Tug Hill Tomorrow Land Trust
Strategic Land Conservation Plan

TUG HILL TOMORROW LAND TRUST

Cornell University

City and Regional Planning
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Acknowledgements

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Cornell University
College of Architecture,
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Foreword

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Dear Friends:

The City and Regional Planning Department at Cornell University has helped nonprofit organizations overcome planning challenges with technical assistance provided in client-based workshops. Over the Fall semester of 2006, 13 graduate students undertook the task of creating a Strategic Land Conservation Plan for Tug Hill Tomorrow Land Trust (THTLT), based in Watertown, NY. Incorporated in 1991 by a group of local citizens, THTLT's mission is to retain the special character of the region – its forests, farms, recreation and wild lands – through voluntary private land protection, education and research. We recognized the value of this mission statement by building a series of inventories of important conservation resources linked to it. By examining these inventories a vision for "conservation infrastructure" was created featuring recreation corridors, river corridors and wildlife areas. This vision offers a grand picture of Tug Hill's future as a region and can be achieved by working in partnership with other stakeholders.

Covering over 1.3 million acres, the Tug Hill plateau is a very large territory for a land trust with a small staff. We designed decision aiding tools to help the land trust make good choices about what land conservation projects to undertake. One of the primary tools that we have tested for THTLT is focus areas - high priority regional landscapes that land trust decision makers use to guide their conservation activities. In an earlier planning effort, THTLT had proposed five focus areas and we have tested these areas for their value in achieving goals articulated in the organization's mission statement. We found that the proposed focus areas were successful in identifying the most important areas for conservation on Tug Hill. With the aid of a computer model, we have identified 50,000 acres, or 23%, of land within the focus areas that are of highest priority. As the land trust will continue to consider projects outside of its focus areas too, we have created a computer model that evaluates the entire region of Tug Hill, providing land trust decision makers with a triage tool to help sort projects and use their limited resources wisely.

Even with focus areas and computer models, it is clear that the scale of land conservation activities facing THTLT is beyond its capacity to execute by relying on conservation easements alone. Recognizing this reality, we offer a variety of alternative approaches that THTLT can use in partnership with local communities and other organizations to implement the proposed plan. By working together in a planning framework we can achieve great things. The formation of THTLT, the success of the land trust to date, and the success of other planning initiatives, such as the Tug Hill Commission, gives us reason to be optimistic that this plan will succeed.

Ole M. Amundsen III, Visiting Lecturer
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Table of Contents

Photo: Chelsey Norton

Introduction

The Tug Hill Region encompasses 2,100 square miles of land between Lake Ontario and the Adirondack Mountains in Upstate New York (Map 1.1). Rising west from the Great Lakes, the land, formed by glaciers, ascends 2000 feet over 100 miles before falling to the Black River.[1] The ice sheet left behind soil consisting of fine silts, clay, sand, and rock which were carved to create the many gorges, locally known as gulfs. The region includes 41 municipalities in portions of Jefferson, Lewis, Oneida, and Oswego Counties. The natural landscape and relative isolation of the area define Tug Hill. The more densely populated towns in the outer ring of Tug Hill encircle a 150,000 acre hardwood forest known for its wildlife, timber production, and recreational opportunities. The area is dotted with country hamlets and farms, and the entire region is celebrated for its natural features and the hard-working lifestyle of long-time residents.

History

Prior to the 1700's, the Iroquois inhabited the region. Little is known about their use of Tug Hill, but given the harsh winters, it is likely the region was occupied cyclically, rather than year-round. Until European settlers arrived in the region, the Iroquois lived peacefully with neighboring tribes. After the American Revolution, lands were taken from the Iroquois and sold in vast tracts.[2] William Constable, a colonial land speculator, was able to purchase nearly 4 million acres, an area including all of Jefferson, Lewis, and Oswego Counties.[3] Constable marketed the land to New Englanders and immigrants arriving from Europe, and donated 10,500 acres to be used for roads, canals, and other public improvements to aid development in the region.[4]

Settlement in Tug Hill soared by the mid-1800's as a result of the inexpensive land. As more settlers arrived, they cleared trees to create farms. Just as the Erie Canal provided transportation for food harvested in central and western New York, the Black River Canal offered a commercial outlet for Tug Hill. Winter oats, Indian corn, hops, and apples were transported south to feed New York City's growing population. Following the canal, railroads branched out of the core areas to move timber products lumbered at the sawmills. The railroads created new towns and new sources of jobs.

In the late 1800's, Tug Hill and the Adirondacks became the center of New York State's logging industry as timber-based businesses, including sawmills, pulp and paper industries, and furniture manufacturing concentrated in the area.[5]

Population rose sharply to 80,000 by 1870 as workers were attracted to such industries as logging, shipping natural resources, dairy, and paper mills (Figure 1.1 in Technical Appendix). After 1870, the new shift in population was a result of farmers leaving the region due to the poorly yielding soils, rugged terrain, and harsh climate. Despite these challenges, and in tribute to the hardworking lifestyle of residents, the forest and dairy industries continue to have a large economic and cultural presence in the region.

Agriculture

Tug Hill's diverse farming and agricultural economy consists of a variety of products including dairy produce, maple sugar, and firewood. Jefferson, Lewis, Oneida and Oswego Counties are all major producers of crops and livestock. In 2004, these counties received 11% of the cash receipts for livestock and 6% for all crops in New York State.[6] The Tug Hill Region is known for agricultural goods and the Tug Hill counties are often awarded for the quantity and quality of their crops, livestock, and dairy products (Figure 1.2 in Technical Appendix). Dairy farming dominates the landscape; many crops are grown solely for dairy cattle feed. Despite the success of local farmers, Tug Hill still mirrors the national trend as larger outfits continue to replace smaller farms.[7] From 1987 to 1997 farming acreage in Jefferson, Oswego, and Oneida Counties continued to decrease.[8] In an effort to improve the health of the farming industry, agricultural districts were created in 1971 to offer farmers and communities needed economic incentives. By 2000, Jefferson, Oswego, and Oneida Counties had all started to restore lost farming acreage. On Tug Hill, farms subsist adjacent to wild and natural habitats. Despite recent successes, the farming industries in Tug Hill must actively coexist with the wild and natural habitat of the core area that has come to define the Tug Hill Region.

All-Terrain Vehicles (ATVs)

While Tug Hill's undeveloped core and extensive trail and logging road networks benefit the local economies and provide recreation opportunities, the increasing popularity of ATVs throughout the state has caused some concern in Tug Hill, especially given the desire of many residents to enhance and maintain area trails. The recent increase in ATV purchases in New York State, coupled with the increase of ATV clubs, fuels these concerns. In response, the Cooperative Tug Hill Council commissioned Camoin Associates to conduct an economic and fiscal impact assessment of ATV activity in Tug Hill. The total direct impact in sales for local businesses is $23.1 million, which provides employment to 564 people, who earn $7.9 million in wages. According to the report, the indirect and induced impacts of ATV use increased sales by $12.2 million, supporting employment for 137 individuals who earn wages of $3.5 million. The quantifiable government revenue from sales, occupancy, and property taxes is approximately $1.49 million. Report writers project that if a 40-mile trail is developed and users are charged a $25 annual fee, then there would still be a potential cash-shortfall of $273,000 for a public trail system, a $245,000 subsidy would be required for a public-private trail, and $120,000 would have to be raised to create a private system. Therefore, a privately funded system would be the most cost-effective solution. Negative impacts of the trail system include sound pollution, environmental hazards, and inconvenience to others such as hikers and bikers. Such impacts are difficult to quantify, but could cost Tug Hill residents monetarily and otherwise.

Source: Camoin Associates. Tug Hill Region ATV Economic Impact Study. Cooperative Tug Hill Council, January 2006.

Recreation

Tug Hill is a tourist destination largely due to its proximity to the Great Lakes, the Adirondack Park, and the Thousand Islands vacation area. It receives more snow than any other region east of the Rocky Mountains. Over 200 inches of annual snowfall and over 55 inches of annual precipitation supply an abundance of wetlands, streams, and rivers. These water sources, in addition to the roadless core forest and state-managed parks, provide opportunities for a multitude of sports including snowmobiling, cross-country skiing, hiking, fishing, and hunting. In addition to these main activities, bird watching, nature study, bicycling, camping, canoeing, white water rafting, and theme trails also attract visitors.[9]

In 1989, the New York Statewide Comprehensive Outdoor Recreation Plan (SCORP) projected that recreation in Tug Hill would increase. Over the next 20 years, nature walking is predicted to increase by 10%, bicycling by 5%, fishing by 7%, day hiking by 9%, cross-country skiing by 10%, hunting by 12%, and snowmobiling by 2%.[10] Non-profit cooperative efforts like the Tug Hill Business Association and independent retail outlets, lodgings, and tour operators are preparing for the increasing demand for outdoor recreation, while towns and villages are voluntarily maintaining access for biking, cross-country skiing, and snowmobiling on state lands.[11] Public lands make up only 12%, or 154,200 acres, of Tug Hill, and are used heavily for recreation.

Land Ownership and Housing

While the private ownership of large land tracts on Tug Hill is a key factor in the preservation of its rural and remote character, these areas could still support recreation and tourism goals. Private owners and industrial landowners could allow access or lease rights to sporting groups. The Tug Hill Tomorrow Land Trust (THTLT) manages conservation easements that permit landowners to voluntarily sell or donate the development value of a farm or forest lands for tax relief.

Economic incentives are important conservation tools for both environmentalists and concerned residents in Tug Hill. While the average median household income increased from $27,000 to almost $36,000 from 1990 to 2000, the poverty level for the region is $31,534. Median household incomes in the Towns of Worth, Leyden, Harrisburg, and Williamstown all fall below the poverty line in the region. Although the nearby cities of Syracuse and Rome have slightly lower median household incomes at $25,935 and $33,643, respectively, Tug Hill remains one of the poorest contiguous regions in all of New York State.[12]

Like most of Upstate New York, Tug Hill residents enjoy a high home-ownership percentage with approximately 80% of housing being owner-occupied units.[13] One of the few spatial anomalies in home ownership rates exists at Fort Drum on the northern border of Tug Hill, where there are almost no owner-occupied residences in the Towns of Wilna,

Table 1.1: Winter Recreation on Tug Hill

Trails	***Snowmobiling***	***Snowshoeing***	***Cross-Country Skiing***	***Dog Sled Racing***	***Downhill Skiing***	***Trail Connections***
There are numerous trails in the Tug Hill Region used for cross-country skiing, snowmobiling, hiking and bicycling. There are presently several existing and proposed long-distance trails, which have the potential to serve as links to other areas and facilities.	In 1989, Tug Hill was the primary destination for over 5,000 registered snowmobilers. At least 25 local clubs have volunteers who develop and maintain 400 miles of state-designated trails and over 350 miles of secondary trails. In a survey, 16 out of 20 businesses reported a total of 30,000 snowmobiler patrons.	Snowshoeing allows visitors and residents access to some of the most beautiful and remote areas of the region including the icy rivers and gulfs. While helping visitors to appreciate the uniqueness of the area, snowshoeing requires no trail maintenance and has negligible impacts on the environment.	There are 225 miles of cross-country ski trails at 22 areas within Tug Hill. *The Tug Hill Tourathon* is an exciting 50-kilometer race that has become an annual event. This decade-old tradition has attracted as many as 600 participants. The region has the potential for long distance trails, which could connect lodging along the way. The majority of cross-country ski areas do not charge a fee.	Members of the Mohawk Valley Sled Dog Racing Association utilize the Little John Wildlife Management Area as a training area for dog sled racing, a sport that continues to grow in popularity across the country.	There are three downhill ski areas in the Tug Hill Region: Dryhill located in the City of Watertown, Snow Ridge in the Town of Turin, and Woods Valley in the Town of Western. In the future, these ski areas could attract more weekend skiers from area cities including Ottawa and New York City.	There are many existing recreation trails, with the potential to provide more economic, environmental and recreational benefits. These trails include the Black River Recreational Trail, the Salmon River Recreational Trail, the Cross-Tug Hill Ski Trail, the Snowmobile Corridor Trail Network, and the North Country Scenic Trail.

Source: Tug Hill Tomorrow Land Trust. (2006). Tug Hill Recreation Guide 6th Edition.

Philadelphia, Le Ray, and Antwerp. While there has been a marginal 8% increase in renter-occupied housing across the region between 1990 and 2000, there was an 18% jump in rental units in Rutland and a 20% increase in Watertown; both towns border Fort Drum. Overall, rental units represent 20% of the area's housing. The majority of renters remain in their unit for less than 10 years; however, there has been a substantial increase in renters remaining in their units for 20 to 30 years. Similarly, the number of homeowners living in their homes for 20 to 30 years increased 22% from 1990 to 2000.[14] This regional trend may be explained by the aging of the population, which mirrors national trends. While the stability provided by long-term housing and farmland tenure is a benefit, an increasing proportion of seniors living with limited monthly incomes could present a future economic challenge to the region.

Demographics and Employment

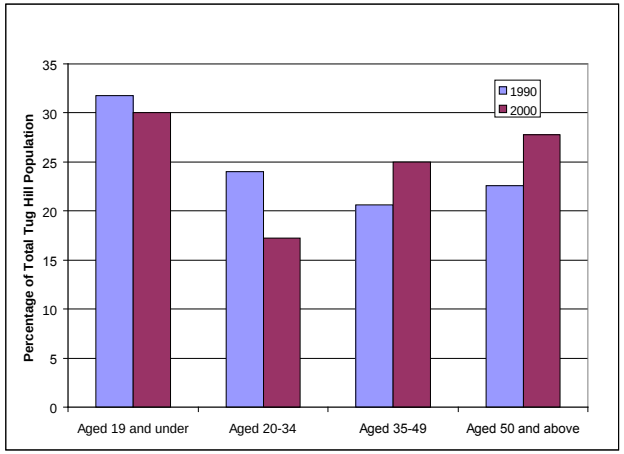
Aging Baby Boomers can partially account for the fact that 37% of the population is not part of the eligible workforce. Even as economic incentives make it easier for residents to help conserve land and regional character, the economy could worsen as the Tug Hill workforce continues to age. Tug Hill's population grew slightly from 1990 to 2000, from 101,849 to 104,298 residents.[15] Most of the population growth in the region is attributable to the increase in people age 50 and over (Figure 1.3). This cohort increased by 16% from 1990 to 2000. All four counties within Tug Hill displayed similar growth trends in the 50 and over age bracket. From 1990 to 2000, the 20 to 35 age group decreased by 25%. Overall, only Oswego County in southeast Tug Hill increased in population, whereas the other county populations decreased or had minimal change. Caucasians comprise the majority of the region's population in Tug Hill, totaling 95% in 2000. Minority populations continue to make up a small proportion of Tug Hill residents.[16]

The employment rate in Tug Hill remained static between 1990 and 2000 at 92%, with the unemployment rate decreasing from 7.9% to 6.2%.[17] While employment figures remain stable, many Tug Hill residents drive

increasingly longer distances to work. Long commutes are not a new phenomenon for Tug Hill. However, these drives may soon become a reason for current residents to leave. The number of people commuting an hour or more increased 28% percent between 1990 and 2000.[18]

While data has not shown significant rates of new home construction or in-migration of families, some towns have observed an increase in year-round home ownership on prime recreation land. These households often have children and commute long distances to work. School enrollment in Tug Hill, from nursery school to 12th grade, has remained stable from 1990 to 2000. The graduation rate of 80.3% is relatively similar to the national average. Only 13.3% of residents in Tug Hill have a bachelor's degree or higher, which is much lower than the 24.4% national average. This information suggests that many students complete their high school education, but few attend college or remain in Tug Hill after obtaining college degrees.[19]

Figure 1.3: Tug Hill Age Distribution by Cohort, 1990 and 2000



Source: Data Source: U.S. Census Bureau 1990 Summary Tape File 1 (SF 1) and 2000 Summary File 1 (SF 1)

Planning for the Future

Despite myriad recreational opportunities and the undeveloped nature of the region, challenges to the land and lifestyle persist. Whether due to the isolation, the beauty of the area, the residents' attachment to the land, or the threat of large-scale development, a group of farmers, residents, and politicians agreed they would need to work together to protect the Tug Hill cultural landscape and its special resources. Their work has led to unprecedented planning efforts.

Photo: Tug Hill Easement

Unlike the top-down Adirondack Park Agency, the state-mandated Temporary Tug Hill Commission began a participatory dialogue with the Tug Hill towns that led to the formation of a regional planning organization, the Cooperative Tug Hill Council. Leery of the highly centralized land controls in the Adirondacks, Tug Hill residents ensured that they would lead all efforts. However, the Tug Hill Commission (THC) continued to serve as an advisory board long after the original legislation intended. To date, the THC has been active in the region for more than thirty years.

During the 1970s, numerous stakeholders produced reports and management plans. While there were many challenges, the establishment of five more regional planning boards signifies a history of cooperation with the State Government and across town lines, industries and interests. Tug Hill cooperative planning boards are responsible for a rural development code, code enforcements, and inter-municipal agreements.[20] The success of non-profit conservation groups such as The Nature Conservancy (TNC) and regional organizations like THTLT are part of this conservation and planning legacy.

THTLT is a nonprofit organization founded in 1991 with the responsibility of protecting the Tug Hill Region's natural landscapes. THTLT works with private landowners in order to protect wild lands, forests, farms, and recreation areas. Conservation easements are the primary method of land protection for THTLT. The voluntary program protects significant natural resources, such as recreation areas, open space, agricultural lands, and ecologically rich areas. A conservation easement is the donation or sale of development rights of a property, either to a government agency or an appropriate non-profit organization, such as a land trust. Each ease-

ment is a unique contract negotiated by the landowner and the organization receiving the easement. Once an easement is created, the restrictions stay with the property in perpetuity, protecting the landscape for future generations.

By managing conservation easements, THTLT also supports the local economy. Since its founding in 1991, THTLT has worked with 22 landowners to permanently protect 3,250 acres in Tug Hill.[21] New tax code legislation offering property tax relief to landowners and farmers in exchange for the donation of conservation easements should increase the need for land trusts and lead to further conservation successes.[22]

The Nature Conservancy (TNC) is also an active participant in the Tug Hill Region and partner of THTLT. In 2002, TNC greatly increased their presence in the Tug Hill Region by purchasing approximately 45,000 acres from Hancock Timber for $9.1 million. This purchase was the largest TNC land acquisition in New York.[23] After this purchase, TNC worked with both the Federal and New York State Departments of Environmental Conservation (DEC and NYS DEC), the Tug Hill Commission, THTLT, and GMO Renewable Resources of Boston to conserve the land tract while ensuring that the area remained an economic resource for Tug Hill's core towns. TNC retained 14,000 acres and created a 30,000-acre working forest within an easement held by the DEC. The NYS DEC maintains the remaining 1,350 acres as a state forest.[24]

Fort Drum Army Base

Jefferson County's Fort Drum Army Base, located just north of the Tug Hill Region, intends to expand in the near future. With over 18,000 soldiers and civilians employed at Fort Drum, there is a great need for housing in the region.[25]

Potential Economic and Conservation Challenges

- Increased numbers of Fort Drum employees may encroach on Tug Hill housing stock and raise housing costs.
- Increasing year-round resident populations could contribute to rising infrastructure costs in towns with already limited financial resources.
- ATVs may negatively impact the soundscape, trails, and natural habitats of the region.
- Increased tourism may cause pollution and trail damage or disrupt wildlife habitats.
- An increase in vacation home construction could lead to the subdivision of large land tracts for private development.
- The large number of Baby Boomers in the region will soon retire, further aging Tug Hill towns, and possibly creating a cohort of residents with limited income (this may be especially true of retired farmers).
- The decreasing population of young adults could weaken the Tug Hill workforce.
- Limited income opportunities for farmers could result in the loss of small farms.

