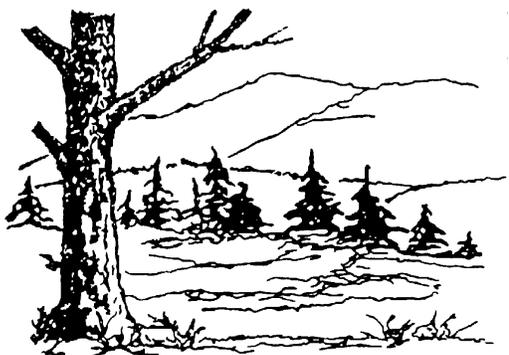


FOREST RESOURCE MANAGEMENT PLAN
for the
HURRICANE WATERSHED
HURRICANE TOWN FOREST
and
HURRICANE FOREST WILDLIFE REFUGE
565.0 acres in
Hartford, Vermont



Harwood Forestry Services, Inc.

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Purpose:

This Forest Resource Management Plan has been prepared as an update of a plan last prepared in November, 1998 by Harwood Forestry Services, Inc. of Tunbridge, VT. The document is designed to assist in the long range management of an important forest ecosystem that provides the people of the Hartford area an opportunity to be part of a vibrant natural community. The plan consists of several components including maps of the natural and man-made features of the property which have been designed to assist the viewer in orienting and locating various features here. They were not designed to be interpretive trail guides but several could become the basis of such maps in the future. The enclosed maps were prepared from a compilation of surveys, GPS field reconnaissance, soils maps, topographic maps and aerial photography.

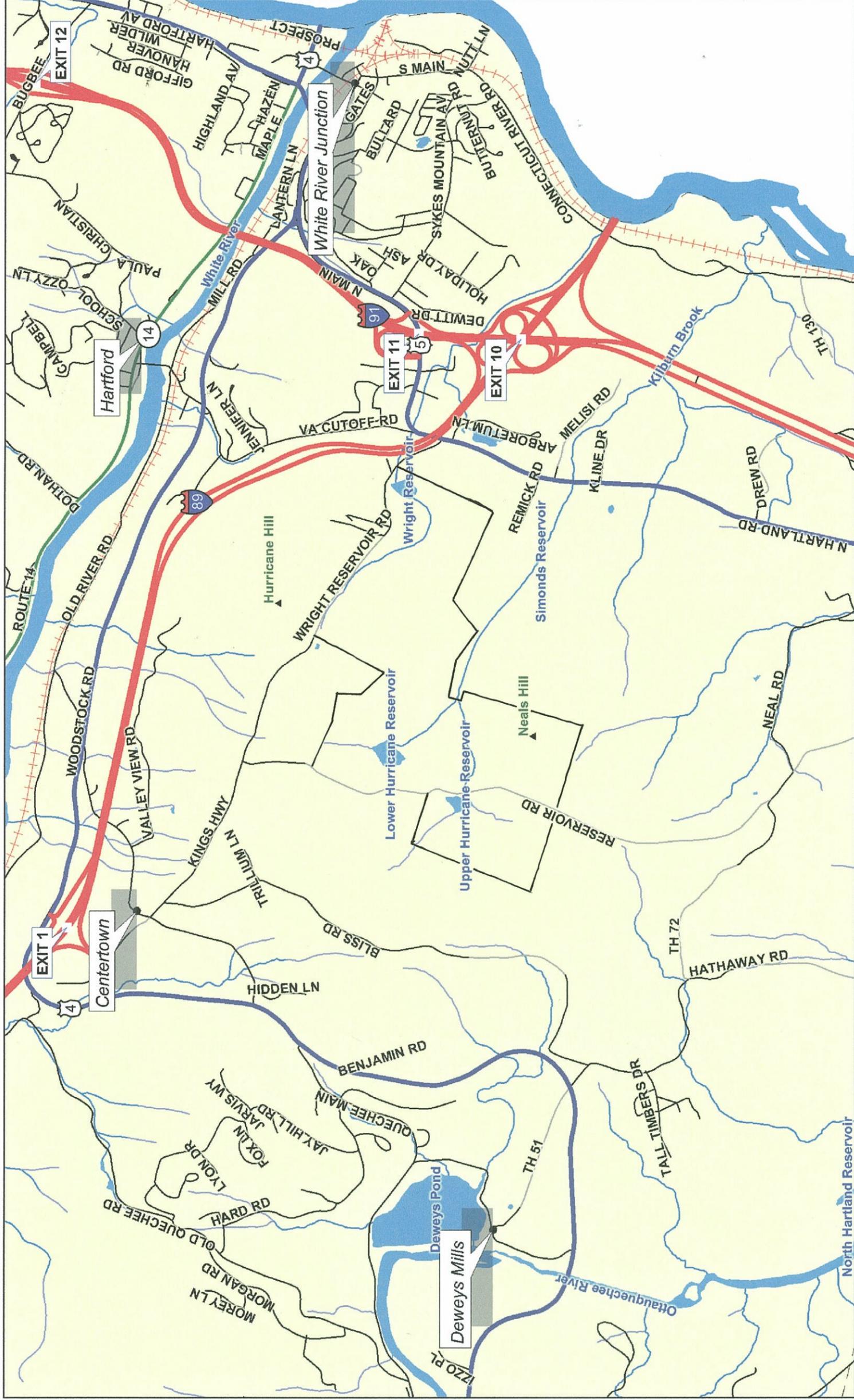
The plan also includes descriptions/over-views of the existing natural and man-made resources found within Hurricane Watershed. Natural resources here include the forest overstory and understory vegetation, transient and resident wildlife populations, water features, soils and topography. Man-made attributes include access/management roads, recreational trails, reservoirs, stone walls, cellar holes, wire fence lines and property boundary lines.

The final component of this plan represents detailed prescriptions of how to proceed with managing the resources discussed in the description section of this document. Here we discuss the impacts of recreational pressures and how to mitigate their impacts on the natural communities within this property. The plan outlines issues that could have negative impacts on the forests, understory vegetation, wildlife and water quality here. Some of the issues are addressed with readily available prescriptions and recommendations while others will require further investigation, research or policy determination.

It is intended that this document be considered dynamic and should be used as a basis for future decision making rather than an absolute outline or timeline for future activities. As new issues, conflicts, policies or problems arise, this document should be revised, updated or amended. It is also intended that this document be used as a compliment to other plans for this same property; i.e. "Town of Hartford, Hurricane Town Forest, Recreation Management Plan - July 2002".



Town of Hartford - Hurricane Watershed



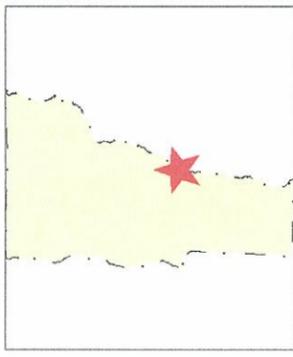
Map center: 510869, 127194

VT State Plane Meters (NAD83)

Scale: 1:25,000



- Legend**
- Airports
 - Mountains and Hills
 - Interstates
 - US Highways
 - VT State Highways
 - Rail Lines
 - Town Boundaries
 - Roads
 - Class 1-3
 - Class 4
 - Rivers and Lakes
 - Streams
 - Intermittent
 - Perennial
 - Unassigned
 - Cities
 - VT State Boundary



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General Description of the Hurricane Watershed:

The so-called Hurricane Watershed is completely owned by the Town of Hartford and is comprised of two, jurisdictionally separate properties. Specifically, the Hartford Town Forest is comprised of 423 acres, that by statute (VSA Title 24, Chapter 118, Section 7), is managed by the Hartford Conservation Commission. The Hurricane Forest and Wildlife Refuge is comprised of 142 acres, much of which was given to the Town in 1974 by the Brown family and which is managed by the Hartford Parks and Recreation Department. This resource management plan combines the two parcels into a single guiding document for forest management purposes.

The property is located on a ridge line west of the Connecticut River, south of I-89 and west of VT Rte. 5. The Hartford Town Forest can best be accessed via Center of Town Road, King's Highway and Reservoir Road and a parking lot at the end of the Class III portion of Reservoir Road. This parking lot serves as the "hub" of access, both management and recreational, for the majority of the Town Forest. The Hurricane Forest Wildlife Refuge (hereinafter referred to as the Wildlife Refuge) is most commonly accessed via VT Rte. 5 and the Wright Reservoir Road and one of two small parking areas along the south side of the road.

The property rises from a low point of about 700 feet above mean sea level along the eastern boundary line just below Wright Reservoir to a high point of 1,312 feet at the top of Neal's Hill in the southeast corner of the Town Forest. A decommissioned FAA communication tower site straddles the line between the Town Forest and the Wildlife Refuge where the elevation is 1,271 feet. Topography within the property is generally gentle to moderately sloping with a predominately southeastern aspect.

Both parcels are almost entirely forested and collectively contain three reservoirs, several miles of recreational trails, seasonal and permanent streams, varied topography and a diverse wildlife habitat ecosystem. Wright Reservoir Road and a Class IV section of the King's Highway make up a portion of the northeastern boundary while the Reservoir Road makes up much of the northwestern boundary. A section of the Class IV portion of the Reservoir Road bisects the Town Forest in the southwestern corner.

Much of this watershed parcel has been in the ownership of the Town or the Hartford Water Company since about 1890. Around 1900, the Water Company began the construction of the Upper and Lower Reservoirs along with Wright and Simonds Reservoirs. For many decades these reservoirs provided for the domestic water needs of the people of the Town of Hartford. Around 1950, a replacement well was established in Wilder marking the beginning of the phasing-out of the use of these reservoirs for domestic water purposes. The last use of these reservoirs for that purpose was in 1975.

Prior to the mid 1980's, little directed forest management took place here. In 1984, the first Forest Resource Management Plan was prepared by Continuous Forest Management of Lebanon, NH, which marked the beginning of active, directed commercial management of the forest resources of the Town Forest lands. From a practical standpoint, active commercial management of the forest ended around 1992. An update of the management plan was prepared in 1999 by Harwood Forestry Services, Inc. and active forest management resumed within the Town Forest. Two winter harvests have occurred within the Town Forest since 2005 encompassing about 100 acres with plans to continue activities periodically into the future. Commercial forest management activities have not occurred within the Wildlife Refuge since at least the 1960's and will not be part of management prescriptions for the foreseeable future.

The Town Forest portion of the Watershed was acquired primarily through the acquisition of four separate parcels; those being the Pease Estate at the northern portion of the Forest along the eastern edge of the Reservoir Road, the Marston and Clifford farms making up the southern portion east of the Reservoir Road (Class IV portion today) and the Coutermarsh farm located at the southern portion of the property west of the Class IV portion of the Reservoir Road.

