Kollar Wildlife Management Area Management Plan (2023 through 2033)

Adaptive Management

This plan is based on an adaptive management format. Natural resource management occurs in a dynamic landscape that is often affected by outside variables. The outcomes of the actions described in this plan will be monitored to determine if management objectives are being met. This will allow modifications to occur if conditions change, there are undesirable outcomes, or new information becomes available.

Current Habitat Conditions

Upland forest accounts for approximately 98.7% of the habitat on the property. The remainder of the land is comprised of wetlands, waterbodies, old fields and shrubland. The majority of the property, 89.7%, is comprised of pole and sawtimber size class forest. Sapling forest makes up 9% of the property and seedling forest is nonexistent.

Wildlife Habitat

Wildlife management is the primary goal of habitat management on the property. This plan will focus on creating, enhancing, and maintaining a diversity of habitats utilizing a variety of habitat management prescriptions. These practices will help to provide valuable habitat for the American woodcock, ruffed grouse and over 50 other species of Greatest Conservation Need.

Economic Benefits

Hunting opportunities on the property will contribute to the Department of Energy and Environmental Protection's hunter recruitment, retention, and reactivation strategy. Hunters provide an essential funding source for wildlife management in Connecticut. They also contribute to the local economy by creating and supporting jobs within the state. The 477 acres of silviculture treatments outlined in this plan will also provide jobs and produce sustainably harvested Connecticut Grown forest products.

Wildlife-based Recreation

The property is open to most types of hunting, as well as fishing and trapping. The public is encouraged to use the area in a manner that is compatible with sound natural resource management such as bird watching and wildlife viewing. While no formal trails are designated, an existing old woods road provides the public with ample access. This plan will explore the possibility of developing a handicap accessible trail utilizing the existing service road system.

Resource Management Concerns

The primary resource management concerns are invasive vegetation and insects, unauthorized trails stemming from illegal dirt bike and all-terrain vehicle use, unleashed dogs, and illegal dumping. Invasive vegetation can threaten biodiversity, while illegal trails can impact nesting birds, insects, sensitive soils, and plant communities. This plan will address these concerns along with other issues such as encroachments from abutting landowners.

Climate Change

Forests play an important role in mitigating the effects of climate change. This plan provides the opportunity to store and sequester carbon through sustainable forest management and the subsequent production of value-added wood products.

STATE OF CONNECTICUT

DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION

Bureau of Natural Resources

Wildlife Division and

Division of Forestry

Kollar Wildlife Management Area
Tolland, CT
941 acres

WILDLIFE MANAGEMENT AREA PLAN
2023 through 2033

Approvals:

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Jenny Dickson, Director Date
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3/16/2023
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TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF TABLES

LIST OF MAPS

APPENDICES

A. Executive Summary

Kollar Wildlife Management Area (WMA) is a 941-acre property in Tolland and Willington, Connecticut (CT) managed by the CT Department of Energy and Environmental Protection (DEEP) Wildlife Division. The property was acquired by DEEP in three parcels with 885 acres purchased in 1986, 25 acres purchased in 1991 and 31 acres donated in 2020. The goals for the WMA include increasing habitat for ruffed grouse, American woodcock and other species dependent on early successional habitats; improving mature forest habitat for wood thrush, cerulean warbler and other mature forest species; and providing wildlife-based recreational opportunities such as hunting and wildlife viewing.

Early successional stage (ESS) habitats (old field, shrubland and young forest) are important to species such as American woodcock, ruffed grouse and 25 other bird species that are listed in Connecticut's 2015 Wildlife Action Plan as "Species of Greatest Conservation Need" (SGCN). The plan categorizes American woodcock as "Most Important" and ruffed grouse as "Very Important." Management of Kollar WMA will focus on creating and maintaining habitat for these two species, which will also benefit blue-winged warbler, eastern towhee and a variety of other SGCN that depend on early successional habitats. These early-stage habitats are also important to a wide variety of insects such as bees as well as butterflies, moths and their caterpillars. Reptiles such as box turtles and wood turtles use ESS habitats for nesting.

The majority of Kollar WMA contains mature forest. Mature forest is important for many species including SGCN such as broad-winged hawk, cerulean warbler and wood thrush. Approximately seventy-five percent of the property will contain mature forest habitat structure.

Management objectives for this 10-year plan include:

- Increasing the area of young forest from 87 acres of sapling stage habitat to 182 acres of seedling/sapling stage habitat
- Increasing the area of aspen from 15 acres to 40 acres
- Maintaining ½-acre herbaceous openings for ruffed grouse brood habitat
- Maintaining approximately 25 acres of old field habitat
- Maintaining approximately 25 acres of shrubland habitat
- Maintaining at least 250 acres of mature uneven-aged forest habitat to support wood thrush and other mature forest species.
- Improving forest diversity and enhancing hunting opportunities on 472 acres
- Enhancing stand-level resilience to disturbance on 122 acres
- Maintaining boundaries
- Maintaining infrastructure

The management activities prescribed in this plan will be carried out over the next ten years. Treatments will be conducted on 100 acres to create young forest habitat and improve mature forest.

B. Property History and Overview

Acquisition History

The 941-acre Kollar Wildlife Management Area (WMA) is located in the towns of Tolland and Willington, CT (Map 1). The property was acquired in three transactions. The first two parcels, totaling 910 acres in the Town of Tolland, were purchased for $1,287,540 from Vladimir M. Kollar during 1986 and 1991. These parcels were acquired with one-third of the funding from the Recreation & Natural Heritage Trust Fund and two-thirds from General State Bond Funds. In the first purchase during 1986, Mr Kollar sold approximately 885 acres to the State of Connecticut for "recreation and conservation purposes." In the second purchase in 1991, he sold an additional 25 acres to the State. These two acquisitions are known collectively as the Kollar parcels. In 2020, 31 acres were donated by the Goeller By-Pass Trust and the Goeller Family Survivior's Trust. This parcel is located in the Town of Willington, on the east side of the Willimantic River and is known as the Goeller parcel. Upon acquisition, supervision of each of these parcels was assigned to the Wildlife Division.

Management History

In the 1980's, prior to acquisition by the State, the former owner of the Kollar parcels removed a significant portion of the easily accessible timber throughout the property. Several acres of sand and gravel had also been mined from the southeastern portion of the property. The Wildlife Division completed an initial habitat inventory in 1991. In 1992 the Wildlife Division installed a WMA shield sign, constructed a 20-car parking lot, and installed two vandal resistant gates and pressure-treated hemlock barriers to restrict vehicle access. Work was completed with the assistance of DEEP Field Support Services Division.

Considering the findings of the 1991 habitat inventory, past land use practices on the property, and proximity to other State-owned, managed forest lands, the Wildlife Division determined the new WMA would be best managed using a featured species approach. In the early 1990s the Wildlife Division and Ruffed Grouse Society (RGS) established a cooperative agreement to manage the area to enhance habitat for ruffed grouse (see Appendix 3 for scientific names of all species mentioned in this plan). A $6,000 grant was awarded to the Wildlife Division by the RGS for access improvements.

Management activities continued through the 1990s with projects carried out by the Wildlife and Forestry Divisions. Specific projects included

- 100 crabapple and hemlock trees planted in 1992
- Ruffed grouse drumming surveys conducted in; 1992, 1993, and 1994
- 8 miles of boundary posted in 1993
- 20 acres of habitat mowing conducted in; 1993, 1996, and 2000
- Cleanup of 25,000 tires, abandoned cars, and hazardous materials
- Former homestead and outbuildings removed in 1993
- Road system upgrades and daylighting along abandoned section of North River Road in 1994
- Four patch cuts totaling 20 acres were completed with assistance from the Forestry Division in 1995 to create early successional habitat for ruffed grouse.
- Dedication ceremony held and plaque installed in 1995
- 8-miles of boundary line maintained in 1996
- 2,500 feet of North River Road hunting trail enhanced in accordance with Americans with Disabilities Act (ADA) specifications in 1998.
- Roadside mowing of ADA hunting trails, and construction of an ADA compliant parking lot in 1998.

In 2000, the Wildlife and Forestry Divisions of DEEP (then known as Department of Environmental Protection) collaborated on developing a 10-year Forest Management Plan (2001-2010) for Kollar WMA. The plan prescribed management activities intended to create and perpetuate ruffed grouse habitat on the property. It called for 100 acres of thinning and 110 acres of final shelterwood harvest designed to regenerate to a thick cohort of hardwood reproduction. Stands were divided into 40-acre Grouse Management Units (GMUs) which consisted of four 10-acre blocks and harvested to establish a checkerboard of suitable habitats with connectivity between patches. The treatments were generally 10 acres of thinning, and 10 acres of final harvest per GMU per year. Due to a decline in resources and changing management priorities, only about half of the 2001 - 2010 work plan was implemented. The management impact amounted to 91 acres of regeneration release treatments, 22 acres of regeneration cuts, and 26 acres of thinning (Table 1, Map 2). The Forestry Division suspended work at the WMA around 2005. Since then, the Wildlife Division has carried out periodic mowing of old field and shrubland habitat to perpetuate early successional cover.

Table 1. Silvicultural treatments implemented between 1999 and 2006 at Kollar WMA.

Stand	Silviculture	Acres
2-1	Irregular shelterwood	18
3-2	Thinning	26
5-5	Group Selection	10
6-3	Final shelterwood	10
6-5	Final shelterwood	11
6-8	Final shelterwood	11
6-9	First shelterwood	12
6-13	Final shelterwood	8
8-3	Final shelterwood	7
8-6	Final shelterwood	7
9-1	Final shelterwood	15
9-2	Final shelterwood	13
9-4	Final shelterwood	9
Total		157

C. State Wildlife Management Areas

The mission of the DEEP Wildlife Division is to advance the use, appreciation and conservation of wildlife for the citizens of Connecticut. This mission is supported by maintaining stable, healthy and diverse wildlife populations on all suitable habitats across the state, in numbers compatible with habitat carrying capacity and existing land use practices. Acquiring and managing WMAs is one mechanism for accomplishing this goal. WMAs are properties of land and water having unique or outstanding wildlife quality that are managed primarily for the conservation and enhancement of fish and wildlife habitat and to provide opportunities for fish and wildlife-based recreation. WMAs are open to the public for hunting, trapping, fishing, wildlife viewing and walking (consult the Connecticut Hunting and Trapping Guide for season dates, regulations and permit information, or see the CT DEEP Hunting and Trapping

website). The Wildlife Division is responsible for managing 112 WMAs that total approximately 34,000 acres. Over 7,200 acres have been acquired through the Federal Aid in Wildlife Restoration Program and the majority of management activities on all WMAs is funded through this federal program. WMAs range in size from one acre to 2,110 acres and include a variety of habitats such as grasslands, reverting/old fields, shrublands, forests, coastal salt marshes and freshwater marshes.

This 10-year plan is based on an adaptive management approach which allows managers to amend the plan components to respond to changing conditions. Forest and wildlife management occurs on a dynamic landscape affected by innumerable variables which can influence management outcomes. Changes in climate, public use, severe storm events, habitat conditions, wildlife populations, disease, or new information may necessitate adjustments in plans. In addition, the evaluation of past management activities and their effectiveness are considered to advance achievement of the plan's goals. Adaptive management allows for management changes in light of unforeseen circumstances, changing conditions, undesirable outcomes, or if new information becomes available.

D. Access

Access*:* Kollar Wildlife Management Area is accessible from North River Road, and Babcock Road in Tolland Connecticut. Access to the 31-acre Goeller parcel is from Route 32 in Willington. The WMA has ½-mile of road frontage on North River Road, and nearly 1.5 miles of frontage on Babcock Road. The area is also accessible from the abandoned portion of North River Road which extends northeast towards the Willimantic River for over ½-mile. Roughly 795-acres are accessible from publicly traveled, town-maintained roads. One hundred and fifteen acres are accessible by the abandoned town road. There are no roads within the WMA that are publicly accessible by vehicle. Three gates prohibit vehicle access to the WMA and collectively block 3.15-miles of service road. An additional 1.32-miles are blocked by boulders. Service roads are typically a hybrid of natural materials, gravel, and stone. There are local drainage issues along portions of the road system which will be addressed on a project-by-project basis. The 31-acre Goeller parcel has access limitations due to its location between the Willimantic River and railroad tracks.

Operability*:* Of 941 total acres roughly 792 acres have the potential to be actively managed using forestry operations. There are 115 acres of land which is not suitable for active habitat management due to steep slopes, excessively rocky terrain, or saturated wetland soils, and 31 acres of inaccessible land.

Boundaries*:* Kollar WMA has approximately 9.75 miles of boundary line to be maintained on a 5- to 7-year rotation. The Wildlife Division is responsible for maintaining the boundaries of the WMA. Boundaries of the Goeller parcel were signed and painted, and boundaries of the Kollar parcel were refreshed in 2020, except for the northern boundary where an encroachment issue is being addressed at the time of this plan being developed.

E. Infrastructure

Parking: Kollar WMA contains two parking areas: a 100 x 40-foot dirt parking lot on the west side of Babcock Road and a five-car paved parking lot on the east side of Babcock Road, both near the intersection with North River Road (Map 3). The five-car lot was designed to be used for ADA access to the southern portion of the service road.

Roads: Approximately three miles of service road form a loop on the east side of Babcock Road (Map 3). The southern portion of the service road is the abandoned section of North River Road. The abandoned portion of the road begins near the intersection with Babcock Road. The asphalt along the edge of this intersection has eroded from runoff from Babcock Road. Approximately 2,500 feet of the southern part of the road is flat and had been dressed with gravel in 1998 to provide a level surface for accessibility. The remainder of the road is dirt.

Signs: A wooden WMA roofed kiosk sign is located in the main dirt parking lot.

Gates: Three metal gates are located on the property. Two are located on the east side of Babcock Road and one is located on the west side of the dirt parking lot.

Other structures: There are no buildings, but one old stone foundation exists on the property.

Trails: There are no authorized trails at Kollar WMA.

F. Landscape Setting and Physical Features

Landscape*:* Kollar WMA contains 910 acres in the northeast corner of Tolland, and 31 acres on the eastern edge of Willington, Connecticut. This area lies on the border of the Eastern Connecticut Upland and Southern New England Coastal Plains and Hills ecoregions of the Northeastern Coastal Zone, as defined by the U.S. EPA (U. S. EPA, 2016), and in the Northeast Hills ecoregion of the Northern Hills-Central Hardwoods-White Pine Zone as defined by Dowhan and Craig (Dowhan and Craig, 1976). These ecoregions are characterized by elevations ranging from 100-500 feet with moderate slopes. Soils in the region developed primarily on glacial till in the upland areas and on stratified deposits of sand, gravel, and silt in the valleys. Major forest types of this ecoregion are transition hardwoods (maple-beech-birch, oak-hickory), central hardwoods (oak-hickory), and successional oak-pine forest. Elm, ash and red maple are typical of southern New England's forested wetlands.

The landscape surrounding Kollar is characterized by dispersed rural residential development dominated by single family homes, with some industrial and commercial zoning along the I-84 corridor, and major State highways. Further west in the town of Tolland, the landscape becomes more suburban with larger neighborhoods and more development.

The Willimantic River serves as the WMA boundary for nearly two miles and bisects the Kollar and Goeller parcels for approximately one-half mile. Though historically the Willimantic River was heavily polluted by the industrial activities which occurred along its banks, today it is a vital resource that supports a robust fishery. Kollar represented a very high priority acquisition for DEEP due to its landscape position with significant frontage on the Willimantic River. Active railroad tracks and Route 32 parallel the river opposite the WMA. The 941-acre WMA supports numerous tributaries which feed the Willimantic. These tributaries are shaded by the surrounding forest to keep water cool and oxygenated. The forest filters pollutants from rainwater and further protects water quality in the Willimantic.

Proximity to other State Lands: The WMA is part of an assemblage of conservation land in the Tolland – Stafford – Willington area (Map 4). A 450-acre block of Nye Holman State Forest is situated just to the south and east of Kollar, its closest point approximately 250 feet from the Kollar boundary. A 345-acre block of the forest sits less than one mile to the northwest of the property. The Furnace Brook-Middle River Flood Control Area on the Tolland/Ellington line sits approximately 2.4 miles from Kollar. Nye Holman State Forest and Charter Marsh Sanctuary protect additional frontage on the Willimantic River and the Skungamaug River respectively, while Shenipsit, and Nipmuck State Forests occur north of the WMA and add to the local conservation lands.

Soils: The WMA contains fifteen soil types (Table 2, Map 5), including loamy soils. Loamy soil is an important component of American woodcock habitat because it provides easy earthworm foraging opportunities (U.S. Fish and Wildlife Service, 2001). Some areas of loamy soil at Kollar WMA are suitable for woodcock foraging while others may be too rocky.

Table 2. Soil Types Found at Kollar WMA, Tolland/Willington, CT

Soil Type	Acres
Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	1
Canton and Charlton fine sandy loams, 8 to 15 percent slopes	203
Fluvaquents-Udifluvents complex, frequently flooded	34
Gloucester gravelly sandy loam, 3 to 8 percent slopes	33
Nipmuck-Brimfield-Rock outcrop complex, 3 to 15 percent slopes, very stony	19
Nipmuck-Brimfield-Rock outcrop complex, 15 to 45 percent slopes	72
Nipmuck-Brookfield complex (loam), 3 to 15 percent slopes, very rocky	359
Nipmuck-Brookfield complex (loam), 15 to 45 percent slopes, very rocky	93
Occum fine sandy loam	8
Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	59
Pootatuck fine sandy loam	6
Ridgebury, Leicester, and Whitman (loam) soils, 0 to 8 percent slopes, extremely stony	22
Saco silt loam	2
Udorthents-Pits complex, gravelly	9
Udorthents-Urban land complex	7
Water	14
Total	**941**

Description of Major Soil Types:
Nipmuck-Brookfield (48%) soils are moderately deep to very deep, well-drained, acid soils derived from sulfide schist, with some bedrock outcroppings. Common trees and shrubs found on this soil type include oaks, red and sugar maples, eastern white pine, witch hazel and huckleberry.
Canton – Charlton (23.5%) soils are very deep, well-drained upland soils. Formation is within a loamy mantle underlain by sandy or sandy-skeletal till. Slopes in the management area are predominantly 8-15%. The deposits of sand make this series slightly drier and conducive to white pine and black oak.
Nipmuck-Brimfield-Rock outcrop complex (9.7%) consists of soils that are shallow to moderately deep, well-drained to somewhat excessively well-drained, formed in a thin mantle of till derived from sulfide schist. Common trees and shrubs found on this soil type include northern red, white, black and chestnut oaks, hickory, black birch, eastern white pine, mountain laurel, witch hazel, huckleberry and low-bush blueberry.
Paxton – Montauk (6.9%) soils are well-drained loamy soils formed in lodgment till. Soils are deep to bedrock and occur over a range of slopes. Hydraulic conductivity is high when soils are saturated. Montauk series share these characteristics but differentiate due to a sandy substratum. Productive soils with a hardpan layer, this series provides additional access to moisture and supports stands with sugar maple and yellow birch components.

Lakes, Ponds, Rivers, Streams, Wetland: Kollar WMA is bisected by or has frontage on four perennial drainages and at least five intermittent streams (Map 6). The Willimantic River forms the eastern boundary of the WMA for approximately 1.4 miles, separates the Kollar parcels from the Goeller parcel for 0.5 miles and then forms the southeastern boundary for approximately 0.5 miles. One mile of the Willimantic River, from Roaring Brook south to the Rte. 74 crossing, was designated as the Cole B. Wilde Trout Management Area (TMA) by DEEP's Fisheries Division in 1976. The area is regulated for fly fishing only and catch and release for trout. The area is monitored by DEEP Fisheries and Law Enforcement. This portion of the Willimantic supports American eel, bluegill sunfish, blacknose dace, stocked brown trout, chain pickerel, common shiner, fallfish, golden shiner, largemouth bass, pumpkinseed, redfin pickerel, redbreast sunfish, smallmouth bass, tessellated darter, wild brook trout, white sucker, and yellow perch (CT DEEP Fish Community Data 1994).