A total of 6,000 new soldiers were added to the base over the last two years. The army has been partnering with a private developer to build housing in Jefferson and Lewis Counties. Soldiers are also able to find housing on their own, and occasionally look as far as Syracuse. However, Fort Drum's expansion may also present new conservation opportunities. The Department of Defense (DOD) openly supports the donation of easements as a means to mitigate possible negative impacts of base expansion.[26]

Army Vice Chief of Staff General John M. Keane has addressed the potential degradation of quality of life in communities surrounding military installations. According to Keane, although bases were originally located in rural areas far from populations that may have felt any negative impacts, increased development in the surrounding areas has brought the civilian population closer to the military. Keane blames this expansion for tension between installations like Fort Drum and the surrounding population regarding noise, dust, and other nuisances. He recognizes that these tensions can be relieved by creating natural buffers around such installations through the use of conservation easements.[27]

Conclusion

Tug Hill's rural setting and agricultural economy are distinctive to the region. Communities want to preserve the natural landscape and their way of life while protecting natural resources and promoting a healthy economy. Residents and local groups like the Tug Hill Tomorrow Land Trust must continue to balance the economic needs of residents while protecting agricultural land, water resources, and recreation areas. THTLT prioritizes education efforts in order to maintain a dialogue on planning and conservation in Tug Hill. Although private land protection is voluntary, conservation planning requires non-profit organizations, municipal support, community input and local research.

Endnotes

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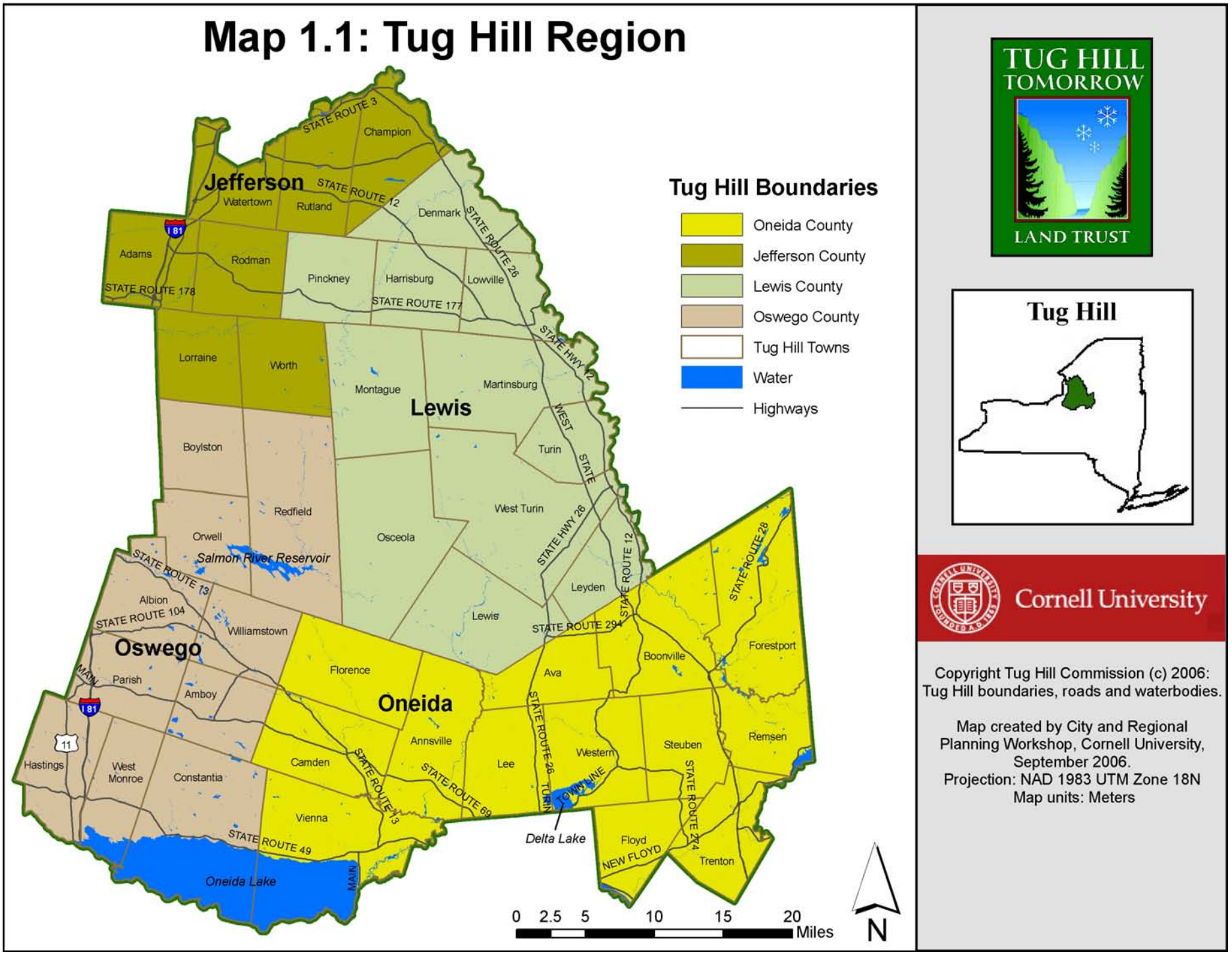
Map 1.1: Tug Hill Region



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Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters


Natural Resources
Photo: Mark Emery

Introduction

The Tug Hill Region is an area with diverse biological and cultural landscapes, which are used by a variety of different stakeholders. To understand the importance of the resources of Tug Hill as well as potential challenges, an inventory of the biological and cultural resources is presented with a landowner analysis in this chapter.

Geology of Tug Hill

The geology of Tug Hill contributes to its unique biological characteristics. The underlying rock layer slants upward from the west at Lake Ontario to the east in the Black River Valley. The rock layer is mostly shale and sandstone which comprises the top most layer of Tug Hill. Movement of the Adirondacks and Mohawk Valleys contributed to the creation of Tug Hill's western slopes, which were further shaped by glacial and water activity. Glacial activity created the natural rock gorges with waterfalls and cliffs, known locally as gulfs, that Tug Hill is famous for. Glacial activity also created the poor glacial till soils for which Tug Hill is infamous. Tug Hill is drained by the Oswego River Basin.

Land Cover and Species Richness

The Tug Hill Region is an area of high biodiversity, and is comparable to both the Adirondack and Catskill Regions. With one of the largest undisturbed tracts of forest in New York State, the area also supplies water to 11 major rivers (including the Salmon River, East Branch of Fish Creek, Deer River, Mad River, Sandy Creek, and South Sandy Creek) and 6 major watersheds in the region, including the Lake Ontario drainage basin. Significant ecological communities of Tug Hill include remnants of old-growth spruce-fir and hemlock-northern hardwood forest, as well as an extensive network of fens, swamps and wetlands.

Analysis of vegetative land cover for the Tug Hill plateau shows greater biodiversity for the core forest area of sugar maple mesic as well as wetland, successional, and evergreen-northern hardwood forests, with the exception of small inter-dispersed patches of old-field, shrubland, and agricultural and pastoral lands (Map 2.1, Table 2.1 in the Technical Appendix). In particular, sugar maple mesic and evergreen-northern hardwood are extremely high in biodiversity. These land cover types comprise nearly half of the Tug Hill Region, accounting for 22% and 25% of total land area, respectively. Of the federal, state, county, and land trust holdings that are protected, 32% are sugar maple mesic land cover and 42% are evergreen-northern hardwood land.

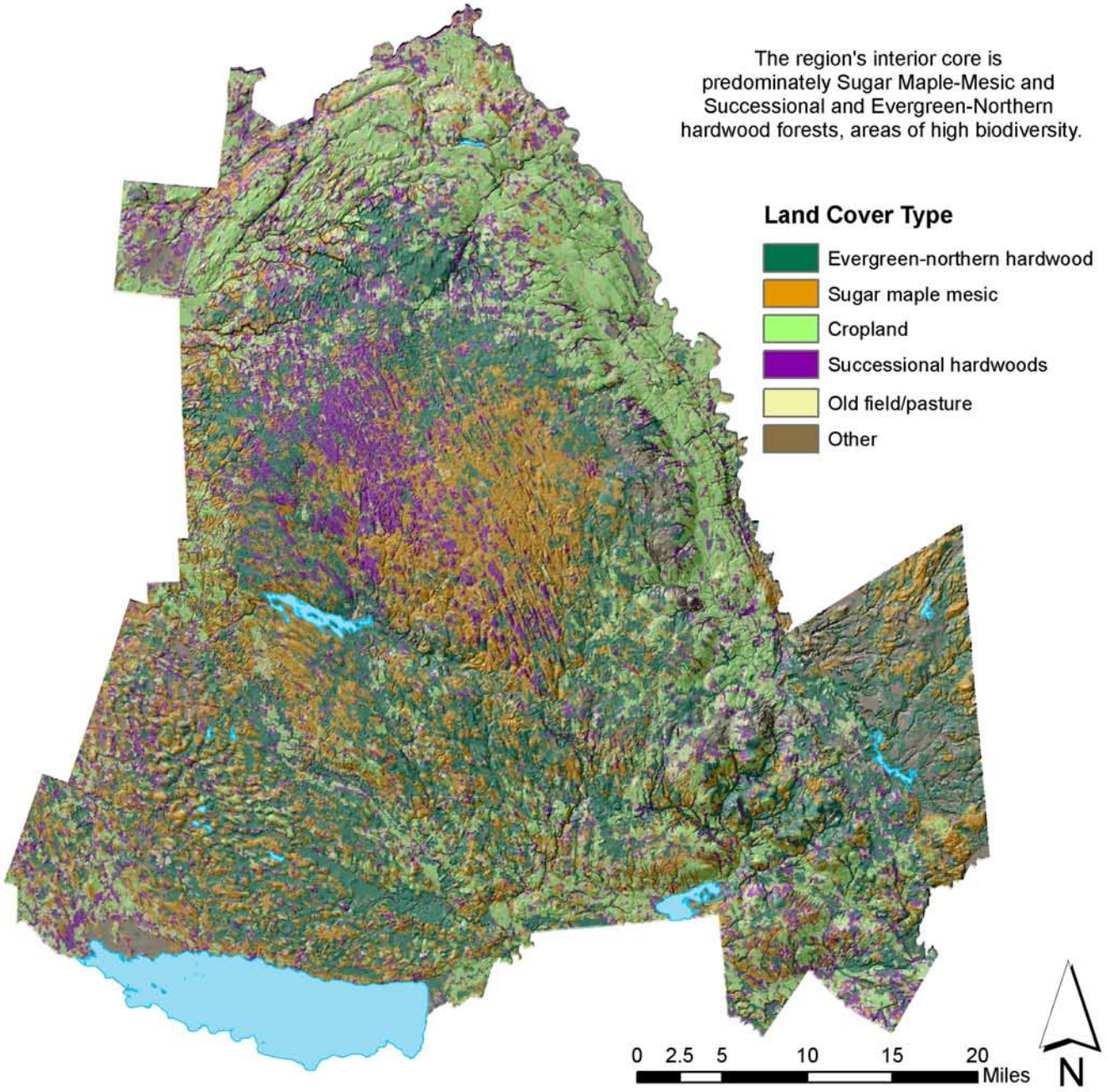
Areas of marginal biodiversity are located within the agricultural and pastoral areas that surround the core forest area, particularly to the north and northeast. Such uses of the land over time have created a reduction of forest structure sufficient to support the life cycle of many of the local native tree, shrub and herb species. The regeneration of these forests has also been slow because of the poor glacial soil quality in the region. Additionally, Tug Hill forests lack ecologically significant features characteristic of old-growth forests, such as coarse woody debris. Accordingly, there is an identified need to target conservation efforts towards the protection of forested areas that have not been fragmented by logging and transport roads, in addition to the restoration and rehabilitation of disturbed forest lands.

Species richness refers to the potential number of different species supported by a landcover type. It can be used to make assumptions about the health of an ecosystem. Species richness, as a measure of biological diversity, and the presence of rare species are two of the most common criteria for the selection of conservation target areas.

The GAP analysis program is a nation-wide strategy that uses species richness to predict the biodiversity and habitat for plant and animal species that are not currently represented in conservation lands. Using GAP analysis data, species richness has been used to measure the biological resources of Tug Hill (Map 2.2, Table 2.2 in the Technical Appendix).

Sugar maple mesic, successional hardwoods, deciduous wetland, and evergreen-northern hardwood are the land covers with the greatest species richness, signaling their importance as conservation areas. While the sugar maple mesic and evergreen-northern hardwood comprise 27% and 45%, respectively, of total *protected* areas in Tug Hill, their high degree of species richness may indicate the need for a more targeted strategy of conservation for these and other areas high in species richness, including successional hardwoods and deciduous wetlands (Table 2.1).

Map 2.1: Land Cover Types in Tug Hill, NY



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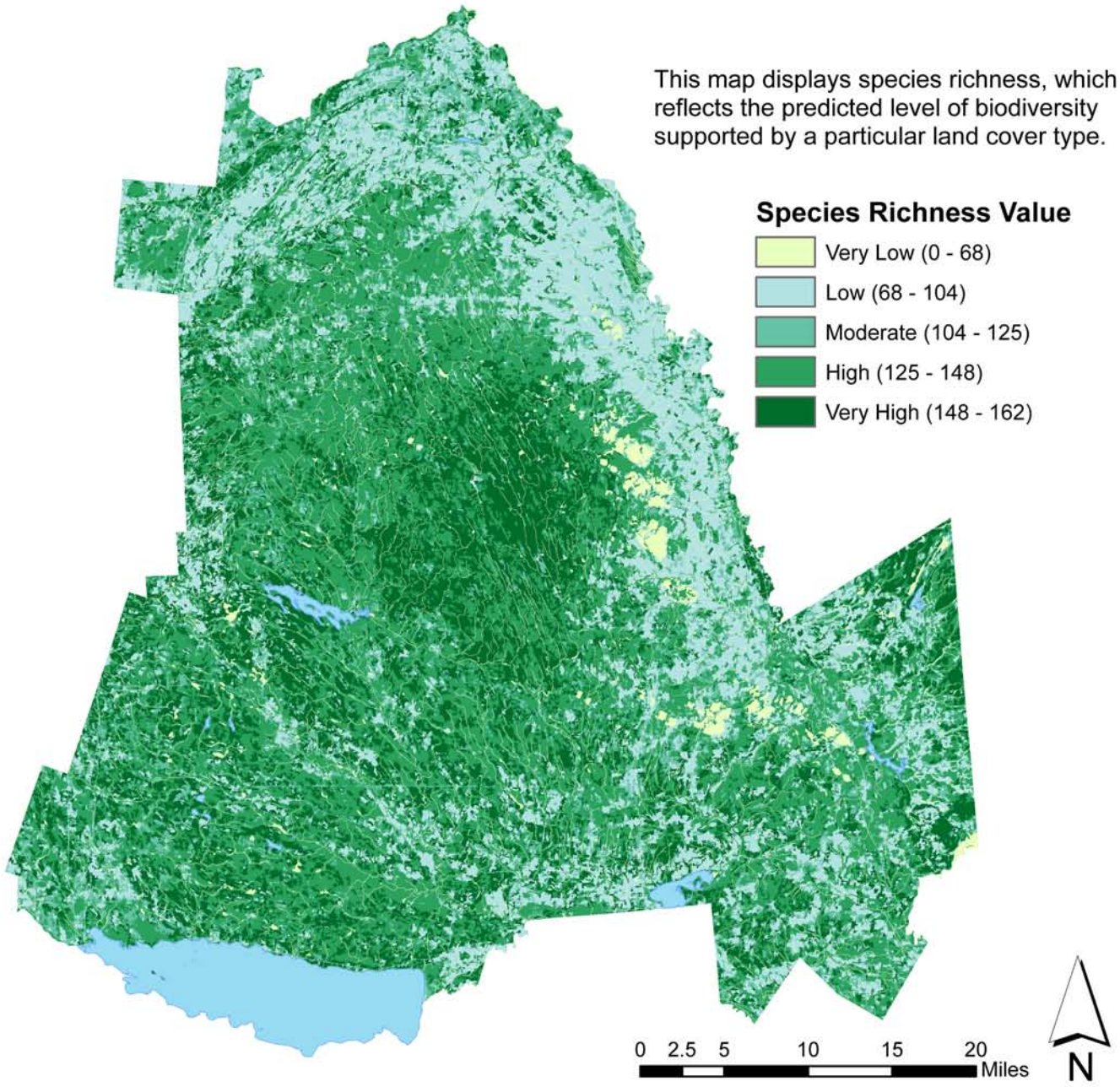
Tug Hill boundaries and waterbodies. Land Cover data from New York Gap Analysis Project. DEM from Cornell University Geographic Information Repository. Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Land Cover Type	Acreage	Percent of Tug Hill
Evergreen-northern hardwood	341,024	25.4
Sugar maple mesic	296,897	22.1
Cropland	242,866	18.1
Successional hardwoods	154,667	11.5
Old field/pasture	79,878	5.9
Other	228,667	17.0
Total	1,344,000	100.0

Map 2.2: Species Richness in Tug Hill, NY



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Species richness data from New York Gap Analysis Project. Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

The GAP analysis method has two main limitations. First, the land cover data is several years old and therefore does not reflect more recent changes to topography through human or natural processes. Second, species richness is a predictive assumption, rather than an actual record, of the biodiversity of a particular area. Using species richness as the sole tool in planning may not be sufficient to represent target areas for conservation; however, in situations where extensive resources are not otherwise available, it may be the most realistic strategy.

Tug Hill is recognized as an Important Bird Area (IBA) as part of the Audubon Society's IBA program in New York State. Bird species targeted for conservation by the New York State Department of Environmental Conservation (NYS DEC) and The Nature Conservancy (TNC) for the Tug Hill Region include the American Bittern, Sharp-Shinned Hawk, Northern Goshawk, and Red-Shouldered Hawk. Priority habitats for these species include mountaintop-stunted conifer woodland, northern hardwood and mixed forests, early successional forest and edges, spruce-fir forests, grassland and agricultural land, and freshwater wetlands (Table 2.3 in Technical Appendix).

Water Resources

Wetland ecosystems such as bogs, marshes, swamps and fens are areas of high endemism and biodiversity that provide a multitude of important ecosystem benefits and services. Endemic species are those that only occur in one location. Wetlands function as headwater catchments that protect downstream areas from the effects of flooding and in addition, maintain the quality of aquatic, riparian and groundwater ecosystems by filtering pollutants and excessive nutrients that may exist in the environment. The NYS DEC identifies wetland areas in New York State as Class I, II, III, or IV, relative to ecological benefits and services.[1] A full 86% of wetlands in Tug Hill are designated as Class I or Class II, meaning that they are recognized as critical and important habitats (Map 2.3, Figure 2.1 in the Technical Appendix).