The Wildlife Refuge is comprised of two parcels starting with the acquisition of the Wright Reservoir Lot by the Water Company around 1890 and the generous gift to the Town of the Brown Lot in 1974. The acquisition of the Brown Lot resulted in the formation of a single, physically contiguous property (Town Forest and Forest Wildlife Refuge) for the first time.

The recreational use of both properties began in earnest in the late 1980's to the early 1990's. Hiking, snowmobile and cross-country ski trails began to be developed, mostly in an informal, unregulated manner, often using the footprint of past timber management trails until around 2000 when the Town received a grant to develop trails within the Town Forest and Wildlife Refuge. Recreational use has increased steadily and the Conservation Commission developed a comprehensive Recreation Management Plan in 2002 that documents, plans and regulates recreational activities within the Town Forest. Recreational activities within the Wildlife Refuge are regulated and controlled directly by the Hartford Parks and Recreation Department.

The property was surveyed by Roy G. Hathorn of Hathorn Surveys in 1982 (Project #16582). All of the lines were blazed and painted after the survey was completed and again re-painted in 2001 by Harwood Forestry Services. At the present time, all boundary lines are clearly marked and readily identifiable.

The Windsor County Forester and State Lands Foresters with the VT Department of Forests, Parks and Recreation and Wildlife Biologists from the

VT Fish and Wildlife Department have been actively involved in the management review and oversight of activities within this important regional resource. Site visits, tours and training programs have been conducted here for the public, resource professionals and students from the local elementary, high schools and vocational programs. A variety of groups have been involved in resource mapping, monitoring, trail work, invasive plant control and various other activities. The community involvement with, and use of, this dynamic property is impressive.

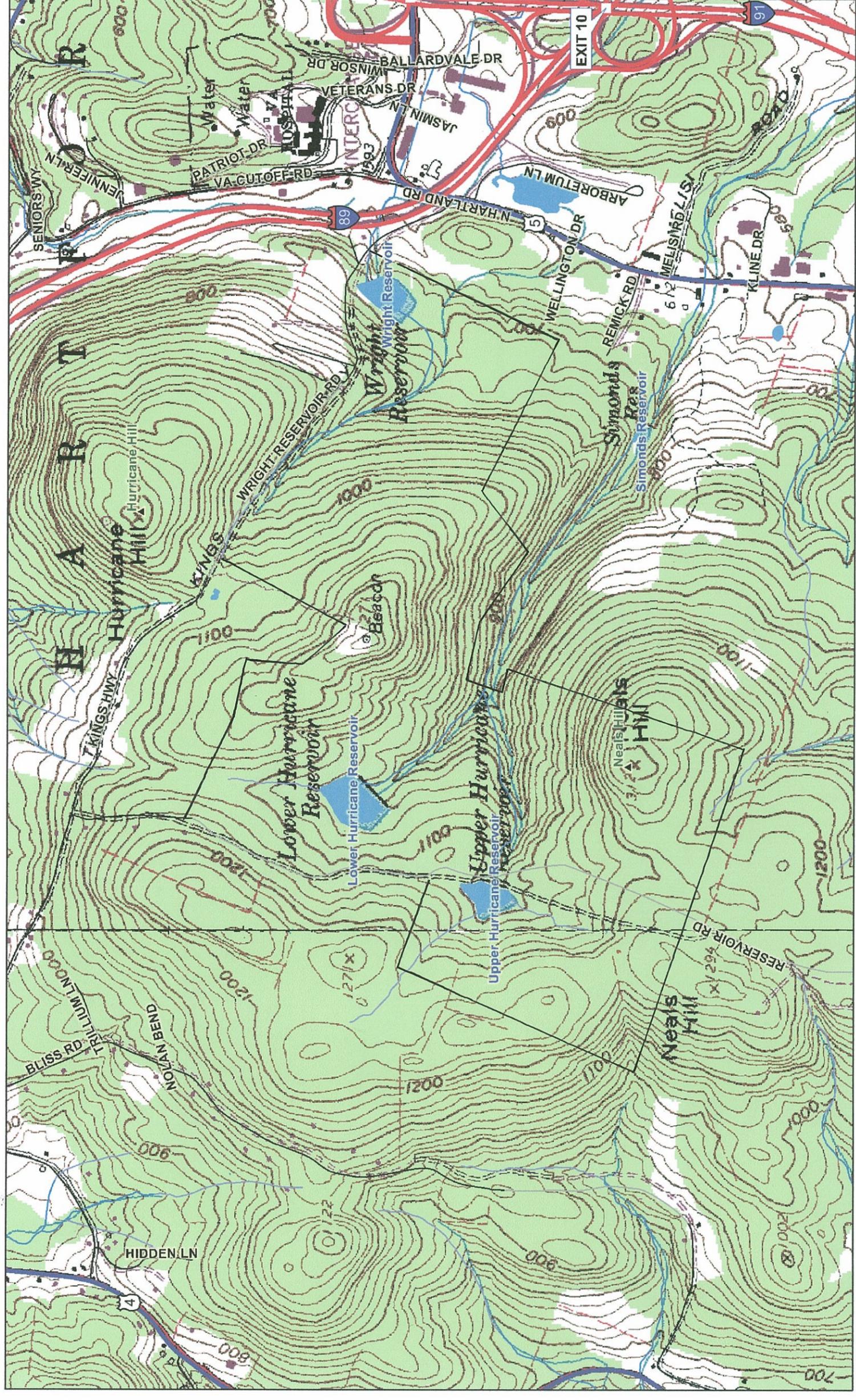
Ownership Objectives:

The objectives of ownership for this management plan could be considered as varied as the population of the town, as in a sense, each resident is an owner of these two Town parcels. The following objectives were developed by working with the Hartford Conservation Commission, the Hartford Parks and Recreation Director and the incorporation of public input from two community meetings:

- Maintain a healthy, viable forest resource using sustainable, socially responsible and environmentally sensitive methods.
- Protect all water resources using acceptable management practices for the benefit of both water quality and riparian wildlife habitat protection.
- Maintain and enhance wildlife habitat and habitat connectivity.
- Develop and maintain a multiple use recreational network that respects the users and the related natural ecosystems.
- Expand the educational uses of the property for youth and adults through cooperation with schools, outdoor groups and professional organizations. Activities within the Watershed should be exemplary and demonstrable.
- Educational and recreational activities should be exemplary and follow “tread lightly” guidelines.



Town of Hartford - Hurricane Watershed



Map center: 510869, 127194

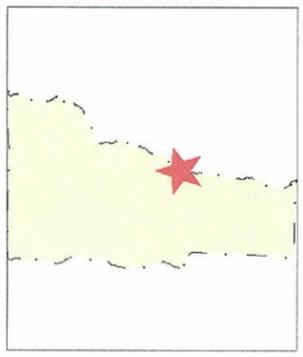
VT State Plane Meters (NAD83)



Scale: 1:13,000

Legend

- Airports
- Mountains and Hills
- Interstates
- US Highways
- VT State Highways
- Rail Lines
- Town Boundaries
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- Class 1-3
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- Rivers and Lakes
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Resource Descriptions:

Soils:

The underlying geology of this area is heavily influenced by the most recent collision of North America with Africa about 330 million years ago. That collision (plate tectonics) resulted in a soil classification in this area called the Waits River Formation, well known for its calcium rich soil types which fertile soils for agricultural and forestry uses. The last glacial period of 13,000-15,000 years ago further carved the surface of the region and covered this region with a layer of ice over a mile thick! After the great ice sheets receded, a huge body of water now known as Lake Hitchcock was created. The Hurricane Watershed property is located near the northwestern end of that great lake. The Connecticut River drainage basin was created as that lake receded and the hills and mountains nearby retain the evidence of substantial erosion as the glaciers carved their path southward and the great lake drained.

The topography here is directly related to the geological history of the site. The undulations, steep slopes and water courses found within the Watershed resulted from the actions of glaciers and time on the bedrock substrate that still underlies the soils found here today.

The soils found under the surface here were all mapped by the USDA Soil Conservation Service (now called the Natural Resources Conservation Service). The Soils Map on the following page indicates the result of that mapping effort and denotes the location and types of soils found here. The soil types include Glover-Vershire complex, Vershire-Buckland complex, Vershire-Dummerston complex, Cabot, Shelburne and Buckland. All of these are considered fertile, shallow to deep, calcium rich, loam based soils.

Forest productivity, a measure of tree growth potential, is good to excellent on these soil types. The productivity potential of the forest soils is often determined by the site index, which is a measure of the average height in feet that a dominant or co-dominant tree of a specific species reaches in a specified number of years (generally 50 years). The site index represents the productivity potential of the soil to grow trees (the higher the site index, the better the site). Almost all of the forest soils here fall within the Vermont productivity classes of Site Class 1 (able to grow greater than 85 cubic feet/acre/year) and Site Class 2 (able to grow 50-85 cubic feet/acre/year).

Small, wetland associated sites, can be found scattered throughout and are indicated on the Water Resources Map. Here, drainage limitations can effect and lower productivity potential, however all such sites will be protected from management activities and therefore productivity becomes less relevant.

It can be anticipated that positive results will occur from the sound management of forest resources within this property. The health of the forest

as a result of these soils will benefit wildlife communities here, allow for the maintenance of recreational trail networks and assist in the maintenance of overall water quality within.

See Soils Map on the following page:

<u>Soil Code</u>	<u>Soil Name/Description</u>
19C	Vershire-Dummerston complex, 8-15% slope, rocky
19D	Vershire-Dummerston complex, 15-25% slope, rocky
19E	Vershire-Dummerston complex, 25-60% slope, very rocky
20C	Glover-Vershire complex, 3-15% slope, very rocky
20D	Glover-Vershire complex, 15-35% slope, very rocky
20E	Glover-Vershire complex, 35-60% slope, very rocky
22D	Shelburne fine sandy loam, 15-35% slope, very stony
26C	Buckland loam, 8-15% slope, very stony
31B	Cabot loam, 0-8% slope, very stony
49C	Vershire-Buckland complex, 8-15% slope

