- Town Boundary
- State Route

SCALE

0 4,500 9,000 Feet

N

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