The stream and river waterways within the Tug Hill Region feed into six regional watersheds: Oneida Lake Watershed, Mohawk River Watershed, Chaumont Perch Watershed, Oswegatchie-Black Watershed, Indian Lake Watershed, and the Mid-Northern Lake Watershed. Watershed areas that are recognized as being particularly sensitive to the effects of stormwater runoff include sedge meadows, bogs and fens, coniferous swamps, lowland hardwood swamps, seasonally flooded basins, vernal pools, and wetlands containing rare, threatened, or endangered species. Each of these types of watersheds exist in Tug Hill (Map 2.4, Figure 2.2 in the Technical Appendix).

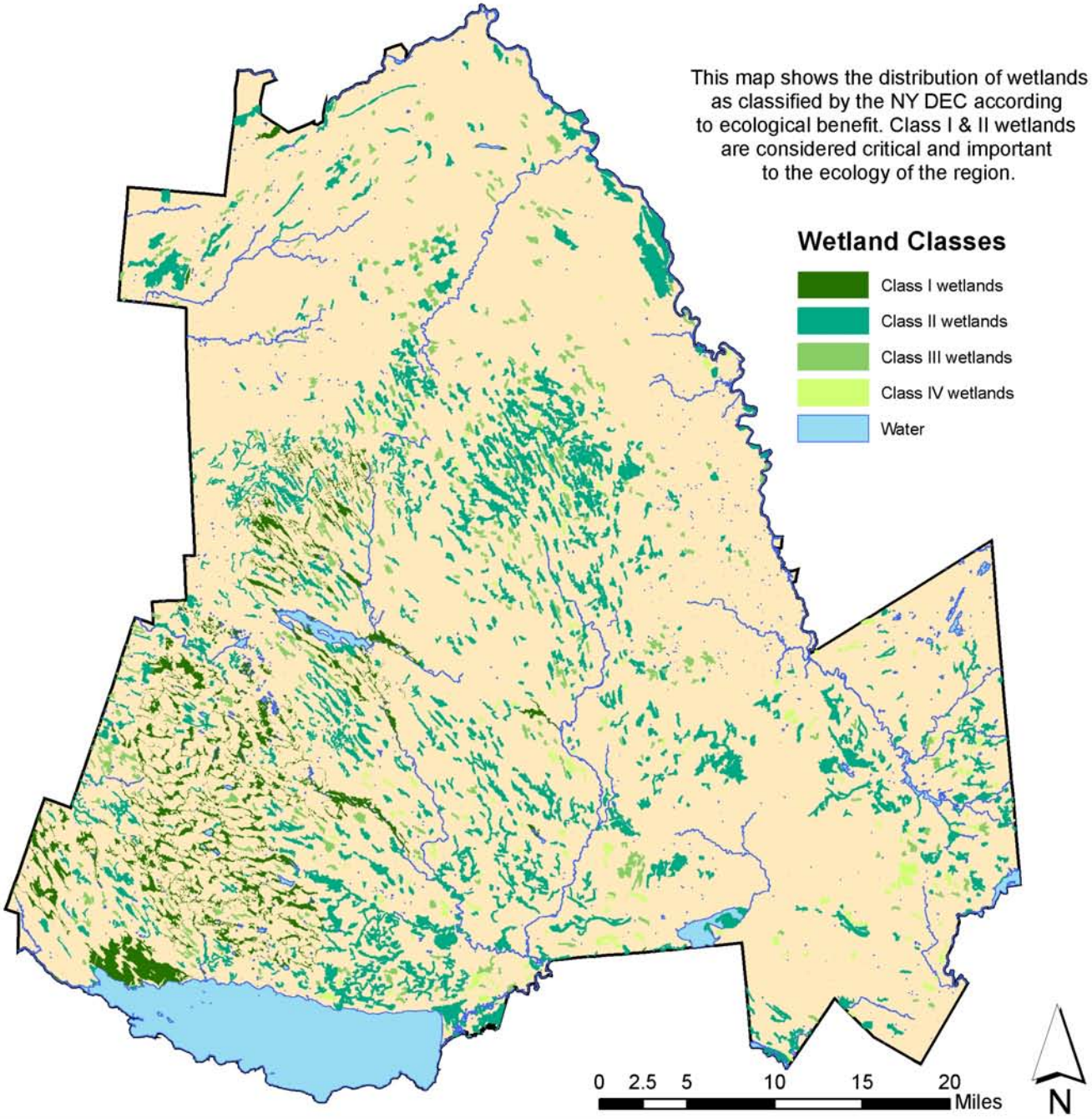
Soils and Farmlands

Agriculture is one of the main drivers of the Tug Hill economy. These working landscapes are also important for scenic and biological reasons. As such, farmland protection is rated as the fourth priority of the Tug Hill Tomorrow Land Trust (THTLT). Dairy and maple syrup production are both crucial to the farming sector. While loss of traditional agricultural lands usually results in a greater percentage of forested areas and successional farmlands, those farms that occupy prime soils are important as a conservation tool and contributor to the region's economy. A thorough examination of the soils that support agriculture is important for assessing priority farming areas and important farmlands for potential conservation easements. Over 1,000 farms dot the landscape of Tug Hill and most are located in the northern and western parts of the region where soils are well-drained and fertile.

Map 2.5 shows statewide soil data for Tug Hill. Of the soil associations on this map, those that comprise the well- and moderately-drained categories make up almost 50% of the Tug Hill Region. The location of these soils mirrors the more detailed data describing prime farmland in Oneida and Jefferson Counties. The soils in Tug Hill support farming on the edge of the region. In contrast, the interior "core" of Tug Hill has poorly-drained soils and is better suited to remain as woodlands, which can contribute to maple syrup production and recreational uses (Figure 2.3 and Table 2.4 in the Technical Appendix).

The prime agricultural soils and the soils of state-wide importance are both productive farming soils for New York State. According to the Natural Resource Conservation Service, prime farmland soils are an extremely valuable resource because they can be farmed continuously without degrading the environment.[2] In Tug Hill, there are many former farming areas which have since been abandoned due to poor soils. The climate is too harsh and the growing season too short for many farmers to break even financially; this phenomenon can be stemmed through a better understanding of prime farm soil locations as well as policies that relieve farmers of their usually high tax burdens.

Map 2.3: Wetlands in Tug Hill, NY



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City and Regional Planning Workshop,
Cornell University, September 2006.

Projection: NAD 1983 UTM Zone 18N.
Map units: Meters

Wetlands Class	Regulation Acreage	% of Total Wetlands	% of Tug Hill
0	1,657	1.1%	0.1%
1	43,490	28.5%	3.2%
2	86,430	56.7%	6.4%
3	14,938	9.8%	1.1%
4	5,891	3.9%	0.4%
Total	**152,406**	**100.0%**	**11.3%**

Agricultural Districts and Assessment Programs

The New York Agricultural Districts Law was enacted in 1971 to "conserve, protect and encourage the development and improvement of its agricultural land for production of food and other agricultural products", as well as to "conserve and protect agricultural lands as valued natural and ecological resources which provide needed open spaces for clean air sheds, as well as for aesthetic purposes."[3] The law was intended to protect farms from the impact of development. Within agricultural districts, local regulation to encourage the continuation of farming is required, unreasonable restriction of farm activities is prohibited, protection against private nuisance suits through Right to Farm provisions is granted, and extra benefit assessments on farmland is prevented.

In addition to these benefits, farmers in New York State can apply for agricultural assessments. Section 305 of the Agricultural and Markets Law limits property taxation to the agricultural value of the land for eligible parcels both within and outside of agricultural districts. Parcels must be 10 or more acres in size and produce $10,000 of gross revenue per acre (smaller parcels also qualify if average annual gross sales equal $50,000 or more). The income requirement for a parcel is waived if it is part of a federal conservation reserve program.[4]

The importance of farming in the Tug Hill Region is underscored by the fact that about 367,000 acres—over 25% of the region—fall within agricultural districts (Map 2.6, Table 2.5 in the Technical Appendix). Lewis County, with its fertile Black River Valley, contains the highest percentage of agricultural districts at 48%; Oswego County contains the least at 6%.

Many farmers in the region have also taken advantage of agricultural assessments: as of 2004, these tax exemptions are in place on over 85,000 acres of farmland, representing about 1,200 parcels (Map 2.7). Such working farmlands provide multiple benefits in terms of their economic, open space, scenic, ecological, and rural heritage values. Landowners who have placed their holdings under such temporary exemptions may be interested in the more permanent protection conferred by conservation easements.

Forestry Tax Abatement Programs

In addition to agricultural tax abatement programs, tax incentives exist to promote long-term forest management. Qualifying landowners in New York State may apply for tax concessions for eligible forested lands. Approximately 9,000 acres comprised of 47 parcels in Tug Hill are enrolled in the Forest Tax Law program. With the enactment of Sections 480 and 480(a) in 1959 and 1974 respectively, the State of New York under the Real Property Tax Law made provisions "to encourage the long-term ownership of woodlands to produce forest crops and thereby increase the likelihood of a more stable forest economy."[5]

The NYS DEC is the agency responsible for determining which lands are eligible for concessions. Lands originally enrolled under Program 480 are 100% tax exempt; however, this program was discontinued to new applicants and was replaced by Program 480(a) in 1974. Tracts certified after this transition receive partial tax benefits but are eligible for special assessments.

To be eligible, tracts must contain timber which has been harvested in accordance with sound forest management practices within at least three years prior to the application date and must meet minimum acreage requirements. Under provisions of the Forest Tax Law for Section 480(a), any tract of forest land consisting of at least 50 contiguous acres, exclusive of any portion not dedicated to the production of forest crops, is eligible. Under Section 480, 15 acres was the minimum requirement. An owner must then follow a management plan prepared by a forester and approved by the NYS DEC for 10 years succeeding reception of the tax exemption (Table 2.6 in the Technical Appendix).

Landowner Analysis

The Tug Hill Region is overlaid by 71,150 parcels ranging from quarter-acre or smaller home plots within urban centers to expansive timberlands within the forested core. Encompassing public, private and non-profit landowners, the landownership story of Tug Hill is a complex matrix of protected and developed parcels that is greatly impacted by the pervasive lack of zoning in the region and recent trends such as out-of-state property-owners.

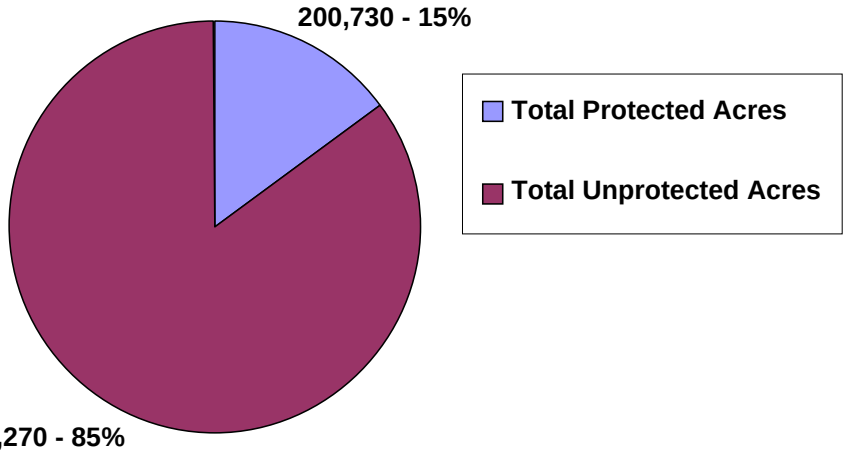
Table 2.7 in the Technical Appendix lists the largest private landowners in the region. Their land holdings make up approximately 8% of the total Tug Hill land area. Some of the acreage may currently be under protected status; however, permanent conservation of privately owned land is still an option for these land owners.

Protected Lands

The Tug Hill Region is endowed with an array of federal lands, several large state land holdings, county reforestation areas, municipal lands, and other protected lands (Map 2.8, Table 2.1 in the Technical Appendix, Figure 2.4). Approximately 200,000 acres, or 15% of the region, is currently protected.

Within the Tug Hill Region there is great diversity among the types of owners of protected lands. New York State is the largest landowner with approximately 150,000 acres, or 75%, of total protected land area. The State's landholdings are divided among its various departments: State Reforestation lands (40,000 acres) constitute the largest segment of State property followed by those owned by the NYS DEC (18,600 acres).

Figure 2.4: Protected and Unprotected Lands in Tug Hill



TNC is the second largest landowner of protected lands and owns 15,000 acres, or 7%, followed by Oswego and Oneida Counties, which together hold approximately 6,800 acres or 3% of protected land area. THTLT holds easements upon 2,800 acres, 1% of protected areas (Figure 2.5 in the Technical Appendix).

Semi-Protected Land Categories

"Gray" landowners are those whose land use suggests a potential inclination towards land conservation. Their landholdings comprise approximately 10% of the total unprotected Tug Hill land area. Table 2.8 in the Technical Appendix identifies all gray organizations owning 300 or more acres in the region. These public and private clubs, civic and religious associations, and recreation areas were identified for their extensive land holdings and potential for conservation status.

The largest group of gray landowners is made up of private trusts. The majority of these are revocable living trusts. A revocable living trust, or family trust, document describes how the trustor's property should be managed while he or she is alive, and how it should be distributed upon his or her death. The terms of the trust enable the trustor to make changes as well as reclaim the property transferred into it. The 'revocable' character of living trusts presents an opportunity for THTLT to negotiate with property owners to ensure continued protection of the land for future generations (Figure 2.6 in the Technical Appendix).

The second largest group consists of Rod and Gun Clubs. Tug Hill's outdoor amenities present an abundance of hunting opportunities within the region. Plentiful lakes, rivers, and streams attract a number of fishing groups. Bird and large animal hunters also consider Tug Hill to be prime hunting ground. Members of hunting clubs are already concerned about the conservation of land for species habitat and breeding; therefore, they represent a valuable asset to the preservation community.

The other categories of gray landowners include camps, religious organizations and churches, civic associations, fire districts, and public schools. Together these groups comprise a large share of unprotected land in Tug Hill and may have an interest in land conservation.
Not included in the gray landowner calculations are municipal lands. Municipalities are not significant owners of protected lands; however, their holdings contribute to the overall fabric of land ownership and should be considered in identification of areas for potential expansion of protected lands within individual communities. These holdings include

town and village parks, playgrounds, athletic fields, picnic grounds, camps, and recreational facilities. The concept of conservation through easements extends beyond municipal borders and involves connecting protected lands throughout the region. Future municipal acquisitions may serve to benefit not only local residents of the individual community but also residents of neighboring communities, the region, and northern New York State.

Emerging and Current Challenges to Land Protection

Climate Change

While the Northeast has low rates of projected future warming compared to other regions in the United States, the warming projected by climate models for the next several decades will have significant effects on the Tug Hill Region. Atmospheric carbon dioxide levels have been on the rise since the late 1800s, and have increased exponentially with the advent of and increased reliance on the automobile and electricity. It is projected that levels could increase by more than two times today's concentration by the early 2100's if CO_2 production continues at the present rate.[6]

Warming is predicted to increase rain over frozen ground, causing rapid snowmelt events that can increase the likelihood of flooding, and may increase the frequency and severity of droughts.[7] Warming will also result in an extended growing season and consequently, increased forest productivity; however, higher temperatures and shorter winters will also make forests more vulnerable to pests.

Impacts on sugar maple mesic forests are likely to be particularly harmful, including disruptions in the freeze-thaw cycle and the muting of foliage coloration. Climate scenarios for Northeast forests predict an almost complete displacement of the sugar maple mesic forests by 2100, as warming temperatures will cause its migration north toward Canada.[8] Given sugar maple mesic's presence in Tug Hill and its high value in species richness, this disappearance would have major implications for biodiversity in the region. There would also be a substantial reduction in forest profits, including timber harvest income, revenue from tourists coming to experience fall foliage, and the multimillion-dollar maple syrup industry.[9]

Photo: Chelsey Norton

These predicted effects signal the need for careful and proactive silvicultural practices on the part of forest producers to provide for the long-term survival of the maple forests abundant in the Tug Hill Region. A water-endowed region experiencing climate change, Tug Hill faces the loss of natural resources required to sustain two of the region's major economic contributors.[10] General trends affecting Tug Hill's economic productivity and environmental health include the unpredictability of snowfall. It generally increases in some years, then falls off dramatically in others, reducing the region's viability as an outdoor recreation area for skiers, snowmobilers, and hunters. Similarly, flooding may destroy trails that once sustained the predominant ATV and off-road vehicle sports; droughts may contribute to the reduction of trout populations, impacting the fishing tourism economy.

Climate change's implications for human health are also a major concern. Lower-income populations, the elderly, and children tend to be disproportionately impacted by the effects of climate change. Human health concerns are a priority because milder winters increase tick survival and thus the incidence of Lyme disease, and increased rainfall and flooding create conditions for water source contamination. [11]

With the onslaught of climate change, species migration becomes a sensitive topic. Enabling animal species to move north into Canada through greenways and wildlife corridors may be necessary to ensure the preservation of many rare and endangered species. Areas recommended for providing connectivity and wildlife corridors through concerted conservation efforts will help build the framework for species migration north to Canada.

The ability of Tug Hill and the Northeast to adapt to the changing climate will invariably rest upon the prioritization among various institutions and agencies in identifying vulnerable populations such as the sugar maple mesic. Conservation of private land is the first step in ensuring sustainable management practices that will provide the opportunity for collaboration among key stakeholders.

Point-Source Pollution

A number of point-source pollution sites have been identified in Tug Hill (Map 2.9, Table 2.9 in the Technical Appendix). The US Environmental Protection Agency's Toxic Release Inventory for 2004 (the most recent year for which data is available) identifies releases of toxic chemicals in the Tug Hill Region from manufacturing and industrial facilities. In addition, there are 29 wastewater treatment sites that discharge directly into navigable waterways. More information is needed on the extent and magnitude of such pollution to determine its implications for nearby conservation efforts.

Landownership

With regard to landownership, two persistent challenges exist. First, a majority of towns within the Tug Hill Region have not enacted zoning regulations. Without a means of planning and guiding the development of their towns, Town Boards will be without recourse when unwanted development begins. Second, large unprotected parcels are possible targets for subdivision.

Out-of-state landowners now control 113,500 acres, or 8% of Tug Hill. This percentage is growing and may threaten the rural character of Tug Hill if land values increase beyond the financial capacity of long time residents. The growing number of second homes, the lack of zoning, and the possibility of large subdivided lots are serious concerns for Tug Hill.