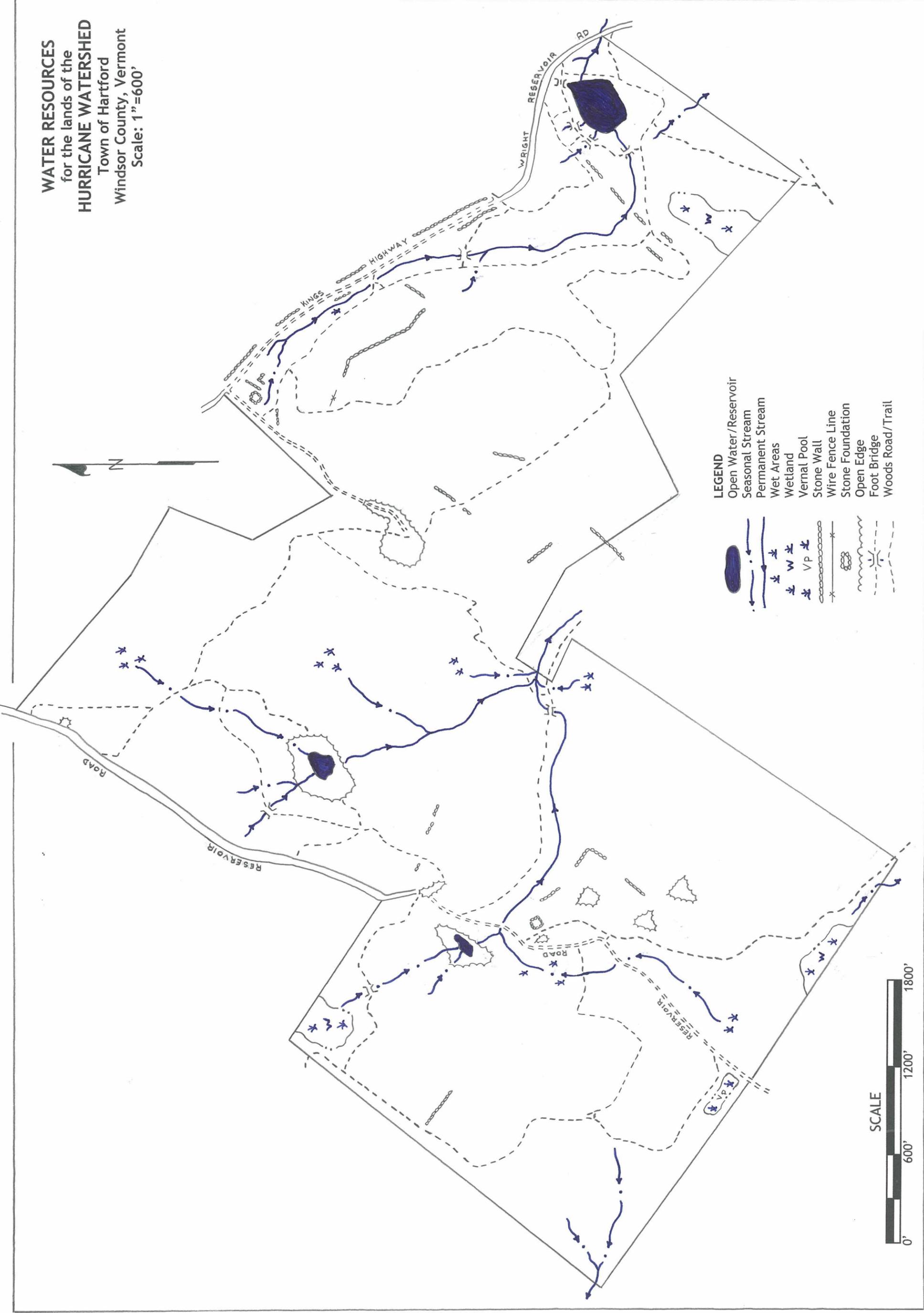
Water Resources:

As indicated earlier, the property contains at least the remnants of three reservoirs. Wright Reservoir is located within the Wildlife Refuge and is still at near full water level. The Upper and Lower Reservoirs are both located within the Town Forest and presently contain only a small representation of their previous full level of water.

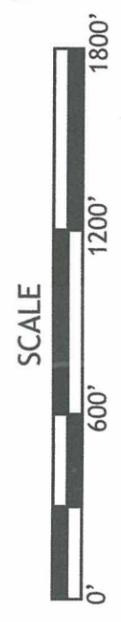
Two permanent streams, one from each of the Upper and Lower Reservoirs, flow southeastward through the Town Forest and exit the property along Simonds Way (see Water Resources Map on the following page). Several small seasonal streams flow into each of the two reservoirs and also directly into the permanent streams. Several small wetlands and wet areas and at least one vernal pool are located within the Town Forest and have been mapped. One small seasonal stream flows southwesterly out of the Town Forest into private lands and into a different physical watershed.

Within the Wildlife Refuge, a permanent stream and several small seasonal streams flow into Wright Reservoir where they converge to form a permanent stream that flows out of the property along Wright Reservoir Road. A relatively large wetland is found southwest of Wright Reservoir along the southern boundary line. This wetland drains southward, out of the Wildlife Refuge parcel.

WATER RESOURCES
for the lands of the
HURRICANE WATERSHED
Town of Hartford
Windsor County, Vermont
Scale: 1" = 600'



- LEGEND**
- Open Water/Reservoir
 - Seasonal Stream
 - Permanent Stream
 - Wet Areas
 - Wetland
 - Vernal Pool
 - Stone Wall
 - Wire Fence Line
 - Stone Foundation
 - Open Edge
 - Foot Bridge
 - Woods Road/Trail



Biological Diversity:

The Hurricane Watershed contains representations of a wide range of vegetative conditions as a result, primarily, of the past management of the resources here. Hardwoods, including red and white oak, red and sugar maple, beech, white and yellow birch, white ash, basswood, black cherry and lesser amounts of other species are found in varying densities with white pine and hemlock throughout. Age and size of this forest component ranges from fully mature, dominant individuals to young dense regeneration on the forest floor. As a result of this varied forest condition, the wildlife habitats found here are equally varied. Riparian forest communities found along water bodies or moving waterways have been buffered from past management activities and are therefore vital ecosystems in themselves. The communities are home to reptiles, amphibians, aquatic insects, birds and both small and large mammals. Surrounding these riparian communities is an upland forest community whose condition ranges from relatively unmanaged, dense over-stories of middle-to-old-age trees, to actively managed forest with a wide range of ages and sizes represented. Wildlife populations have a wide range of habitat needs and this forest contains conditions, at least at some level, that are favorable to most indigenous New England species. This large parcel, combined with nearby other large parcels, provides an important wildlife travel corridor for larger, more mobile species such as moose, black bear, deer and coyote.

In addition to vegetative and wildlife diversity, the Watershed contains a mixture of other resource features such as elevation, varying from approximately 700 feet above sea level to over 1,300 feet and aspect (orientation of the slope relative to the sun) with slopes that face literally all cardinal directions. These seemingly minor variations have dramatic impacts on the forest communities that exist here and definitely affect how they will respond to alterations such as timber harvesting, major wind/icing events, and favorability for use as wildlife habitats, etc. It is this wide range of diverse resource conditions that provides tremendous management opportunities as well as challenges. Anticipating the responses to management actions and balancing that with the varied resource objectives will require a keen sense of the environment and careful planning of the imminent changes that might occur, both natural and man-made.



Map center: 510869, 127194

Scale: 1:13,000

VT State Plane Meters (NAD83)



Legend

- Airports
- Mountains and Hills
- Interstates
- US Highways
- VT State Highways
- Rail Lines
- Town Boundaries
- Roads
- Class 1-3
- Class 4
- Rivers and Lakes
- Streams
- Intermittent
- Perennial
- Unassigned
- 50 ft contours
- Cities
- VT State Boundary

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URL: http://maps.vermont.gov/imf/sites/VCGI_baseemap/jsp/launch.jsp

Recreational Features/Uses:

This property has become a hub of recreational activity over the past 15-20 years. Its proximity to White River Junction and the higher-than-average (for Vermont) population center of Hartford, Lebanon and Hanover, make this an easy to reach, recreational destination. Non-motorized activities here range from hiking, skiing, snowshoeing, mountain biking, hunting (on the Town Forest only), birding and wildlife photography to name a few. Motorized recreational vehicles including snowmobiles and ATV's are allowed on specific, identified trails only. The map on the following page labels and identifies the allowable uses of the trails on the Watershed property.

In 2002, the Selectmen adopted the "Hurricane Town Forest Recreation Management Plan" prepared by the Hartford Conservation Commission. This planning document details the recreational attributes of the Town Forest and develops policies and regulations for their use.

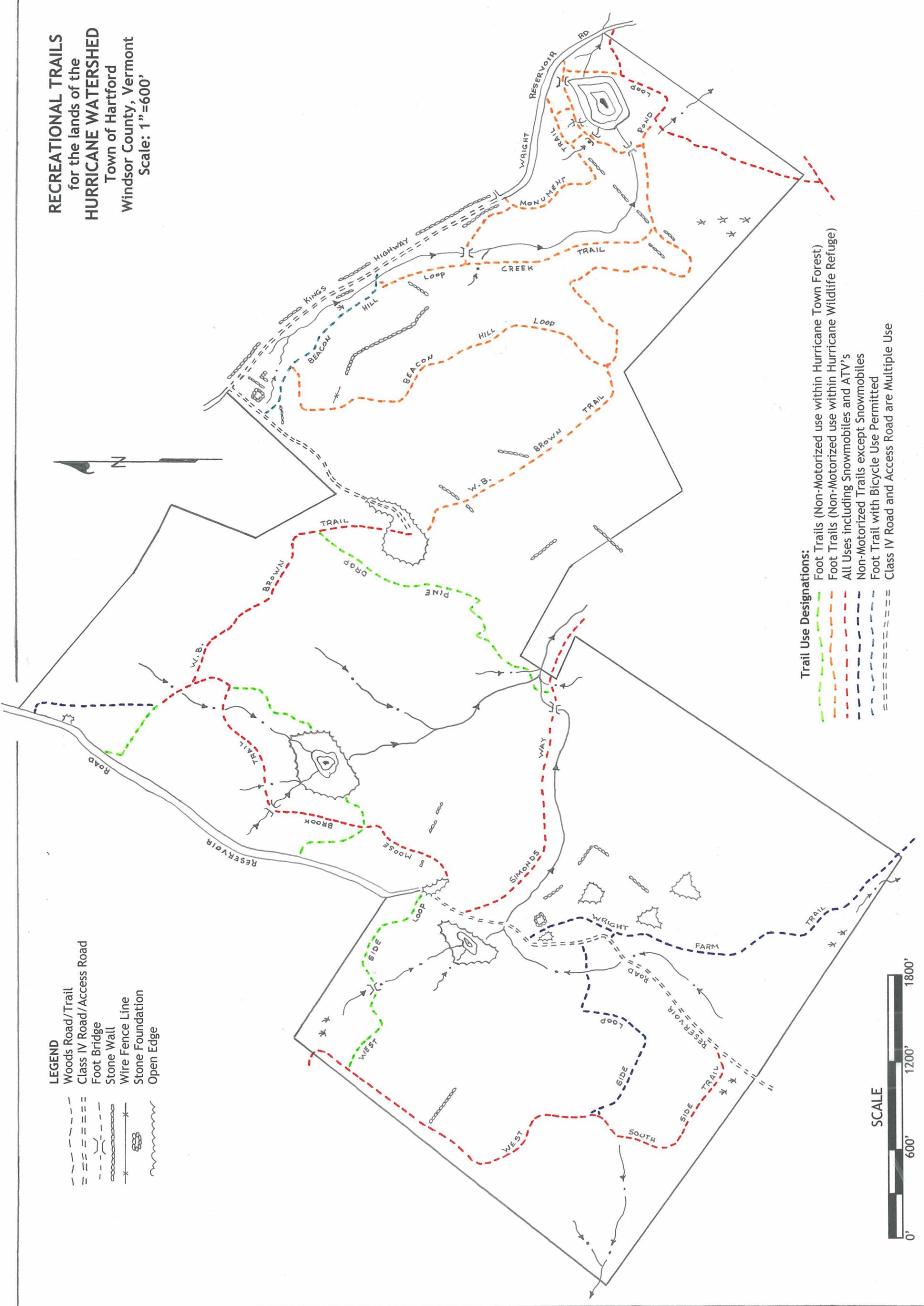
The recreational uses within the Wildlife Refuge are controlled, monitored and maintained by the Hartford Parks and Recreation Department.