Labonte Brook bisects the WMA for roughly 0.85-miles, dividing compartments 3 and 4. There is a historic stream crossing in Stand 3-8 which could be used for access purposes in the future. Labonte Brook will be crossed using timber frame bridges and receive an undisturbed 100-foot buffer from harvesting activities. Fisheries data from the 1990s shows that Labonte Brook supports blacknose dace and wild brook trout.

School Brook flows south along the western boundary of the WMA in Compartment 1. It bisects the WMA for ¼ mile. Stand 1-1 supports an unmapped series of intermittent drainages which feed School Brook and make for complex harvest planning in wet years. The growing stock in the area is indicative of the moist growing site which supports sugar maple, yellow birch, and beech.

Roaring Brook bisects the Goeller parcel for approximately 650 feet before draining into the Willimantic River. Eight species of fish were identified from a sample collected in 2014 in Roaring Brook just upstream from Kollar WMA. The sample included blacknose dace, wild and stocked brown trout, white

sucker, bluegill sunfish, fallfish, redfin pickerel, stocked rainbow trout and wild brook trout. Roaring Brook is managed as a Class 3 Wild Trout Management Area with a 9" minimum length. The railroad tracks that cross Roaring Brook at the boundary of the WMA are treated with a preservative that washes off into the brook which can potentially be an environmental hazard for fish and other aquatic organisms. Volunteers with the CT DEEP Water Monitoring Program assessed the brook at sites just upstream and downstream of the tracks in 2005. Two pollution-intolerant invertebrate species were detected at both sites. Future assessments should be conducted at both upstream and downstream sites to assess the health of the brook.

In order to ensure the protection of surface waters and fisheries, DEEP staff will direct all contractors working on the WMA to employ State-approved best management practices for water quality while harvesting forest products. Specific management recommendations include;

- Riparian corridors will be protected with an undisturbed 100-foot-wide riparian buffer zone. This policy and supporting documentation can be viewed on the DEEP website or by clicking Riparian Policy or Riparian Position Statement. Any deviations from this policy will be at the discretion of the Fisheries Division.
- The Fisheries Division will review any forest road maintenance projects which involve culvert replacement. These projects will be evaluated to ensure fish passage needs are met.
- Forestry operations will avoid stream crossings if possible. If necessary, streams will be crossed during periods of low flow using corduroy or temporary bridges. Temporary bridges will be used over any streams which have steep approaches or soft substrate. Temporary bridges will be removed upon completion of a harvest. Additionally, Forestry will consult recommended stream crossing guidelines.

There are 48 acres of mapped wetland soils at Kollar WMA (Map 6). Over 75% of the wetland forest is associated with the floodplain of the Willimantic River along the southeastern boundary of the WMA. Stands 10-1 and 6-6 contain vernal pools where wood frogs were observed during the breeding chorus in April of 2019. The remaining acreage is associated with the forested wetlands along Labonte Brook.

G. DEEP Management and Special Uses

Critical Habitat: There are no mapped Critical Habitats as defined by the CT DEEP's Connecticut Critical Habitats data layer.

Wildlife Surveys: Ruffed grouse drumming surveys conducted in; 1992, 1993, and 1994. Surveys to document use of the property by birds associated with early successional habitats were conducted in 2005, 2008 and 2009 (see Appendix 1 for results).

Natural Area Preserves: There are no legislatively designated Natural Area Preserves on the property.

Research Plots: There are no formal research plots on the property.

Cultural Areas/Archeological Resources: The land encompassed by what is now Kollar WMA has a diverse cultural and land-use history dating back to Native American settlement. The land along the

banks of the Willimantic River was likely used seasonally by early Native American settlers of the Nipmuck tribe. Land adjacent to the Willimantic River was likely open for farming.

Following European settlement, accessible portions of the land were colonized, notably along the present-day road. Fieldstone foundation and remnant fruit trees occur along both traveled and abandoned sections of North River Road suggesting previous clearing and agricultural usage over the more-fertile soils adjacent to the Willimantic River. Stone piles and stone walls dot and bisect the landscape and allude to an agricultural history on the property. Analysis of the 1934 Aerial photos of Connecticut suggests roughly 138 acres, or 15% of the area, were in an open or semi-open condition with sizable areas of brush pasture likely used for grazing. Stone walls marked the boundaries of tilled fields, or corralled livestock away from the wettest wetlands and the steepest slopes. All stone structures are culturally significant and warrant protection while harvesting forest products and creating wildlife habitat. Despite some history of tilled soils, the soils at Kollar WMA are generally dry and sandy.

At least three historic foundations were observed during the forest inventory process. Early fieldstone foundations occur in Stands 6-6 and 9-6, while a more contemporary foundation and chimney structure were found in Stand 8-6 along the abandoned portion of North River Road. The latter is the Kollar homestead site which was demolished by DEEP in 1993. Additional work will be planned to control invasive shrub and vine growth around the Kollar home site. Any foundations encountered during the implementation of forestry and wildlife habitat management practices will be buffered from activity and preserved as cultural features.

The abandoned portion of North River Road dead-ends at a historic crossing of the Willimantic River. The fieldstone bridge footings which supported the fifty-foot span are still in-place, although their aesthetics are diminished by spray-paint vandalism.

Scientific Collection Permits: Currently, there are no scientific collection permits associated with this WMA. In 2017, 2018 and 2019, a survey of lepidopteran larvae was conducted by Robert Bagshi of the University of Connecticut. No listed species were found in this study. In 2006, one male woodcock was collected by John Barclay and Brian Hiller as part of a contaminant study conducted through the University of Connecticut. Permit applications are reviewed on an individual basis at the discretion of the Wildlife Division.

Cordwood Permits: Cordwood harvesting permits may be issued by DEEP Forestry upon request. Wood for removal would consist of unwanted residue or wood left on a landing after a forest product harvest.

Agricultural License Agreements: There are no agricultural license agreements for this WMA. No agricultural license agreements will be considered or initiated at Kollar WMA for the duration of this plan.

Special Use Licenses: There are no Special Use Licenses associated with this property.

H. Recreational Uses

Wildlife-Based Recreation:
Hunting: Kollar WMA is open to deer, turkey and small game hunting. See the Connecticut Hunting and Trapping Guide for license requirements, season dates and other regulations.
Trapping Furbearer trapping is permitted at Kollar WMA. The property falls within the eastern trapping unit.
Fishing: Kollar WMA is used to access the Cole B. Wilde Trout Management Area. This section of the Willimantic River is open for fly-fishing only and catch-and-release trout fishing only. DEEP Fisheries and Environmental Conservation (EnCon) Police routinely patrol the area for sportsman compliance with State Fish and Wildlife laws. Fishing regulations can be found in the Connecticut Fishing Guide.
ADA Access: While Kollar WMA does not have access that meets ADA codes, there is dedicated handicap parking near the gate on North River Road. The abandoned section of the town road serves as a service road into the WMA from the gate. While this section of the road is relatively flat, portions get muddy and rutted and can be challenging for wheelchair access. The need for ADA access will be assessed and an ADA compliant trail may be constructed. Requests from disabled hunters to access the property with an all-terrain vehicle (ATV) have been granted through the issuance of ATV access permits (2006-2014, 2019 and 2020).
Bird Watching/Wildlife Viewing: Fifty-five species of birds at Kollar WMA have been reported to eBird.org by local birders. eBird is an online bird reporting site administered by the Cornell Lab of Ornithology. Species at Kollar WMA that have been reported to this site include Species of Greatest Conservation Need (SGCN) such as broad-winged hawk, black-billed cuckoo, blue-winged warbler, prairie warbler, eastern towhee and cerulean warbler.
Trails: There are no authorized hiking trails at Kollar WMA. The existing access road provides the public with a representative sample of major habitat types and important features found on the property.

I. Resource Management Concerns

Unauthorized or illegal activity: There is ongoing illegal use of forest access roads by local ATVs and dirt bikes. Illegal ATV use is also occurring in Compartment 8, south and east of the abandoned portion of North River Road. Access originates from the gate on North River Road. Trails traverse Stands 8-3, 8-5, and 8-6. This ongoing use will detract from the intended habitat development as grouse have been well-documented to expand their range size or displace to less-suitable ranges to avoid continuous human disturbance. There is also recent fire pit and party-spot evidence in the area. DEEP EnCon Police have been notified of the activity. Minor footpath development was also observed through parts of the interior forest. Forest product harvesting implemented as part of this plan will attempt to control unauthorized use by armoring existing gates, and blocking new access points with gates, boulders, or large cull logs. Other management concerns include unleashed dogs and illegal dumping.

Climate Change: Climate change will over time affect soil moisture resulting in changes in regional species composition. In this area it is expected that species at or near the southern extent of their range will be among the first impacted. Sugar maple, aspens, eastern hemlock, and gray/paper birch may experience decline in this region due to climate change. On the other hand, it is anticipated that growing conditions will improve for species towards the northern extent of their ranges. Scarlet oak, pitch pine,

and hickories should fare well barring any impacts from other stressors like southern pine beetle or spongy moth. The Connecticut Climate Change Preparedness Plan calls for strategies that aim to conserve and enable the persistence of a representative array of habitats. One strategy identified in the Plan is to increase active management of upland forests to improve regeneration, diversity and resilience (CT DEEP, 2011). Thinning and early regeneration cutting in stands which are expected to be impacted by climate change may be a good strategy for prolonging health. Maintaining a variety of forest plant species will promote resilience and benefit an array of wildlife including ruffed grouse and other SGCN.

Invasive species: Invasive species pose a significant threat to wildlife. The impacts of invasive insects such as spongy moth caterpillars and emerald ash borer are conspicuous when their feeding activities lead to the death of large numbers of trees. Invasive plants also pose a serious threat to wildlife, although their impacts may not be as noticeable. When non-native invasive plants outcompete native plants, they reduce diversity by outcompeting the many species of native plants in an area. In addition, the invasion of non-native plants leads to the loss of the insect food base required by many species of wildlife. Most of our native plant-feeding insects can only feed on the native plants with which they evolved. Without native plants, these insects disappear, greatly reducing the available food for birds and other animals. Nearly all of Connecticut's terrestrial birds raise their young on insects, such as caterpillars. Even though many birds also feed on berries, which can be obtained from invasive plants, these non-native berries do not provide the same nutrition as the berries of native shrubs. Not only must existing invasive plants be controlled, it is imperative to not introduce more invasive plants to the WMA to the extent possible. Invasive plants can be spread by equipment such as mowers and forestry equipment that transport seeds from one area to another. This inadvertent spread of invasive plants can be minimized by cleaning off equipment that has been used in areas with invasive plants. Preventing the spread of invasive plants will also reduce future costs associated with the control of these plants. Connecticut should adopt Best Management Practices, such as those adopted by California and Minnesota, to reduce the spread of invasive plants. Invasive plants at Kollar WMA include Japanese barberry, Asiatic bittersweet, multiflora rose, Morrow's honeysuckle, autumn olive, mugwort and Japanese stiltgrass.

J. Wildlife Habitats

Major Cover Types: The dominant forest types are hardwood forest and hardwood/softwood forest, with a smaller component of conifer forest (Table 3, Map 7 and Figure 1). These forest stands contain sapling, pole and saw-timber age-classes. Sapling stage stands are at least 19 years old. The last clearcut that was conducted was implemented in 2001. In most cases, young forest lasts only 10 to 20 years before it becomes less useful to young forest wildlife (The Young Forest Project).

Despite its relatively small size, a 16-acre aspen stand is an important component of this property. Young aspen stands provide valuable habitat for ruffed grouse and other young forest species. Other important wildlife habitat types on the property include a 1-acre shrubland and a 1-acre old field. These small patches should be expanded to increase their usefulness to species that are dependent on these early-stage habitats.

The property has potential for a wide range of species associated with mature forest including black bear, bobcat, river otter, coyote and wild turkey.

Table 3. Existing major cover types of Kollar WMA, Tolland and Willington, CT, 2020

Habitat Type	Current Acres
Mature Hardwood Forest	449
Sapling Hardwood Forest	44
Mature Mixed Hardwood/Softwood	368
Sapling Mixed Hardwood/Softwood	13
Mature Conifer Forest	21
Sapling Conifer Forest	17
Mature Aspen	14
Sapling Aspen	2
Emergent, scrub/shrub wetland	5
Forested wetland	4
Old Field	1
Shrubland	1
Emergent wetland	1
Total	**941**

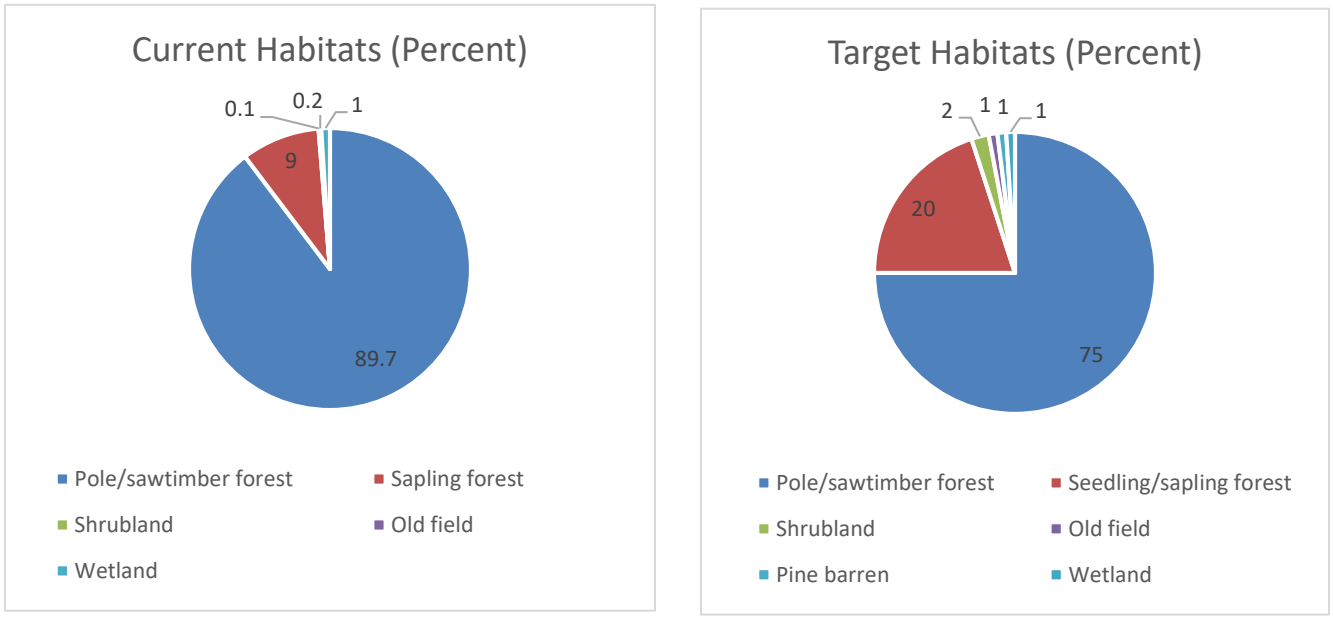


Figure 1. Percentages of current and target habitat types at Kollar WMA, Tolland/Willington, CT.

The property had been heavily logged prior to acquisition. The removal of most of the easily accessible mature trees promoted seedling/sapling stage forest and provided a unique opportunity to continue to manage the property for early-stage habitats such as shrubland and young forest. At the time of acquisition, the property contained regenerating clearcuts, exposed ground from gravel excavation, seedling/sapling and pole to saw timber size class forest stands. Between 1995 and 2001, 60 acres were cleared in eight stands. These cuts ranged in size from 7 acres to 28 acres. The regenerating aspen, mixed hardwoods and white pine provided habitat for shrubland and young forest species, including the

10 SGCN documented on the site. In 2001, three permanent openings totaling 12 acres were created in Compartment 8, two openings totaling two acres were created in Compartment 3, Stand 4, and one three-acre opening was created in Compartment 9, Stand 6. These openings have been filling in and require management to maintain them as open habitats.

Connecticut's Wildlife Action Plan has identified over 50 bird, mammal and reptile SGCN as being associated with young forest and other early successional habitats such as grassland, reverting field, and shrubland. Open habitats, (grasslands, savannah, barrens and shrubland) have declined by 98% in the last 60 years (The Northeast Upland Habitat Technical Committee and the Massachusetts Division of Fisheries & Wildlife. 2006), resulting in the population decline of species dependent on these habitats. Twenty-two species of birds that depend on early successional habitats are now on Connecticut's Threatened, Endangered and Special Concern Species list (2015). Also, many insects such as bees, butterflies and moths depend on early successional habitats. Even mature-forest birds spend much of their time feeding on insects in early successional habitats during the breeding season.

Generally speaking, larger habitat patches will enhance the long-term survival of a greater variety of wildlife. However, smaller patches between five and twenty-five acres will still allow for the survival and reproduction of a variety of species (The Northeast Upland Habitat Technical Committee and the Massachusetts Division of Fisheries & Wildlife, 2006). With 941 acres, Kollar WMA has the potential to be managed for a diversity of habitats. See Appendix 4 for descriptions of grassland, shrubland, reverting field, young forest and mature forest as they pertain to wildlife needs.

Old field: Old fields are characterized by herbaceous plants with scattered shrubs and tree seedlings, typically less than 10 feet tall. SGCN such as blue-winged warbler, field sparrow and eastern kingbird depend on old field habitat. These species were documented between 2005 and 2009 in the clearcuts that were created in 2000 in Compartments 3, 8 and 9. Old field habitat was created in stands 9-5 and 9-6 and in a portion of 3-4. Forest succession and invasive shrubs have reduced these areas to openings that are too small for these and other old field species. Old field habitat can be restored on 9 acres in Stands 9-5, 9-6 and a portion of 9-7.

Shrubland: Shrublands are dominated by shrubs and tree seedlings, typically less than 10 feet in height. Shrubland vegetation such as blackberry and raspberry (*Rubus* spp.) that forms thick tangles provides excellent cover for shrubland birds. Shrublands support SGCN such as willow flycatcher, indigo bunting, and brown thrasher, a species of special concern. Approximately 10 acres of shrubland was created after clearcuts in Stands 3-4 and 9-4. SGCN including Baltimore oriole, blue-winged warbler, eastern towhee, field sparrow, indigo bunting and prairie warbler were documented in Stand 3-4 between 2005 and 2009. Once this habitat succeeds to young forest, species such as blue-winged warbler, field sparrow and indigo bunting disappear. In 2019, approximately 1 acre remains in Stand 3-4. Shrubland habitat can be expanded in Stand 3-4, additional shrubland can be created by conducting clearcuts in Stands 3-5s, 3-6 and 3-7, and additional shrubland/seedling forest can be created by conducting clearcuts on ninety acres per 10-year work plan with minimum patch sizes of five acres.

Pitch pine/Scrub oak barrens: Barrens provide important habitat for ground-nesting bees and rare insects. Kollar WMA contains areas of dry sandy soil with pitch pine and scrub oak in Compartment 8. Three openings totaling 12 acres were created in 2001 in this compartment. SGCN such as Baltimore oriole, blue-winged warbler, eastern kingbird, eastern towhee, field sparrow, indigo bunting, prairie

warbler and rose-breasted grosbeak were documented in these openings between 2005 and 2009. A punctured tiger beetle was found here in 2016.These openings have succeeded to sapling stage forest and require management. Scattered pitch pines and scrub oak should be left at these sites while removing other woody vegetation.

Seedling/sapling forest: Seedling/sapling forest is dominated by trees less than 5 inches diameter at breast height (dbh) and includes what is referred to as "young forest" habitat. Young forest is the term used to describe the habitat that species such as ruffed grouse, American woodcock and approximately 50 other vertebrate species depend on. Young forest tends to be thick, tangled, and less than 20 feet tall (Wildlife Management Institute). Some species depend on earlier stages of seedling/sapling forest, for example chestnut-sided warbler populations begin to decline 10 years post-clearcut (Schlossberg and King, 2007). American woodcock typically feed in deciduous forest stands that are 3 to 15 years of age (USDA Natural Resources Conservation Service. 2010). Kollar WMA currently has approximately 87 acres of sapling forest that is nearly 20 years old. At this stage, it has lost its habitat value for most of the SGCN that depend on young forest habitat. Through forest management, seedling/sapling forest is expected to increase to approximately 182 acres. The use of clearcuts to promote young forest will help ruffed grouse, American woodcock, chestnut-sided warbler and other young forest species.