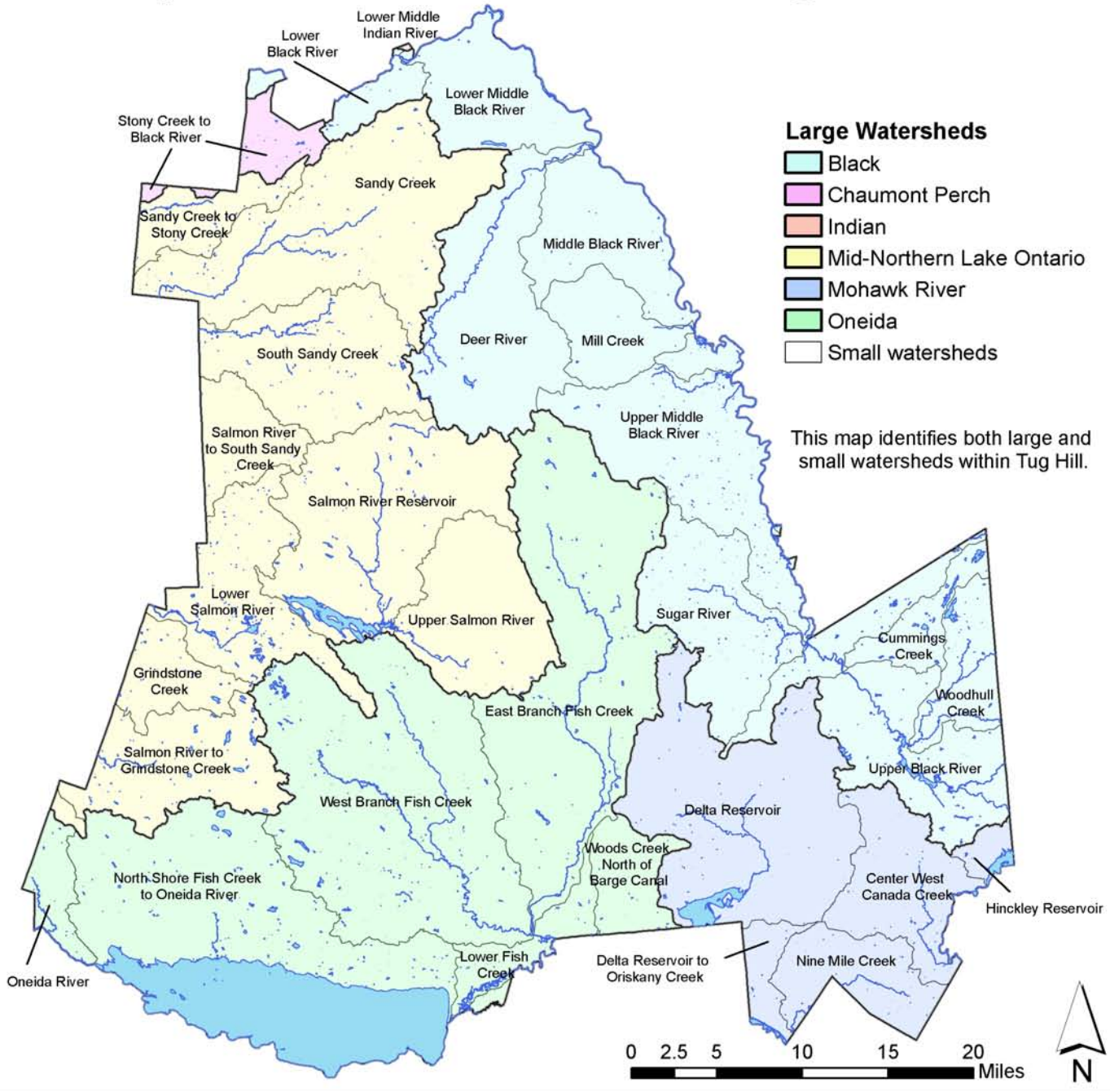
Conclusion

Tug Hill presents a unique opportunity to preserve critical natural and cultural resources, such as vegetation types that support high levels of biodiversity and working farmlands. This preliminary analysis of resource conditions highlights the need to develop working relationships with several types of landowners to foster future conservation efforts.

Endnotes

[1] New York State Department of Environmental Conservation. http://www.dec.state.ny.us/website/regs/part664.html.
[2] United States Department of Agriculture: Natural Resources Conservation Service. http://www.nrcs.usda.gov
[3] New York State Office of Real Property Services. http://www.orps.state.ny.us/pamphlet/exempt/agassess.htm
[4] New York State Department of Agriculture and Markets. http://www.agmkt.state.ny.us/AP/agservices/2004C115.pdf
[5] New York State Department of Environmental Conservation. http://www.dec.state.ny.us/website/dlf/privland/privassist/taxlaw.html
[6] Forests: The Potential Consequences of Climate Variability and Change. National Forest Assessment Group. US Department of Agriculture.
[7] NOAA Northeast Report: The Potential Consequences of Climate Variability and Change. October 2000, p. 3.
[8] *ibid*, p. 6.
[9] Cool Air, Clean Planet Fact Sheet. http://www.cleanair-coolplanet.org/
[10] Tug Hill Region of New York State Informational Brochure. Watertown, NY.
[11] NOAA Northeast Report.

Map 2.4: Watersheds of Tug Hill, NY



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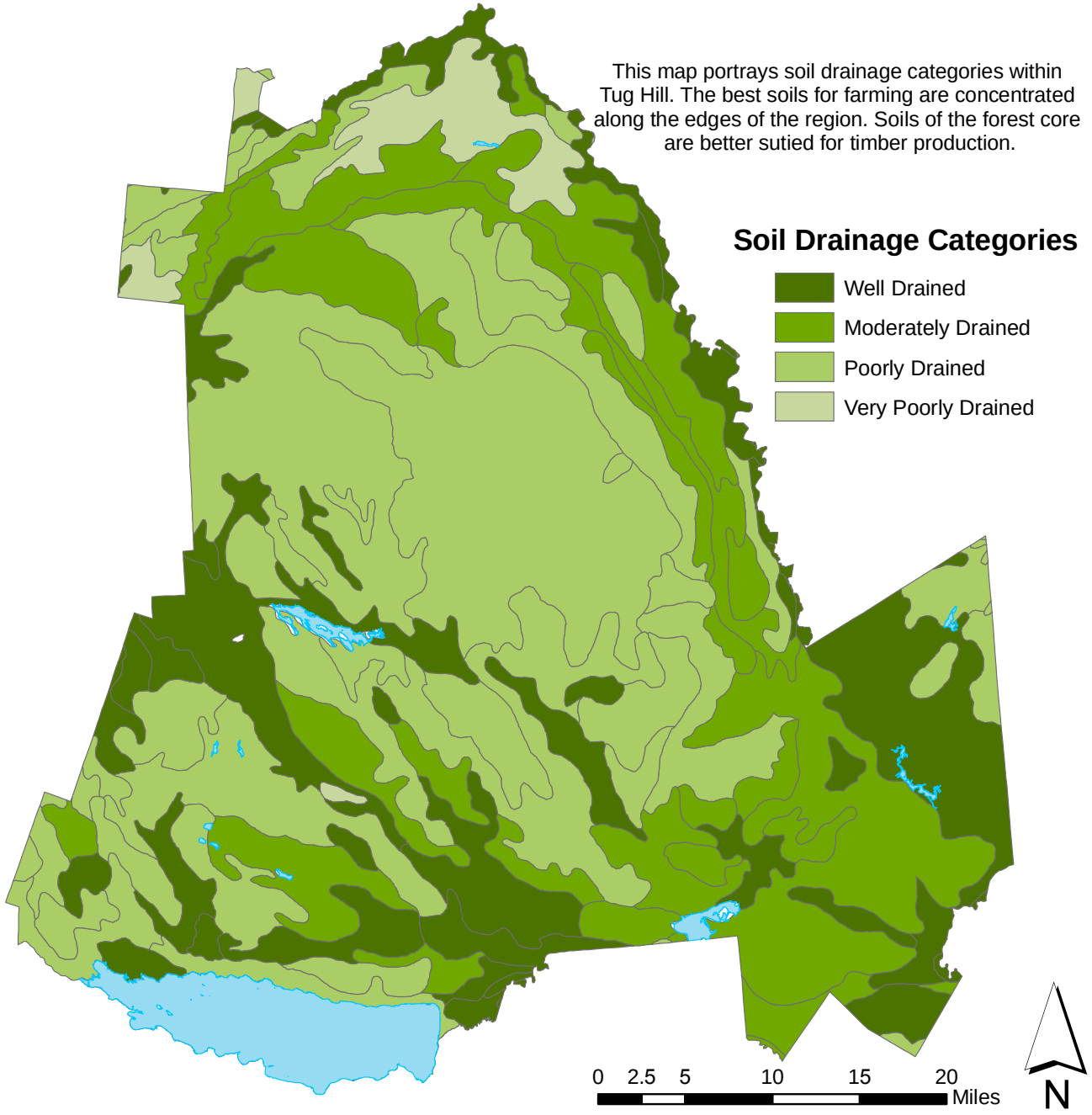
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Watershed	Acreage	% of Total
Mohawk River	167,883	12.14%
Black River	367,372	26.56%
Indian River	131	0.01%
Chaumont Perch	11,403	0.82%
Oneida River	434,620	31.43%
Mid-Northern Lake Ontario	401,570	29.04%
Total	**1,382,979**	**100%**

Map 2.5: Soils in Tug Hill, NY



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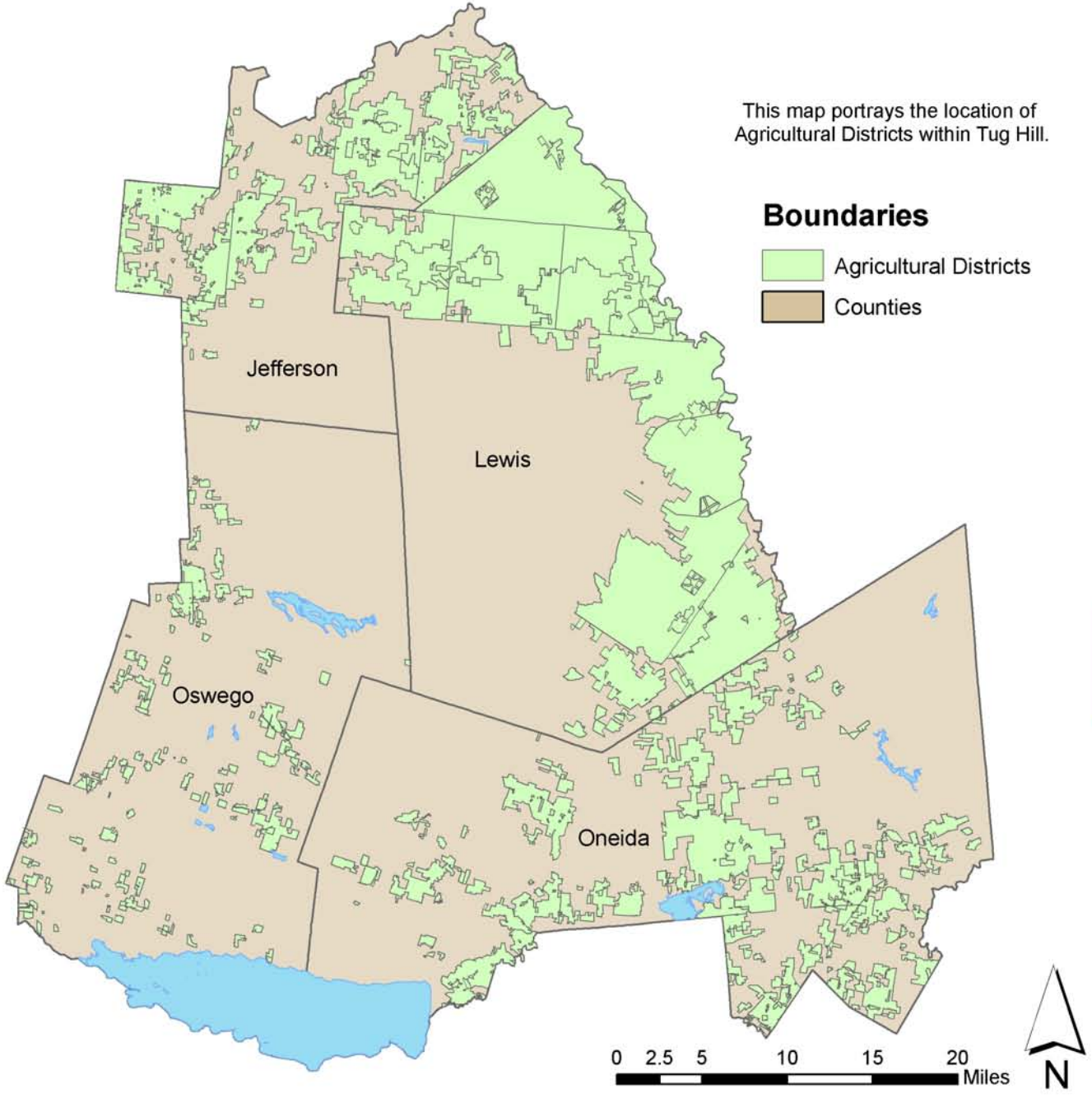
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Soil Drainage in Tug Hill

Category	Acres	Percent of Tug Hill
Well Drained	294,231	22.2
Moderately Drained	351,548	26.5
Poorly Drained	637,628	48.1
Very Poorly Drained	43,229	3.3

Map 2.6: Agricultural Districts in Tug Hill, NY



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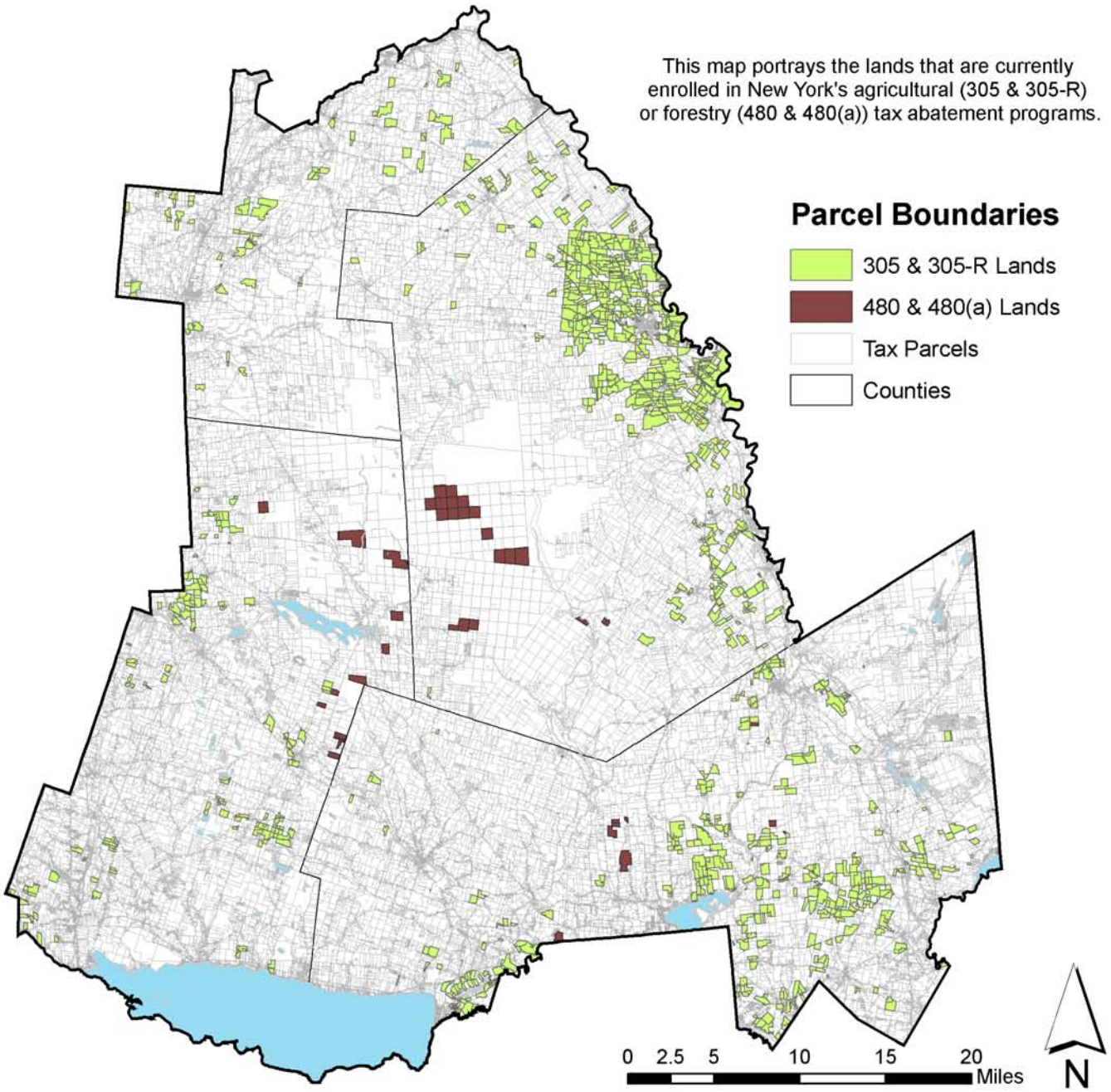
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Tug Hill Lands in Agricultural Districts

County	Acres in Ag Districts	Percent of County
Jefferson	60,395	32.1
Lewis	195,868	48.5
Oneida	88,334	19.4
Oswego	22,062	6.6
Total	366,660	26.5

Map 2.7: Tax Abatement Lands in Tug Hill, NY



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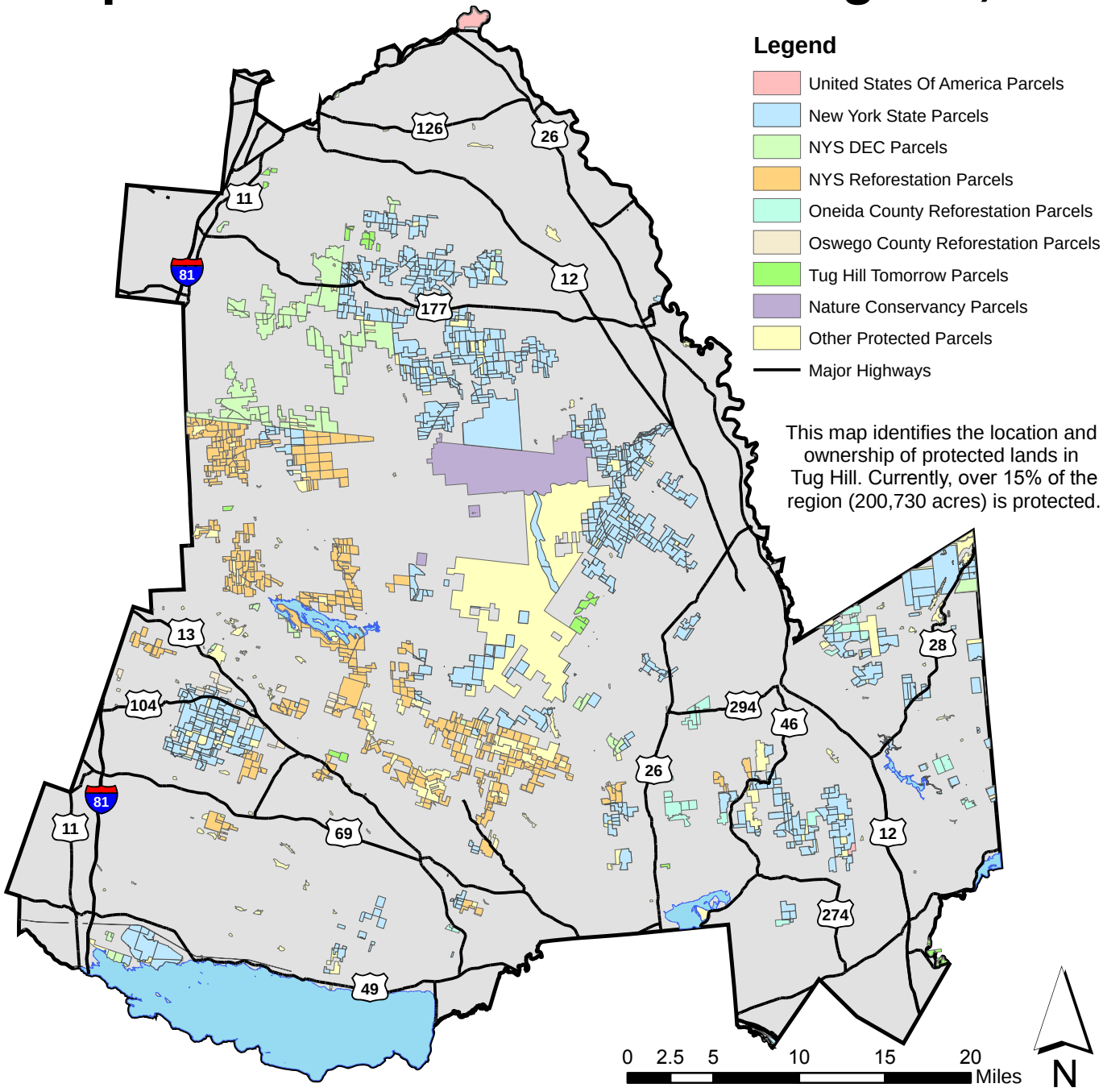
Map created by City and Regional Planning Workshop, Cornell University, September 2006
Projection: NAD 1983 UTM Zone 18
Map units: Meters

Tug Hill Lands in Tax Abatement Programs

	Program		
	480/480(a)	305/305-R	Totals
County	Acres		
Jefferson	n/a	7,496	7,496
Lewis	4,795	41,459	46,254
Oneida	1,523	27,863	29,386
Oswego	2,676	8,536	11,212
Total Acres	8,993	85,354	94,347

Map 2.8: Protected Lands in Tug Hill, NY



This map identifies the location and ownership of protected lands in Tug Hill. Currently, over 15% of the region (200,730 acres) is protected.