It is not intended that this Forest Resource Management Plan will further discuss, plan or recommend activities related to the recreational uses of either the Town Forest or the Wildlife Refuge.

RECREATIONAL TRAILS
for the lands of the
HURRICANE WATERSHED
Town of Hartford
Windsor County, Vermont
Scale: 1" = 600'

- LEGEND**
- Woods Road/Trail
 - Class IV Road/Access Road
 - Foot Bridge
 - Stone Wall
 - Wire Fence Line
 - Stone Foundation
 - Open Edge

- Trail Use Designations:**
- Foot Trails (Non-Motorized use within Hurricane Town Forest)
 - Foot Trails (Non-Motorized use within Hurricane Wildlife Refuge)
 - All Uses including Snowmobiles and ATV's
 - Non-Motorized Trails except Snowmobiles
 - Foot Trail with Bicycle Use Permitted
 - Class IV Road and Access Road are Multiple Use



Timber Resources:

For the first 60-80+ years of the town ownership (1890-1980) here, timber attributes were of little concern. The forest essentially provided a “buffer” of undisturbed land that protected the reservoirs that provided domestic water supplies to the town. Little evidence was found, either on the ground or in historic documents, to suggest that timber harvesting activities occurred at all here prior to around 1980. This actually makes sense because the majority of the Town Forest and Wildlife Refuge was active farm land prior to the town’s acquisition. The Pease, Marston, Coutermarsh and Hubbard farms make up the majority of the present Watershed property. Historically, many of these small hill farms had begun to fall apart financially around the late 1800’s and it is about that time that we began to see these farms revert back to their forested conditions. In 1900, Vermont was about 80% open land and only 20% forested. By 2000 the numbers had switched and Vermont was 80% forested and only about 20% open. Thus, most of the forestland we see today resulted from agricultural land abandonment that began around the late 1800’s.

There is evidence throughout the Watershed that the above scenario played out here and that the older trees within the forest today are about 100-120 years old. Stone walls, cellar holes and smoother land surfaces indicate an agronomic past. Knowing this, it is reasonable to suggest that there was little justification for timber harvesting until around the 1980’s when the forest was at a point in age and size where removing timber products became profitable.

The Forest Resource Management Plan prepared in 1984 prescribed an even-aged management approach throughout; a strategy that suggests trees within a given stand would be grown as a single age group, then harvested fully at a pre-determined age, say 120 years. This type of management results in a large fluctuation in vegetative conditions (old growth forest followed closely by a very young forest), long periods between the generation of revenues from timber harvesting and the political implications of the final harvest (clearcutting) within a public parcel. The Resource Management Plan adopted in 1999 redirected the management emphasis toward the creation of an uneven-aged forest which would perpetuate a forest cover represented by trees of all ages and eliminate the final overstory removal. This also tends to better regulate the revenues from timber harvests and minimize the negative aesthetic impacts of forest management. The forests resources of the Town Forest will now be managed using these uneven-aged management strategies into the future. It has been determined that the forest resources within the Wildlife Refuge will not be managed for timber products and no commercial harvesting activities will be scheduled here for the foreseeable future. Tree cutting within the Wildlife Refuge will be limited to wildlife habitat manipulation, recreational trail construction and maintenance and hazard tree mitigation.

Wildlife Resources:

This remote, generally forested portion of town provides great habitat opportunities for a host of wildlife species. Specifically, this parcel is one of the largest single holdings in town and provides at least seasonal habitats for most of the upland mammal and bird communities indigenous to this part of Vermont. Reptiles and amphibians that favor water features such as wetlands, vernal pools and streams have many opportunities to satisfy their life requirements here. Wright Reservoir has a healthy fish population and it is suspected that the larger permanent streams within the property are also populated with native fish species.

A review of State maps and records maintained by the VT Fish and Wildlife Department, Non-game and Natural Heritage Program indicate no presence of threatened, rare or endangered species or of any “critical deer wintering habitats” often referred to as deer yards. This does not mean that deer populations do not over-winter here, only that the density of deer or the survival importance of the area does not rise to the level where the area is formally mapped.

As could be expected, there are substantial seasonal fluctuations of most wildlife populations, both by species and individual numbers. Evidence of transient species such as moose, black bear, coyote and turkey has been documented at various times of the year.

As the forest community changes and evolves here, desirability of the habitat for many species will fluctuate and populations will “adjust” accordingly. Food, cover and water are critical and are generally the limiting life requirements of all species. As forests mature, the presence of food and cover (usually provided by low vegetation) declines and results in a less favorable habitat condition for many species. Therefore, it will be advisable to combine future timber management activities with a goal of creating/perpetuating low forest cover in an effort to retain healthy wildlife populations.

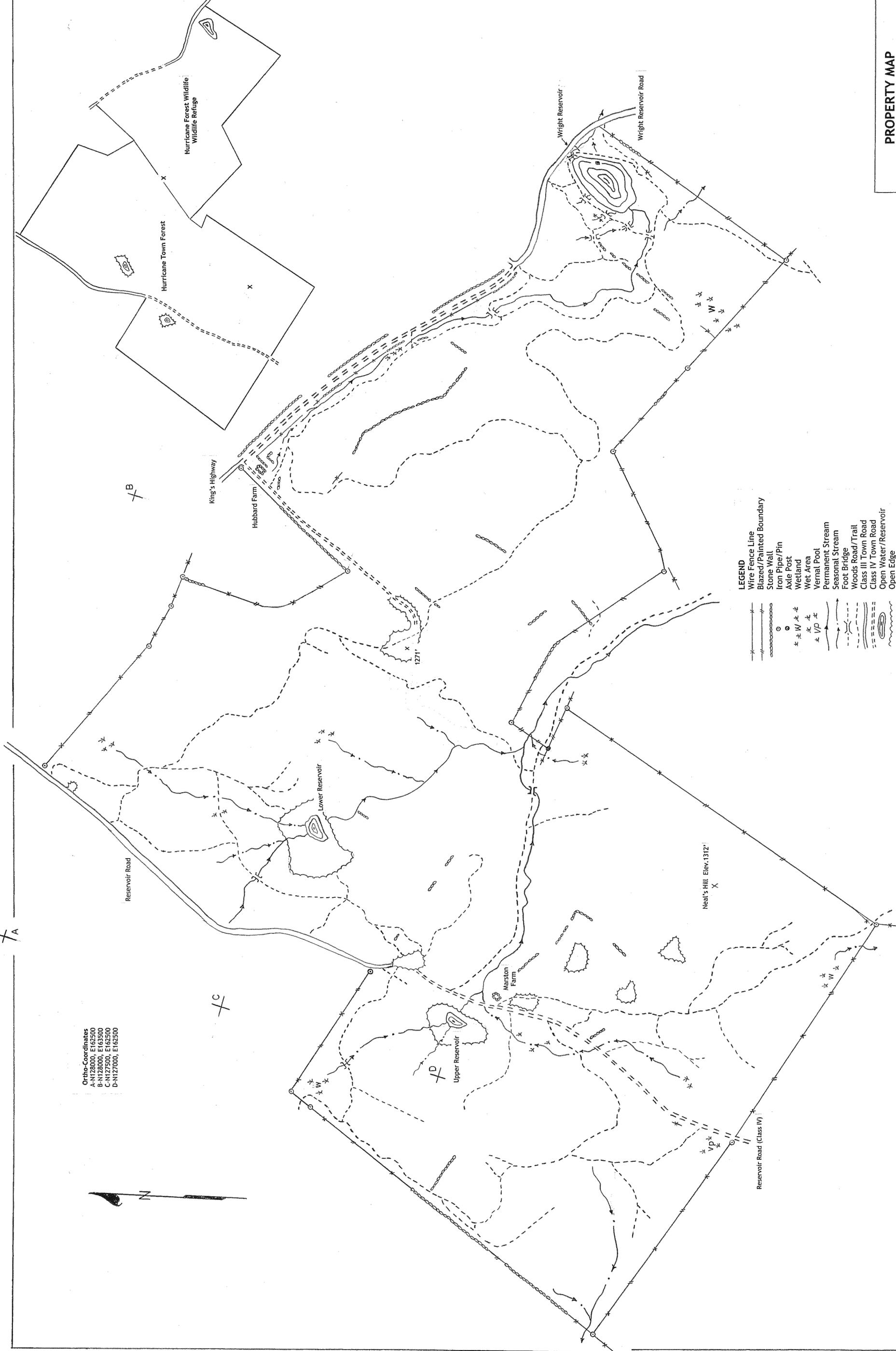
As stated earlier, wildlife populations within and adjacent to riparian corridors are extremely important to a vibrant wildlife community. This property contains a substantial amount of such riparian ecosystem conditions and the habitat benefits provided to many species is notable.

Linking Lands Alliance:

The Hurricane Watershed comprises 565 acres and makes up one of Hartford's largest undeveloped parcels. As such, it provides a range of habitats suitable for many of the wildlife indigenous to this part of Vermont. This block connects to other large habitat blocks, which viewed at a landscape level, provide wildlife with a matrix of varied habitats including wetlands, uplands, feeding, and denning sites spanning several towns. Wide-ranging wildlife such as moose, black bear, bobcat, deer, and coyote rely on this connected matrix of habitats for their survival.

The importance of the Hurricane Watershed for its wildlife habitat and connectivity has been recognized by the Linking Lands Alliance (LLA) through its Wildlife Initiative Project. The LLA is a grassroots group of community members from ten neighboring towns which is addressing natural resource issues that transcend town borders. Through the identification and protection of habitats and travel corridors vital to the wide-ranging animals, the ecological health of a multitude of other plants, animals and invertebrates that make up the valley's natural diversity and beauty is maintained. The LLA region includes the following ten municipalities: Hartford, Hartland, Norwich, Pomfret, Sharon, Strafford, Thetford, Vershire, West Fairlee and Woodstock.