Mature forest: Kollar contains 754 acres of mature forest. Mature forest provides habitat for species such as black bear, bobcat, wild turkey, ovenbird and wood thrush. Wood thrush is a Most Important SGCN that breeds in mixed or deciduous forest with a tall canopy and a dense understory of shrubs and saplings. Stand 2-2 contains an understory of mountain laurel, a shrub that is often used for nesting by wood thrush. Wood thrush and other mature-forest SGCN such as eastern wood-peewee, veery and black-and-white warbler have been observed at Kollar WMA during the breeding season. Additional mature-forest species at Kollar WMA include pileated woodpecker, great-crested flycatcher, red-eyed vireo, hermit thrush, ovenbird and scarlet tanager. Cerulean warblers at Kollar were reported to eBird in May of 2018. It is unknown if they breed on the property. The cerulean warbler is a Species of Special Concern in Connecticut. Cerulean warblers breed in large tracts of mature forest (minimum area requirement range from 25 to 1700 acres) with tall, large diameter trees and small forest openings (see Appendix 4 for cerulean warbler requirements). Seventy-five percent of Kollar WMA will contain mature forest structure. Habitat improvement for cerulean warblers can be achieved by releasing white oaks and sugar maples, leaving a basal area of approximately 40 to 90 square feet per acre. Stand 1-1 is a 65-acre stand containing a sugar maple component. Stands 1-2 and 4-1 contain a white oak component and add another 70 acres of potential habitat adjacent to stand 1-1.

Streams: Labonte Brook bisects the WMA for roughly 0.85-miles (Map 6). Fisheries data from the 1990s shows Labonte Brook to support blacknose dace, and wild brook trout. Labonte Brook and its associated riparian habitat also provides habitat suitable for species such mink, northern waterthrush and Louisiana waterthrush. School Brook flows south along the western boundary of the WMA for ¼-mile. The Willimantic River borders the WMA and provides habitat for species such as common merganser, great blue heron and belted kingfisher.

Wetlands: The National Wetlands Inventory identifies 10.13 acres of wetlands on the property, consisting of 0.92 acres of seasonally flooded/saturated, needle-leaved evergreen wetland (PFO4E); 3.91 acres of broad-leaved deciduous, seasonally flooded/saturated wetland (PFO1E); 5.3 acres of emergent, persistent, scrub/shrub, needle-leaved evergreen, seasonally flooded/saturated wetland (PEM1/SSSE).

The CT DEEP inland wetland soil data layer identifies 47.8 acres of wetland soils, with approximately 7 of these acres overlapping the National Wetlands Inventory wetlands. The additional acres identified in the inland soils data layer include approximately 22 acres of floodplain soils along the Willimantic River, 12 acres of poorly drained and very poorly drained soils along LaBonte Brook, and 6 acres of poorly drained and very poorly drain soils in Compartment 10. The wetland in Compartment 10 serves as a breeding pool for wood frogs (*Lithobates sylvaticus*).

Special Features: Special features on the property include two vernal pools in Compartments 10 and 6; 16 acres of aspen in stands 9-2 and 9-3; 29 acres of Somewhat Excessively Drained soils in Compartment 8 with a pitch pine/scrub oak component; and 5 apple trees in Stand 3-4 (Map 8).

K. Wildlife

General Wildlife Use: Forty-five bird species were detected on the property between 2005 and 2009 (Appendix 1). Seven additional species were detected on the property on June 3, 2019, and June 4, 2020 (Appendix 1a). Wood frogs were also detected in 2019. Forest generalist species are expected to use the property including white-tailed deer, fisher, black bear and bobcat.

SGCN: Species of Greatest Conservation Need (SGCN) are species of regional or state conservation responsibility and have populations that are at risk of declining (CT DEEP, 2015). Nineteen SGCN bird species, as identified in Connecticut's State Wildlife Action Plan, have been documented at Kollar WMA (Table 4). Ten of these species depend on early successional habitats such as old field, shrubland and young forest; eight depend on mature forest; and one depends on wetland edges. Thirteen of these species were documented during point count surveys that were conducted between 2005 and 2009 as part of DEEP's Early Successional Bird Surveys (Appendix 1). Ruffed grouse were reported to eBird.org in 2010 and 2011 within approximately 500 feet of Kollar WMA. One was reported in 2016 at the nearby Nye Holman State Forest. In 2003, ruffed grouse and American woodcock were reported on the property by a student at the University of Connecticut. A local hunter reported seeing ruffed grouse on the property on two separate occasions in September of 2019.

Early successional habitats such as grassland, old field, shrubland and young forest have been declining in Connecticut and throughout the Northeast, as have the wildlife species associated with them. Active management is essential to maintain viable populations of these species.

In addition to the SGCN birds, wood frog, an Important SGCN, was observed on the property by DEEP staff on April 3, 2019. Wood frogs depend on vernal pools for breeding and on surrounding forest for foraging and over-wintering. Compartment 10 and Compartment 6 Stand 6 contain vernal pools where wood frogs were observed during the breeding chorus.

Table 4. Bird Species of Greatest Conservation Need found at Kollar WMA.

Common name	Scientific name	Typical Habitat
Blue-winged warbler	*Vermivora pinus*	Old field
Eastern kingbird	*Tyrannus tyrannus*	Old field
Field sparrow	*Spizella pusilla*	Old field
Prairie warbler	*Dendroica discolor*	Old field
Indigo bunting	*Passerina cyanea*	Shrubland
Rose-breasted grosbeak	*Pheucticus ludovicianus*	Shrubland/forest openings
Baltimore oriole	*Icterus galbula*	Forest openings
American woodcock	*Scolopax minor*	Young forest/Grassland
Eastern towhee	*Pipilo erythrophthalmus*	Young forest
Ruffed grouse	*Bonasa umbellus*	Young forest
Broad-winged hawk*	*Buteo platypterus*	Mature forest
Black-and-white warbler	*Mniotilta varia*	Mature forest
Cerulean warbler*	*Setophaga cerulea*	Mature forest
Eastern wood-peewee	*Contopus virens*	Mature forest
Northern flicker	*Colaptes auratus*	Mature forest
Ovenbird	*Seiurus aurocapillus*	Mature forest
Veery	*Catharus fuscescens*	Mature forest
Wood thrush	*Hylocichla mustelina*	Mature forest
Northern waterthrush	*Seiurus noveboracensis*	Wetland edge

*Species of Special Concern in Connecticut.

Natural Diversity Database Assessment: According to the Natural Diversity Database, six state-listed species have been documented in the vicinity of Kollar WMA. These include the endangered variable sedge (*Carex polymorpha*), the threatened Nuttall's milkwort (*Polygala nuttallii*); the special concern species whip-poor-will (*Caprimulgus vociferus*), and common crayfish; and state-listed reptiles. The eastern whip-poor-will depends on young forest. Nuttall's milkwort is found in dry, sandy fields, barrens and woodlands. Variable sedge occurs in sandy, acidic soils with seasonal flooding or near wetlands.

According to the Natural Diversity Database, Kollar WMA lies entirely within the HU-C6 Terrestrial Core-Connector Network as identified by the Terrestrial Core-Connector Network mapping project (McGarigal et al., 2017). Species for which this core area is important include box turtle, wood thrush and wood duck. Wood thrush is an SGCN with a ranking of Most Important. Wood thrush require large unfragmented, uneven-aged forest for adequate nest success. Wood ducks require slow moving, shallow water near forested habitat with suitable nest cavities. Wood thrush have been observed at Kollar WMA. Box turtles have not been documented on the property.

The section of Nye Holman State Forest to the north of Kollar WMA falls within the Core Block. This section of Nye Holman is approximately 350 acres and is separated from Kollar WMA by approximately 4,100 feet at its closest point.

Wildlife Surveys: Ruffed grouse drumming surveys had been carried out at Kollar starting in the early 1990s. Surveys were conducted by DEEP Wildlife Division staff. Five routes were established through the WMA to facilitate early morning surveys during the mid-April to early-May breeding season.

Survey procedures involve walking a ¼-mile transect between survey points and recording the number of drumming grouse heard during a four-minute count period. Survey work for grouse ceased in the late 1990s due to time demands of staff. Grouse survey work may resume in the future to determine grouse population levels at the onset of a new management planning period. Survey work should continue during the life of the management plan to determine whether management activities are yielding the desired species-specific outcomes.

Target species use:
American woodcock: The American woodcock is another SGCN that is dependent on young forest. Its population has been declining across its range for the past 50 years. Loss of young forest habitat is the primary reason for this decline. In addition to young forest, woodcock also depend on clearings such as pastures, reverting fields and powerline right-of-ways where the males perform their springtime breeding displays. Loam soil is also an important component of woodcock habitat. They probe for earthworms and other soil invertebrates in loam soils. The property has several areas of loam soils.

Kollar WMA is located within an American woodcock focus area, as defined by the DEEP Wildlife Division. These focus areas are created as a guide to targeting work and funding. With its location within a focus area, its potential to create young forest habitat, and its areas of loam soils, Kollar WMA is a suitable site for creating woodcock habitat.

American woodcock benefit from clearcuts of at least 5 acres. Regenerating clearcuts with approximately 10,000 woody stems per acre provide ideal feeding areas. Ideal nesting areas consist of approximately 6,000 hardwood stems per acre with areas of bare soil. A seven-acre clearcut will be conducted within stands 3-5 and 3-6. Ten-acre clearcuts should be conducted within each ten-year work plan in areas with loam soils to provide perpetual habitat for woodcock. Loam soils occur throughout the property but some areas may be too rocky for suitable woodcock foraging. The loam soils that occur in Compartment 8 are Somewhat Excessively Drained and are not suitable for woodcock foraging, therefore clearcuts for woodcock should not be conducted in this compartment.

Ruffed grouse: The ruffed grouse population in Connecticut has declined by approximately 7.4% per year since 1966 (Sauer et al., 2017). Populations of this species have been declining throughout the Northeast. One reason for this decline is the loss of habitat that this bird needs to survive and reproduce. Ruffed grouse habitat requirements change throughout the year. Males perch on logs or stumps in dense forest and perform their drumming display to attract females. The females nest against a log, stump or tree in mature forest. The chicks require small herbaceous openings, interspersed with dense shrub cover, where they forage for insects. Adults feed in dense young forest that provides escape cover from predators. Adults feed almost exclusively on plant material and need a variety of plants that produce food throughout the year. See Appendix 2 for a list of important ruffed grouse food plants. In winter, grouse seek thermal shelter in young forest or dense conifer stands. Therefore, they need several habitat types in close proximity (Pennsylvania Game Commission):
1. Young forest (3 to 20 years) with a high density of stems, especially aspen, but also oaks with a diverse component of trees, shrubs, vines and ferns. These areas provide cover from predators, and food in the form of buds, fruits, leaves and acorns. (See Appendix 3 for important food sources.) In stands where there is good oak reproduction, clearcutting provides the best results for ruffed grouse habitat. (Ruffed Grouse Society)

2. Herbaceous openings with 50-70% forb cover together with high stem density brambles, shrubs and seedlings where the chicks feed heavily on insects. These openings should be ½-acre or less.
3. Five- to twenty-year-old forest, or mature forest with a developed shrub layer with 12-18" diameter drumming logs for breeding displays.
4. Pole to sawtimber size forest for nesting.
5. Dense conifer stands, mountain laurel thickets, stands of young oaks that retain leaves, and/or dense hardwood seedling/sapling stands to provide thermal cover in winter.

Managing stands of aspen of differing age between 0 and 30 years, managing stands of oak for young forest structure with a diverse understory, promoting dense stands of conifer cover and maintaining small herbaceous openings with dense shrub cover will improve habitat at Kollar WMA for grouse and other SGCN.

Stand 9-2 is dominated by aspen, a tree species that is especially important to ruffed grouse. Aspen is the best grouse habitat in the Northeast (Ruffed Grouse Society, 2019) Dense stands of aspen with 2,500 to 15,000 stems per acre (Virginia Department of Forestry) provide cover from predators. The buds and flowers of mature male aspen provide an important source of protein. Because grouse rely on both young and mature aspen, ideal ruffed grouse habitat consists of small 5- to 20-acre aspen patches all close together but of different ages (Ruffed Grouse Society). Aspen must be cut no later than every 30 years or it will be lost (Pennsylvania Game Commission). In 2001, a final shelterwood cut in stand 9-2 resulted in ten acres of aspen regeneration. This is the only stand of aspen on the property except for a two-acre stand in stand 9-3. An additional final shelterwood in stand 9-1 created an additional ten acres of hardwood regeneration.

Stand 6.7 is adjacent to stands 9-1 and 9-2. This stand contains a white pine component. Regenerating patches of white pine provide winter thermal cover. Treatments in this stand should include openings to promote conifer regeneration. Conifers should be within 100 feet of mature aspen (Minnesota Department of Natural Resources, 2009). Treatments in this stand should also include a 150-foot-wide clear cut along the edge of stand 9-2 to encourage the spread of aspen.

Stand 6-6 contains an area of approximately 1 acre where an open canopy due to oak mortality has created an herbaceous ground cover. Harvesting these dead oaks will leave an herbaceous opening of approximately 0.5 acres. This opening should be permanently maintained as brood habitat by mowing a portion every year and leaving patches of thick shrub cover. This area is accessible from the access road.

Whip-poor-will:
The whip-poor-will is a species of special concern in Connecticut. This bird was documented nearby at the Nye Holman State Forest. Like ruffed grouse, whip-poor will also use a combination of habitat types. They are found in regenerating to pole-size, dry deciduous to mixed forest with canopy or understory openings. The majority of Kollar WMA contains well-drained soils with a component of somewhat-excessively-drained soils in compartment 8. This section contains a pine-scrub oak community which appears to be a preferred habitat of whip-poor wills, along with pitch pine-oak forest and oak-hickory forest. They also use open habitats such as fields, orchards and open wetlands for foraging. These openings require periodic maintenance such as invasives control and mechanical control of trees larger than three-inch dbh. Managing for multiple forest age-classes at Kollar WMA and

maintaining the pitch pine-scrub oak community in Compartment 8 will improve habitat for whip-poor-will.

Eastern box turtle/wood turtle:
Box turtles and wood turtles are both species of special concern in Connecticut. Both have been documented at sites one mile or more away from Kollar WMA. The box turtle is a species for which the Core Block in HU-C6 Terrestrial Core-Connector Network is important (see Landscape Context below). Box turtles are typically found in well-drained, deciduous forest, adjacent to well-drained fields and reverting fields where they lay their eggs. The majority of Kollar WMA contains well-drained soils, with smaller amounts of somewhat-excessively-drained and poorly-drained soils in Compartment 8. Wood turtles hibernate in rivers and forage in riparian forests. They lay their eggs in soft soil, typically sandy deposits near streams. Maintaining the openings on the somewhat-excessively-drained soils of Compartment 8 would provide nesting substrate for box turtles that may be using the surrounding well-drained deciduous forest, and for wood turtles that may hibernate in the adjacent portion of the Willimantic River. NDDB reviews will be done prior to forest harvests, and all Best Management Practices for box turtles and wood turtles will be followed when conducting forest harvests and other habitat work at Kollar WMA.

Wood thrush:
Wood thrush is a Most Important SGCN. Wood thrush were observed on the property in 2005, 2008 and 2019. They breed in shady, moist, mature deciduous or mixed forest with a tall canopy and a dense understory of saplings and shrubs. Their nests are typically placed on or near the ground, usually in a low branch of a shrub or tree seedling. Nests in taller shrubs were found to have higher nest success. Concealment of the nest from above and below are important factors for nest success (Hoover and Brittingham, 1998). Uneven-aged management throughout a stand creates favorable conditions for the species. In general, forest patches greater than 250 acres fosters adequate rates of nesting success. Stand 2-2 contains an understory of mountain laurel, a shrub that is used by wood thrush for nesting. Stands 2-1, 2.2 and 2-3 collectively contain 47 acres of deciduous and mixed forest. Maintaining the dense understory of mountain laurel and implementing silvicultural practices that create uneven-aged forest with well-developed but broken canopies in these stands will benefit wood thrush. While these stands make up only 47 acres, they could serve as a core nesting area within the larger forest block (Map 9). While the emphasis for management at Kollar WMA is on young forest, mature forest will make up 75% of the area. Wood thrush also depend on shrublands and young forest in the post-fledging season where they fuel up on berries before migration. Clearcuts in Stands 3-5s, 3-6, 6-3 and 6-10, and managed openings in stands 3-4, 9-5, 9-6 and compartment 8 will provide pre-migration habitat during this ten-year plan.

Cerulean warbler:
Cerulean warblers were reported on the property in 2018. The cerulean warbler is a Species of Special Concern in Connecticut and is included in the list of Birds of Conservation Concern maintained by the U.S Fish and Wildlife Service. Cerulean warblers breed in large tracts of mature forest (minimum area requirement range from 25 to 1700 acres) with tall, large diameter trees, a structurally diverse canopy, upper canopy gaps, and small forest openings, $<100m^2$, with multiple vegetation layers. Mean nest tree height was eighty feet and mean diameter at breast height (dbh) was 16 inches in a study in Ohio (Cerulean Warbler Technical Group) with a preference for sugar maple and white oak (Boves, 2011). Other tree species that are frequently found in cerulean warbler nesting territories include sycamore and

hickories (Cerulean Warbler Technical Group) especially bitternut hickory (Jones and Robertson, 2001). Nests are placed close to the outer edge of a long branch in the canopy (Hamel, 2005). Seventy-five percent of Kollar WMA will be maintained as mature forest. Habitat improvement for cerulean warblers can be achieved by releasing white oaks and sugar maples, but not red oak or red maple. Grapevines are also important components of cerulean warbler habitat. Grapevines help conceal nests, are used as nest material, and are positively associated with nest success (Bakermans, 2008). Stand 4-1 contains mature white oak with several small openings created by spongy moth-killed oaks. Silvicultural practices such as group or patch cuts or crop tree release that create canopy openings around individual or groups of white oak and sugar maple will benefit cerulean warblers as well as wood thrush and other forest species. Stands 1-1, 1-2 and 4-2 also contain sugar maple and white oak but with smaller trees and in smaller amounts. Releasing these trees while also creating openings around mature hickories, especially bitternut, and sycamores in these stands will improve conditions for cerulean warblers.

L. Wildlife Habitat Goals and Objectives

Goals: The goals of the WMA are to increase habitat for American woodcock, ruffed grouse and other species dependent on young forest; to improve mature forest habitat; and to provide hunting opportunities.

Objectives:

- Increase area of young forest from 87 acres of sapling to 182 acres of seedling/sapling
- Improve forest diversity and enhance hunting on 472 acres
- Increase area of aspen from 15 acres to 40 acres
- Enhance stand-level resilience to disturbance on 122 acres
- Maintain ½-acre herbaceous opening
- Maintain shrubland habitat on 20 acres
- Maintain 9 acres of old field habitat
- Maintain boundaries
- Maintain adequate mature forest habitat to support wood thrush and other mature forest species

To accomplish the objectives, management treatments may include all modern wildlife management techniques including but not limited to mowing, mulching, tree harvesting, scarification, planting, invasive plant control, including the use of herbicides, and prescribed burning. As part of these management activities, the use of vehicles may be required. Existing access will be used to conduct management activities and new limited access may be developed as needed to allow agency-authorized vehicles and equipment to conduct management activities.

Actions:

- Conduct final shelterwood harvests on 15 acres in Stands 6-3 and 6-10 to create young forest habitat for species such as American woodcock, ruffed grouse and other young forest species
- Conduct irregular shelterwood harvests on 57 acres in Stands 3-5s, 3-6, 3-7, 6-9, 6-11, 8-8, 9-5 and 9-7
- Conduct selection harvests on 200 acres in Stands 6.6e, 1-1, 1-2, 4-1, 4-2, 2-2, 3-2 and 5-5.