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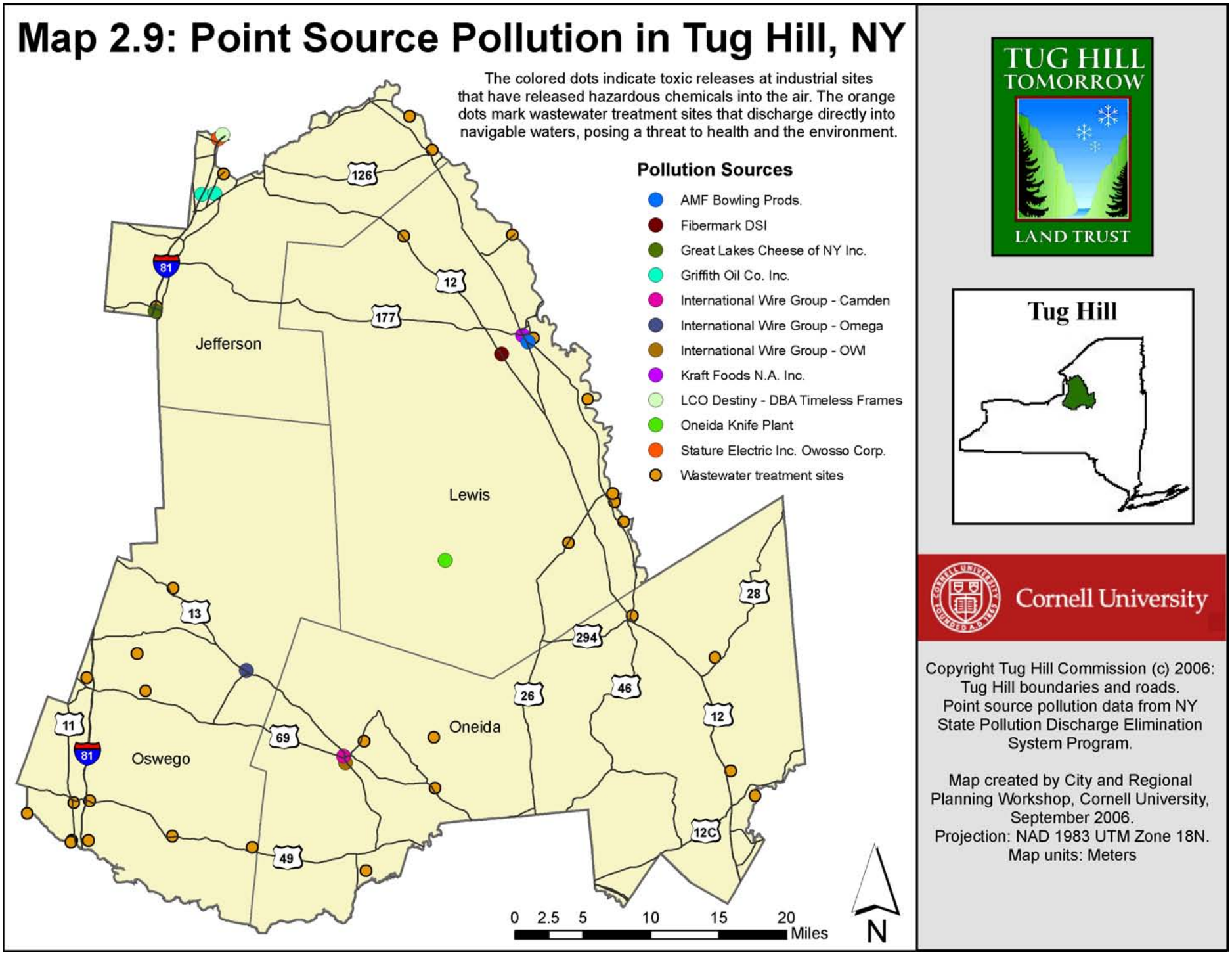
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Map 2.9: Point Source Pollution in Tug Hill, NY



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Projection: NAD 1983 UTM Zone 18N.
Map units: Meters


Scenic Resources
Photo: Mark Emery

Introduction

While there are many layers to consider when selecting land to conserve, this section focuses on the visual characteristics of potential sites. The rivers and fields, gulfs and hamlets, and dense, forested core of the Tug Hill Region create a strong visual identity for the area, which the Tug Hill Tomorrow Land Trust (THTLT) wishes to preserve. This scenic inventory serves as a starting point for prioritizing conservation easements within Tug Hill.

Background

The systematic process of surveying landscapes for scenic integrity can be traced to the Massachusetts Landscape Inventory of 1982, in which the Commonwealth identified a need to shift their landscape preservation focus from large, uninterrupted tracts of land, which were increasingly rare, to multiple, smaller, privately-held parcels of land that were being engulfed by development pressures.[1]

In 1991, The Tug Hill Commission completed an inventory of the scenic resources in the Tug Hill Region. Their visual landscape inventory enabled the Commission to delineate, classify, and record areas in the region that were considered to be visually significant. The information from the scenic inventory was intended for use as an additional tool in deciding appropriate land uses, resource development objectives, and prescriptive management.

For their inventory, the Commission focused their attention primarily on public roads surrounding the Tug Hill plateau (Map 3.1) with an initial focus on preserving scenic roadways rather than scenic viewsheds. When driving the chosen route, viewpoints that were considered scenic were marked by hand on maps. For each point, an evaluation form was completed that assigned the view a quantifiable score. The viewpoints were later organized into folders by town and corresponding roads. The Tug Hill Commission's efforts in 1991 were a visual landscape inventory, and stopped short of analyzing the collected data.

Methodology

Establishing Criteria

When evaluating a landscape's scenic integrity, it is necessary to have a standardized method of comparison against which to measure various sites. For the Tug Hill Region, the Cornell team created an evaluation form that was based on the work previously completed by the Tug Hill Commission's scenic inventory in 1991 and the Massachusetts Landscape Inventory of 1982.

The evaluation form lists seven positive components and two negative components (Table 3.1). Each component also contains clarifying subcategories. Sites were graded positively based on their accessibility, presence of water, landform, land cover, vista, rural vitality, and built environment. They were graded negatively for landscape scars and incompatible structures.

Accessibility

THTLT requested that the scenic landscape inventory include only those views visible from public roads in the region. Views from hiking, biking, and snowmobile trails were not included. For future updates, THTLT may consider adding views originating from these paths. The evaluation form includes an entry for views seen from hiking, biking, or snowmobile trails as well, so as opportunities become available THTLT may begin to preserve sites strictly visible to its recreation-oriented users.

Presence of Water

The Tug Hill Region is the location of various headwaters and watershed reservoirs that provide water to surrounding municipalities such as Rome and Utica. As such, providing water security can serve a dual purpose by protecting scenic landscapes as well. Also inventoried were sites where water was present in various forms including streams, rivers, ponds, reservoirs, lakes, waterfalls, and wetlands.

Landform

The subjective classification of landform composition is explained in Figure 3.1.

Land Cover

In determining scenic integrity, sites were evaluated based on their diversity of land cover and associated wildlife. A variety of vegetation, such as mixed-tree forests, will provide a more dynamic experience year-round as the trees transform from season to season. The presence of pattern creates visual organization within a view, as with the

linear structure of active farm fields or field-forest edge relationships. Texture enhances pattern with variations in surface style, such as the juxtaposition of ferns and grassy fields. Finally, a visible presence of birds, reptiles, amphibians, and mammals contribute to the sense of protection and stability that land trusts seek to achieve.

Vista
The criteria acknowledge two equally important classifications of vistas worth preserving. Enclosed or enframed vistas highlight a site by focusing the viewer's attention directly on the scene. Panoramic or distant vistas offer a sweeping view that puts a scene into context and can sometimes cover many square miles. Both types of views are present across the Tug Hill Region, with framed vistas concentrated in the heavily forested interior and panoramic vistas dominant along the eastern edge of the plateau.

Rural Vitality
Given THTLT's mission to "retain Tug Hill's farm, forest, recreation and wild lands"[2], preserving bucolic scenes of active agricultural lands juxtaposed with standing forests could encapsulate all four land types at once. Sites were scored based on their rural attributes, including the presence of barns, silos, farm houses, livestock, haystacks, farm fields, and winding roads.

Built Environment
Preservation of scenic integrity can easily be dominated by the preservation of wilderness or open space. For the Tug Hill scenic inventory, the preservation of the region's cultural heritage is directly related to its scenic integrity. Distant views of small hamlets, rural cemeteries, historic stone walls and post-and-baton fences, or architecture that honors the local history all have a place in Tug Hill's landscape preservation.

Landscape Scars
When prioritizing lands to preserve, negative factors need to be considered in addition to positive attributes. Particularly in the Tug Hill Region, where extractive industries once dominated, unsightly signs of past use lower scenic integrity. Obtrusive lumbering scars or slashes, erosion, gravel or sand mining operations, excessive utility lines or corridors, and angular road cuts or fills are a few examples of Tug Hill's extractive history.

Incompatible Structures
The hamlets in Tug Hill have not yet established comprehensive plans regarding appropriate styles and locations of development within the region. The lack of such restrictions has created situations where scenic integrity has been sacrificed for development interests. Sites displaying strip development, incompatible buildings in town, incompatible rural buildings, dilapidated buildings or structures, junkyards or extensive litter, storage tanks, and obtrusive signage should receive a lower priority strictly regarding scenic integrity.

Data Collection
Once the scenic criteria were established, the Cornell team decided on a route for the fieldwork. The previous study of scenic resources, conducted in 1991 by the Tug Hill Commission, focused primarily on the western portion of Tug Hill. Taking this study into consideration, along with general guidance from THTLT, the team mapped out a preliminary route based on road usage and recognized scenic areas. Rather than focusing on the routes covered in the 1991 scenic inventory, the team created a more extensive route, highlighting the southern and eastern portions of the region. In one day, the team drove over 350 miles and, using the criteria defined in the previous pages, identified 61 scenic viewpoints (Map 3.1). Each viewpoint was recorded, photographed and scored for its scenic amenity, and the coordinates were saved using a Global Positioning System (GPS).

Landscapes of the Tug Hill Region take a variety of different forms, ranging from open fields to rushing streams. This scenic assessment does not prioritize one type of view over another, but rather values this diversity. To demonstrate the variability, each viewpoint was classified in one of the following landscape categories: farmscape, water feature, open field, or other. The "other" category includes villagescapes, escarpments, and enframed forest views (Map 3.1).

Data Analysis
After the fieldwork was completed, the collected coordinates were loaded from the GPS to a Geographic Information System (GIS), and

Figure 3.1: Definitions of the Landform and Vista Criteria in Pictures

VARIETY AND CONTRAST IN TOPOLOGY
Differences in elevation: hill, plateau, valley, mountain

LINE
Border or edge in the landscape that one can follow: ridge, alley, wall, river

SLOPE
Describes the measurement of the steepness, hillside

HEIGHT
Natural elevation of the earth's surface providing a scenic view from above

PANORAMA
Unbroken view of an entire surrounding area

CONTOUR
Shows the shape and elevation of the land

ENFRAMED
Limited field of vision, vista includes parts of the adjacent landscape

overlaid onto a Digital Elevation Model (DEM). Using the Viewshed Analysis tool in GIS, viewsheds visible from each of the 61 scenic viewpoints were identified. These individual viewsheds were then overlaid on the map and their degree of overlap was measured. The resulting map (Map 3.2) prioritizes scenic areas of Tug Hill, assuming that the areas visible from the greatest number of viewpoints are the most valuable in scenic amenity.

The scenic views were categorized into four categories: Non-Priority, Priority, High-Priority, and Critical. Non-Priority areas are those not visible from the collected viewpoints. Priority areas are those that fall within view of 1 to 3 viewpoints. High-Priority areas can be seen from 4 to 6 viewpoints. Lastly, critical areas are those which can be seen from 7 to 12 viewpoints.

Findings

Viewshed Analysis

The viewshed analysis prioritizes those sections of the region traveled during the scenic inventory. To some extent, therefore, the results are self-selecting. Since THTLT suggested emphasis on the southern and eastern areas of the region, the scenic viewshed analysis identified these areas as the most critical for preservation. Table 3.2 details the total acreage of scenic priority in Tug Hill. Given its large size and the relatively limited number of scenic viewpoints collected, nearly 90% of the region is classified as non-priority.

Table 3.2 Acreage and Percentage of Priority Areas in Tug Hill, Fall 2006

Classification	Total	
	Acres	% of Total Area
Non-Priority (0)	1,206,020	89.73
Priority (1-3)	133,156	9.91
High-Priority (4-6)	3,742	0.28
Critical (>6)	1,082	0.08
Total Acres in Tug Hill	1,344,000	100.00
Total Acres in Viewsheds	*137,980*	10.27

A general assessment of the viewshed analysis reveals that the extreme eastern and southeastern portions of the region have the highest scenic value. Based on the analysis, these areas are of the highest priority for conservation of scenic quality.

It is important to note that the high-value viewsheds in the northeastern portion of the region extend beyond the boundary of the service area. Protecting these views may not be a possibility at this time. However, the lands that make up these views are also important wildlife corridors between the Adirondacks and Tug Hill. Consideration of these outlying scenic viewsheds could add value to a potential corridor study.

Scenic Typology

One of the most valuable scenic qualities of the Tug Hill Region is its variety of landforms and topography. The table in Map 3.1 shows the proportion of landscape type classifications for all of the 61 viewpoints.

Panoramic views of farmscapes and vast open fields make up much of the scenic landscape of Tug Hill. However, water features in the Tug Hill Region also provide high levels of scenic amenity. The most significant of these is Oneida Lake on the southwest border of the area. Other large water bodies include the Salmon River Reservoir, Panther Lake, and Delta Lake. In addition to these features, numerous streams and rivers cut through the region, further enhancing its scenic quality.

The escarpment toward the eastern portion of the region is another unique feature that enhances Tug Hill's landscape. The drastic change in elevation of the escarpment is scenic in its own right, but equally important is the visual perspective such a landform offers.

Challenges and Opportunities

Unrestricted Development

The vastness of the Tug Hill Region presents both challenges and opportunities for THTLT. Planning on a regional scale is difficult in an area made up of 41 municipalities in 4 different counties. Few municipalities enforce zoning, which is a major hurdle in planning for future growth. While this could lead to sprawl, it also presents THTLT with the opportunity to expand its efforts to protect valuable scenic areas.

In addition to local development, second-home residential development pressure from other regions, including New York City, New Jersey, and Pennsylvania, also presents both challenges and opportunities for the preservation of scenic integrity. This development has the potential to significantly alter the traditionally rural landscape. At the same time, many of the incoming residents are better prepared financially to support conservation efforts.

Wind Farms

Although stand-alone turbine applications exist throughout New York State, there is a trend towards clustering turbines, known as wind farm development.[3] The Tug Hill Region represents a prime location for such development, largely due to its elevation and proximity to Lake Ontario. Averaging between 1600 and 1800 feet above sea level, the plateau is subject to lake-effect weather that includes high winds. This combination of location and topography create a high wind energy resource potential.[4]

Taking advantage of this potential, wind energy development corporations PPM Energy and Horizon Wind Energy began the Maple Ridge Wind Farm at Tug Hill. The project, located in Lewis County, broke ground in the spring of 2005. When construction is complete the wind farm will house nearly 200 turbines, each 260 feet tall, with three rotor blades each measuring 130 feet in length. Maple Ridge will contribute a substantial amount of energy to the New York State electrical grid.[5] Opinions concerning the effect of wind farms on the scenic quality of the local landscape vary. Generally, surveys of public aesthetic preference conclude that if a wind farm is well-sited, support for that wind farm will increase.[6] Standards for a well-sited wind farm, however, are not clear.

Photo: Chelsey Norton

Recommendations

The previously stated findings suggest that THTLT could benefit by focusing its efforts on preserving those areas identified as priority scenic viewsheds, particularly the most visible scenic areas located in the easternmost and southeastern corner of the region. One of the main defining features of Tug Hill is its pristine scenery, and it is critical that this amenity is maintained into the future. As parcels are reviewed for potential conservation easements, the scenic viewshed analysis can serve as one tool to guide prioritization.

This scenic inventory analysis could additionally aid THTLT in obtaining federal funding for designating Scenic Byways throughout Tug Hill. The analysis highlights New York State Routes 12, 26, and 49 as particularly high in scenic value. The Scenic Byway designation can help to define Tug Hill as an area of national significance, attracting tourism and potential economic growth.

Conclusion

Residents and visitors alike recognize Tug Hill as a hidden gem of Upstate New York. However, as the region becomes more recognized as a desirable destination, the scenic integrity that defines Tug Hill will be threatened. The Tug Hill Tomorrow Land Trust can help to preserve Tug Hill's identity by using this scenic inventory to guide conservation of valuable landscapes.