PROPERTY MAP
for the lands of the
HURRICANE WATERSHED
Town of Hartford
Windsor County, Vermont
Orthophoto: #160124-1994
Scale: 1"=417'
Drawn: 1998
Updated: 11/09-L. Miraldi
Harwood Forestry Services, Inc.



Ortho-Coordinates
A-N178000, E162500
B-N178000, E163500
C-N177500, E162500
D-N177000, E162500

LEGEND

	Wire Fence Line
	Blazed/Painted Boundary
	Stone Wall
	Iron Pipe/Pin
	Axle Post
	Wetland
	Vernal Pool
	Permanent Stream
	Seasonal Stream
	Foot Bridge
	Woods Road/Trail
	Class III Town Road
	Class IV Town Road
	Open Water/Reservoir
	Open Edge
	Stone Foundation



Note: Not a survey! Drawn from survey by Hathorn-1982, previous Forest Type Map and GPS collected field evidence. Not intended for uses such as conveyance of title or proof of ownership. Harwood Forestry Services will not be held liable for the accuracy of boundary representations.

Forest Health:

The forest resources of the Hurricane Watershed could be classified as quite healthy. During the field examination of this property for this plan update as well as during site visits since 1999, few notable health threats were identified or detected.

A violent localized windstorm (probably a micro-burst) during the Fall of 2004 uprooted and/or broke many trees within an area of about 8-10 acres in the southwest corner of the Town Forest. A substantial number of large, dominant red oak trees were affected. A marked thinning/harvest operation had been scheduled for an area adjacent to this damage and was slated to occur during the winter 2005-2006. The area of damage was added to the scheduled project and the uprooted/broken trees were salvaged and sold. Quick response to this wind-throw event resulted in minimizing the economic losses that usually occur from such events.

No records were found to suggest that forest fires have ever been a problem here however appropriate precautions should always be taken during drought conditions in the future.

A large hurricane slammed into New England in the Fall of 1938 and leveled thousands of acres of forest land in the region. Southeast facing slopes were hardest hit and this forest was not spared. Looking closely today, one can still find evidence of this devastating wind event in the form of tipped trees which survived and turned-up branches that became the dominant, upright stem later. These types of events have occurred in varying intensities for millennia and will undoubtedly occur again at unpredictable intervals.

Several native insects and diseases have impacted the health and vigor of trees throughout the region but none were noted here that have had a dramatic impact on forest health. Past gypsy moth infestations have undoubtedly occurred here as oak is a preferred species and the Watershed contains large amounts of oak.

Additionally, exotic (non-native) insect and disease species are threatening our regional resources and warrant monitoring in the future. Such an example of an exotic insect is hemlock wooly adelgid (an aphid) which has seriously impacted hemlock resources in states south of Vermont and which was recently discovered in Windham County. Asian Long-horned beetle and emerald ash borer are exotic hardwood pests that threaten our region and have the potential to be devastating to the hardwood forests of New England. None of these pests are currently known to exist within the Watershed.

Non-Native (exotic) and Invasive Plants:

Non-native and invasive plants have become common to the forest in our region and throughout New England. Species commonly found in this area include Oriental and bush honeysuckle, Oriental barberry, common and glossy buckthorn, autumn olive, wild chervil, Japanese knotweed and purple loosestrife to name but a few!. These plants can out-compete our native species and often become the dominant vegetation cover. Invasive plants take advantage of forest disturbances (both natural and man made) and establish themselves across the available germination sites. These plants have the ability to out-compete our native plants for nutrients, water and light and possess the ability to produce large amounts of seeds and/or reproduce rapidly through root sprouting. Seeds are dispersed by wind, birds, other animals, people, water and products moving from state to state. These aggressively growing plants, in many situations, can out-compete native regeneration important to wildlife habitat, biodiversity and timber production.

During the field examination of this property, varying amounts of bush honeysuckle and Oriental barberry were noted, and then most commonly in the Wildlife Refuge in the area around Wright Reservoir.

Archeological, Cultural and Historic Sites:

Stone foundations remain visible from the Marston Farm located south of the Upper Reservoir Road within the Town Forest and the Hubbard Farm located along the King's Highway within the Wildlife Refuge. Several segments of stone walls can be found along the boundary lines and within both parcels. These stand as a testament to the past agricultural nature of life on this hill.

The Federal Aviation Administration (FAA) established and maintained two communication towers on a height of land straddling the Town Forest and Wildlife Refuge boundary. Within the past several years the use of these towers has been terminated. One tower has been fully removed while the other tower was only partially removed. An observation platform and ladder may be established here for use by the public to enjoy distant views. The old power line (poles only) that served the tower site can be found along the W. B. Brown Trail just southeast of the tower site.

No archeological sites, mines or unique geological features were noted within this property.

Climate Change:

As climate change impacts Vermont's forests and wildlife, active management actions need to be taken in order to help both humans and wildlife adapt to these changes. Some plant species that comprise local forests and wildlife habitat will move north as climate warms, leaving us with unknown ecological consequences. Making sure that there is flexibility in the Hurricane Watershed Forest Resource Management Plan will help future planners adjust to unforeseen changes. Climate change adaptation management practices should be considered to help facilitate wildlife migration northward, while ensuring that Hartford's needs are still accounted for (e.g. clean water, timber, hunting, etc.). Thus, it is important to still include current management practices, such as timber harvesting, human safety, trail maintenance, and existing wildlife conservation methods while considering climate change management strategies.

Many wildlife and forest climate change projects and programs are already being researched and established by organizations and state agencies. Pending future funding, decision-makers will consider participating in one or more of these programs and/or undertake one or more of these projects in the Hurricane Watershed.

Management Recommendations/Schedules:

Timber Resources

A timber management policy has been established within the Hurricane Watershed to forgo timber harvesting activities within the portion of the Watershed known as the Wildlife Refuge. Natural processes of growth and mortality will be the extent of timber management within the Refuge until further notice. Tree cutting here will be limited to hazard tree reduction, trail clearing and specific wildlife habitat improvement projects.

The forest land of the Town Forest portion of the Watershed has been divided into five separate management units called Forest Management Units (FMU's). FMU's A-E are located fully within the Town Forest (see Forest Management Unit Map on the following page). Each FMU has been created to represent logical, physical timber harvesting units that minimize stream or waterway crossings, concentrate recreational impacts during treatment periods, involve economically viable timber volumes/values to assist in attracting bids from reputable timber harvesting contractors and use topographic and physical features to optimize log landing locations.

Recent timber harvesting activities (2005-2008) were conducted within FMU's A and B. Winter condition operations were required and ground skidding of timber products from the stump to the log landing was prohibited. The use of a "forwarder" was required to bring products to the log landing/loading site so as to minimize soil disturbance and residual stand damage which often results from ground skidding.

It is hereby recommended that all future timber harvesting activities within the Town Forest be limited to frozen ground, winter conditions only in an attempt to help protect water quality, reduce site impact as stated above and to reduce conflicts with the recreational users of the property. The recent requirements to limit removals of timber products to the use of a forwarder has worked very well and as long as such vehicles remain an option, future projects should be similarly constrained.

Timber harvests regulated by FMU's should be marked by a professional forester and put out for competitive bidding as they have been in the past. In general, progressive treatments of these FMU's will be designed to occur in different units at about three to five year intervals with adjustments to dates as necessary to reflect market conditions, weather or operator availability. This would mean that treatments within a given unit would occur at about 21-23 year intervals.

Every effort will be made to notify the public well in advance of harvesting operations. Maps showing harvest sites will be posted at major trail-heads and appropriate signage will be erected, temporarily closing all trails affected by

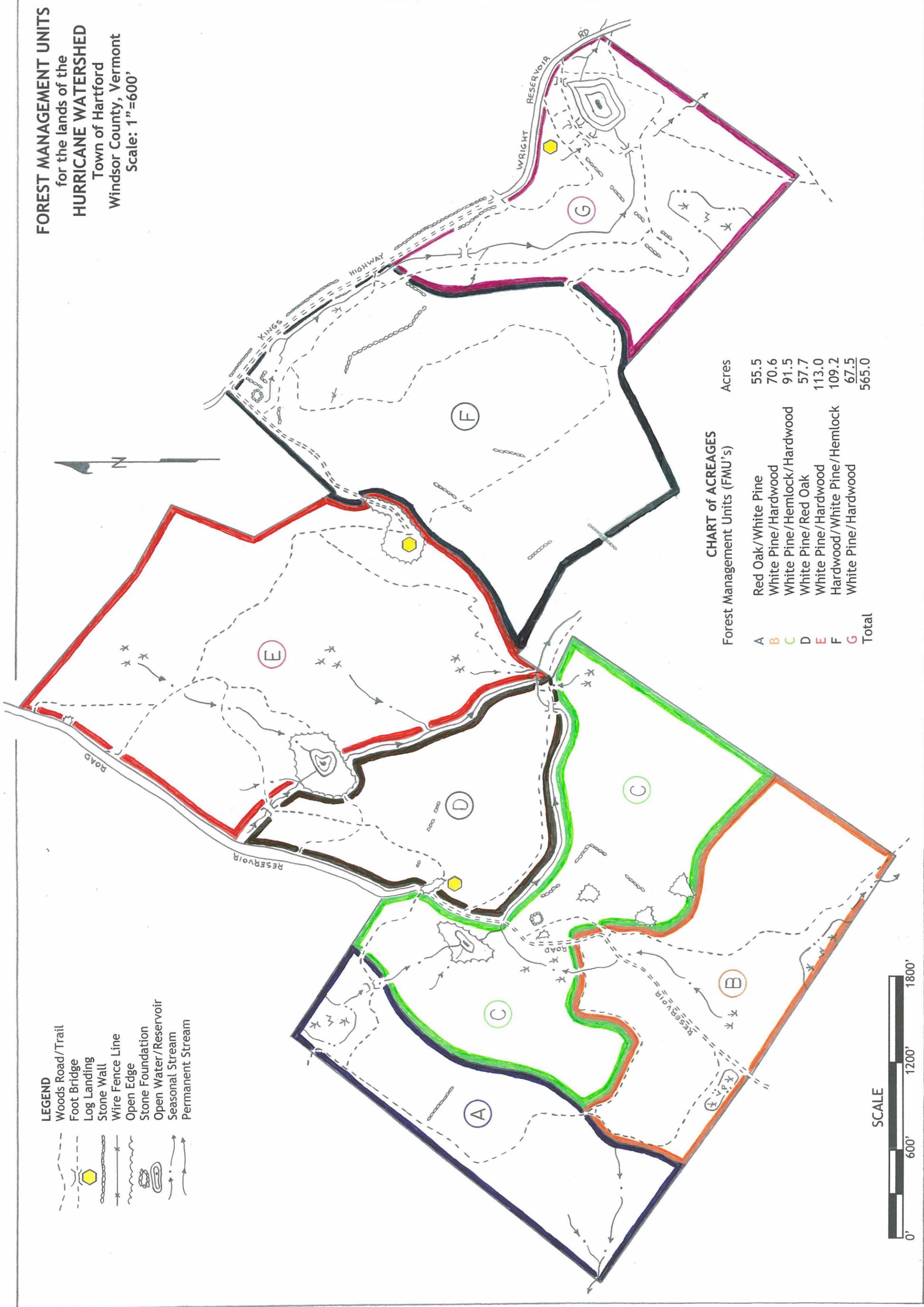
these projects. Public information site inspections will be scheduled before and after each harvesting operation. All log landing/loading sites will be restored fully and seeded upon completion and where practical, these sites will be used as recreational parking areas during interim periods.