- Establish advanced regeneration on 122 acres through first shelterwood and selection harvesting in Stands 3-3, 5-3, 6-7, 6-13, 6-14 and 3-2
- Conduct clearcut on 7 acres in Stands 3-4 and 3-5 to promote young forest habitat on loam soil for American woodcock
- Heavy mow Stand 9-6 to expand old field habitat to nine acres for species such as blue-winged warbler, field sparrow and indigo bunting.
- Create ½-acre herbaceous opening in Stand 6-6 for ruffed grouse brood habitat
- Heavy duty mow 7 acres of Stand 9-2 to regenerate aspen
- Mow one half of herbaceous opening in Stand 6-6 every third year, leaving high-stem-density clumps of native shrubs for ruffed grouse brood feeding and cover
- Herbicide 4 acres of invasive shrubs in Stand 9-6 to promote native vegetation for wildlife food and cover
- Herbicide invasive plants on 26 acres in Compartment 8 and in Stand 9-2
- Heavy duty mowing of trees on 10 acres in Stands 9-5, 9-6 and 3-4 every 5 to 7 years to maintain old field and shrubland habitats
- Hand-felling trees larger than 5" dbh as necessary to prolong old field and shrubland habitat
- Refine boundary and correct any discrepancies
- Control invasive shrub and vine growth around the Kollar home site.
- Follow up with Property Management regarding actions on boundary encroachments
- Investigate boundary dispute west of LaBonte Brook

Plans and Initiatives: The Connecticut Wildlife Action Plan (WAP) identifies conservation actions needed to address threats to Connecticut's wildlife. Specific actions identified in the WAP that are addressed in this 10-year plan include:

- Prioritize management for SGCN and their habitats on state lands with a focus on rare and declining habitats.
- Minimize impacts from over-browsing by deer to the habitats of SGCN. Increase invasive plant control on public lands.
- Create, restore and manage a variety of early successional habitats to benefit SGCN.
- Conserve breeding populations of early successional birds.
- Improve habitat on small and large acreages.
- Conserve and increase population of ruffed grouse.
- Conserve breeding populations of American woodcock.

The Management Plan for American Woodcock in Connecticut (2012) goal is to increase American woodcock populations on state controlled lands and in woodcock focus areas. One objective to meet this goal is to increase the extent of young forest habitat on state controlled lands by 10%. Increasing young forest habitat by 100 acres at Kollar WMA will help to meet this goal.

Infrastructure:
Routine maintenance: Kollar WMA has a 0.1-acre parking area that should be inspected periodically for maintenance needs such as trash pick-up, gravel maintenance (i.e. potholes), top-dressed with gravel as needed, and kiosk maintenance.

Road repairs: The abandoned portion of North River Road, where it intersects with Babcock Road is in need of repair. Staff should coordinate with the Town of Tolland to determine appropriate measures to take to make needed repairs.
Access Road Maintenance: Maintenance and improvement of the WMA access roads will occur on an as needed basis to support on the ground habitat management activities. Gravel or stone for significant capital improvements can be purchased by DEEP through the project plan process. Minor improvements like truck road aprons associated with an active harvesting project may be tied to the job as part of the harvesting contract.
Boundaries: A sizable tree cutting encroachment was discovered toward the northeastern extent of the WMA in 2018 during initial recon for management plan preparation. The encroachment was identified and reported to property management. Forestry, Wildlife, Parks, Law Enforcement, and Property Management each played integral roles in investigating the encroachment, remediating hazard trees, and re-marking the WMA boundary. At the time of this writing the encroachment case is unresolved. The affected boundary was subsequently surveyed and re-marked by DEEP Property Management, Wildlife and Forestry Divisions. The encroachment is currently being discussed with DEEP legal staff to determine the next appropriate steps.

While re-marking the boundary northeast of the encroachment site, DEEP Forestry identified a discrepancy where the boundary line evidence doesn't "meet in the middle". Two non-intersecting lines were identified and remain unrectified. DEEP Wildlife and Forestry staff will work with Property Management to refine the boundary location and correct discrepancies in the past marking.

During forest inventory DEEP identified a minor leaf and lawn debris encroachment emanating from a private property on Babcock Road. Despite the clearly marked boundary the current owner has been depositing numerous piles of woody and organic material well-beyond the State's marked boundary. Property management will be notified and a letter will be sent to the owner asking to cease the dumping activities.

The previous management plan for Kollar identified a boundary dispute involving a line segment over 2,000-feet west of Babcock Road between Labonte Brook and School Brook. DEEP Forestry and Wildlife staff will investigate whether this dispute was settled during previous boundary maintenance. During inventory, the boundary in this part of the WMA was encountered several hundred feet east of where it would appear on DEEP property maps. However, the location of the marked boundary seems to coincide well with municipal parcel lines.

The property boundaries will be maintained by DEEP Wildlife in 2020.

Signs: WMA signs will be maintained or replaced as needed.
Right-of-ways: Eversource (formerly CL&P) has a 150-foot wide right-of-way running north-south along the west bank of the Willimantic River. The service line is no longer present, however, poles are still visible along the ROW.

Recreational Use:
ADA Access: An ADA accessible parking lot was established in 1998, at the junction of North River Road and Babcock Road. A 2,500-foot hunting trail was established in 1998 along the abandoned

section of North River Road. This section of the road is relatively flat, but portions get muddy and rutted and can be challenging for wheelchair access.
Trails: No new trails will be established. Ongoing efforts to close unauthorized trails may occur throughout the duration of this plan.

Other:
Wildlife Population Controls – The Wildlife Division will monitor and control beaver activity in the Willimantic River and its tributaries to ensure no impacts to the recreational fishery. The entire WMA is open to public hunting by zone and season.

M. Forest Management and Ten-Year Work Plan

Forest management*:*
Rotations and cutting cycles used (acres of each)
American woodcock and ruffed grouse are the featured species DEEP will hope to perpetuate through the forest management work plan. Both species require a portion of their home range allocated to young forest habitat (forest less than 20 years of age). Young forest habitat will also support over 50 other wildlife species which rely on dense, young stands of trees to fulfill their habitat niche. Due to the young-forest focus of this plan, the forestry division will manage the commercially viable even-aged acreage under an 80-year rotation. With 792 even-aged, operable acres and a fifteen-year entry period for scarlet oak, DEEP will aim to regenerate over 150-acres during the 10-year planning period. Roughly one-third of that acreage will be allocated to final or irregular shelterwood harvesting while the remaining two-thirds will be managed regeneration cuts to establish and perpetuate regeneration under moderate shade. In regeneration-release treatments about 4 trees per acre >10" DBH will be designated as "cut-and-leave", trees to be felled and left on site for habitat utilization as grouse drumming logs.

Forest health
a. Invasive Plants
The WMA has established populations of invasive plants generally concentrated towards the southern extent of the property along North River Road. These populations seem to be associated with historic agriculture, homestead sites, cart paths, and cutting treatments. Japanese barberry is the most common invasive plant with locally significant areas of autumn olive, multi-flora rose and bittersweet. During implementation of this management plan DEEP will use Pittman-Robertson derived program income to hire contractors to treat invasive plants adjacent to and within harvest areas and on other sites where invasive control may improve the experience for hunters and others. Fecon forestry mowing and follow-up cut-stump treatment may also prove a reasonable control strategy in areas with mature olive growth or areas of severe invasive density. Control treatments will occur prior to associate harvesting work.
b. Invasive Insects
Emerald ash borer (EAB) and southern pine beetle (SPB) are both currently active in Connecticut and experiencing range expansion as human activity and climate change allow insects into previously un-colonized areas. EAB was identified in Connecticut in 2012 with 2015 identification in Ellington, and 2017 identification in Vernon – both abutting Tolland to the west. DEEP and partners at Connecticut Agricultural Experiment Station (CAES), USDA APHIS, and The US Forest Service are working with local stakeholders to slow the spread of this insect, but it is not believed that this insect can be controlled. Since ash only represents 2% of the basal area across the WMA, the effects of EAB will be

somewhat limited at Kollar. Ash is locally important however in stand 3-3 where it represents 16% of the basal area and is growing roughly 17,000 board-feet stand-wide. Its targeted removal in this area will be congruent with the general management goals for this oak-pine stand.

The Southern Pine Beetle (SPB) is native to the southeastern United States and has been showing up further north since 2009; first New Jersey, then Long Island in 2014. In 2015 it was identified in Connecticut. In Connecticut pitch pine, Scots pine, and red pine are the most vulnerable host species. A trees individual defense against SPB is resin or pitch flow. Healthy trees can effectively spit-out invading beetles under low population levels. SPB is a significant concern when insect populations reach outbreak levels and can easily overwhelm a trees defenses based on the sheer number of invading beetles. SPB coordinate such mass attacks using pheromone semiochemicals emitted by both the beetle and the invaded host tree. This pheromone release attracts nearby beetles toward a suitable host. Thinning is an effective strategy of reducing stand susceptibility to SPB. Thinning increases tree vigor and resin production positioning released trees to more effectively ward-off invasion. Thinning also allows more complete air flow through a stand which helps dissipate pheromone plumes. Monitoring for the presence of SPB in Connecticut is a challenge given the current survey techniques and limited staffing for survey work. CAES is the primary State entity surveying for SPB in Connecticut.

c. Spongy Moth and Secondary Stressors

Oak defoliation by spongy moth caterpillar has been a significant issue in eastern Connecticut since 2015. Long-thought controlled through the introduced maimaiga fungus and periodic build-up of a naturally occurring virus, spongy moth populations boomed in 2015, 2016, and 2017 following dry spring conditions and prolonged drought in 2016. Due to the drought the environmental build-up of the maimaiga fungus did not occur in 2015 and 2016, as a result, caterpillar populations were able to complete their life cycle and lay eggs propagating a robust population for 2016 and 2017. Defoliation coupled with severe drought in 2016 and late-season moderate drought in 2017 has caused significant mortality to the dominant oak cohort throughout eastern half of the State. A reasonably moist spring of 2017 led to successful build-up of the fungus and marked die-off of the fourth and fifth instar caterpillars. Though the majority of the population did not complete their life cycle in 2017 there was a significant spongy moth impact in east-central Connecticut in 2018. Despite successful environmental build-up of the fungus at Kollar, a subset of the population was able to complete its life cycle leading to additional defoliation in 2019. Early years of this planning cycle will be exceptionally telling as trees weakened by spongy moth are expected to experience colonization by two-line chestnut borer or shoestring root-rot. Significant chestnut-borer activity was evident on the landscape in the summer of 2018 as full oak crowns browned and wilted in mid-July. These secondary stressors, an insect, and a fungal pathogen, have shown to attack stands previously stressed by spongy moth.

Old Forestland Management Sites

Old Forestland Management Sites are designated to recognize the intrinsic value of having sizable remote areas of unmanaged forest. Though the sites are not currently old growth and may not necessarily be any older than the rest of the forest, it is expected that the reserve status will eventually lead to the development of old growth attributes such as very large trees, canopy gaps, multiple age-classes of trees, large volumes of both standing and downed dead trees, and climax community composition. Old Forestland Management Sites by design have limited human influence, and trails planning is ideally excluded from these areas. Although forest fires are somewhat infrequent,

suppression tactics such as burning out to natural fire breaks will be encouraged in Old Forestland Management sites. Tree cutting in old forest sites will be limited to hazard tree removal.

A 67-acre Old Forestland Management Site will be established in the northeast corner of the WMA in Stand 7-1 (Map 10). The area is delineated by its steep rocky terrain sloping east to the Willimantic River. The forest is characterized by a mixture of late successional oak, hemlock, pine, sugar maple, and other mixed hardwoods with abundant surface stones, ledge, and locally dense mountain laurel.

Multiple unmapped intermittent streams and underground springs that percolate out of the bedrock in Stand 7-1 flow east toward the Willimantic River. There is a good deal of past wind disturbance affecting the hemlock in the stand. This canopy-gap succession will foster competition from shade-tolerant species like sugar maple, perpetuate multiple-age classes, and late-successional forest characteristics. Portions of the stand have been operated in the past under private ownership. Given the excessive slope, abundant rock, and poor access the stand will be managed as a biological reserve and excluded from the suitable timber base.

Silvicultural actions:
Actively managed, even-aged forest land will be managed on an 80-year rotation. Eighty-years should be considered a short rotation in this forest type. Short rotation forestry is planned due to the habitat and age requirements of the two featured species to be managed for. An 80-year rotation was selected to best serve the habitat needs of the target species while simultaneously ensuring foresters can grow forest products to a commercially viable size prior to culmination of the rotation. The desired future condition for Kollar WMA would perpetuate a rotation of young forest stands to serve the habitat needs of the featured species. See the table below for a breakdown of current size classes versus an ideal desired future condition size-class distribution.

	Current Forest	Desired Future Condition
Seedling / Sapling	12%	20%
Poletimber	5%	30%
Sawtimber	80%	40%
All-Aged	3%	10%

Wildlife habitat is the primary objective of all the forest product harvesting planned for Kollar WMA. Silviculture is the most efficient tool for manipulating large areas of forest habitat to achieve a desired vegetation response. Forestry staff from DEEP will prescribe silvicultural practices designed to achieve a suitable habitat structure for the focal species. Silvicultural work will employ a range of different treatments applied at the stand, or sub-stand level depending upon stand size. Foresters will work under the general guidelines of establishing four different age-classes of habitat per 40-or-so-acre management unit.

Based on the predominant age-classes of the WMA, and deficiencies in the current age-class distribution, harvesting will rely heavily on the shelterwood system with over 60 acres of final harvest, and 100 acres of shelterwood establishment cutting (Map 11). Additional thinning, selection cutting, and timber stand improvement should occur judiciously to accelerate volume and value growth given the short rotation goals. Thinnings, selection system, and timber stand improvement harvesting will also yield some transitional habitat and benefit long-term forest reproduction goals.

Aspen trees are valued by grouse for multiple reasons. Young regenerating aspen stands grow at significantly high stem densities which result in high-quality predator escape cover. Conversely mature male aspen flowers constitute a critical late winter, early spring food source for grouse. Despite well-developed sapling-sized aspen in one portion of the WMA, aspens only accounted for 1% of the trees in the forest inventory. In the absence of aspen, regeneration goals will focus primarily on oak due to its secondary utilization by ruffed grouse. Soils at Kollar WMA are suitable for white pine. Young dense stands of white pine provide winter cover for ruffed grouse. A diverse mixed uneven-aged forest provides the structure that makes suitable nesting habitat for wood thrush. Site suitability will represent an additional area of focus, especially for American woodcock management. Suitable woodcock sites will support fine-textured soils adjacent to forested wetlands and intermittent streams. The historic old field habitat should coincide with good woodcock sites. In these areas a combination of invasive plant control, and the aggressive harvesting of low-value forest products will be applied to convert old field stands away from white pine composition.

Forest size classes by forest type (total forest)

Type	Seedling-Sapling	Pole Timber	Saw Timber	All Size	Total
Mixed Hardwood	79	35	372	13	**507**
Northern Hardwood	0	0	73	0	**65**
Softwood Hardwood	29	10	286	13	**338**
Total Acres	**108**	**45**	**731**	**26**	**910**

Forest type size class and condition class on areas to be managed

Even-Aged Forests	**DBH Range**
Seedling	<= 1”
Sapling	1.0” <= 4.9”
Pole	5.0” <= 11.9”
Small Sawtimber	12.0” <= 13.9”
Medium Sawtimber	14.0” <= 16.9”
Large Sawtimber	17.0” and larger
Two-Aged Forests	
Sawtimber – Seedling	>12.0” and <=1”
Sawtimber – Sapling	>12.0” and <=1” – 4.9”
Sawtimber – Pole	>12.0” and 5.0” – 11.9”
Multi-Aged Forests	
Sawtimber – Pole – Sapling	>12.0” and 5.0” – 11.9” and 0.1” – 4.9”

Active Forest – Type Group by Size Class

Type Group **Size Class**	**Oak/Hickory**	**Birch/Beech/ Maple**	**Oak Pine**	**White pine**	**Aspen Birch**	**Total**
Seedling	8	0	0	0	0	**8**
Sapling	57	0	13	16	13	**99**
Sawtimber/seedling	0	0	0	0	0	**0**
Sawtimber/sapling	24	0	10	0	0	**34**
Pole	35	0	10	0	0	**45**

Sawtimber/pole/sap	13	0	13	0	0	**26**
Sawtimber/pole	116	65	116	0	0	**297**
Sawtimber	114	8	143	16	2	**283**
Total	**367**	**73**	**305**	**32**	**15**	**792**

The plan calls for expansion of two existing maintained openings, and creation of a third maintained opening in Stand 6-6e. The existing shrubland habitat in stand 3-4 will be expanded to the west into Stand 3-5s. The 6.8-acre expansion area will receive a final shelterwood harvest. The area will be allowed to naturally succeed to young forest. Stand 9-5 will receive an irregular shelterwood harvest intended to release existing pine reproduction and expand upon an existing opening in Stand 9-6. Two or three 1/3-acre circular patch cuts will be implemented in Stand 6-6e to support grouse brood habitat. These openings are intended to be maintained in an herbaceous condition.

Forests play an important role in mitigating the effects of climate change. Trees and green plants absorb carbon dioxide from the atmosphere for use in photosynthesis. They release oxygen and store carbon in trunks, roots, branches, and leaves. Dead trees store additional carbon which is transferred to the soil when snags fall and gradually decompose. Meanwhile the soil acts as its own carbon sink which on average stores over 30% of the combined carbon pool in regional forests.

In their importance toward mitigating climate change, forests serve two significant functions; sequestering carbon dioxide, and storing carbon, often referred to as “sequestration” and “storage”. However, the forest’s ability to perform these functions is maximized at two different points during development. Sequestration potential is maximized in vigorously growing forests which are efficiently photosynthesizing, and rapidly adding wood. Typically, this occurs when a forest is aged 30-70 years. Carbon storage benefits peak in old forests which support large diameter trees and accumulations of dead and downed wood. These attributes are more common in forests over 200 years old.

The Wildlife Division believes in pursuing a diversity of carbon management strategies to meet the demands of a changing climate while also accomplishing traditional land management objectives. Not only forests, but forest products play a critical role in mitigating climate change. Value-added wood products from responsibly managed forests store carbon for decades and beyond while tree removals from sound forest management allocate growing space to higher quality trees, improve sequestration and wood production rates, add structural complexity, and improve wildlife habitat.

Forest Stand Thinning – See Silvicultural Work Plan

Forest Stand Regeneration – See Silvicultural Work Plan

Uneven-aged Management – Stands 3-2, and 5-5 will be managed on an uneven-aged basis using a combination of expanding gap shelterwood and thinning with small group selection. These areas are well-aligned to an uneven-aged approach given the past management history, forest composition, and distribution of spongy moth-induced oak mortality. See Silvicultural Work Plan.

Pre-Fire Suppression Work – No pre-fire suppression work is planned. Kollar WMA has been moderately to heavily impacted by oak mortality caused by spongy moth defoliation. Roads and fire lines have many overhead hazard trees which are likely to fall within the next five years. Forest product

harvesting will remove dead and dying trees from adjacent forest access roads, but complete elimination of hazards would require a significant funding commitment.