Endnotes

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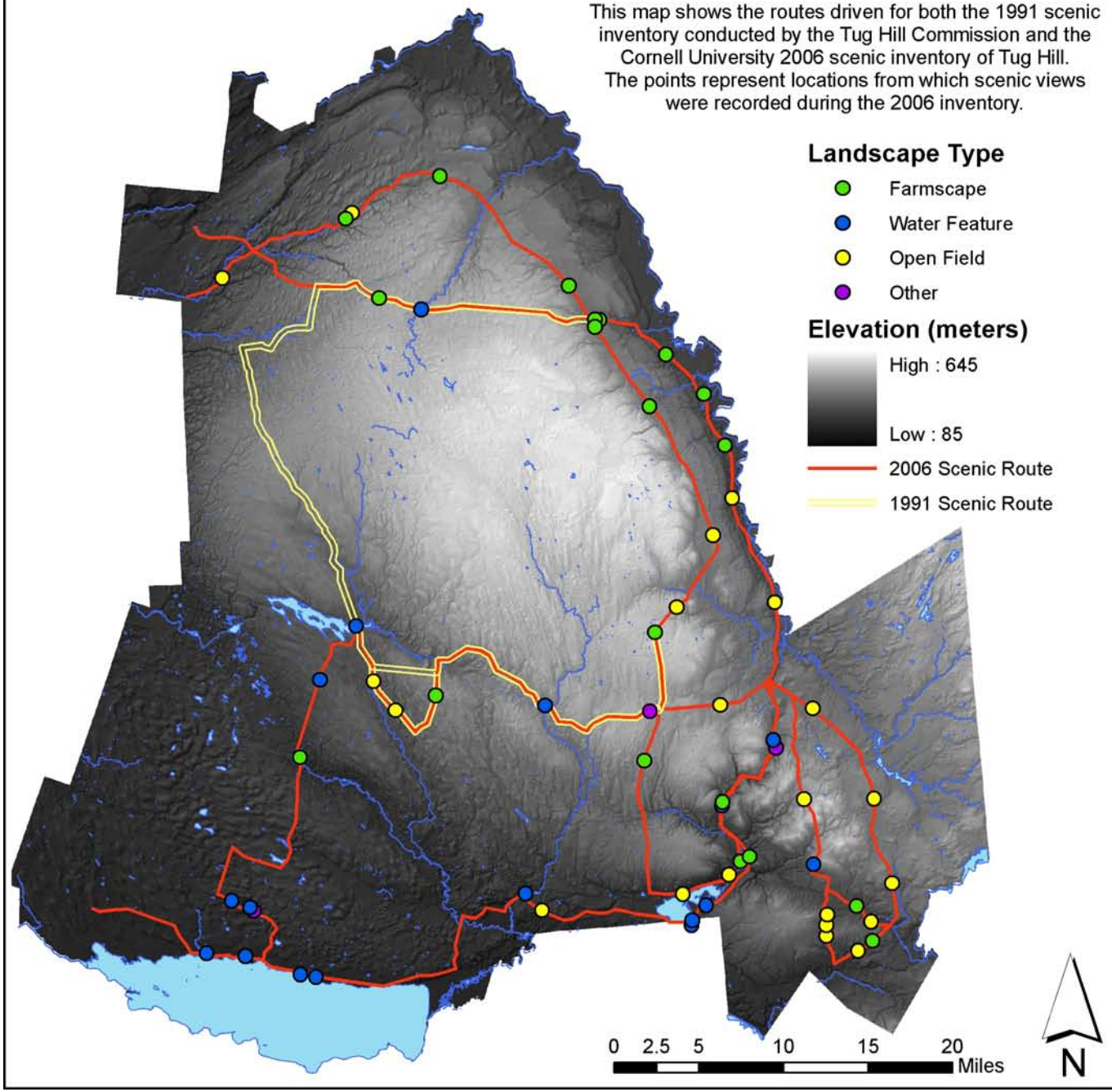
Map 3.1: Scenic Viewpoints in Tug Hill, NY



TUG HILL TOMORROW LAND TRUST

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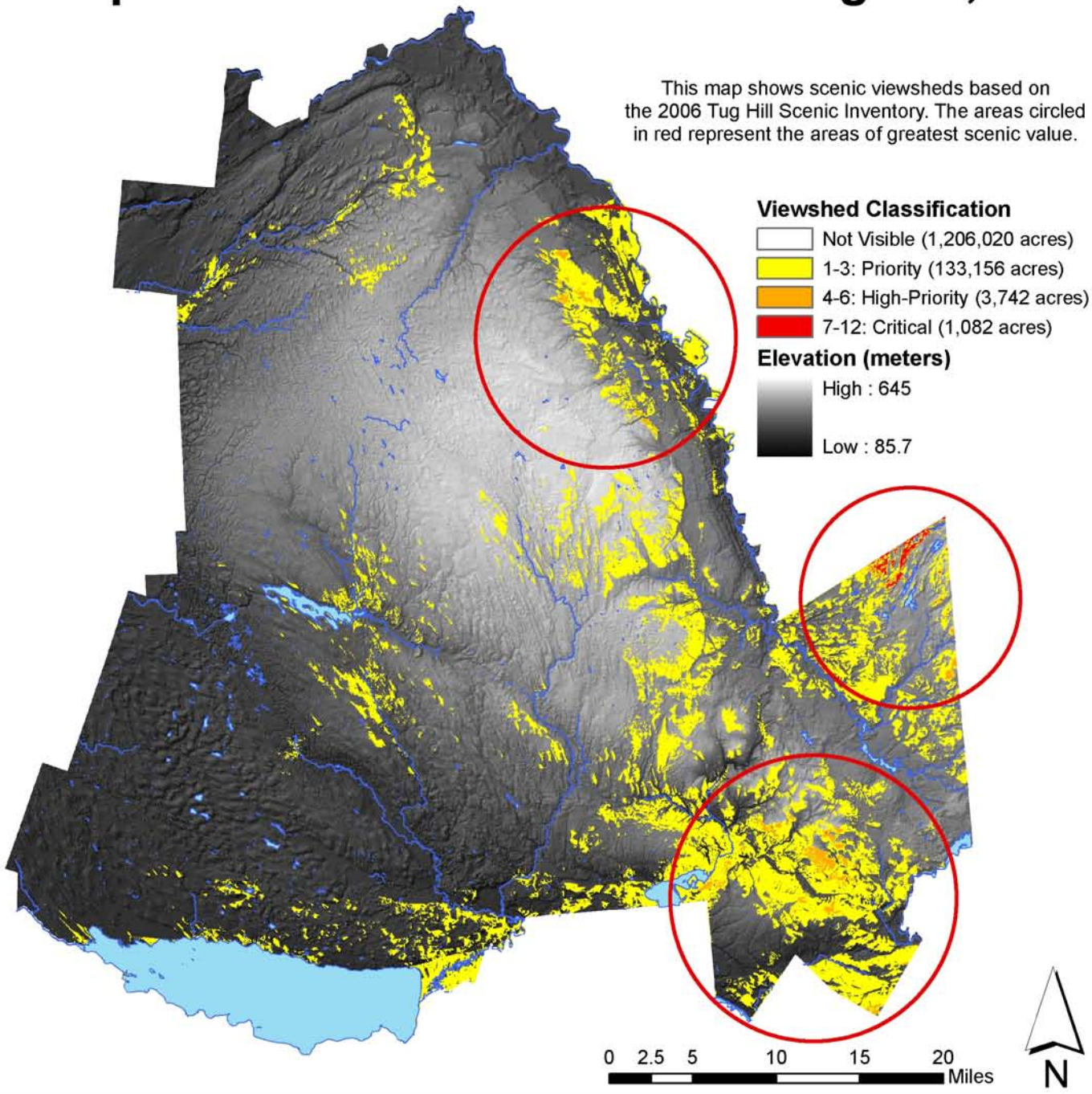
DEM from Cornell University Geographic Information Repository. Map created by City and Regional Planning Workshop, Cornell University, September 2006. The viewsheds were calculated using a z-factor of 1.
Projection: NAD 1927 UTM Zone 18N
Map units: Meters

Viewpoints by Landscape Type

Landscape Type	Number	Percent
Farmscape	20	32.8
Open Field	20	32.8
Water Feature	17	27.9
Other	4	6.6

*The "Other" category includes escarpment and enclosed forest views.

Map 3.2: Scenic Viewsheds of Tug Hill, NY



TUG HILL TOMORROW LAND TRUST

Cornell University

Scenic viewpoints, viewshed analysis, and map created by City and Regional Planning Workshop, Cornell University, September 2006. The viewsheds were calculated using a z-factor of 1.
Projection: NAD 1927 UTM Zone 18N
Map units: Meters

Table 3.1: Scenic Viewpoint Evaluation Form

County_____ Town_____
Road_____
Direction_____
Recorder_____
Date_____ Weather_____

Positive Sub-Total	_____
Negative Sub-Total	_____
Total Scenic Score	_____

Positive Components		Notes
1. Accessibility		
By Car		
Hiking/biking/snowmobiling trail nearby		
2. Presence of Water		
Stream		
River		
Pond		
Reservoir		
Lake		
Waterfall		
Marsh/Wetland		
3. Landform		
Variety and Contrast in Topography		
Slope		
Contour		
Line		
Height		
4. Landcover		
Variety of Vegetation		
Pattern (i.e. field and forest edge)		
Variety of Color		
Texture		
Presence of Wildlife		
5. Vista		
Enframed, Enclosed or Valley View		
Panoramic or Distant View		
6. Rural Vitality		
Barns		
Silos		
Farmhouses		
Livestock		
Haystacks		
Farm Fields		
Windy Roads		
7. Built Environment		
View of Village, Hamlet		
Cemeteries		
Covered or Other Bridge		
Stone Wall or Wooden Fence		
Architecture that Honors Local History		
Positive Sub-Total		

Negative Components		Notes
1. Landscape Scars		
Obtrusive Lumbering Scar or Slash		
Erosion		
Gravel or Sand Mining Operation		
Utility Line, Corridor or Substation		
Angular Road Cut or Fill		
2. Structures		
Strip Development		
Incompatible Building in Town (i.e. McDonald's)		
Incompatible Rural Building		
Other Incompatible Structure		
Dilapidated Building or Structure		
Junkyard/Extensive Litter		
Storage Tanks		
Obtrusive Signage		
Negative Sub-Total		

Photo: McNamara

Introduction

Focusing conservation efforts on different themes actively identifies the most valuable land in a given region. In this chapter, the Cornell team focused on three types of conservation infrastructure. Recreation Corridors protect trail systems and link existing recreation areas in Tug Hill. River Corridors protect areas surrounding major rivers to preserve Tug Hill's water quality and maintain an abundance of aquatic species for future recreation purposes and ecosystem health. Lastly, Wildlife Habitat Areas provide uninterrupted protected lands, which allow for a rich diversity of species in the region.

Recreation Corridors

Background

The Tug Hill Region is well known for its numerous outdoor recreation opportunities. Tug Hill Tomorrow Land Trust (THTLT) places a priority on recreation, and developed a guide that demonstrates the region's value in offering a wide range of outdoor activities.

The objectives of the Cornell team's strategy are to maintain and enhance the recreational value of forest resources in Tug Hill–including the aesthetic value of the forest landscape–and to provide trails and sites which facilitate public recreational use of these lands.[1] The main tool the team chose to address these goals was the recreation corridor, a system of trails, paths and seasonal roads that produce a connected system for recreation uses. In addition, the team proposed creating recreation centers to further enhance areas with especially high concentrations of existing recreation opportunities.

Concentrating seasonal recreation uses efficiently can benefit the region by providing economic savings and attracting businesses. In addition to the supply of recreational opportunities, it is important to consider the demand for a variety of outdoor activities. Since most outdoor recreation occurs close to home, recreational areas might best be located within a driving distance of 30 minutes from residential development.[2]

Some recreational activities, such as snowmobiling, cannot be combined with other uses due to the disturbance and danger that they cause. Those trails designated for snowmobiling could be used as mountain bike trails during non-winter months.

It is important to have a balance between natural resource conservation and recreational needs of a region. Management activities that benefit wildlife species require study, planning, effort, and resources. Developing local recreation programs can attract state, federal, and private funding for the development and maintenance of recreational areas.

A primary motivation for landowners' active management is to improve recreational hunting on their lands. Funds from hunters support the majority of private conservation efforts.[3] In addition, as the markets for these services grow, landowners are increasingly providing access for bird-watching and other ecotourism.

Methodology

To produce the recreation corridors map, recreation trails in Tug Hill were identified. Then, using GIS, a quarter-mile buffer was added on either side of existing trails throughout the entire trail system. The resulting map identifies those areas targeted for conservation.

The recreation centers were identified analytically by determining where the highest concentration of existing areas of recreational activity are located. Given this information, the existing protected lands within these areas were identified and highlighted.

Findings

Map 4.1 displays the recreation corridors, a system of seasonal trails that allow access to a substantial amount of outdoor recreation in Tug Hill. This map shows the quarter-mile buffer on either side of existing trails. This buffered area would not only promote recreation, but also allow snowmobiles to be kept a substantial distance from cabins or other development.

Map 4.2 shows two areas that would benefit from a recreation center. Within these areas, hiking and cross-country skiing trails are located close to one another and could benefit from additional connectivity. Enhanced connections between adjacent recreation areas would be beneficial for management and overall access, as well as a range of other activities. Historical sites could be included in the recreational corridors to link hiking trails for increased cultural significance. Finally,

when constructing a recreation corridor, utilizing public input will maximize its effectiveness.

Recommendations

The value and economic impact of recreation corridors in the area will depend upon the ideas, suggestions and information provided by local residents and businesses both within and outside the corridor area. In Tug Hill, there are currently several trail systems, such as the Cross-Tug Hill Ski Trail.[4] These trails are important to the economy of Tug Hill and to the heritage of this region. The Trenton Greenbelt is an example of a recreation corridor, where private landowners allow the public to use their land for hiking and skiing trails.

The first step in creating a recreation corridor is to combine complementary recreation types.[5] In Tug Hill, hiking and snowshoeing are complementary uses that would benefit from having a designated recreation corridor. The second step is to connect trail systems that are currently established. There is an extensive network of recreation trails in the Tug Hill Region for which improved connectivity would promote tourism opportunities. Whenever possible, this connectivity must be in areas of the highest scenic quality and biodiversity.


Photo: Mark Emery

Caveats

The information for hiking trails, bike trails, and cross-country trails were unavailable in a digital format and therefore were not used in this report. This information, if made available, could be used to enhance the recreation corridors of the region. Snowmobile trails were used to identify recreation trails, but fail to provide a comprehensive assessment of the trail system in Tug Hill. A quarter-mile buffer was used to accomplish two goals. The first goal limits the impacts of snowmobiles and other types of recreation that create noisy conditions for nearby housing. The second goal allows for flexibility in case of the need to relocate an established trail due to trail erosion or other phenomena.

River Corridors

Background

THTLT has a long-standing interest in protecting rivers. They hope to create river conservation corridors around the major rivers identified in their Strategic Conservation Plan in order to protect endangered species, promote biodiversity, preserve ecological habitats, and protect water quality.[6] To achieve this goal, the plan calls for a natural buffer around the rivers.

A buffer is a strip of naturally vegetated land that protects water resources from neighboring land uses. Nutrients and run-off that threaten water quality include fertilizers, pesticides, leaking sewage lines, and animal waste that may create toxic algal blooms and deplete oxygen in the rivers. Buffers are instrumental for removing these pollutants before they enter the water body and are a cost-effective treatment system.[7] Two focus areas provide current examples of river corridor conservation in Tug Hill: West Canada Creek and the Salmon River Watershed.

West Canada Creek

THTLT is working with current landowners along West Canada Creek to preserve the stream's water quality, the watershed, open space, and scenic character. West Canada Creek is known for its premier trophy trout fishing waters.[8] The New York State Department of Environmental

Conservation regulates West Canada Creek due to its outstanding cold water fishery habitat.[9] In order to conserve the ecology of the stream, THTLT recommends creating a buffer around the stream to maintain the habitat and promote recreational activities such as fishing and canoeing.

Salmon River Watershed
The Salmon River Watershed comprises 173,000 acres across Jefferson, Lewis, Oneida, and Oswego Counties. The Salmon River is a popular area for Steelhead, Chinook Salmon, and Coho Salmon fishing. The area is also well known for its 2,000-plus miles of snowmobile trails. Forest lands include beech-maple mesic forest with many streams and wetlands.[10]

The upcoming Salmon River Watershed Natural Resource Assessment, facilitated by the Tug Hill Commission, will document the location and conditions of sensitive areas within the 173,000 acres of the watershed. The assessment will provide information to identify vulnerable areas, which could be conserved to protect the quality of the river as a natural system and as a sport-fishing destination area.[11] The study will provide an analysis of natural resource quality for the entire watershed, as opposed to the more site-specific, fragmented information presently available. THTLT seeks to inform private landowners, non-governmental organizations, local governments, and state land managers as they pursue their own distinct planning activities within the watershed.[12]

Methodology
Using GIS data provided by THTLT and the Tug Hill Commission, a layer consisting of major rivers was created. The major rivers were identified in the Strategic Land Conservation Plan, and include:

- East Branch of Fish Creek
- Salmon River
- Black River
- Sandy Creek
- South Sandy Creek
- Mohawk River
- West Canada Creek
- Mad River
- Deer River

A quarter-mile buffer was created from these rivers, identifying those areas targeted for conservation.

Findings
The River Corridors map depicts rivers in Tug Hill that would benefit from a corridor (Map 4.3). Of the selected rivers, Salmon River, West Canada Creek, and the East Branch of Fish Creek are current focus areas for THTLT. These three rivers connect to existing protected lands and support THTLT's goal to protect the Tug Hill landscape. The Black River corridor at the border of Tug Hill is another currently existing corridor that will remain an area of interest for its recreational uses and riparian protection.

Recommendations
To enhance riparian wildlife and promote water quality, the U.S. Fish and Wildlife Service recommends at least a 300 foot buffer around the water body.[13] However, the buffer width varies depending on local and vulnerable species, slope, impervious surfaces, and soil types. Generally, the larger the buffer, the more beneficial it is to the water body. For Tug Hill, a more extensive buffer of a quarter-mile is suggested to protect the water quality and prevent discharge and other pollutants from entering the rivers. THTLT should focus their conservation efforts on lands that fall within these river corridors.

Wildlife Habitat Areas

Background
A wildlife habitat area is a contiguous set of preserved lands that can foster feeding, roosting, breeding, nesting, and refuge for a variety of species.[14] These areas allow for a greater variety of species which adds to the health and vitality of the ecosystem. Biodiversity is of great interest to THTLT for its benefits to the region in terms of environmental sustainability, recreational purposes, and regional attractiveness.

A wildlife habitat protection analysis consists primarily of two parts, species richness value and protected lands. By examining the spatial layout of these features, the analysis seeks to connect protected lands through the most valuable lands–those with the highest level of species richness. Therefore, the analysis targets land conservation efforts to those parcels that will produce the greatest benefit.

Ideally, the study would utilize a habitat inventory to identify those areas with the greatest potential impact on species conservation. However, such an inventory is infeasible given THTLT's capacities, so an approximation of species richness was used instead. The species richness calculates an approximate number of species that can be expected in a given area, based primarily on the land cover type. To improve the accuracy of these data, a comprehensive habitat inventory would be required.

Methodology

Areas with the greatest amount of species richness are of most value to conservationists in order to sustain the greatest number of species. Moreover, adjacency to protected lands enhances conservation value. Lands with a high species richness value that is adjacent to or between already protected lands is the most valuable and of the highest priority for conservation.[15]

A suitability analysis was conducted to determine those areas of highest conservation value. Using GIS, species richness and distance to protected lands were calculated to produce the resulting suitability map. The areas with the highest suitability value are those that are in close proximity to protected lands and have high levels of species richness.

Findings

Map 4.4 identifies areas in the Tug Hill Region with the highest value for creating and expanding a wildlife habitat area. It is apparent from the map that areas in the core of Tug Hill are the most valuable, while peripheral areas, particularly to the east, tend to be less valuable. Areas with high levels of protection tend to have greater species richness. Further conservation in these areas will produce the greatest benefit for the region.