For the purpose of updating this Forest Resource Management Plan, the standing forest component within the Hurricane Watershed was evaluated in the summer of 2009. A stratified, random point sampling cruise was performed to collect information relevant to each management unit.

Point sampling is a method of selecting trees to be tallied on the basis of their size rather than their frequency of occurrence. Information at each point was tallied using a 10 basal area factor (BAF) prism which is the industry standard in this part of the country. The resulting tree tally was used to compute basal area, mean stand diameters and number of trees per acre. Information about soils, operability, health, vigor, insect and disease issues, regeneration and wildlife habitat were gathered at each point as well as throughout the overall woodlot.

The collected field data was processed through a forest inventory computer program called NED-1 developed by the US Forest Service. All trees with a diameter at breast height (DBH) of 5" and greater were tallied and placed into two inch diameter classes.

FOREST MANAGEMENT UNITS
for the lands of the
HURRICANE WATERSHED
Town of Hartford
Windsor County, Vermont
Scale: 1"=600'



- LEGEND**
- Woods Road/Trail
 - Foot Bridge
 - Log Landing
 - Stone Wall
 - Wire Fence Line
 - Open Edge
 - Stone Foundation
 - Open Water/Reservoir
 - Seasonal Stream
 - Permanent Stream

CHART of ACRES

Forest Management Units (FMU's)	Acres
A	55.5
B	70.6
C	91.5
D	57.7
E	113.0
F	109.2
G	67.5
Total	565.0



Technical Descriptions and Prescriptions for FMU's

Forest Management Unit A: Red Oak/White Pine 55.5 acres

This unit is located along the southwestern edge of the Town Forest, west of the Class IV section of Reservoir Road. Compiled, average forest statistics for this unit is as follows:

Site Class: 2

Access Distance: 0.4 miles

Inventory Points Sampled: 15

Age Class: Even-aged

Stand History: The unit was last commercially thinned during the winter 2005-2006. This scheduled activity included the salvage of about 8-10 acres which were damaged in a wind event during the Fall of 2004. Prior to this treatment, the area was thinned around 1988. Total volumes removed during the most recent treatment included: 71,135 bd. ft. sawlogs and 109.32 cords pulp/firewood with a gross stumpage receipt of \$12,284.59. Calvin Johnson and Sons, LP was the logging contractor and a forwarder was used to bring the trees from the stump to the log landing. The parking lot at the end of the Class III portion of the Reservoir Road was used as a log landing/loading site.

Topography and Access: This unit is found on gentle to moderate slopes with soils that are generally well drained and suitable for management purposes. A small wetland is located at the north end of this unit and will be excluded from all future management activities with buffers as previously indicated. Forest products have been/will be removed from the stump and transported to the log landing via routes that pass substantially south of the Upper Reservoir and onto the Reservoir Road. Other than the care needed to protect the sensitive wetlands and the potential conflicts with recreational users here, there are no other limitations or concerns regarding forest management in this unit.

Primary Species Composition: Red oak, white pine, red maple, beech, white ash, poplar, hemlock and sugar maple.

Total Basal Area (BA): 106 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 75 sq ft/ac.

Mean Stand Diameter (MSD): 9.8"

Crown Closure: 60% to 90%

Trees Per Acre: 282

Total Tree Heights: 80'-100'

Stand Age: 90+ years

Cutting Cycle: 22 years

Stocking Level: Adequately stocked (B line). The stocking chart used was from “A Silvicultural Guide for Northern Hardwood Types in the Northeast” mixedwood chart.

Wildlife Considerations: White pine does not provide the best overhead protective cover for animals. Food, in the form of browse, is available from the established regeneration and water is available from the wetland, springs and streams (both seasonal and permanent).

Recommended Wildlife Activities:

1. Release large red oak to increase hard mast production.
2. Create 3-5 small patch openings (0.1-0.2 acres each) during the next commercial entry to add layers of dense regeneration for browse and cover.

Insect and Disease: None affecting management.

Regeneration: Very well established. The regeneration is comprised primarily of shade tolerant hardwood ranging in height from 4' to 20'.

Slope: 3% to 10%+

Aspect: Southeast

Scheduled Treatment and Prescription: 2029-2030. An improvement thinning/harvest will be scheduled. This thinning will focus on the further development of a healthy and valuable stand of trees. This treatment will reduce stocking levels back to B line stocking or about 110 sq/ft/ac..

Re-evaluation of Unit: 2019

Forest Management Unit B: White Pine/Hardwood 70.6 acres

This unit is found straddling the Class IV portion of the Reservoir Road at the south end of the Town Forest. Neal's Hill lies at the northern edge of this unit near the southeastern boundary of the Town Forest.

Site Class: 1 and 2

Access Distance: 0.4 miles

Inventory Points Sampled: 21

Age Class: Even-aged

Stand History: The unit was last commercially thinned during the winter 2007-2008. Prior to this treatment, the area was thinned around 1990. Total volumes removed during the most recent treatment included: 122,447 bd. ft. sawlogs and 252.73 cords pulp/firewood with a gross stumpage receipt of \$23,514.94. Calvin Johnson and Sons, LP was the logging contractor and a forwarder was used to bring the trees from the stump to the log landing. As with Unit A, the parking lot at the end of the Class III portion of the Reservoir Road was used as a log landing/loading site.

Topography and Access: This unit is found on gentle to moderate slopes with soils that are generally well drained and suitable for management purposes. A vernal pool, a mapped wetland and scattered small wet areas scattered toward the south end of this unit and will be excluded from all future management activities with buffers established around each. Forest products will be removed from the stump and transported to the log landing via routes that utilize portions of the Reservoir Road and the Wright Farm Trail. Other than the care needed to protect the sensitive wetlands and the potential conflicts with recreational users here, there are no other limitations or concerns regarding forest management in this unit.

Primary Species Composition: White pine, red maple, red oak, beech, poplar, white birch, sugar maple and hemlock.

Total Basal Area (BA): 122 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 69 sq ft/ac.

Mean Stand Diameter (MSD): 8.5"

Crown Closure: 60% to 80%

Trees Per Acre: 319

Total Tree Heights: 80'-100'

Stand Age: 90+ years

Cutting Cycle: 22 years

Stocking Level: Adequately stocked (B line). The stocking chart used was from “A Silvicultural Guide for Northern Hardwood Types in the Northeast” mixedwood chart.

Wildlife Considerations: This area contains very desirable features that provide for the habitat needs of large and small upland mammals, birds, and reptiles and amphibians. Populations noted here were strong and there is substantial indication of deer browsing impacts on the lower regeneration. Though not mapped by the VT Fish and Wildlife Department as a deer wintering area, it is very likely small numbers of deer use that area for that purpose.

Recommended Wildlife Activities:

1. Release large red oak to increase hard mast production.
2. Create 5-6 small patch openings (0.1-0.2 acres each) during the next commercial entry to add layers of dense regeneration for browse and cover.

Insect and Disease: None affecting management.

Regeneration: Very well established. The regeneration is comprised primarily of shade tolerant hardwood, hemlock and white pine ranging in height from 4’ to 20’. Deer browsing impacts on hardwood and hemlock are evident.

Slope: 3% to 20%+

Aspect: Southeast

Scheduled Treatment and Prescription: 2033-2034. An improvement thinning/harvest will be scheduled. This thinning will focus on the further development of a healthy and valuable stand of trees. This treatment will reduce stocking levels back to B line stocking or about 120 sq/ft/ac..

Re-evaluation of Unit: 2019

Forest Management Unit C: White Pine/Hemlock/Hardwood 91.5 acres

This unit lies directly north of FMU B and also straddles the Class IV portion of the Reservoir Road. The unit contains Upper Reservoir and the Marston Farm foundation. The Reservoir Road, the stream flowing from the Upper Reservoir and the Simonds Way trail make up the northern boundary of this unit. Four small wildlife openings are found here, south and southeast of the Marston homestead. As with Units A and B, the parking lot at the end of the Reservoir Road will serve as the log landing site for this unit.

Site Class: 1 and 2

Access Distance: 0.3 miles

Inventory Points Sampled: 18

Age Class: Even-aged

Stand History: Portions of this unit were treated commercially during the harvests that occurred within the Town Forest around 1985-1992. Steeper slopes down toward the stream that parallels Simonds Way were left untreated.

Topography and Access: This is one of the steeper units within the Forest. Slopes here range from quite gentle around the Upper Reservoir to quite steep on the north facing slope north of Neal's Hill. Soils are generally well drained and suitable for management purposes however several sections of wet soils can be found at the foot of the slope near the stream and along the seasonal stream that feeds into the Upper Reservoir. These areas will be excluded from management and buffered as previously indicated. The Class IV section of the Reservoir Road will be used as an access route for almost all of the wood product removals coming from this unit. Trees from a small section of forest found north of the reservoir will be hauled east and onto the Reservoir Road at the parking lot/log landing.

Primary Species Composition: White pine, hemlock, red maple, beech, red oak, white ash, white birch and sugar maple.

Total Basal Area (BA): 148 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 90 sq ft/ac.

Mean Stand Diameter (MSD): 10.3"

Crown Closure: 80% to 100%

Trees Per Acre: 259

Total Tree Heights: 70'-100'

Stand Age: 100+ years

Cutting Cycle: 22 years

Stocking Level: Well stocked (mid A-B line). The stocking chart used was from “A Silvicultural Guide for Northern Hardwood Types in the Northeast” mixedwood chart.

Wildlife Considerations: This is an excellent wildlife area which provides a wide range of habitat conditions and features. The open grass land around the Upper Reservoir provides a unique semi-aquatic ecosystem so important to many species. The small woodland openings found southeast of the Marston homestead provide insect feeding grounds for turkey and grouse chicks with readily available escape cover. Large, dominant red oaks provide seasonal acorn crops for deer, gray squirrel, turkey and others. The stream at the north edge of the unit creates a niche for aquatic insects, amphibians and reptiles as well as small mammals like weasels, mink and fisher who feed notable within these ecosystems.

Recommended Wildlife Activities:

1. Release large red oak to increase hard mast production.
2. Expand and or create 3-5 additional small patch openings.
3. Protect all wetland features with appropriate buffers.

Insect and Disease: None affecting management.