Silvicultural Work Plan

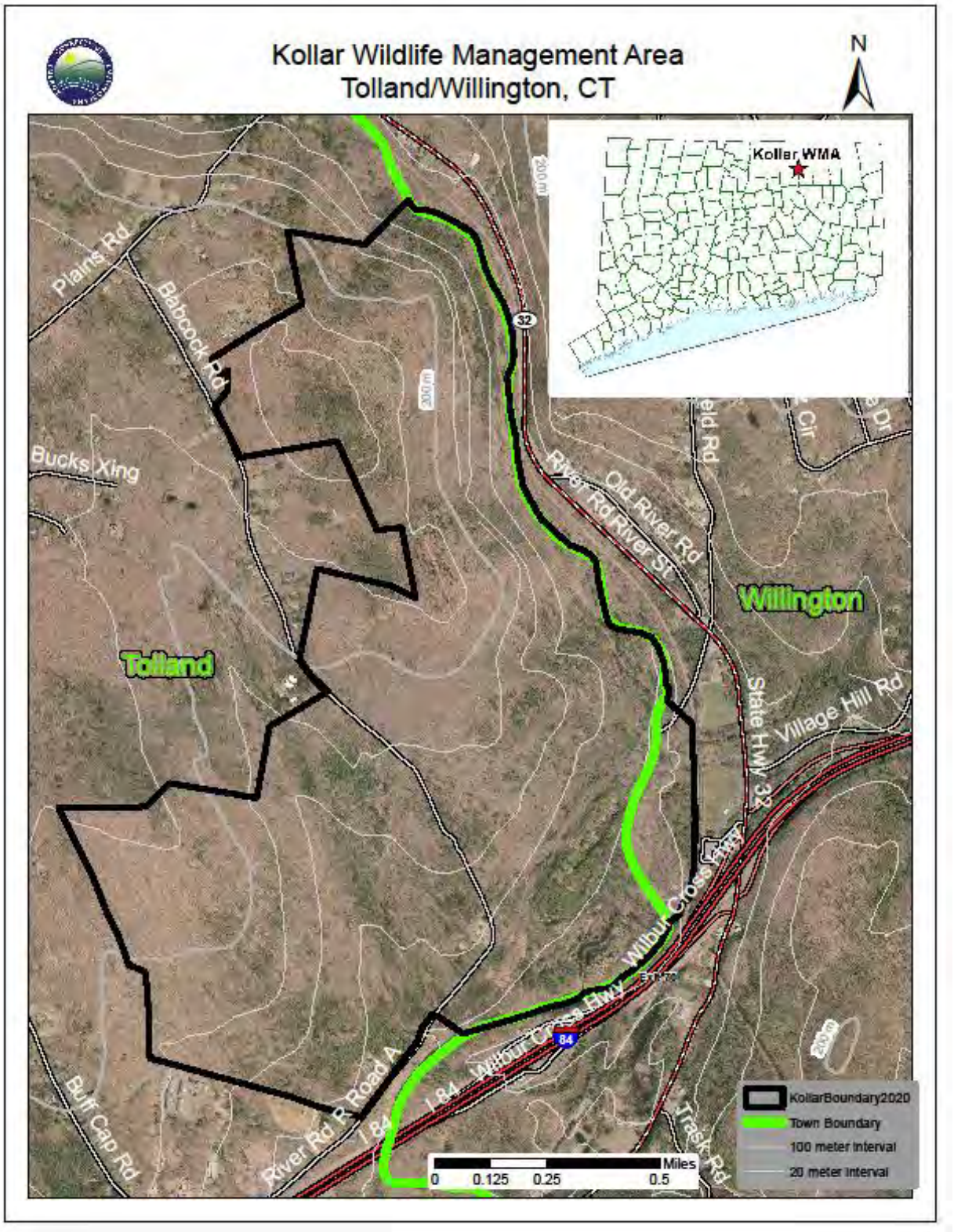
Year	Treatment	Stand	Acres	Division
Complete	Final Shelterwood	6-10	6	Forestry
	First Shelterwood	6-11	8	Forestry
	Irregular Shelterwood	6-9	12	Forestry
	First Shelterwood	6-7 (S)	9	Forestry
	Tree/Brush mow	8-1, 8-6, 9-2 (E), 9-6	6	Wildlife
2023	Invasive control	3-4, 3-5s, 8-6, 9-2, 9-5, 9-6, 9-7	36	Forestry
	Irregular shelterwood	3-5s, 3-6, 3-7	16	Forestry
	First Shelterwood	6-7 (N)	15	Forestry
	Group Selection	6-6e	1	Forestry
	Irregular Shelterwood	8-8	3	Forestry
	Irregular Shelterwood	9-5, 9-7	16	Forestry/Wildlife
2025	Selection	1-1, 1-2, 4-1, 4-2	151	Forestry
2027	First Shelterwood	6-13, 6-14	9	Forestry
	Thinning	6-1, 6-2	10	Forestry
	Final shelterwood	6-3	10	Forestry/Wildlife
	Selection	2-2, 3-2	38	Forestry
2029	First Shelterwood	3-3, 5-3	49	Forestry
	Thinning/TSI	5-7	17	Forestry
	Thinning	5-6	19	Forestry
	Selection	5-5	10	Forestry

Acquisition objectives: The area surrounding Kollar WMA is predominantly characterized by rural residential development. As a result, there are generally few forested parcels without houses and established infrastructure. Most of the adjacent properties support improved homes which make them less desirable for State acquisition. There are four undeveloped parcels abutting Kollar WMA (Map 12). Two are on the east side of Babcock Road, a 16-acre parcel located at 206 Babcock Road, parcel 17/A/001, and a 12-acre parcel at 224 Babcock Road, parcel 06/B/024. Acquiring the property at 206 Babcock Road would secure the headwaters of an intermittent tributary of the Willimantic, mixed hardwood and softwood forest land, and additional frontage on Babcock Road for access. Acquiring each of these parcels would maintain huntable areas at Kollar WMA due to the 500-foot restriction. The third undeveloped parcel abutting Kollar WMA is located at 220 Buff Cap Road, parcel 17/B/006.01 and contains the headwaters of School Brook. The parcel abutting the southwest corner of the property is undeveloped but land clearing activities have been ongoing. Should this parcel become available, it would make a great addition to Kollar WMA as it contains loam soils and could be maintained as an herbaceous opening for woodcock.

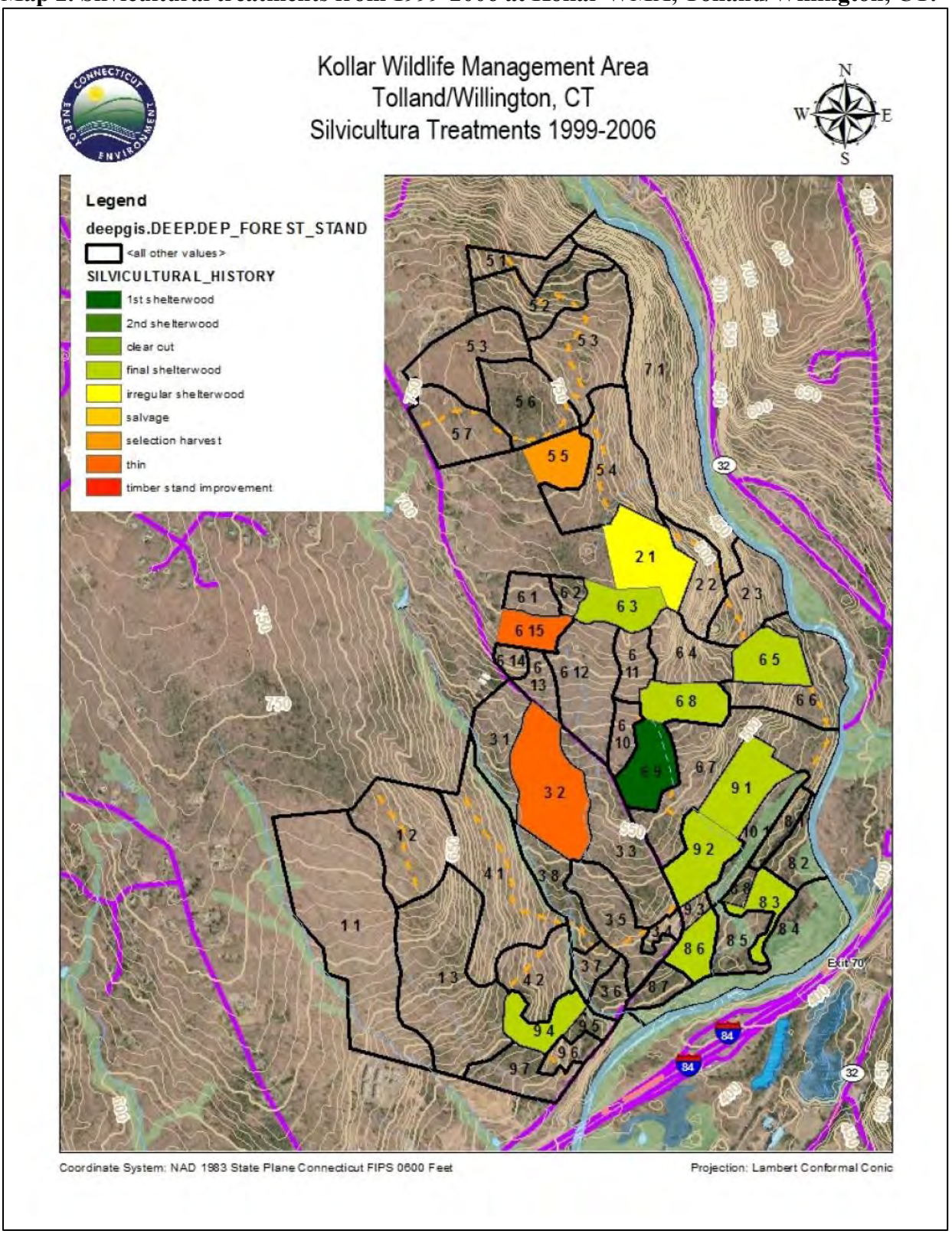
Public Involvement: DEEP actively solicits management plan comments from local conservation commissions and community conservation groups. A draft of this management plan was sent to the members of the Tolland Conservation Commission and to the Lead Steward of the Tolland Conservation Corps. A virtual presentation was delivered by a DEEP wildlife biologist to the commission and members of the public on October 28, 2021. No concerns were raised regarding the plan. One member asked if hunting would continue on the WMA. The response from DEEP staff was that hunting would continue. A general question was asked about the impact to wildlife from dogs going off trails. Dogs off leash have a negative impact on wildlife by killing birds and small mammals, causing nest failure, and causing physiological responses to stress. Another general question was asked about managing early successional habitat on town-owned land. The Town is developing a forest management plan for one of its properties. DEEP staff encouraged the creation of early successional habitat on town-owned properties.

N. Maps

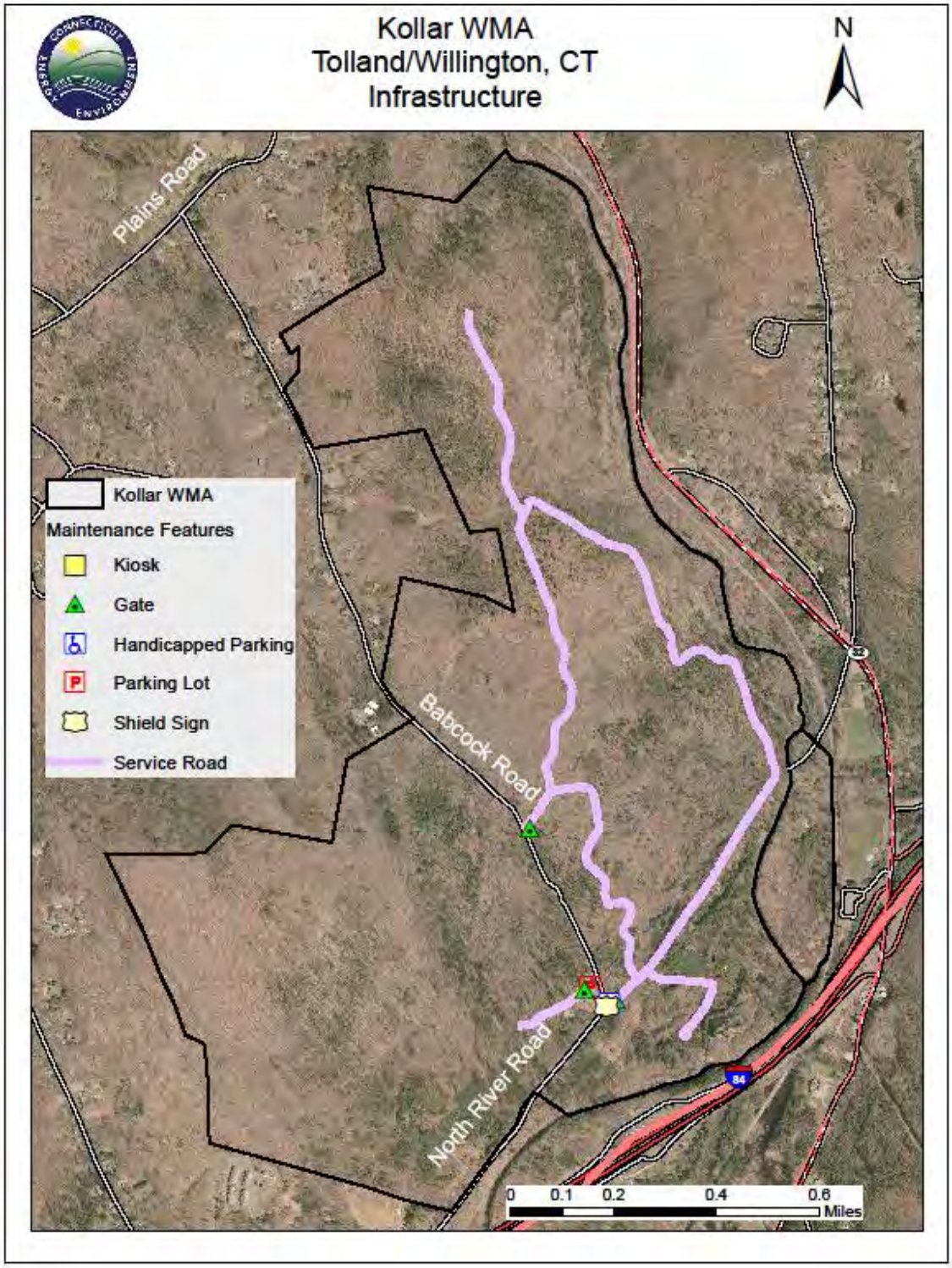
Map 1. Location of Kollar WMA, Tolland/Willington, CT.



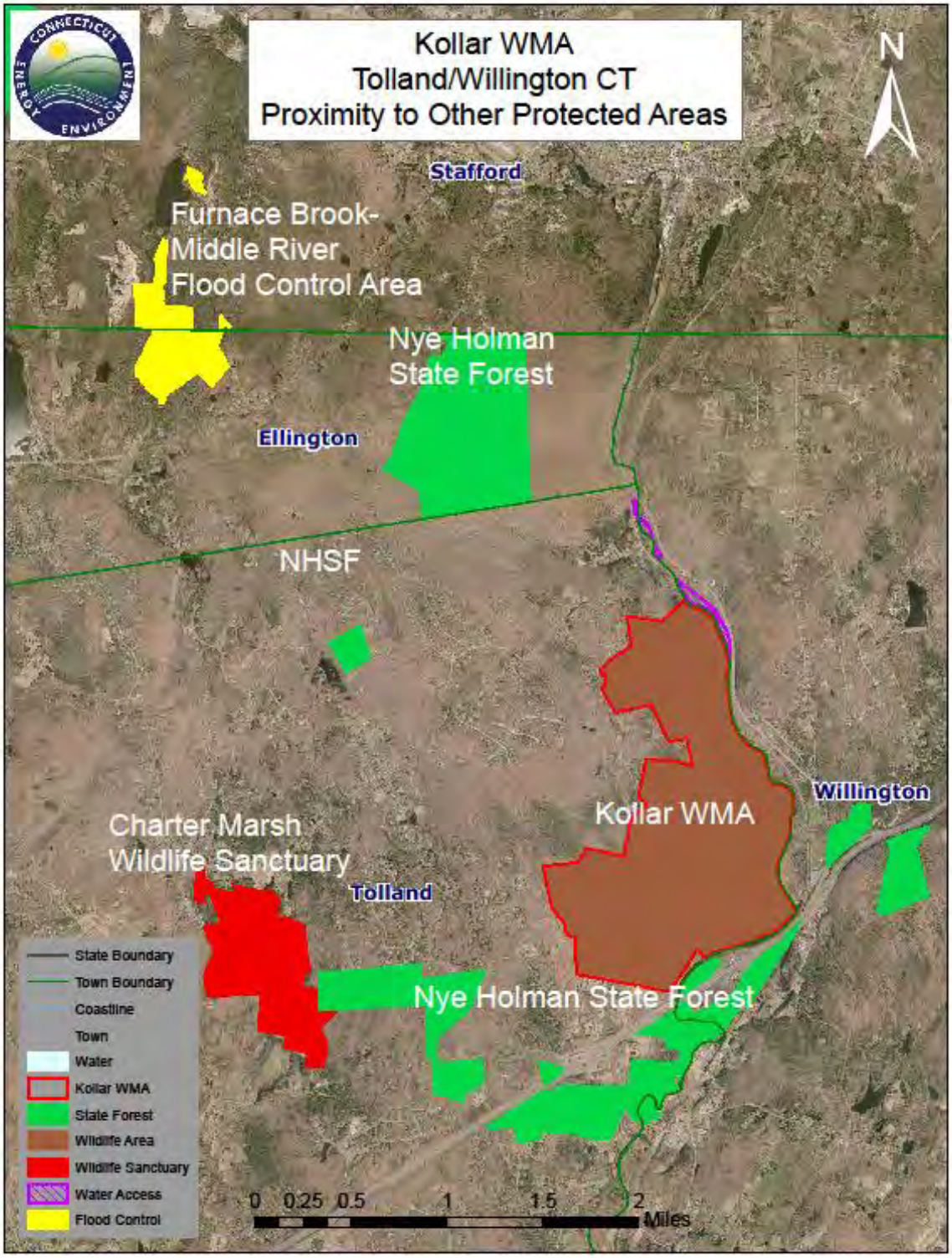
Map 2. Silvicultural treatments from 1999-2006 at Kollar WMA, Tolland/Willington, CT.



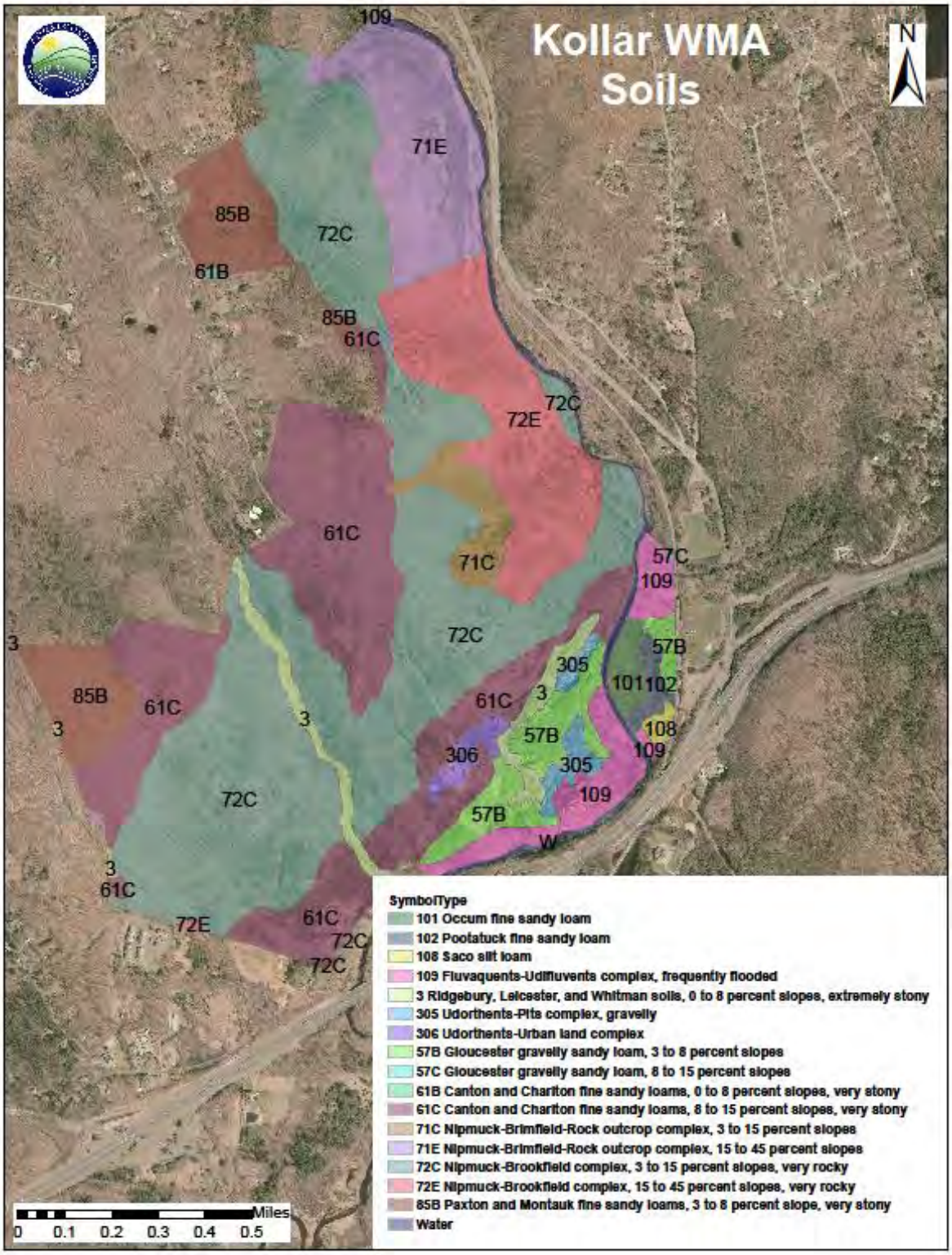
Map 3. Infrastructure of Kollar WMA, Tolland/Willington, CT.