Recommendations

A wildlife habitat protection analysis can provide THTLT with a measure of a parcel's value for conservation in terms of wildlife protection. In general, a habitat area's potential for success will depend on its size and the condition of the surrounding land. The larger the wildlife habitat area, the greater the species diversity and larger the populations it will support. THTLT can use this analysis to further their conservation efforts.

Conclusion

The suggested Recreation Corridors, River Corridors, and Wildlife Habitat Areas outlined in this chapter are intended to provide guidance to THTLT. The areas identified on the maps could help THTLT prioritize lands for conservation. By focusing on these priorities, Tug Hill will maintain its recreational amenities, riparian vibrancy, and richness of wildlife diversity.

Endnotes

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2 Texas Parks and Wildlife. Outdoor Recreation Analysis. http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_pl_e0100_0867/land_priorities/outdoor_rec_analysis/

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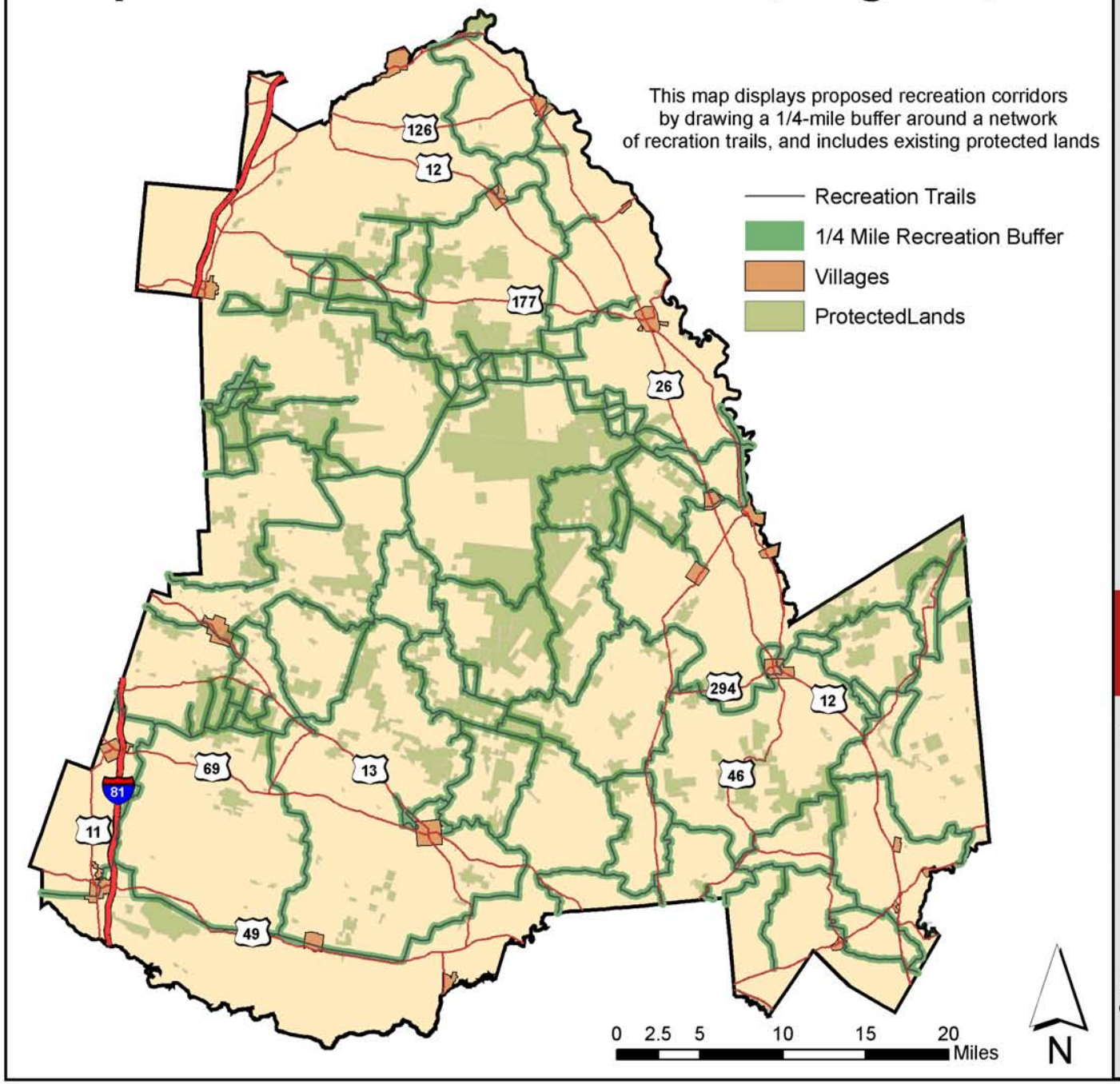
16 *ibid*

Map 4.1: Recreation Corridors, Tug Hill, NY



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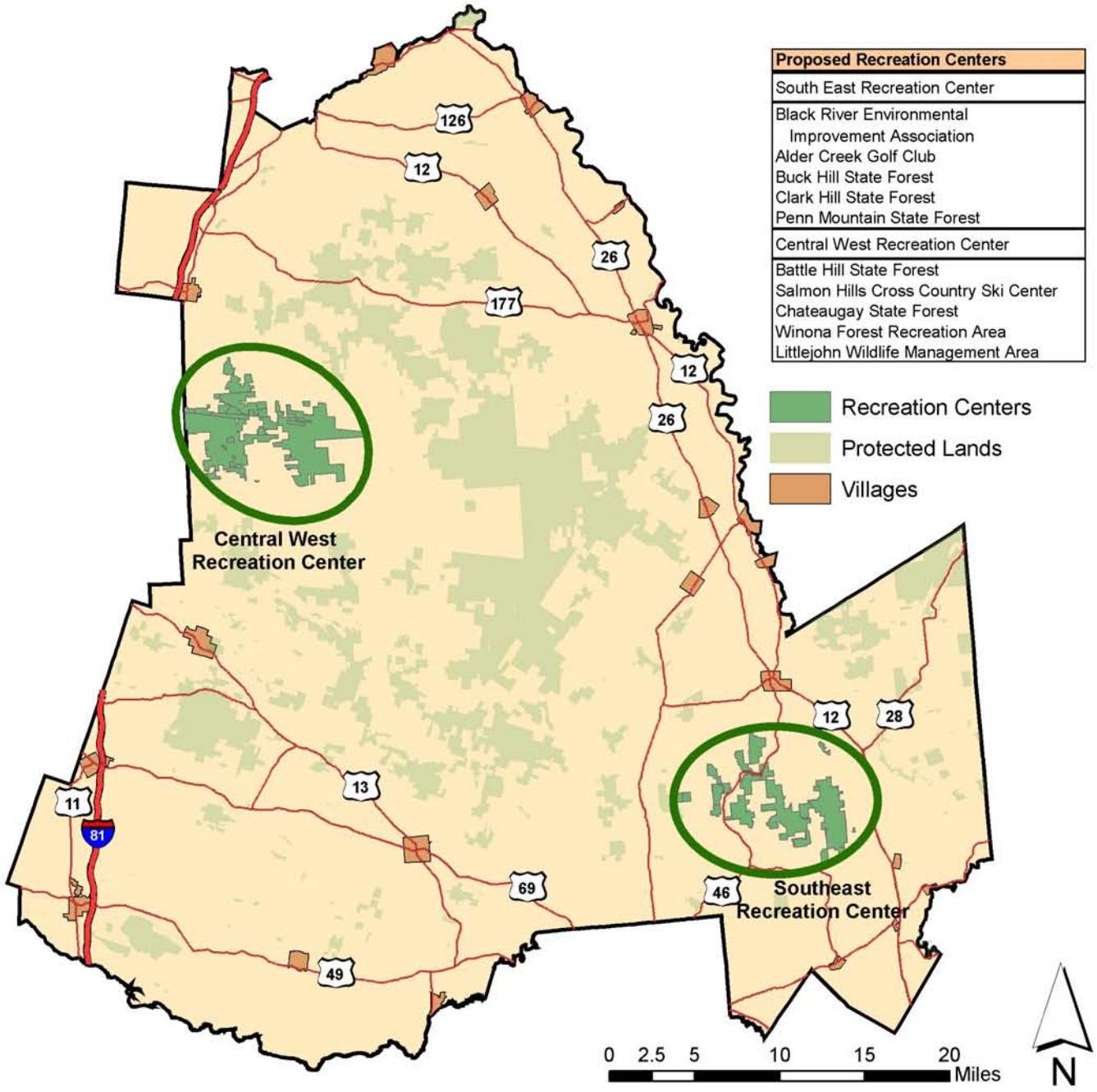
Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Note: 1/4-Mile buffer represents a 1/4 mile distance from each edge of recreation trail

Map 4.2: Recreation Centers, Tug Hill, NY



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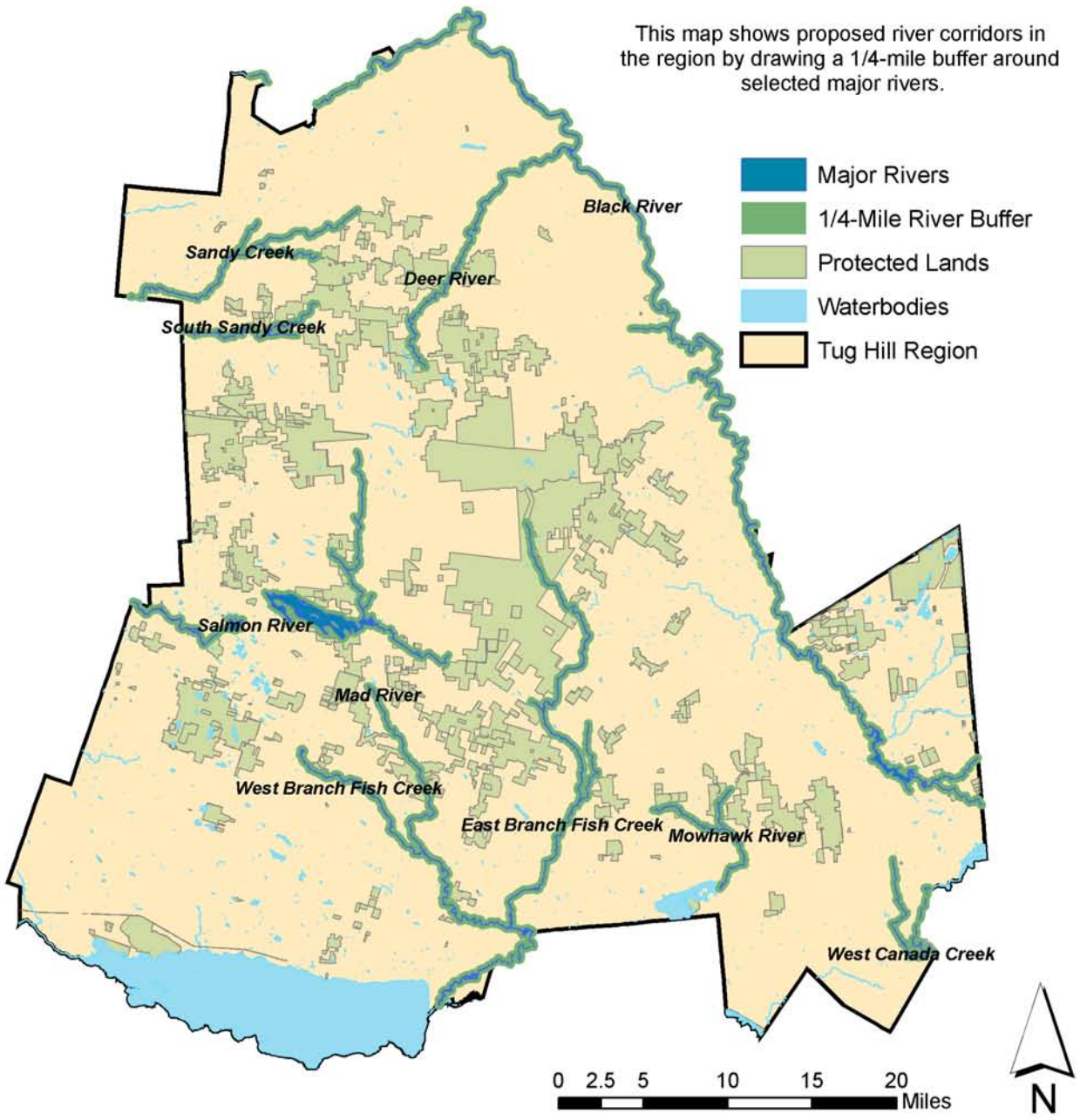
Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

This map highlights two locations for proposed recreation centers based on the concentration of existing protected lands in the region.

Map 4.3: River Corridors, Tug Hill, NY



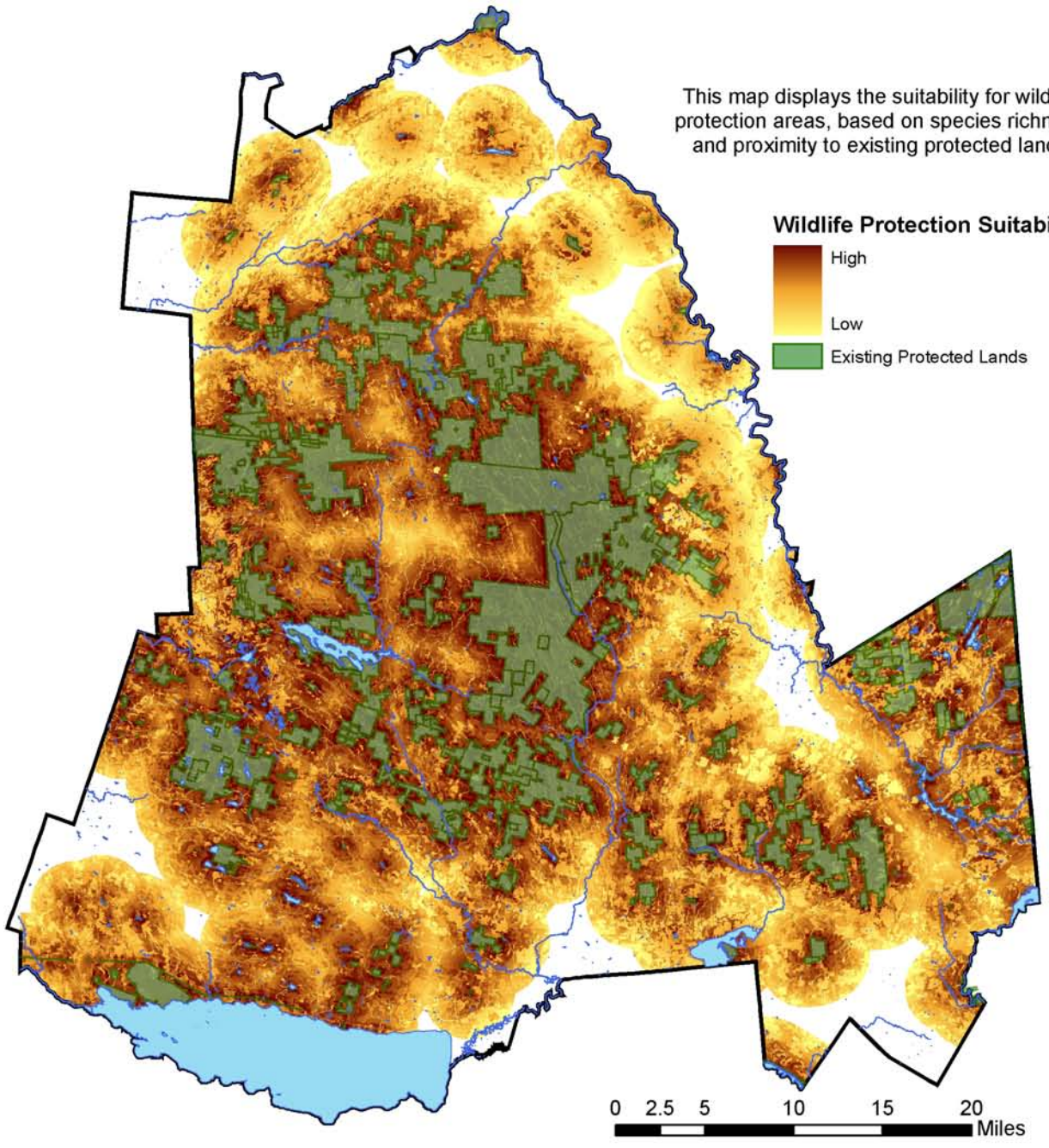
TUG HILL TOMORROW LAND TRUST

Cornell University

Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Note: 1/4-Mile buffers represent a distance of 1/4 mile from both river's edges

Map 4.4: Wildlife Habitat Area Suitability, Tug Hill, NY



TUG HILL TOMORROW LAND TRUST

Cornell University

Map created by City and Regional Planning Workshop, Cornell University, September 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters


Suitability Analysis
Photo: Sophie Mintier

Introduction

The land conservation decision-making process requires an assessment of a complex network of forces that act upon a given parcel of land. These forces may include physical components such as water bodies or non-physical components such as land use regulations. One method of assessing the impact of various forces on a parcel involves creating a suitability analysis model in a Geographic Information System, or GIS. This model is created using a computer mapping software, therefore only forces that can be spatially represented are able to be used.

A suitability analysis model can be defined as "a model that weights locations relative to each other based on given criteria."[1] Such a model can provide a reference map to use within the process of selecting land for conservation. By using a ranking scheme, the model puts individual parcels into a broader context. A suitability analysis streamlines the land conservation process, freeing up the limited resources of a land trust. It is important to note, however, that the model provides a snapshot of a changing region—it should not be considered the ultimate guide to conservation decisions. Using GIS, the Cornell team was able to create a suitability analysis model for the Tug Hill Region.

Methodology

Creating the Suitability Model

To ensure that the analysis would be tailored to the Tug Hill Tomorrow Land Trust's (THTLT) needs, the model was based on the existing evaluation criteria developed by THTLT for their Strategic Conservation Plan. Certain criteria were omitted for several reasons: they could only be determined on a case-by-case basis, a spatial dataset was not available, or they overlapped with other criteria. Ultimately, spatial datasets were generated for eleven of THTLT's twenty criteria (Table 5.1).

The next step was to assign ranking schemes to each criterion. All of the spatial datasets were converted to raster form, with each grid cell representing 100m x 100m. The raster datasets were reclassified on a 10-point scale, with 10 being "most suitable" and 1 being "least suitable". Most criteria developed by THTLT could be evaluated in a "yes/no" manner; for instance, is a parcel within an agricultural district or not? In these cases, "yes" was ranked as "10", while "no" was ranked as "1". Other criteria, such as size of parcel, were defined on a sliding 10-point scale.

The final step in setting up the suitability analysis was to assign relative weights to each criterion. Since THTLT assigned equal weight to their original criteria and later verified this decision, an equal weighting scheme was used. Additionally, parcels which are already protected were removed from the model, so that the suitability analysis would only consider land which has yet to be protected. Oneida Lake, representing substantial acreage, was also removed from the analysis.

Once these preliminary steps were complete, the suitability analysis was run. The raster calculator tool in GIS was used to calculate a "suitability score" for lands within the Tug Hill Region. All criteria were ranked equally; therefore, for every grid cell, the rankings for each criterion were simply summed. The three sublayers making up the Water Resources criterion were multiplied by 0.3 and summed to create that criterion's weight. The resulting values thus represent the conservation suitability of those areas. The highest potential score given the ranking and weighting scheme was 110 (if a parcel scored a "10" for all criteria). The resulting range of scores was then ready to be broken down into classes of varying suitability.