Regeneration: Variable, ranging from sparse on the north slopes of Neal’s Hill down to the stream to abundant within areas that were thinned about 20 years ago. The regeneration is comprised primarily of shade tolerant hardwood and white pine ranging in height from 4’ to 30’.

Slope: 3% to 30%+

Aspect: Variable-southeast and north

Scheduled Treatment and Prescription: 2010-2011. An improvement thinning/harvest will be scheduled. This thinning will focus on the removal of scattered mature pines and low quality hardwoods. Hemlock will generally be retained for its wildlife cover attributes. Large red oak will be retained at a rate of at least 5-8 trees per acre for wildlife food purposes and to help establish future red oak replacements. This treatment will reduce stocking levels back to B line stocking or about 110 sq/ft/ac.. The steeper slopes north of Neal’s Hill will not be included in this project.

Re-evaluation of Unit: 2019

Forest Management Unit D: White Pine/Red Oak 57.7 acres

This relatively small unit is located just north of the parking lot at the end of Reservoir Road within the Town Forest. The stream that flows into and through the Lower Reservoir represents the northern edge of this unit while the Class III portion of Reservoir Road represents the western boundary. Simonds Way trail represents the southern boundary. The unit is represented by gentle slopes that were undoubtedly part of an active community 120 years ago. The parking lot/log landing at the end of the Reservoir Road is located within this unit.

Site Class: 1 and 2

Access Distance: 0.2 miles

Inventory Points Sampled: 12

Age Class: Two-aged

Stand History: The unit was commercially thinned/harvested during the late 1980's to early 1990's. There was no evidence to suggest that trees were harvested here prior to that time. This area was probably at the southern end of the Pease farm in the late 1800's.

Topography and Access: This unit is found on very gentle to moderate slopes with soils that are generally well drained and suitable for management and recreation purposes. Access to the log landing for the removal of wood products will be easy as trails and topography are favorable. Wetland buffers will be established along the southern edge of the Lower Reservoir as well as along the streams that bound this unit on the north and south.

Primary Species Composition: White pine, red oak, red maple, white ash, poplar, hemlock black cherry, beech and sugar maple.

Total Basal Area (BA): 129 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 82 sq ft/ac.

Mean Stand Diameter (MSD): 8.5"

Crown Closure: 80% to 90%

Trees Per Acre: 242

Total Tree Heights: 80'-100'

Stand Age: 90+ years

Cutting Cycle: 22 years

Stocking Level: Adequately stocked (just above B line). The stocking chart used was from "A Silvicultural Guide for Northern Hardwood Types in the Northeast" mixedwood chart.

Wildlife Considerations: Wildlife habitat attributes are varied and of good quality here. Topography, vegetative diversity and proximity to several water features make this a very desirable forest for many species.

Recommended Wildlife Activities:

1. Release large red oak to increase hard mast production.
2. Create 2-3 small wildlife openings within this unit as part of future timber harvesting projects. Each opening should be 0.2-0.3 acres in size and located in such a way that a dominant red oak tree lies along its northern edge.

Insect and Disease: None affecting management.

Regeneration: Very well established. The regeneration is comprised primarily of shade tolerant hardwood ranging in height from 5' to 20'.

Slope: 0% to 15%+

Aspect: Northeast

Scheduled Treatment and Prescription: 2017-2018. An improvement thinning/harvest will be scheduled using single tree and small group selection techniques. This thinning will focus on the further development of a healthy and valuable stand of trees. The treatment will reduce stocking levels back toward B line stocking or about 110-115 sq/ft/ac. by removing scattered mature pine sawlogs and lower quality hardwoods. Small amounts of mature red oak will be removed while retaining large, healthy mast trees for wildlife purposes. 2-3 small openings should be created to help establish vegetative diversity within the unit.

Re-evaluation of Unit: 2019

Forest Management Unit E: White Pine/Hardwood 113.0 acres

Unit E is found in the northernmost portion of the Town Forest block. It is also the largest single management unit within the Watershed. It is bounded on the west by the Reservoir Road, the east by the boundary line with the Wildlife Refuge and the south by Unit D. The Lower Reservoir falls within this unit and is located at the southern edge. Two small wet areas and at least two seasonal streams are found here and feed both the reservoir and the stream that exits the reservoir. All of these important wetland features will be protected during future management activities. The decommissioned FAA tower site falls along the eastern edge of this unit at an elevation of about 1,250 feet.

Site Class: 1 and 2

Access Distance: 0.3 miles

Inventory Points Sampled: 30

Age Class: Two-aged

Stand History: As with the other units, this area was included in the harvesting project completed around 1985-1990. Prior to that time, the forest provided a protective buffer to the Lower Reservoir and was probably not managed for the purposes of timber production. The forest here was established naturally after agricultural abandonment in the late 1800's.

Topography and Access: This unit is located on a large broad bench at the north end of a ridgeline and the Town Forest. Soils are generally well drained and suitable for management purposes. Several small wet areas and seasonal streams drain southward into the Lower Reservoir. Trails are abundant and well suited for forest management purposes. At the time of future harvesting operations, trees will be hauled to the old FAA site clearing which will additionally be used as a log landing site for Unit F.

Primary Species Composition: White pine, red maple, beech, white ash, poplar, red oak, hemlock and sugar maple.

Total Basal Area (BA): 127 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 63 sq ft/ac.

Mean Stand Diameter (MSD): 9.7"

Crown Closure: 80% to 100%

Trees Per Acre: 253

Total Tree Heights: 70'-90'

Stand Age: 100+ years

Cutting Cycle: 22 years

Stocking Level: Well stocked (mid A-B line). The stocking chart used was from “A Silvicultural Guide for Northern Hardwood Types in the Northeast” mixedwood chart.

Wildlife Considerations: The wildlife habitat benefits here are numerous. Regeneration levels are dense and well established which provides cover and food for many species. Interspersed wet areas in close proximity to seasonal and permanent streams and the grassy conditions within the open area around the Lower Reservoir, make for ideal conditions for fawns, black bear, mink, weasels, fox and coyote.

Recommended Wildlife Activities:

1. Create 5-7 small patch openings during the next commercial entry to add layers of dense regeneration for browse and cover. Locate as to take advantage of existing patches of dense regeneration or proximity to mast trees.
2. Protect all water resources through the establishment of appropriate buffers.

Insect and Disease: None affecting management.

Regeneration: Very well established in most areas. The regeneration is comprised primarily of shade tolerant hardwood ranging in height from 4' to 20'. The impacts of winter deer browsing are apparent here.

Slope: 3% to 18%+

Aspect: North/northwest

Scheduled Treatment and Prescription: 2025-2026. An improvement thinning/harvest will be scheduled. The objective of treatment here will be the improvement of growth rates of the better stems, establish/release regeneration for wildlife and forest replacement and create patch openings for improved wildlife habitat diversity. Resulting stocking levels after treatment should be around 110-115 sq/ft/ac..

Re-evaluation of Unit: 2019

Forest Management Unit F: Hardwood/White Pine/Hemlock 109.2 acres

Unit F is the westernmost management unit within the Wildlife Refuge and the second largest unit within the Watershed. This is part of the land that was gifted to the Town in 1974 by Winsor and Bertha Brown with deed restrictions specific to forest management. The deed states, among other things, that: “clearcutting of wood and timber on the tract will be forever prohibited, but selective cutting and marketing of mature lumber and trash trees under the direction of the State Forester will be permitted”. Other than the occasional removal of hazard trees or trees cut for trail construction and maintenance, no forest management activities have been conducted since the town acquisition. A stream originates near the Hubbard farm homestead and flows generally parallel to the Kings Highway down to Wright Reservoir. This stream represents about the only water feature found within this unit. The FAA tower site and the access road to the site also are found within this unit. Several stone wall sections bear evidence to the agricultural history of this area.

Site Class: 2

Access Distance: 0.3 miles

Inventory Points Sampled: 32

Age Class: Even-aged

Stand History: There was no evidence noted during the field examination of this unit to suggest that forest management practices have been implemented here for at least 40 years. No cut stumps or remnants of logging roads were found. Since its abandonment for farming, it appears that this forest has developed naturally.

Topography and Access: This unit is found on moderate to fairly steep slopes on soils that are generally well drained and suitable for recreation and wildlife management purposes. Timber products will not be harvested here as per management policies established in 2011.

Primary Species Composition: Red and sugar maple, beech, white pine, white ash, poplar, and hemlock.

Total Basal Area (BA): 149 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 103 sq ft/ac.

Mean Stand Diameter (MSD): 8.7”

Crown Closure: 90% to 100%

Trees Per Acre: 312

Total Tree Heights: 70’-80’

Stand Age: 90+ years

Cutting Cycle: Not applicable

Stocking Level: Well stocked (approaching A line). The stocking chart used was from “A Silvicultural Guide for Northern Hardwood Types in the Northeast” mixedwood chart.

Wildlife Considerations: This is a diverse management unit with dense pockets of young hemlock interspersed with large mature hardwoods and pine. This diversity of habitats is great for most species. If this area has a habitat shortcoming, it would be with the fact that there is not an abundance of young, dense regeneration. Low cover is scattered and generally sparse. This is a direct result of no timber harvesting here in the recent past. Large, even-aged crowns effectively block out the sun that typically reaches the forest floor and precludes the establishment of useful regeneration.

Recommended Wildlife Activities:

1. Release large red oak to increase hard mast production through non-commercial removals of competing stems.
2. Protect wetland riparian corridors through the establishment of appropriate buffers where recreational activities are minimized.

Insect and Disease: None affecting management.

Regeneration: Sparse to barely adequate. The regeneration is comprised primarily of shade tolerant hardwood ranging in height from 4' to 8'.

Slope: 5% to 30%+

Aspect: East/southeast

Scheduled Treatment and Prescription: No timber management activities are scheduled within this management unit for the anticipated future. Natural ecosystem development will be encouraged.

Re-evaluation of Unit: 2019

Forest Management Unit G: White Pine/Hardwood 67.5 acres

Unit G is a rather special management in that it contains Wright Reservoir and probably the highest density of recreational users within the Watershed. It is located at the extreme eastern end of the Wildlife Refuge and is accessed primarily via the Wright Reservoir Road. Most of the unit is part of the Brown gift to the town of 1974. The lowest elevations within the Watershed are found here at about 700 feet above sea level along the eastern boundary below the Wright Reservoir dam. A large, mapped wetland lies straddling the southern boundary line and a permanent stream bisects the unit.

Site Class: 1

Access Distance: 0.2 miles

Inventory Points Sampled: 18

Age Class: Even-aged

Stand History: As with Unit F, there is no evidence to suggest past timber harvesting occurred here. Stone walls, wire fences and relatively smooth ground surfaces suggest that this entire area was once part of a larger agricultural unit. After the reservoir was constructed around 1900, the forest component was probably considered a protective buffer rather than a manageable resource. Exotic invasive plants (barberry, honeysuckle and buckthorn) are beginning to become established in the proximity of the reservoir and some minor efforts have been made to control them.