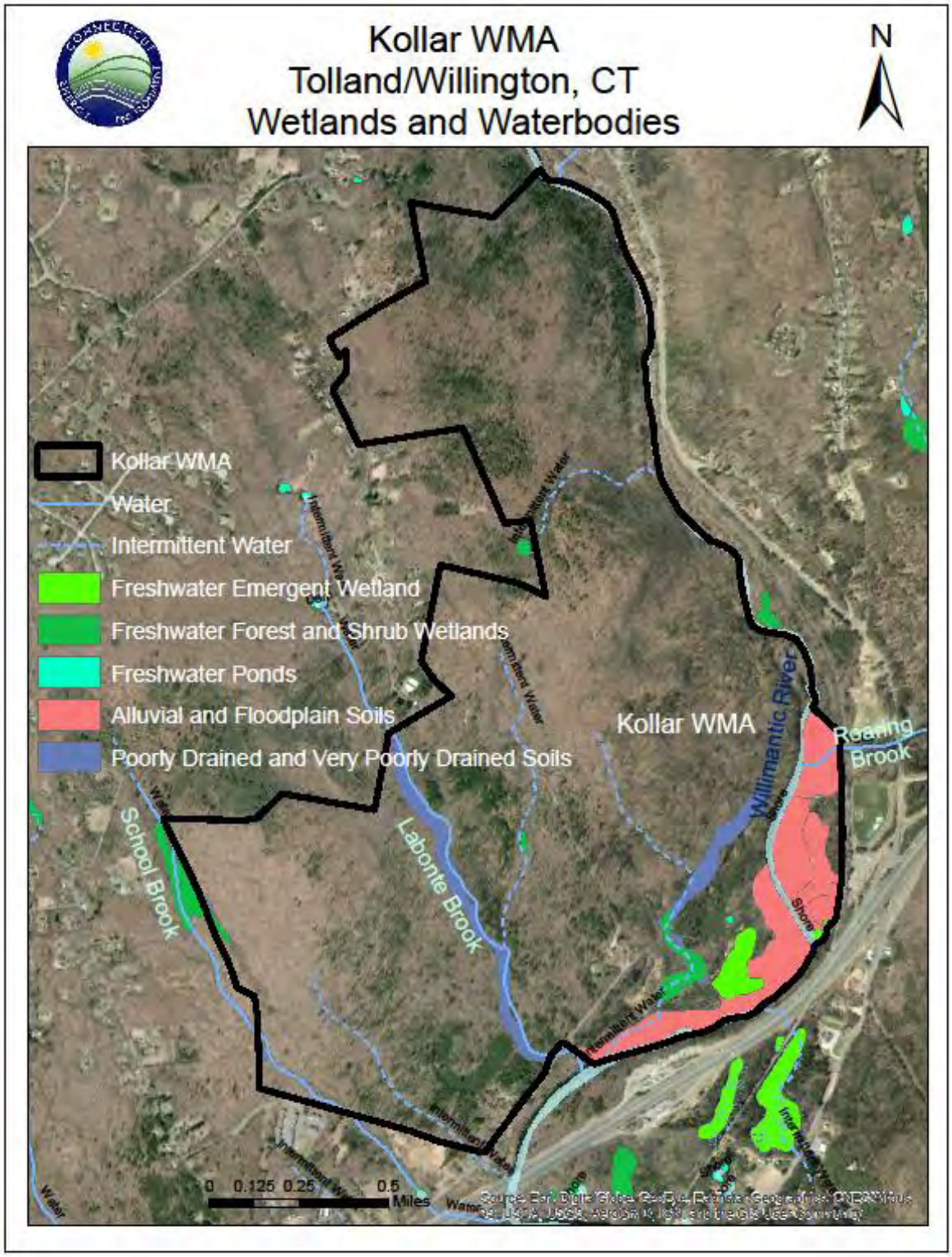
Map 4. Other protected areas in proximity to Kollar WMA, Tolland and Willington, CT.



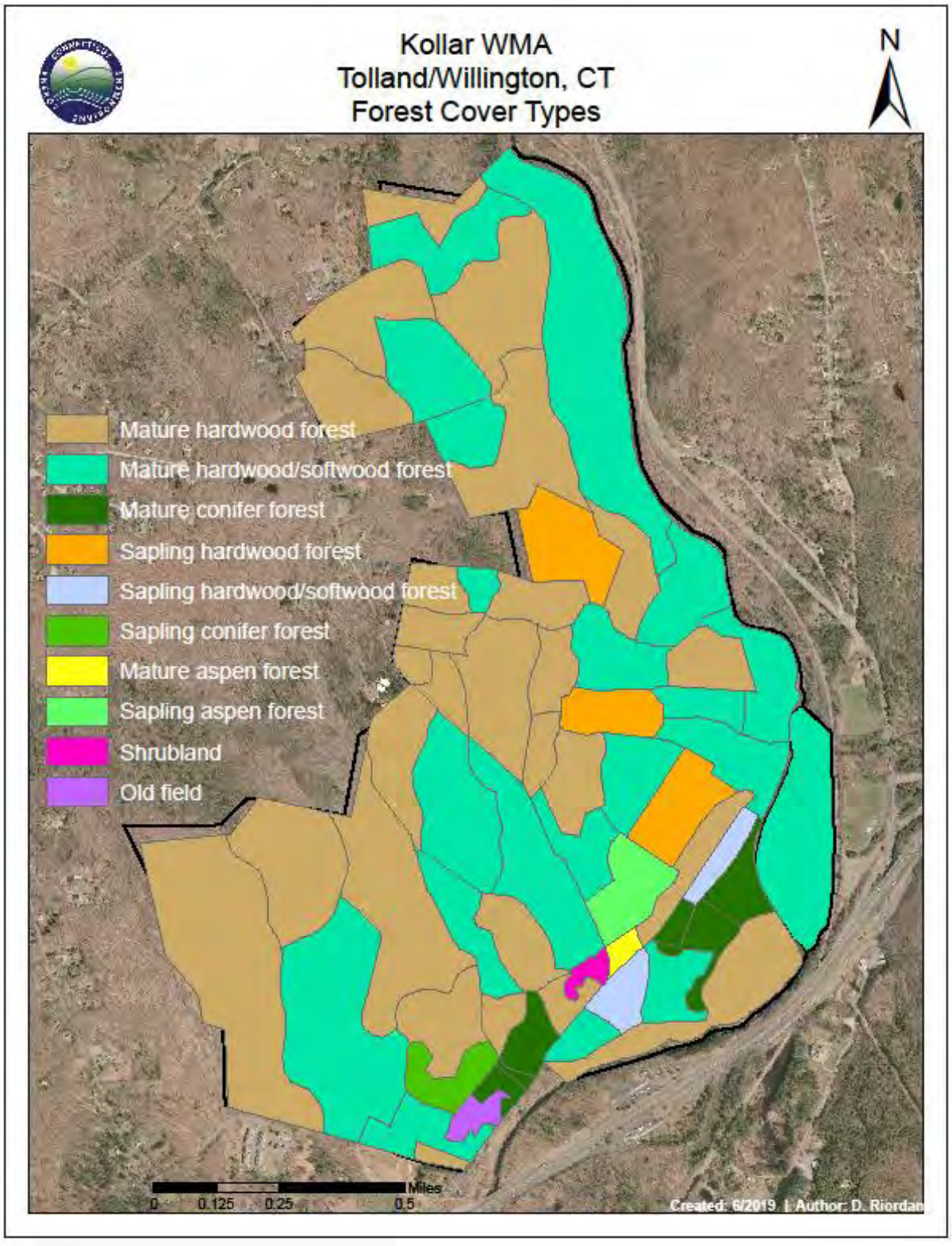
Map 5. Soil types of Kollar WMA, Tolland/Willington, CT.



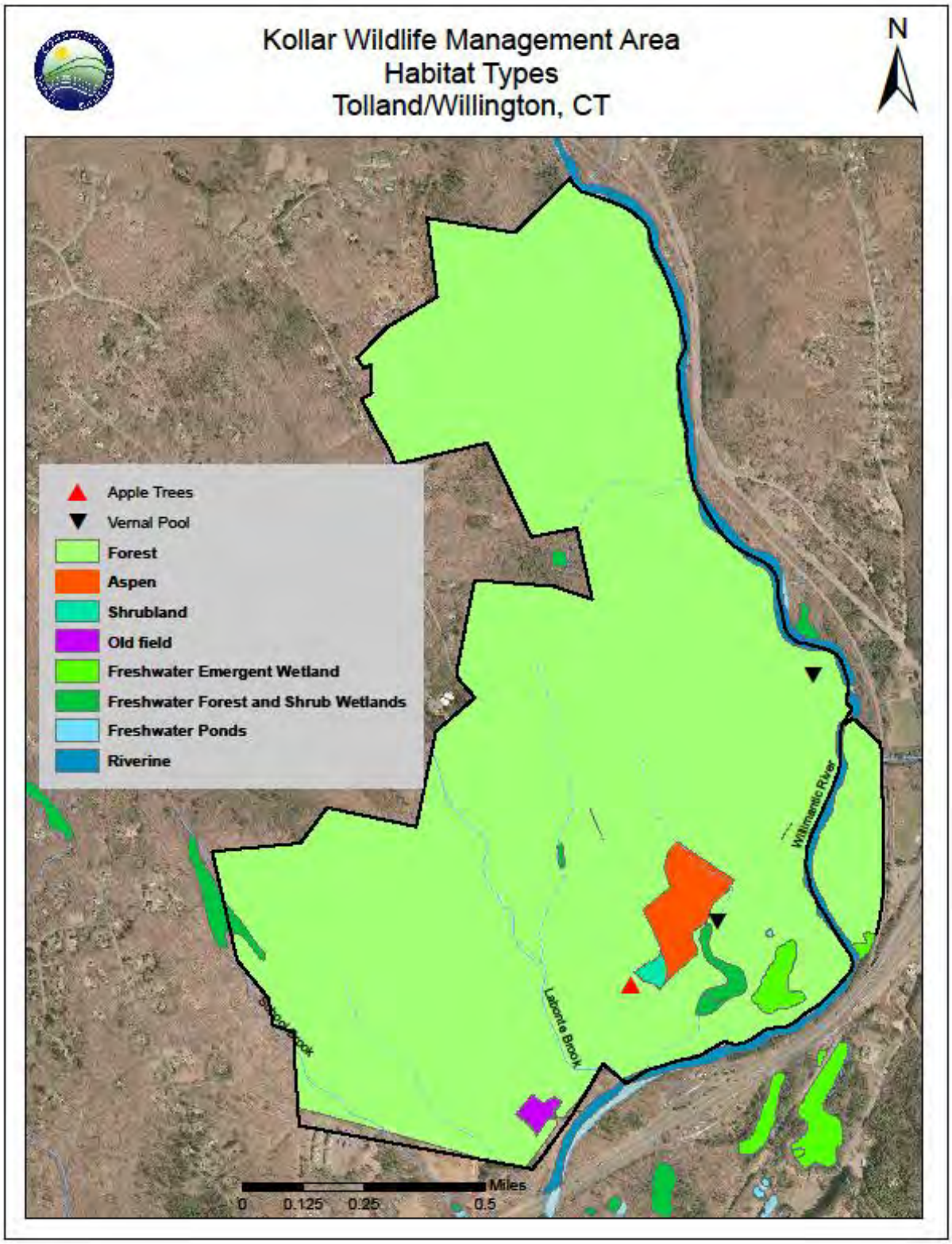
Map 6. Wetlands and waterbodies of Kollar WMA, Tolland/Willington, CT.



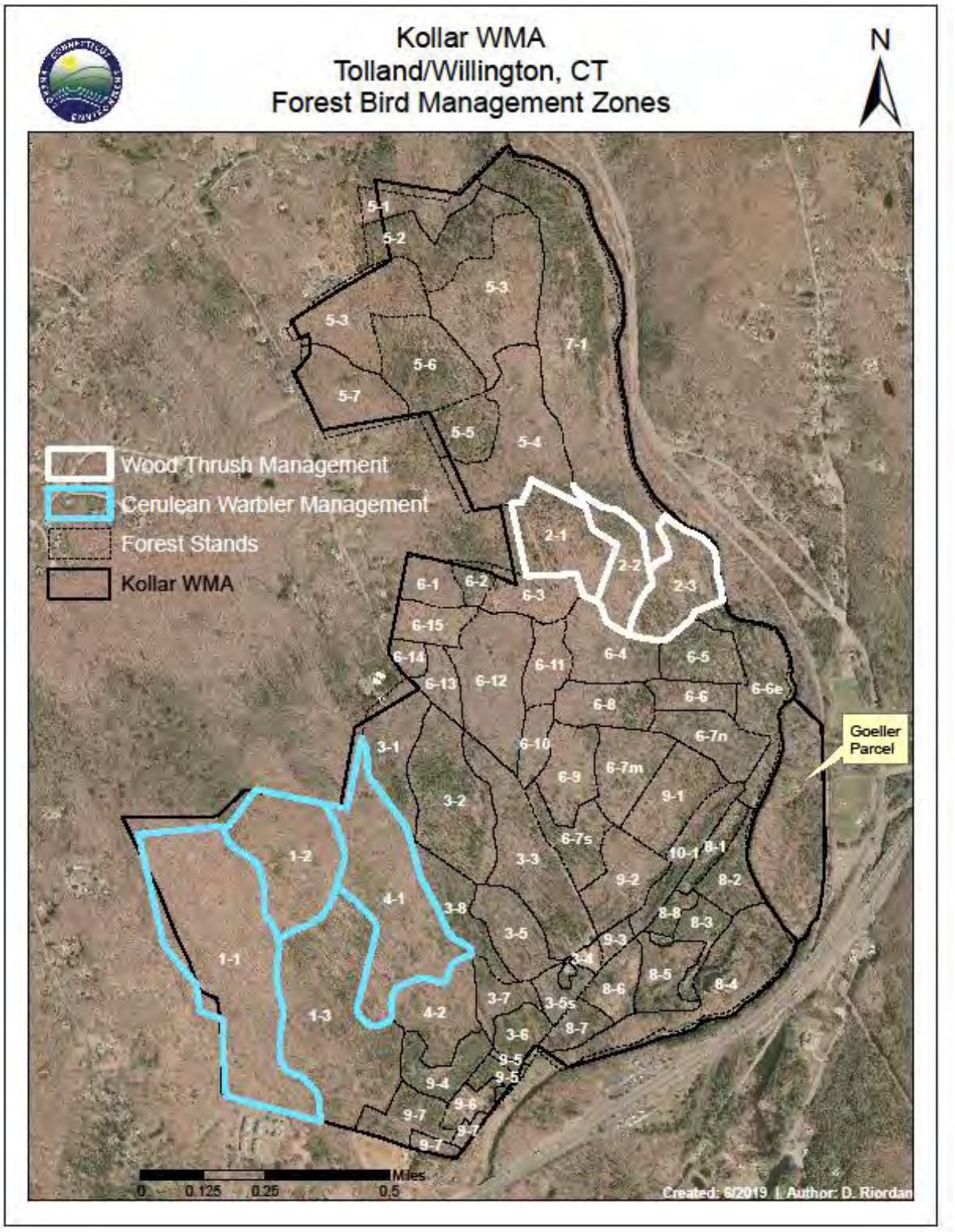
Map 7. Forest cover types of Kollar WMA, Tolland/Willington, CT.



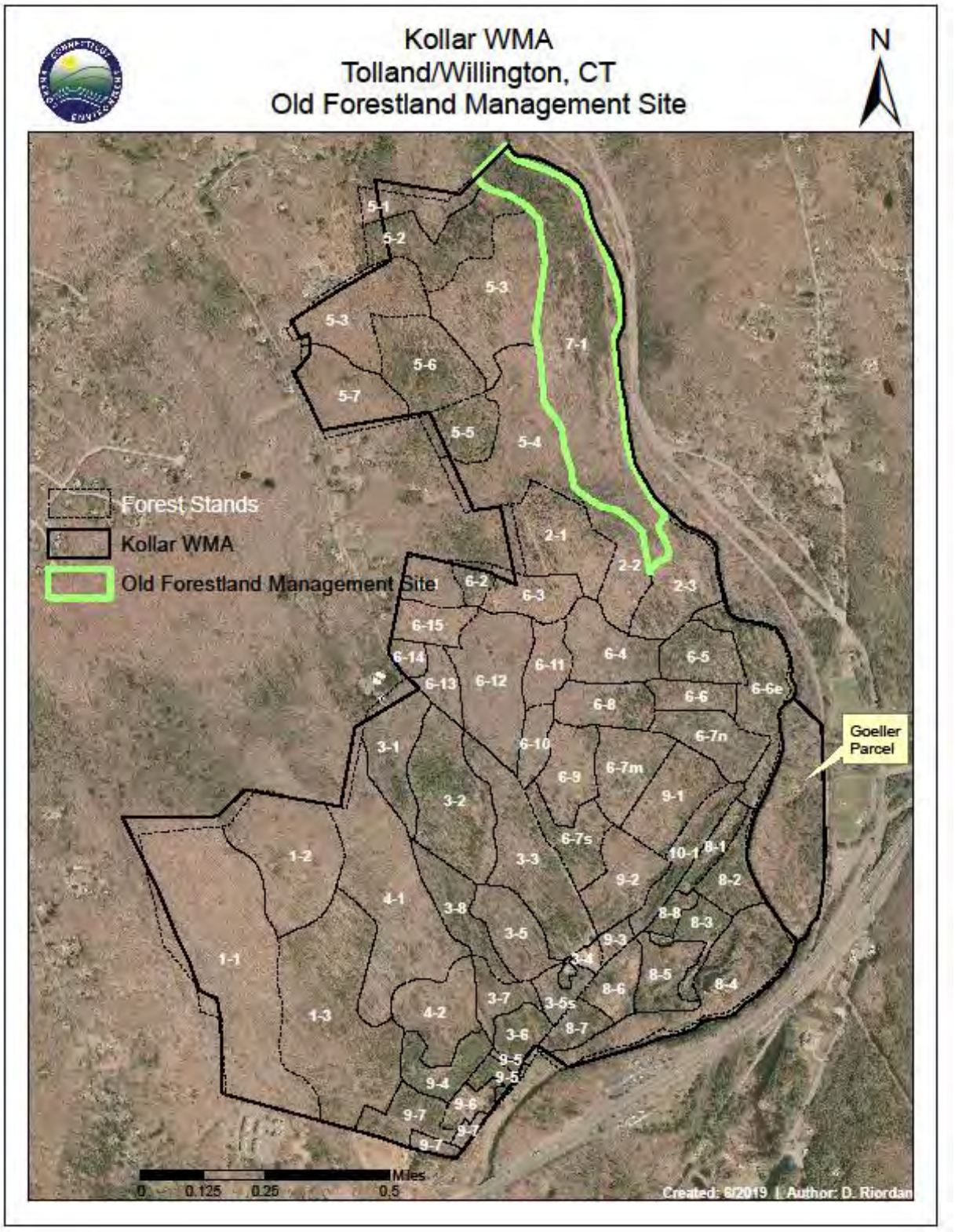
Map 8. Habitats and special features of Kollar WMA, Tolland/Willington, CT.



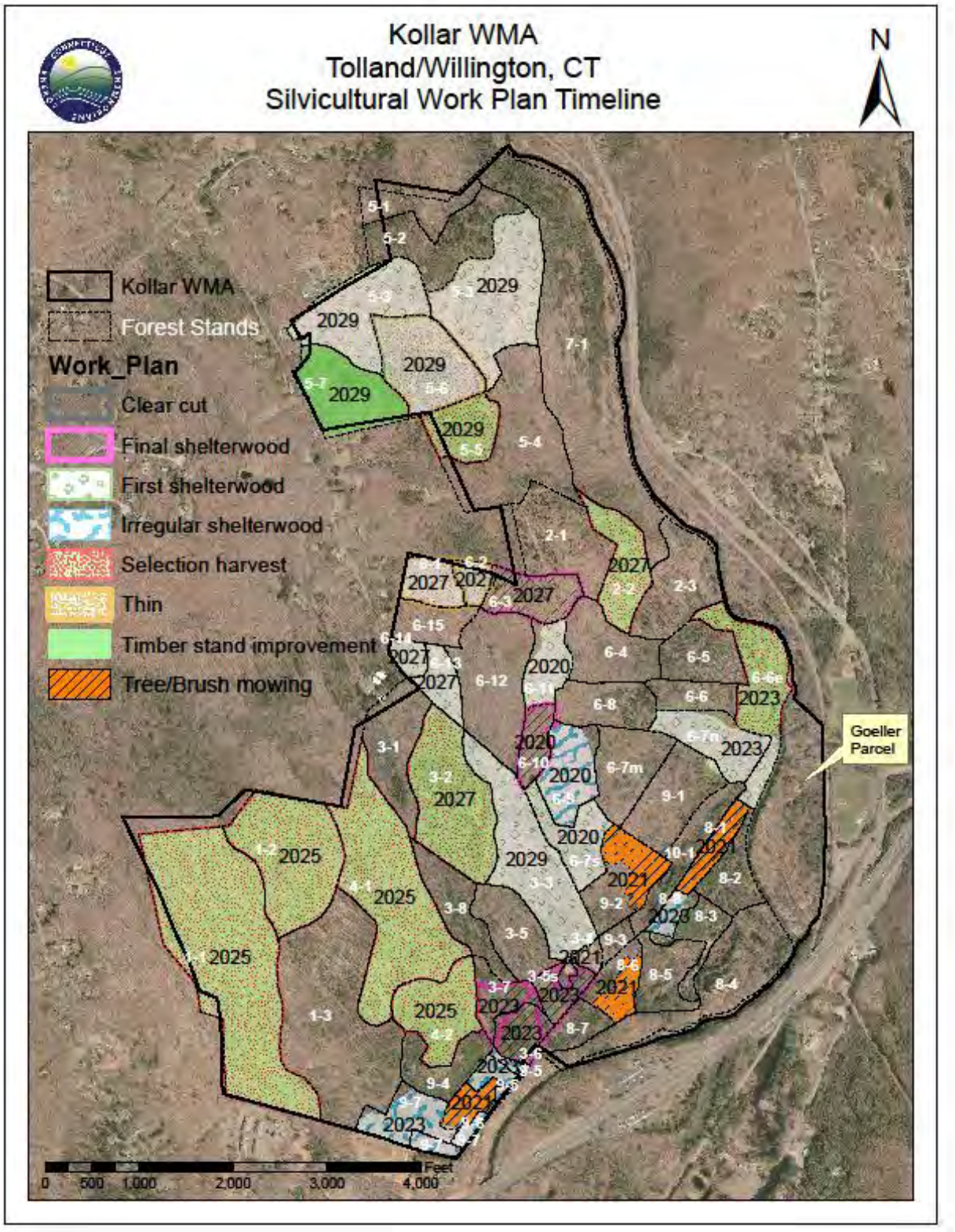
Map 9. Forest bird management zones of Kollar WMA, Tolland/Willington, CT.



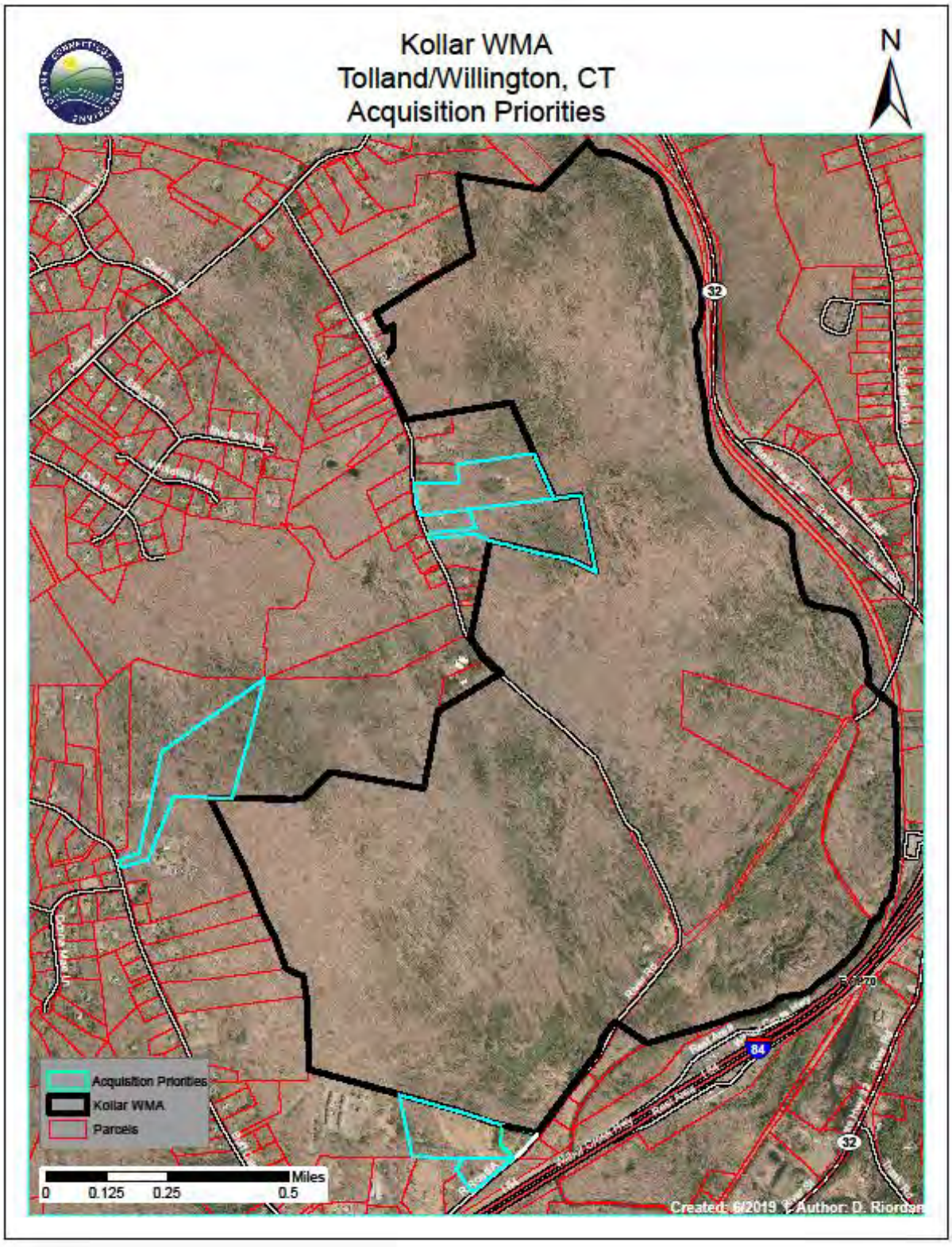
Map 10. Old Forestland Management Site of Kollar WMA, Tolland/Willington, CT.



Map 11. Workplan timeline for Kollar WMA, Tolland/Willington, CT.



Map 12. Acquisition priorities of Kollar WMA, Tolland, CT.



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P. Appendices

Appendix 1. Species documented at Kollar Wildlife Management Area during ESS Bird Surveys 2005-2009.

American goldfinch	House wren
American redstart	Indigo bunting*
American robin	Mourning dove
Baltimore oriole*	Northern cardinal
Black-and-white warbler*	Ovenbird*
Black-capped chickadee	Pine warbler
Blue jay	Prairie warbler*
Blue-gray gnatcatcher	Red-eyed vireo
Blue-winged warbler*	Red-winged blackbird
Brown-headed cowbird	Rose-breasted grosbeak*
Cedar waxwing	Ruby-throated hummingbird
Chipping sparrow	Scarlet tanager
Common grackle	Song sparrow
Common yellowthroat	Tree swallow
Downy woodpecker	Tufted titmouse
Eastern kingbird*	Veery*
Eastern phoebe	Warbling vireo
Eastern towhee*	White-breasted nuthatch
Eastern wood-peewee*	Wild turkey
Field sparrow*	Wilson's warbler
Gray catbird	Wood thrush*
Great blue heron	Yellow warbler
Hairy woodpecker	

* Species of Greatest Conservation Need (SGCN)

Appendix 1a. Additional species detected at Kollar Wildlife Management Area on June 3, 2019, and June 4, 2020.

Broad-winged hawk*	Northern waterthrush*
Brown creeper*	Pileated woodpecker
Carolina wren	Red-bellied woodpecker
Great-crested flycatcher	Yellow-billed cuckoo*
Hermit thrush	Yellow-throated vireo
Northern flicker*	

* Species of Greatest Conservation Need (SGCN)

Appendix 2. Important food plant species for ruffed grouse

Apple (Malus spp.)
Aspen (Populus tremuloides)
Birch (Betula spp.)
Blackberry (Rubus spp.)
Blueberry (Vaccinium spp.)
Cherry (Prunus spp.)
Clover (Trifolium spp.)
Dogwood (Swida spp.)
Elderberry (Sambucus spp.)
Ferns, especially Christmas fern (Polystichum acrosticoides) in winter
Greenbriar (Smilax spp.)
Grape (Vitis spp.)
Hawthorn (Cretaegus spp.)
Hazelnut (Corylus spp)
Oak (Quercus spp.)
Raspberry (Rubus spp.)
Strawberry (Fragaria spp.)
Sumac (Rhus spp.)
Willow (Salix spp.)
Wintergreen (Gaultheria spp.)

Appendix 3. Common and scientific names of all species mentioned in this 10-year (2023-2033) Wildlife Management Plan for Kollar Wildlife Management Area, Tolland and Willington, CT.

Mammals	
Black bear	*Ursus americanus*
Bobcat	*Lynx rufus*
Coyote	*Canis latrans*
River otter	*Lontra canadensis*
White-tailed deer	*Ododcoileus virginianus*
Birds	
American goldfinch	*Spinus tristis*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
American woodcock	*Scolopax minor*
Baltimore oriole*	*Icterus galbula*
Black-and-white warbler*	*Mniotilta varia*
Black-capped chickadee	*Poecile atricapillus*
Blue jay	*Cyanocitta cristata*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue-winged warbler*	*Vermivora cyanoptera*
Broad-winged hawk	*Buteo platypterus*
Brown creeper	*Certhia americana*
Brown-headed cowbird	*Molothrus ater*
Carolina wren	*Thryothorus ludovicianus*
Cedar waxwing	*Bombycilla cedrorum*
Cerulean warbler	*Setophaga cerulea*
Chestnut-sided warbler	*Setophaga pensylvanica*
Chipping sparrow	*Spizella passerine*
Common grackle	*Quiscalus quiscula*
Common yellowthroat	*Geothlypis trichas*
Downy woodpecker	*Dryobates pubescens*
Eastern kingbird*	*Tyrannus tyrannus*
Eastern phoebe	*Sayornis phoebe*
Eastern towhee*	*Pipilo erythrophthalmus*
Eastern wood-peewee*	*Contopus virens*
Field sparrow*	*Spizella pusilla*
Gray catbird	*Dumetella carolinensis*
Great blue heron	*Ardea Herodias*
Great crested flycatcher	*Myiarchis crinitus*
Hairy woodpecker	*Dryobates villosus*
Hermit thrush	*Catharus guttatus*
House wren	*Troglodites aedon*
Indigo bunting*	*Passerina cyanea*
Mourning dove	*Zenaida macroura*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*

Northern waterthrush	*Parkesia noveboracensis*
Ovenbird*	*Seiurus aurocapilla*
Pileated woodpecker	*Dryocopus pileatus*
Pine warbler	*Setophaga pinus*
Prairie warbler*	*Setophaga discolor*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-eyed vireo	*Vireo olivaceus*
Red-winged blackbird	*Agelaius phoeniceus*
Rose-breasted grosbeak*	*Pheucticus ludovicianus*
Ruby-throated hummingbird	*Archilochus colubris*
Ruffed grouse	*Bonasa umbellus*
Scarlet tanager	*Piranga olivaceus*
Song sparrow	*Melospiza melodia*
Tree swallow	*Tachycineta bicolor*
Tufted titmouse	*Baeolophus bicolor*
Veery*	*Catharus fuscescens*
Warbling vireo	*Vireo gilvus*
White-breasted nuthatch	*Sitta carolinensis*
Wild turkey	*Meleagris gallopavo*
Wilson's warbler	*Cardellina pusilla*
Wood thrush*	*Hylocichla mustelina*
Yellow warbler	*Setophaga petechial*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-throated vireo	*Vireo flavifrons*
Reptiles	
Box turtle	*Terrapine carolina Carolina*
Wood turtle	*Glyptymus insculpta*
Fish	
American eel	*Anguilla rostrata*
Bluegill sunfish	*Lepomis macrochirus*
Blacknose dace	*Rhinichthys atratulus*
Brook trout (wild)	*Salvilinus fontinalis*
Brown trout (stocked)	*Salmo trutta*
Chain pickerel	*Esox niger*
Common shiner	*Luxilus cornutus*
Fallfish	*Semotilus corporalis*
Golden shiner	*Notemigonus crysoleucas*
Largemouth bass	*Micropterus salmoides*
Pumpkinseed	*Lepomis gibbosus*
Redfin pickerel	*Esox americanus americanus*
Redbreast sunfish	*Lepomis auritus*
Smallmouth bass	*Micropterus dolomieu*
Tessellated darter	*Etheostoma olmstedi*

White sucker	*Catostomus commersonii*
Yellow perch	*Perca flavescens*
Rainbow trout (stocked)	*Oncorhynchus mykiss*
Insects	
Buck moth	*Hemileuca maia*
Dune ghost tiger beetle	*Cicindela lepida*
Spongy moth	*Lymantria dispar*
Punctured tiger beetle	*Cicindela punctulata*
Southern pine beetle	*Dendroctonus fontalis*

Appendix 4. Descriptions of Successional Habitats

Successional Habitats for Wildlife: Grasslands, Old Fields, Shrublands, Pine Barrens, Young Forest and Mature Forest

Connecticut is comprised of a diversity of habitat types, each with its corresponding array of wildlife. Major terrestrial habitats include those on the spectrum of forest succession. Early stages of succession include grasslands, old fields, shrublands, pine barrens and young forest. The number and size of these habitats have decreased significantly in recent decades. As these habitats decline, populations of the species that depend on these habitats also decline.

In general, larger patches of habitat support a greater diversity of species. Species that depend on larger patches are more vulnerable than species that depend on smaller patches. For example, golden-winged warblers, which are endangered in Connecticut, use shrubland patches that are 30 to 100 acres (U.S. Fish and Wildlife Service, 2002). Gray catbirds, which are still fairly common, can nest in shrub patches as small as 1 acre (Roberts and King, 2017).

To maintain stable healthy populations of wildlife, including threatened and endangered species, a variety of habitats must be maintained on state forests and wildlife management areas. These habitat patches must be large enough to support populations of target species.

Grasslands: Grasslands are comprised of herbaceous plants with very little or no woody vegetation. Grassland-dependent species include bobolink, eastern meadowlark and grasshopper sparrow. Bobolink require grasslands of ten acres or more. Other grassland species require larger habitat patches. Grasshopper sparrows, for example, require grassland of 100 acres or more. Very few natural grasslands remain in Connecticut, however abandoned agricultural fields can be converted to grassland habitat. Forest clear-cuts can be converted to grassland habitat, however this process is labor-intensive since woody vegetation rebounds after a clear-cut. Examples of grassland habitat include Suffield WMA, Niering NAP and Trueman Meadow.


Example of grassland habitat


Example of reverting field habitat

Reverting field: Reverting fields are characterized by herbaceous plants with scattered shrubs and tree seedlings, typically less than ten feet tall. SGCN such as blue-winged warbler, field sparrow and eastern kingbird depend on reverting field habitat. Field sparrows nest in reverting fields that are five acres or larger. Reverting fields can occur when agricultural fields are abandoned. They can be maintained through periodic mowing. As in grasslands, reverting fields can be created after a forest clear-cut, however the process would require subsequent mowing to promote herbaceous vegetation. Examples of reverting field habitat include Belding WMA and Barn Island WMA.


Example of shrubland habitat

Shrubland: Shrublands are dominated by shrubs and tree seedlings, typically less than 10 feet in height. Shrubland habitats can form after a clearcut or other disturbance, or as reverting fields become dominated by woody vegetation. Shrublands that form after a clearcut can be short-lived as tree seedlings succeed into sapling stage forest, however shrublands such as alder thickets and coastal shrublands may be long-lived. Vegetation such as blackberry and raspberry (*Rubus* spp.), and grape (*Vitis* spp.) that forms thick tangles provides excellent cover for shrubland birds. Shrublands support SGCN such as willow flycatcher, indigo bunting, and brown thrasher, a species of special concern. Brown thrasher use shrublands of 15 acres or more (Wisconsin Department of Natural Resources, 2013). Once shrubland habitat succeeds to seedling/sapling forest, shrubland species disappear. Examples of shrubland habitat include Nathan Hale State Forest and Bluff Point State Park.

Pitch pine/Scrub oak barrens: It is estimated that 95% of Connecticut's pitch pine/scrub oak barrens have been lost. Pitch pine now makes up less than 1% of the pines in the state. Barrens provide

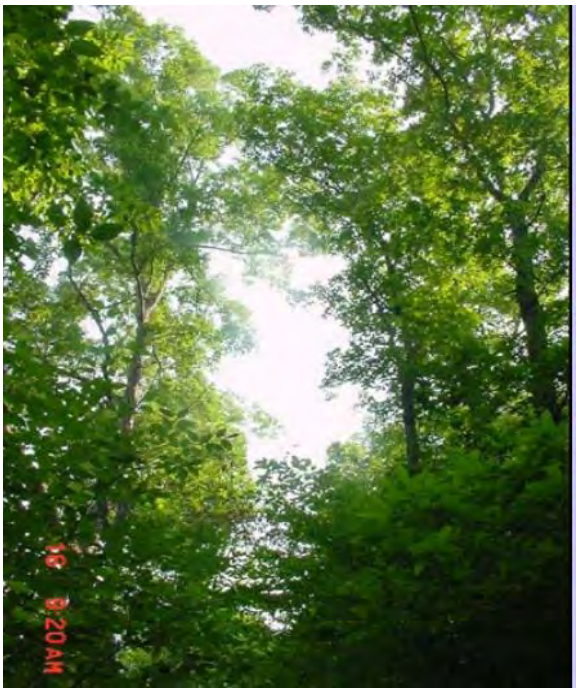
important habitat for ground-nesting bees and rare insects. Barrens are sparsely vegetated areas, usually occurring on sandy soil. The open habitat and dry sandy soil make pine barrens suitable for nesting wood and box turtles. SGCN such as blue-winged warbler, field sparrow, and prairie warbler use pine barren habitat. While larger, sparser barrens are required for SGCN such as buck moth and dune ghost tiger beetle, smaller patches are used by species such as the punctured tiger beetle. Examples of pine barren habitat include Hopeville Pond State Park and Tankerhoosen WMA.