Topography and Access: This unit is found on gentle to moderate slopes with soils that are generally well drained. Recreational trails are abundant within this unit. Timber products will not be managed or harvested here as per management policies established in 2011.

Primary Species Composition: White pine, red oak, red maple, white ash, poplar, hemlock and sugar maple.

Total Basal Area (BA): 157 sq ft/ac.

Acceptable Growing Stock (AGS) Basal Area: 88 sq ft/ac.

Mean Stand Diameter (MSD): 10.7"

Crown Closure: 80% to 100%

Trees Per Acre: 250

Total Tree Heights: 80'-100'

Stand Age: 100+ years

Cutting Cycle: Not applicable

Stocking Level: Well stocked (approaching A line). The stocking chart used was from “A Silvicultural Guide for Northern Hardwood Types in the Northeast” mixedwood chart.

Wildlife Considerations: This area is called a Wildlife Refuge and as such should provide desirable habitats for numerous species. At present, the conditions here could be rated good, but clearly they could be better. The lack of timber harvesting here for so many decades has resulted in a scarcity of good, dense, young regeneration. This missing feature would provide improved habitat conditions to serve as both cover and food for many species. In addition to habitat limitations, there is the issue of people conflicts and good habitat conditions. In general, wildlife prefer areas where their contact with humans is low. The intense recreational use of this area seems to suggest a conflict with the goal of creating good habitats for wildlife. To date, it does not appear that the level has been reached where wildlife abandon their use of the area. Management policies in the future might keep that in mind and recognize that there might come a point where wildlife populations diminish, despite favorable vegetative conditions.

Recommended Wildlife Activities:

1. Release large red oak to increase hard mast production using non-commercial, drop-and-lop techniques.
2. Monitor and begin controls of the exotic-invasive plant community here.

Insect and Disease: None affecting management.

Regeneration: Generally sparse to light. Present regeneration is limited to shade tolerant hardwood and some scattered white pine. Areas of invasive plant establishment may hamper the development of desirable regeneration in the future.

Slope: 3% to 10%+

Aspect: Southeast

Scheduled Treatment and Prescription: No commercial timber management activities are scheduled for this unit in the future as a result of timber management policies adopted in 2011. Natural ecosystem development will be encouraged.

Re-evaluation of Unit: 2019

Timber Management - Harvest Summary Calendar

<u>Activity Year</u>	<u>Management Unit</u>
2005-2006	A
2007-2008	B
2013-2014	C
2017-2018	D
2021-2022	E
2026-2027	A
2030-2031	B
2035-2036	C

Recreational Resources

The recreational uses and management recommendations are outlined in the Town Forest Recreation Management Plan or through the Hartford Parks and Recreation Department. No further recommendations are included in this document beyond what has been previously stated.

Boundary Lines

As mentioned earlier, the property was surveyed in 1982 by Hathorn Surveys. All boundary lines were blazed and painted after the completion of that survey, presumably by the same surveyor.

The boundary lines around the entire Watershed property are in reasonably good condition at this time. Blazes were last painted by Harwood Forestry Services in 2001. An appropriate boundary line maintenance schedule involves re-painting at about ten year intervals. Using that criterion, all lines should be re-painted around 2011. This maintenance operation involves the locating of old blazes and painting them with a visible (usually red or orange) specialized boundary paint. Standard procedures and marking protocol should be used when re-painting lines so as to conform to industry accepted methods. A forester or surveyor could be hired to complete the project or the work could be performed by town employees or volunteers. It is important to use appropriate paint and methods, so employees or volunteers should be trained before beginning.

Future boundary line maintenance should be scheduled at about ten year intervals to ensure that boundary evidence remains clear and abutting landowners are aware of town owned lands. Consideration should be given to purchasing specialized plastic placards that could be attached to trees along the boundary line identifying town owned property.

Roads/Trails

Past timber management within the property over the last 20+ years and roads used for maintaining the water system infrastructure prior to that, has resulted in a substantial internal network of roads and trails here. Many have been developed and maintained through use by hikers, volunteers, conservation commission activities or by town employees.

Road and trail use will be for both recreational and management purposes, coordinated to the extent practical. The location of timber management access trails will be carefully designed to provide for multiple uses in most cases. Log landings need to be accessible by large trucks so it stands to reason that the future use of these specialized sites should double as recreational

parking areas. When topography and vegetation allow, secondary harvesting routes will cross existing recreational trails rather than follow them. This should reduce the overall impact on the recreational trail network.

Every effort will be made to coordinate the harvesting needs/impacts with the users of those areas at that time. For example, temporary snowmobile routes may need to be established as their use occurs fully with the time period scheduled for timber harvesting operations. Proper signage on roads and trails will be important during scheduled harvesting operations to reduce the chance of conflict and injury.

Wildlife Habitats

Wildlife habitats will be strongly considered and where appropriate, the Town Forest and the Wildlife Refuge will be managed to enhance habitats for wildlife. Many wildlife species benefit from a diversity of vegetative conditions. When a variety of native plant species and sizes are available, many wildlife species can find their preferred habitats and successfully reproduce. Uneven-aged forest management generally meets this goal because managers must consider regeneration with every treatment to eventually create a mixture of species of all ages. However, many species need specific habitats (for example, semi-open shrub/scrub for nesting chestnut-sided warblers or dense saplings where grouse chicks can graze safely from raptors). These habitats cannot be created using the “single-tree selection” version of uneven-aged management. Uneven-aged management on the Town Forest will include “group selection” and “patch cuts” to create some of these even-aged habitats. Since the update of the Forest Resource Management Plan in 1998, several small patch cuts (less than 0.5 acres each) have been established within the Town Forest. This method also shall be thoughtfully and carefully implemented within the Wildlife Refuge using non-commercial techniques under the guidance of a Vermont State Forester.

Large, dominant oak trees will be “released” from competition by removing lesser trees around them. This will allow for crown expansion and increase acorn (hard mast) production. All wetlands, wet areas and vernal pools will be protected through the establishment of untreated buffer zones of 75 feet in order to retain viable travel corridors and protect sensitive habitats.

Water Resources

Water is a very dominant and important resource feature here. The development and subsequent use of three domestic water reservoirs is testament to the historic importance of water in this property. The dominant water features have been identified and mapped and include three reservoirs, on vernal pool, several small wet areas, three wetlands, several seasonal streams and three permanent streams.

All of these water features will be protected during future forest management activities through the implementation of guidelines established by the VT Forests, Parks and Recreation Department in a publication entitled "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont". Though these guidelines are provided as "recommendations" for private landowners, they will be considered "minimum" and "required" practices on the Watershed.

Unmanaged buffer strips with a minimum width of 75 feet will be established around all identified water features. Reduced harvesting intensities will be implemented within the area of 75-100 feet from these features.

Water crossings are occasionally required in order to access certain areas for timber management or recreational purposes. When it is absolutely necessary to cross either a seasonal or permanent stream, appropriately designed structures will be used to ensure the protection of water quality. Examples of such structures include bridges (permanent or temporary), culverts or pole fords. As previously indicated, timber harvesting activities will be limited to frozen ground, winter conditions. That alone will go a long way toward protecting water quality as the ground is frozen, soil stability is better and crossings are much less sensitive.

Wet areas, wetlands, vernal pools and open water (reservoirs) are not to be crossed under any circumstance for either timber management or recreational purposes. The above stated buffer requirements pertain to these features as well as streams.

The structural integrity of the dams on all three reservoirs has been of great concern for several decades. Various agencies and firms have conducted periodic examinations and studies to evaluate these structures and make related recommendations. All of these studies concluded that the dams were no longer adequate and that at least in some cases, catastrophic failure was a possibility. Impounded water within the Upper and Lower Reservoirs has been released through carefully designed openings in both dam structures. Wright Reservoir remains at near-full water level.

In 2008, the engineering firm of Dubois and King from Randolph, VT presented a design package outlining options for the safe management of all three reservoirs. Options ranged from complete removal of the water features (no remaining impounded water) to full restoration of the dam structures and a return to full water conditions. The Town officials have reviewed these options and have begun work on the Upper Reservoir as of this writing.

Exotic/Invasive Plants

Bush honeysuckle, Oriental barberry and common buckthorn have become established within the Watershed properties. The most notable concentration is around the area of Wright Reservoir on the Wildlife Refuge. Minimal efforts have been started to reduce their numbers here.

Accelerated efforts should begin immediately to control these plants before their numbers reach the point where control is unlikely. It will also be very important to carefully monitor this property in the coming years and to be vigilant for the eventual presence of other species of noxious plants as they are definitely in the neighborhood. Control begins with prevention!

Natural and human disturbances to a site often prepare it for the establishment of regeneration. These disturbances are necessary for the establishment of new native plant communities and an increase in biodiversity. However, because of the rapid growth, large seed production and lack of natural controls, the non-native species are often able to exploit the disturbance more easily than the native plant communities. Therefore, minimize site disturbances where practical.

Early detection and control of invasive plants is the best way to prevent their overwhelming establishment across a newly disturbed site. Monitoring should become a routine practice for landowners and land managers while walking in the woods. When monitoring, be aware of likely sites of invasion such as roadsides, trailheads, logging sites, open land and water edges, sites in close proximity to where the plants have established themselves and areas which attract birds and other animals.

Preventing and limiting establishment of these invasive plants depends on early detection and control in combination with limiting disturbances that create a situation beneficial to their establishment. Depending on the situation, controlling these plants may be accomplished by volunteers or by professional, licensed specialists. The scope of eradication efforts will be determined by budgets, manpower and time. Prioritization of efforts will be required.

Controlling the non-native and/or invasive species may be accomplished by a number of methods. Mechanical control is the most commonly used method. This involves the repeated cutting and/or pulling of the invasive plant. This method can be successful but is labor intensive, and if pulling is involved, any roots left in the ground may sprout (species dependent) potentially increasing the number of clones. If cutting/mowing is used, time of year is an important factor. Generally, cutting in the spring just as the plants begin to leaf out is most effective. Subsequent cutting throughout the summer will further deplete the roots of their ability to re-sprout.

FOREST MANAGEMENT SCHEDULE

2010-2011		Locate and paint boundary lines.
	FMU G	Begin controlling exotic invasive plants.
2013-2014	FMU C	Improvement thinning/harvest
	FMU G	Identify and remove hazard trees.
2017-2018	FMU D	Improvement thinning/harvest.
2019		Update Forest Resource Management Plan
2021-2022	FMU E	Improvement thinning/harvest. Locate and paint all boundary lines.
2026-2027	FMU A	Improvement thinning/harvest.
2030-2031	FMU B	Improvement thinning/harvest.
2035-2036	FMU C	Improvement thinning/harvest.