Example of pine barren habitat

Seedling/sapling forest: Seedling/sapling forest is dominated by trees less than 5 inches diameter at breast height (dbh). This forest type can occur when a forest regenerates after a clearcut or other disturbance, or when open habitat such as a grassland or abandoned agricultural field succeeds to forest. Seedling/sapling forest includes what is referred to as "young forest" habitat. Young forest is the term used to describe the habitat that species such as ruffed grouse, American woodcock and approximately 50 other vertebrate species depend on. Young forest tends to be thick, tangled, and less than 20 feet tall (Wildlife Management Institute). Depending on plant species composition, young forest can last for up to 20 years after a clearcut or other disturbance. However, some wildlife species, depend on earlier stages of seedling/sapling forest. For example, populations of chestnut-sided warbler and eastern towhee, both SGCN, begin to decline 10 years post-clearcut (Schlossberg and King, 2007). American woodcock feeding habitat is typically deciduous forest stands that are 3 to 15 years of age (USDA Natural Resources Conservation Service. 2010). For nesting, woodcock use seedling/sapling forest that is 2 to 15 years post clearcut but will also use forest stands that are 15 to 25 years post-clearcut if there is a dense shrub layer such as aspen with a hazelnut/dogwood/viburnum understory. The use of clearcuts is a preferred method to promote young forest habitat for the benefit ruffed grouse, American woodcock, chestnut-sided warbler and other young forest species. Examples of young forest include Roraback Wildlife Management Area, Spignesi WMA and Pachaug State Forest.

Example of the stage of young forest that provides habitat for woodcock, ruffed grouse, brown thrasher and other SGCN.

Mature forest: Mature forest provides habitat for species such as black bear, wild turkey, ovenbird, wood thrush and cerulean warbler. Wood thrush is a Most Important SGCN that breeds in mixed or deciduous forest with a tall canopy and a dense understory of shrubs and saplings. Cerulean warbler is a Species of Special Concern that breeds in large tracts of mature forest (minimum area requirement range from 25 to 1700 acres) with tall, large diameter trees, a structurally diverse canopy, multiple vegetation layers and small forest openings. Mean nest tree height was eighty feet and mean diameter at breast height (dbh) was 16 inches in a study in Ohio (Cerulean Warbler Technical Group) with a preference for sugar maple and white oak (Boves, 2011). Habitat improvement for cerulean warblers can be achieved by releasing white oaks and sugar maples, leaving a basal area of approximately 40 to 90 square feet per acre and encouraging grapevines which are important for the survival of cerulean warbler nestlings. Examples of mature forest include Sessions Woods WMA, Gold's Pine Natural Area Preserve and Nipmuck State Forest. For more information on creating and maintaining grasslands, shrublands and young forest, see Managing Grasslands, Shrublands and Young Forest for Wildlife.



Example of cerulean warbler nesting habitat with canopy gaps in mature forest.

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Appendix 5. Forest Stand Summary Tables for Stands to be Actively-Managed at Kollar Wildlife Management Area, Tolland and Willington, CT.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-10	White Oak – Red Oak – Hickory	6	115 sq. ft. / acre	361	Over	Sawtimber - Pole	5,220	26

Predominant Species: White oak, red maple, sweet birch, hickory, black oak
Main Soil Types: Canton – Charlton, Charlton - Chatfield
Access: Excellent – Babcock Road
Regeneration: 525 seedlings per acre – established oak
Invasive Concerns: Multi-flora rose and Japanese barberry in old landing
Stand History: Moderate intensity harvest under private ownership
Notes:
Management Recommendation: Final shelterwood should be applied to release advanced oak reproduction and establish young forest habitat

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-11	Scarlet Oak	8	100 sq. ft. / acre	142	Over	Sawtimber	4,880	22

Predominant Species: Scarlet oak, white oak, sweet birch, red oak, black oak, hickory
Main Soil Types: Charlton Chatfield, Hollis - Chatfield
Access: Excellent – Babcock Road
Regeneration: 260 seedlings per acre – new oak
Invasive Concerns:
Stand History:
Notes:
Management Recommendation: First-phase shelterwood should be applied to establish desirable regeneration which can be released as young forest habitat in a future harvest

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-9	Oak – Mixed Hardwood	12	77 sq. ft. / acre	170	Adequate	Sawtimber – Pole - Sapling	3,320	16

Predominant Species: Red maple, white pine, sweet birch, white oak, red oak, American beech
Main Soil Types: Charlton – Chatfield
Access: Excellent – Babcock Road
Regeneration: 126 desirable seedling / sapling per acre – oaks
Invasive Concerns: Low-density Japanese barberry to be controlled by forestry as part of planned harvesting treatment
Stand History: Heavy thinning around 2005
Notes: Past harvesting has resulted in multiple age-classes of desirable regeneration. Small-scale seasonally wet depressions should be excluded from harvesting.
Management Recommendation: Irregular shelterwood should be applied to release established desirable regeneration by harvesting undesirable sawtimber and pole growing stock and creating conditions for young forest development

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-7s	White Pine – Red Oak – Red Maple	10	84 sq. ft. / acre	80	Adequate	Sawtimber	5,950	21

Predominant Species: White pine, white oak, red maple, scarlet oak, sweet birch
Main Soil Types: Charlton – Chatfield
Access: Excellent – Babcock Road
Regeneration: 490 stems per acre of predominantly oak and pine
Invasive Concerns:
Stand History: Spongy moth defoliation has led to significant oak mortality in this stand
Notes: 2019 will result in a white pine cone crop in this stand
Management Recommendation: First-phase shelterwood to establish white pine reproduction. Stand is adjacent to an aspen management unit. White pine reproduction is desired to represent roosting cover for ruffed grouse using the aspen in stand 9-2.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-7n	White Pine – Red Oak – Red Maple	15	116 sq. ft. / acre	180	Adequate	Sawtimber	7,495	25

Predominant Species: White pine, red oak, red maple, hickory, white oak
Main Soil Types: Canton – Charlton, Charlton – Chatfield
Access: Good – North River Road (Ext.)
Regeneration: 960 desirable seedlings per acre
Invasive Concerns:
Stand History:
Notes:
Management Recommendation: First-phase shelterwood should be applied to perpetuate existing and establish new tree reproduction in the stand. Reproduction will be available for release in a later stand entry

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-6e	White Pine – Mixed Hardwood	15	100 sq. ft. / acre	256	Adequate	Sawtimber	5,470	19

Predominant Species: White pine, sweet birch, hickory, white oak, yellow birch, scarlet oak
Main Soil Types: Charlton - Chatfield
Access: Good – North River Road (Ext.)
Regeneration:
Invasive Concerns: High density, small area of Japanese barberry around old homestead site off North River Road (Ext.)
Stand History: Oak-dominated section has experienced significant mortality following spongy moth defoliation and drought.
Notes: 1.5-acres will be managed for herbaceous growth, 1/3-acre group selection will be installed to recruit hemlock regeneration
Management Recommendation: Small group selection for; herbaceous recruitment, hemlock regeneration to pursue wildlife habitat goals

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
8-8	White Pine	3	80 sq. ft. / acre	72	Adequate	Sawtimber	5,795	21

Predominant Species: White pine, pitch pine
Main Soil Types: Gloucester gravelly sandy loam
Access: Good – North River Road (Ext.)
Regeneration: None
Invasive Concerns: Monitor
Stand History:

Notes: Convert to pitch pine
Management Recommendation: Irregular shelterwood should be applied to regenerate pitch pine on a highly suitable site for perpetuating this imperiled natural community

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
3-5s	Mixed Upland Hardwood	6	100 sq. ft. / acre	193	Over	Sawtimber – Pole	2,400	21

Predominant Species: Hickory, sugar maple, white pine
Main Soil Types: Canton – Charlton
Access: Excellent – Main Parking Area
Regeneration: NA
Invasive Concerns: Winged-euonymus, Japanese barberry – commercial control will be applied
Stand History:
Notes: Adjacent to maintained wildlife opening in stand 3-4
Management Recommendation: Irregular shelterwood to create young forest conditions bolstering habitat for young-forest dependent wildlife

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
3-6	White Pine	6	140 sq. ft. / acre	107	Adequate	Sawtimber	13,150	38

Predominant Species: White Pine, red oak
Main Soil Types: Canton – Charlton
Access: Excellent – Main Parking Area
Regeneration: NA
Invasive Concerns:
Stand History:
Notes: Significant oak mortality following spongy moth defoliation and drought
Management Recommendation: Irregular shelterwood to establish regeneration and create young forest conditions

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
3-7	White Oak – Red	5	80 sq. ft. / acre	107	Adequate	Sawtimber	3,050	19

	Oak – Hickory							

Predominant Species: Red oak, white oak, red maple, white pine
Main Soil Types: Charlton - Chatfield
Access: Excellent – Main Parking Area
Regeneration: NA
Invasive Concerns: Small geographic area of invasive plant concern along the service road at the northern extent of the stand
Stand History:
Notes: Severe oak mortality brought on by spongy moth defoliation and drought
Management Recommendation: Irregular shelterwood to establish reproduction and create young-forest habitat adjacent to watercourses and moist soil types

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
9-5	White Pine	4	140 sq. ft. / acre	143	Over	Sawtimber – Sapling	7,250	29

Predominant Species: White Pine
Main Soil Types: Canton – Charlton
Access: Good – North River Road
Regeneration: White Pine – sapling
Invasive Concerns: Low density invasive plant control will be necessary to eradicate Japanese barberry
Stand History: Wildlife opening established around 2002
Notes:
Management Recommendation: Irregular shelterwood will occur outside the wildlife opening to harvest maturing white pine and release established pine saplings. Harvest will expand existing area of early-successional habitat

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
9-7	White Pine – Mixed Hardwood	12	120 sq. ft. / acre	123	Over	Sawtimber	1,350	31

Predominant Species: White pine, black cherry, sugar maple, red maple
Main Soil Types: Canton – Charlton
Access: Good – North River Road
Regeneration: NA

Invasive Concerns: High density Japanese barberry population with lower density occurrences of other invasive plants
Stand History: Old field
Notes:
Management Recommendation: Irregular shelterwood harvest is prescribed to remove the majority of the undesirable white pine and mixed hardwood growth creating conditions for the reproduction of shade-intolerant tree seedlings and sprouts

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-13 6-14	Mixed Upland Hardwoods	9	120 sq. ft. / acre	217	Over	Sawtimber	1,820	20

Predominant Species: Red oak, white oak, paper birch, sweet birch, hickory
Main Soil Types: Canton - Charlton
Access: Good – Babcock Road
Regeneration: Moderate
Invasive Concerns: Low density Japanese barberry toward the southern extent of the stand along Babcock Road
Stand History:
Notes: The western extent of the area along the boundary has experienced heavy mortality of oak species following spongy moth defoliation and drought
Management Recommendation: First-phase shelterwood to perpetuate and recruit regeneration until it is of appropriate size and density to be released as young forest

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-1	Red Maple	7	100 sq. ft. / acre	143	Over	Sawtimber – Pole	2,960	23

Predominant Species: Red maple, Hickory
Main Soil Types: Canton - Charlton
Access: Fair – Babcock Road
Regeneration: NA
Invasive Concerns: Low density of invasive plants nearby in stands 6-3, and 6-15
Stand History:
Notes:
Management Recommendation: Thinning to accelerate volume growth and allow minor amounts of sunlight to the forest floor. Thinning prolongs habitat utilization by featured species, and accelerates growth rates enabling short-rotation management.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-2	Pine – Oak - Hemlock	4	120 sq. ft. / acre	137	Over	Sawtimber	9,520	28

Predominant Species: White pine, hickory, scarlet oak, hemlock
Main Soil Types: Canton – Charlton
Access: Fair – Babcock Road
Regeneration: NA
Invasive Concerns: Low density invasive plant populations occur nearby in stands 6-3, and 6-15
Stand History:
Notes:
Management Recommendation: Thinning to accelerate volume growth and allow minor amounts of sunlight to the forest floor. Thinning prolongs habitat utilization by featured species, and accelerates growth rates enabling short-rotation management.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
2-2	Mixed Upland Hardwoods	12	73 sq. ft. / acre	70	Adequate	Sawtimber – sapling	4,980	17

Predominant Species: Black oak, sweet birch, red oak, scarlet oak, red maple
Main Soil Types: Charlton – Chatfield
Access: Poor – North River Road (Ext.), Babcock Road
Regeneration: Excellent – established oak sapling
Invasive Concerns: NA
Stand History: High-grade
Notes: Steep slopes
Management Recommendation: Final shelterwood to remove low-quality sawtimber trees and release established cohort of desirable oak seedling and sapling

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
3-2	White Pine – Red Oak – Red Maple	26	110 sq. ft. / acre	160	Over	Sawtimber	6,300	24

Predominant Species: White pine, red maple, red oak, hickory
Main Soil Types: Canton – Charlton, Charlton – Chatfield
Access: Excellent – Babcock Road
Regeneration: Good – oaks and white pine
Invasive Concerns: A low density invasive plant population consisting of mostly Japanese barberry and multi-flora rose emanates from the old landing on Babcock Road.
Stand History: Thinning by DEEP in 2006
Notes:
Management Recommendation: Selection harvest to perpetuate the stand in an uneven-aged condition. Predominantly group selection with openings targeting 0.3 - 0.5-acres and single-tree selection between groups.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
3-3 N	White Pine – Red Oak – Red Maple	14	110 sq. ft. / acre	158	Over	Sawtimber	6,250	25

Predominant Species: White pine, white ash, sugar maple, red maple, hickory, white oak, red oak
Main Soil Types: Canton – Charlton, Charlton - Chatfield
Access: Excellent – Main Parking Area
Regeneration: Good – oaks
Invasive Concerns: Japanese barberry – needs control prior to management
Stand History:
Notes: Desirable sugar maple pole cohort
Management Recommendation: First-phase shelterwood to perpetuate and recruit regeneration until it is of appropriate size and density to be released as young forest.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
5-3	Scarlet Oak	21	87 sq. ft. / acre	237	Over	Sawtimber	2,330	14

Predominant Species: Scarlet oak, sweet birch, red oak, white oak, red maple, hickory
Main Soil Types: Charlton – Chatfield, Paxton - Montauk
Access: Excellent – Babcock Road (North gate)
Regeneration: Moderate – New oak
Invasive Concerns: NA

Stand History:
Notes:
Management Recommendation: First-phase shelterwood to perpetuate and recruit regeneration which can be released in a subsequent stand entry as young forest.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
5-7	Mixed Upland Hardwoods	17	85 sq. ft. / acre	196	Over	Pole	2,190	15

Predominant Species: Sweet birch, red maple, yellow birch, hickory
Main Soil Types: Paxton – Montauk
Access: Excellent – Babcock Road (North gate)
Regeneration: NA
Invasive Concerns: NA
Stand History: Clear cut
Notes:
Management Recommendation: Pre-commercial thinning to accelerate growth rates and stand development while allowing sunlight to the forest floor stimulating vegetative response. TSI better-enables forestry to manage these sites on a short rotation.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
6-3	Mixed Upland Hardwoods	10	53 sq. ft. / acre	566	Under	Pole	490	7

Predominant Species: Sweet birch, white pine, white oak
Main Soil Types: Canton – Charlton, Charlton - Chatfield
Access: Fair – Babcock Road
Regeneration: Good – oak species (seedling/sapling)
Invasive Concerns: Low-density Japanese barberry
Stand History: Final Shelterwood
Notes:
Management Recommendation: Silvicultural clear cut to remove pole overstory and release cohort of seedling/sapling regeneration as young forest.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume

3-3 S	White Pine – Red Oak – Red Maple	14	110 sq. ft. / acre	158	Over	Sawtimber	6,250	25

Predominant Species: White pine, white ash, sugar maple, red maple, hickory, white oak, red oak
Main Soil Types: Canton – Charlton, Charlton - Chatfield
Access: Excellent – Main Parking Area
Regeneration: Good – oaks
Invasive Concerns: Japanese barberry – needs control prior to management
Stand History:
Notes: Desirable sugar maple pole cohort
Management Recommendation: First-phase shelterwood to perpetuate and recruit regeneration until it is of appropriate size and density to be released as young forest.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
5-6	White Pine – Red Oak – Red Maple	20	132 sq. ft. / acre	250	Over	Sawtimber	6,270	29

Predominant Species: White pine, red oak, sweet birch, scarlet oak, red maple
Main Soil Types: Charlton – Chatfield
Access: Excellent – Babcock Road (North gate)
Regeneration: NA
Invasive Concerns: NA
Stand History:
Notes:
Management Recommendation: Thinning to reduce basal area, accelerate volume growth, and allow added sunlight to the forest floor.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
5-5	White Pine – Red Oak –	10	100 sq. ft. / acre	199	Adequate	Sawtimber – Sapling	2,620	22

	Red Maple							

Predominant Species: White pine, scarlet oak, hickory, red maple
Main Soil Types: Charlton – Chatfield
Access: Good – Babcock Road (North gate)
Regeneration: Good – White pine (sapling)
Invasive Concerns: NA
Stand History: Selection
Notes:
Management Recommendation: Selection harvest to perpetuate white pine regeneration in an uneven-aged condition. Harvesting will expand upon previously established groups to release existing regeneration and recruit additional pine and oak establishment.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
1-1	Northern hardwood	65	105 sq. ft. / acre	189	Overstocked	Sawtimber – Pole	3,895	22

Predominant Species: American beech, yellow birch, red maple, red oak, hickories, sugar maple
Main Soil Types: Paxton – Montauk, Canton – Charlton, Charlton – Chatfield
Access: Fair – Cart path from North River Rd. Long skid.
Regeneration: Fair. Beech concerns
Invasive Concerns: NA
Stand History: Harvest 30 years ago
Notes: Intermittent drainages feeding School Brook
Management Recommendation: Selection harvest to facilitate development of uneven-aged characteristics favorable to the development of Cerulean warbler habitat.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
1-2	Northern red oak	29	93 sq. ft. / acre	152	Overstocked	Sawtimber	4,670	21

Predominant Species: Northern red oak, red maple, sweet birch, white pine, yellow birch
Main Soil Types: Canton – Charlton
Access: Fair – Cart paths from North River Rd., Babcock Rd. Long skid.
Regeneration: NA
Invasive Concerns: NA
Stand History: Harvest 30 years ago
Notes: NA

Management Recommendation: Selection harvest to facilitate development of uneven-aged characteristics favorable to the development of Cerulean warbler habitat.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
4-1	Mixed hardwood	42	92 sq. ft. / acre	172	Adequate	Sawtimber – Pole	3,220	14

Predominant Species: Hickories, red oak, red maple, white ash, yellow birch
Main Soil Types: Charlton – Chatfield
Access: Good – Cart paths from North River Rd., Babcock Rd.
Regeneration: Fair – oaks, sugar maple
Invasive Concerns: Low density treatment necessary in spots
Stand History: Harvest 30 years ago
Notes: Surface stones
Management Recommendation: Selection harvest to facilitate development of uneven-aged characteristics favorable to the development of Cerulean warbler habitat.

Stand	Cover Type	Acres	Basal Area	Trees / Acre	Stocking	Size-class	BF / Acre Volume	Cords / Acre Volume
4-2	Mixed hardwood	15	110 sq. ft. / acre	213	Overstocked	Sawtimber – Pole	4,990	23

Predominant Species: Red maple, red oak, hickories, yellow birch, white oak
Main Soil Types: Charlton – Chatfield
Access: Good – Cart path from Babcock Rd.
Regeneration: Fair – oaks, sugar maple
Invasive Concerns: Low density treatment necessary in spots
Stand History: Harvest 30 years ago
Notes: Spongy moth mortality
Management Recommendation: Selection harvest to facilitate development of uneven-aged characteristics favorable to the development of Cerulean warbler habitat.

Appendix 6. Public Comment

A draft copy of this plan was provided to the members of the Tolland Conservation Commission and the Tolland Conservation Corps for review and comment. A remote presentation describing past and future management actions at Kollar WMA was conducted on October 28, 2021 to the Conservation Commission and members of the public. No concerns were raised and no formal comments were received but the presentation prompted the following questions:

One member asked if hunting would continue on the WMA. DEEP staff responded that hunting would continue.

A question was asked about the impact to wildlife from dogs going off trails. Dogs off leash have a negative impact on wildlife by killing birds and small mammals, causing nest failure, and causing physiological responses to stress.

A question was asked about managing early successional habitat on town-owned land. The Town is developing a forest management plan for one of its properties. DEEP staff encouraged the creation of early successional habitat on town-owned land.

Table A. Entities contacted for comments concerning the Kollar WMA management plan 2023-2033.

Entity Contacted	Date Contacted	Formal Comments Received
Tolland Conservation Commission	October 28, 2021	No
Tolland Conservation Corps	October 28,2021	No