Classification Code

After the suitability model assigned point values to each grid cell, the resulting range of values was classified according to its suitability for conservation. It is important to choose a classification code that best presents the data to the map reader. Important criteria include where that data falls on the number line. The Cornell team separated the data into four suitability classes of land parcels with similar point values. They grouped the data naturally using a method called Natural Breaks. By using Natural Breaks separations, the Cornell team attempted to minimize the difference in values within one class while maximizing the differences between classes. Natural Breaks classes are both easy to compute and easy to understand.[2]

The highest score resulting from the analysis was 79. Following the Natural Breaks classification, values from 51 to 79 were designated as "most suitable"; values from 40 to 51 were designated as "highly suitable"; values from 30 to 40 were designated as "moderately suitable"; and the remaining values from 13, the lowest score, to 30 were designated as "least suitable" (Figure 5.1).

Table 5.1. Critieria included in Suitability Analysis

Criterion	Rationale	GIS Data Used	Ranking Scheme	Caveats
1. Focus Areas	THTLT has already defined these areas as priority areas.	Focus areas as defined by THTLT: forest core, East Branch of Fish Creek, Salmon River watershed, buffer around West Canada Creek	10 Within focus area 1 Outside focus area	Shapefile of Trenton Greenbelt and West Canada Creek created by the Cornell team.
2. Proximity to Protected Lands	Land contiguous to already protected lands create larger unbroken conservation areas; isolated parcels have less conservation value.	Buffer around existing protected parcels	10 Contiguous to protected parcels 8 Within 1/4 mile of protected parcels 6 Within 1/2 mile of protected parcels 4 Within 1 mile of protected parcels 1 Over 1 mile from protected parcels	Based on protected land parcel data as of September 2006.
3. Wildlife Habitat	Land that has the potential to support greater species richness is of higher conservation value.	Predicted species richness based on land cover type	10 Highest species richness values 8 High to moderate species richness values 6 Moderate species richness values 4 Moderate to low species richness values 2 Low species richness values	Species richness is predicted based on land cover type; it is not an actual count of existing species. The original data set is at state-level scale and thus only provides an approximation at the parcel level.
4. Working Lands	Preserving working farm and forest lands are important to the economic, cultural, and environmental health of the region.	Tax parcels enrolled in agricultural or forestry tax abatement programs, or designated as agricultural or forest in tax assessor database	10 Tax abatement land/agricultural or forest property code designation 1 No tax abatement program/other designation	Existing tax designations may not represent all extractive use of forest lands.
5. Water Resources	Protecting parcels contiguous to Tug Hill's water resources is vital to preserving water quality, a priority for the economic and environmental health of the region.	5a. Buffer around all surface water features	10 Contiguous to water feature 8 Within 400 meters of water feature 1 Over 400 meters from water feature	No differentiations were made between the ecological value and quality of different water features. State aquifer dataset is not complete.
		5b. NYS DEC Wetlands	10 Contains wetlands 1 Does not contain wetland areas	
		5c. NYS aquifer boundaries	10 Land overlays aquifer 1 Land does not overlay aquifer	
6. Scenic Views	Protecting designated scenic viewsheds is vital to the cultural and economic health of the region.	Viewsheds identified in the Scenic Resources Chapter showing areas of highest scenic value	10 Land of critical importance to scenic viewshed 7 Land of high priority to scenic viewshed 4 Land of priority to scenic viewshed 1 Land not a priority for scenic viewshed	The 2006 scenic inventory focused on the southern and eastern rather than the northern areas of Tug Hill.
7. Historic Resources	Preserving historic sites is important to the culture, history, and economy of the region.	Sites listed on the NYS or National Register of Historic Places	10 Within 150 meters of listed historic resource 1 Over 150 meters from listed historic resource	Archeological site data is restricted by state and national historic preservation acts.
8. Recreation	Preserving lands that contain trails maintains public access rights, protects against uncontrolled development, and provides a buffer for nearby residential areas.	Tax parcels intersected by designated snowmobile trail.	10 Intersected by snowmobile trail 1 Not intersected by snowmobile trail	No spatial data was available for additional recreation uses such as hiking trails.
9. Parcel Size	Larger parcels have higher ecological and therefore conservation value than smaller parcels.	Tax parcels broken down by size classes as defined by THTLT Strategic Conservation Plan	10 Over 500 acres in size 8 250 to 500 acres in size 6 100 to 250 acres in size 4 50 to 100 acres in size 2 10 to 50 acres in size 1 less than 10 acres in size	Based on 2004 tax parcel data.
10. Rare and Endangered Species	Land that supports rare or endangered species has a high conservation value.	Tax parcels that contain rare and endangered species locations and significant ecological communities as defined by NYS DEC.	10 Contains rare or endangered species or significant ecological community 1 Does not contain rare or endangered species or significant ecological community	"Ecologically significant community" is defined by NYS DEC; rare and endangered species locations only include sightings reported to NYS DEC.
11. Agricultural District	Lands in agricultural districts have protections in place to support working farms, which are vital to the economic and cultural health of the region.	NYS designated agricultural districts	10 Within agricultural district 1 Outside of agricultural district	Based on 2001 data.

Figure 5.1: Classification Ranking

Suitability Ranking
Conservation Value

- Most Suitable (51-79)
- Highly Suitable (40-51)
- Moderately Suitable (30-40)
- Least Suitable (13-30)

Findings

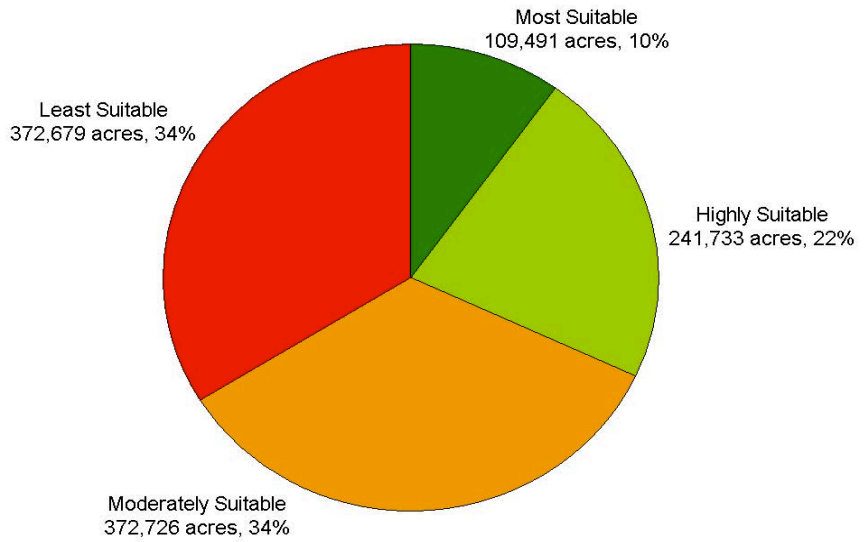
Model Overview

The results of the suitability analysis were mapped using GIS (Map 5.1). Overall, 10% of the region's unprotected lands, or nearly 110,000 acres, were considered most suitable for conservation. Highly suitable and moderately suitable lands were 22% and 34% respectively, and the areas considered least suitable were nearly 34% of the total unprotected lands (Figure 5.2). Lands classified as most suitable and highly suitable are concentrated towards the center and northeastern fringe of Tug Hill. The least suitable lands are clustered along the northern and southwestern periphery.

The spatial distribution of the most suitable lands is best explained by the emphasis placed upon forest resources. Some criteria explicitly favor forest resources. The Wildlife Habitat criterion, for instance, gives greater weight to sugar maple mesic forests, which in Tug Hill have the potential to support the greatest number of species. Other criteria, such as Parcel Size, implicitly highlight forest resources; many of the largest and therefore most suitable land parcels are logging tracts held by timber management companies. This emphasis on forest resources explains why much of the land deemed most suitable for conservation is located within the undeveloped forest core area of Tug Hill.

The analysis highlighted areas rich in natural resources. Areas not scoring highly in the suitability analysis did so for a variety of reasons. Lands in more highly developed areas of Tug Hill scored lower for most of the criteria. Unlike the forest core, which is almost entirely uninhabited, the southern edge of Tug Hill is impacted by nearby urban centers, and the western portions of Tug Hill are adjacent to an interstate highway.

Figure 5.2: Land Conservation Suitability Distribution Tug Hill, NY 2006



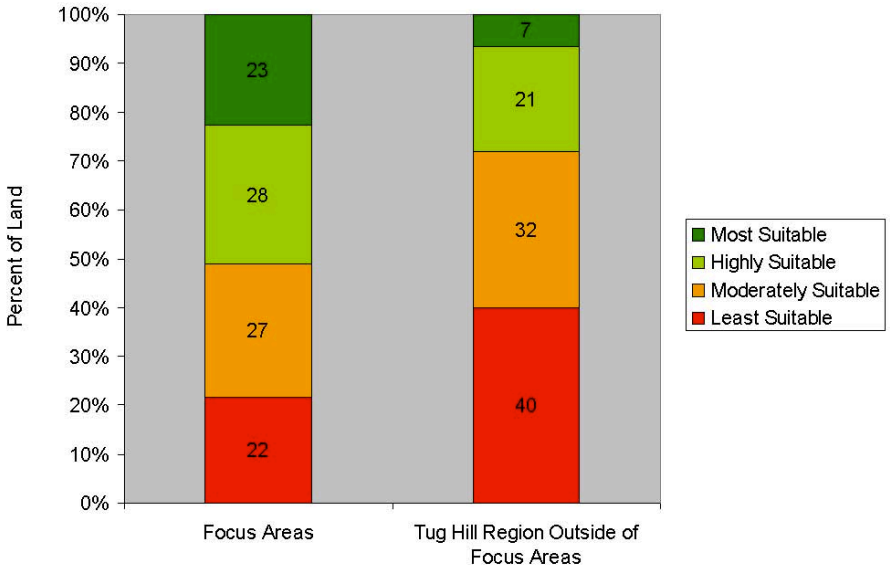
Focus Areas

The focus areas of THTLT encompass the watersheds of the East Branch of Fish Creek and the Salmon River; West Canada Creek; the forest core; and the Trenton Greenbelt. Large swaths of land at the center of the Tug Hill Region contain overlapping focus areas (Map 5.2).

To evaluate the suitability scores of the lands within the focus areas, a secondary suitability analysis was conducted. This second analysis was identical in method to the first except that the Focus Areas criterion was removed from the model (Map 5.3). This allowed comparisons between the suitability classifications of the focus areas relative to the rest of the region without skewing the scores in favor of the focus areas.

The findings indicate that THTLT's focus areas include most of Tug Hill's lands of highest conservation value. A full 23% of focus area lands, or 50,000 acres, fall within the most suitable classification. In contrast, only 7% of lands outside the focus areas are considered most suitable. Incorporating the highly suitable classification into this analysis further demonstrates the focus areas' extraordinary potential for land conservation — 51% of the focus area lands fall within the two highest classifications, compared to only 28% of the remaining lands (Figure 5.3).

Figure 5.3: Suitability of Unprotected Lands
THTLT Focus Areas v. Non-Focus Areas



Based on the criteria present in the suitability analysis, it is obvious that the focus areas delineated by THTLT were well-defined and are worthy of their increased attention.

Test Parcels

THTLT supplied the Cornell team with six pre-ranked test parcels against which to test the suitability analysis. The parcels are currently under consideration by THTLT and are geographically dispersed throughout Tug Hill. They comprised a range of rankings – from highly sought after to minimally considered. Each parcel was overlaid upon the suitability analysis and given an exact suitability score by averaging the range of grid cell scores present within the parcel boundary (Figure 5.4).

The suitability analysis returned scores that generally matched THTLT's rankings. Half of the test parcels received suitability analysis scores that matched perfectly with THTLT's rankings. These parcels received "high" compatibility scores. Two of the remaining three test parcels received scores that were a few points below the threshold for the classification which would have matched THTLT's own ranking. These parcels received "medium" compatibility scores. The final test parcel received a score that was incompatible with THTLT's ranking. That parcel, located in the Town of Redfield, scored highest among all the test parcels yet was ranked by THTLT as only a mediocre conservation priority.

This test showed that overall, the suitability analysis proved to be a powerful tool in translating THTLT's "gut instinct" rankings into a quantitative measure of any individual parcel's conservation potential. The incompatibility of some of the parcel scores highlights the importance of using this model in the context of a qualitative, site-specific project evaluation process, as the suitability analysis is limited in scope by data availability. Criteria not included in the model might make a parcel more desirable than its score might indicate. Conversely, however, a score higher than expected might indicate that such a parcel deserves a closer look.

Recommendations

Whereas the suitability analysis is useful as an immediate reference when potential landowners contact THTLT, it is also ideally suited to support planned conservation projects in the focus areas. Most importantly, THTLT can prioritize the protection of the most suitable land parcels within the five focus areas (Map 5.3). For example, THTLT can prioritize parcels over 150 acres within the Trenton Greenbelt classified as most suitable.

Some areas, specifically the region north of Oneida Lake, did not score highly in the suitability classifications. This does not devalue the conservation potential of these lands but rather shows the limitations of a quantitative GIS model. There are myriad criteria which can neither be spatially represented nor adequately quantified. THTLT's keystone property criterion is one such example. That a parcel will set a precedent for future land acquisitions is impossible to gauge since community attitudes and willingness to engage in conservation are dynamic. Chapter 6 explores and recommends various approaches for protecting these parcels.

Caveats

While GIS maps are an easy way to communicate a large amount of data, GIS software users face a number of challenges and caveats that all map readers should consider. In the case of the conservation suit-

ability analyses, the Cornell team used a variety of spatial layers from different sources and different publication years, each with their own caveats (Table 5.1). The model relied on tax parcel boundaries from 2004 to delineate areas for conservation. Such boundaries are often inaccurate and have no legal significance. Due to the limited availability of digitized spatial information, layers only represent opportunities for conservation and do not represent constraints such as potential development threats. The final suitability analysis calculates the percentage of land that should be prioritized for conservation easements or land registries based on the total Tug Hill acreage calculated within the GIS. It does not include lands already protected but it does include some water bodies such as Delta Lake. Sites with high scenic value are based on an inventory conducted in southern, eastern, and northern areas of Tug Hill (Map 3.2) and do not include sites identified in the 1991 Tug Hill Commission inventory. The total acreage figures used in this analysis were determined through GIS calculations.

A main criticism of site-suitability analysis is scale. For instance, a grid cell representing a square mile will not capture land variations or ecosystem diversity at a quarter-mile scale. To make the Tug Hill suitability model as accurate as possible, every grid cell represents only 100 square meters and almost every layer incorporated within the suitability analysis was based on grid cells of 100 square meters. The only exceptions were the Agricultural Districts layer, which is based on cells slightly larger than 100 meters, and the Viewshed Analysis layer, which was created using cells representing 10 square meters.

Conclusion

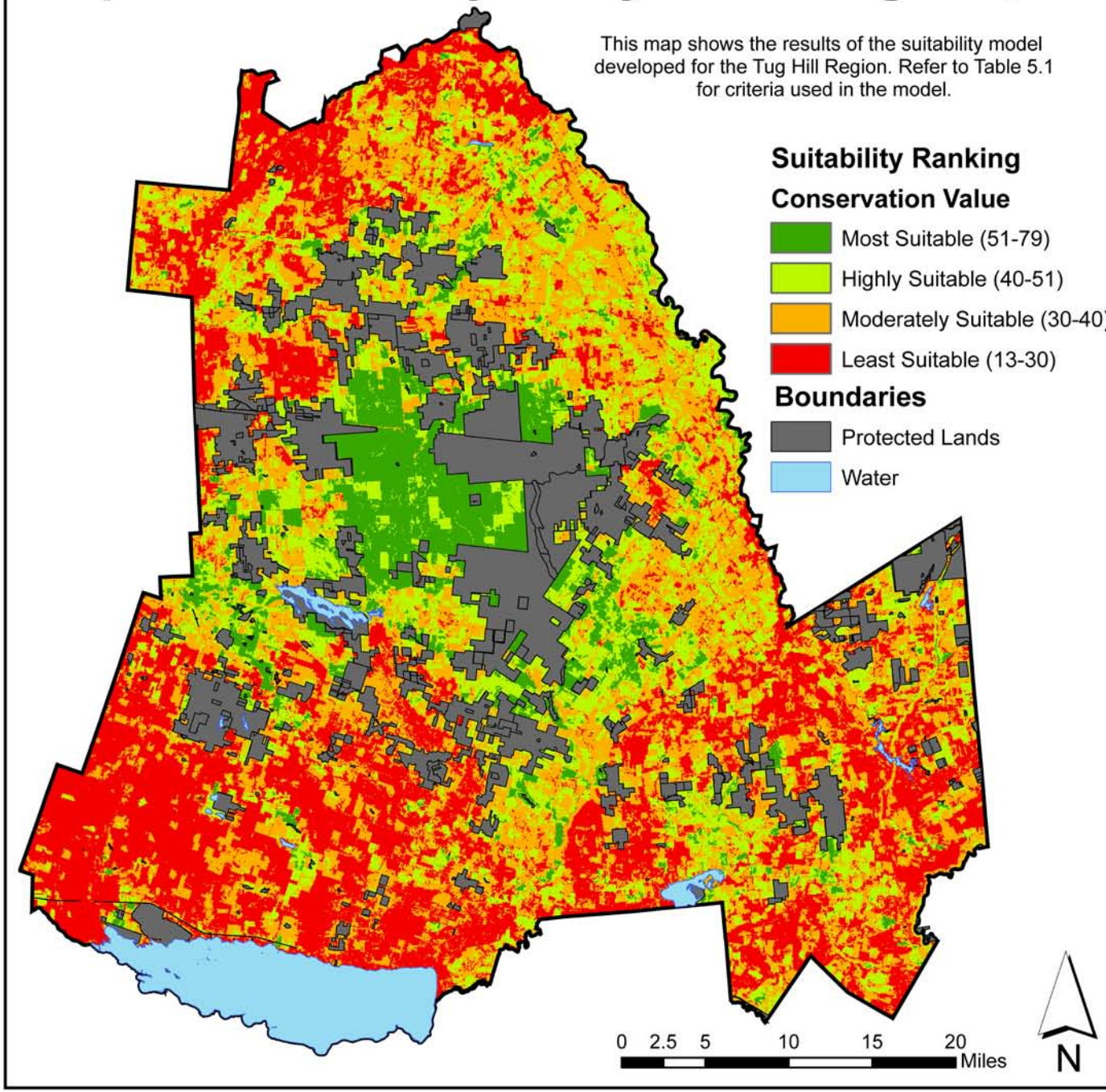
The suitability analysis created by the Cornell team provides a valuable tool to help the Tug Hill Tomorrow Land Trust prioritize their land conservation efforts. This analysis is based on THTLT's criteria for land conservation and translates their verbalized priorities into a spatially represented form. However, it is important to remember that this analysis cannot take all of THTLT's principles into consideration, and should therefore be used within a larger decision-making context.

Endnotes

[1] Environmental Systems Research Institute (ESRI).

[2] Slocum, Terry A., Robert B. McMaster, Fritz C. Kessler, and Hugh H. Howard. 2005. Thematic Cartography and Geographic Visualization. Second Edition. Upper Saddle River, NJ: Pearson Prentice Hall. pp. 77-89.

Map 5.1: Suitability Analysis for Tug Hill, NY



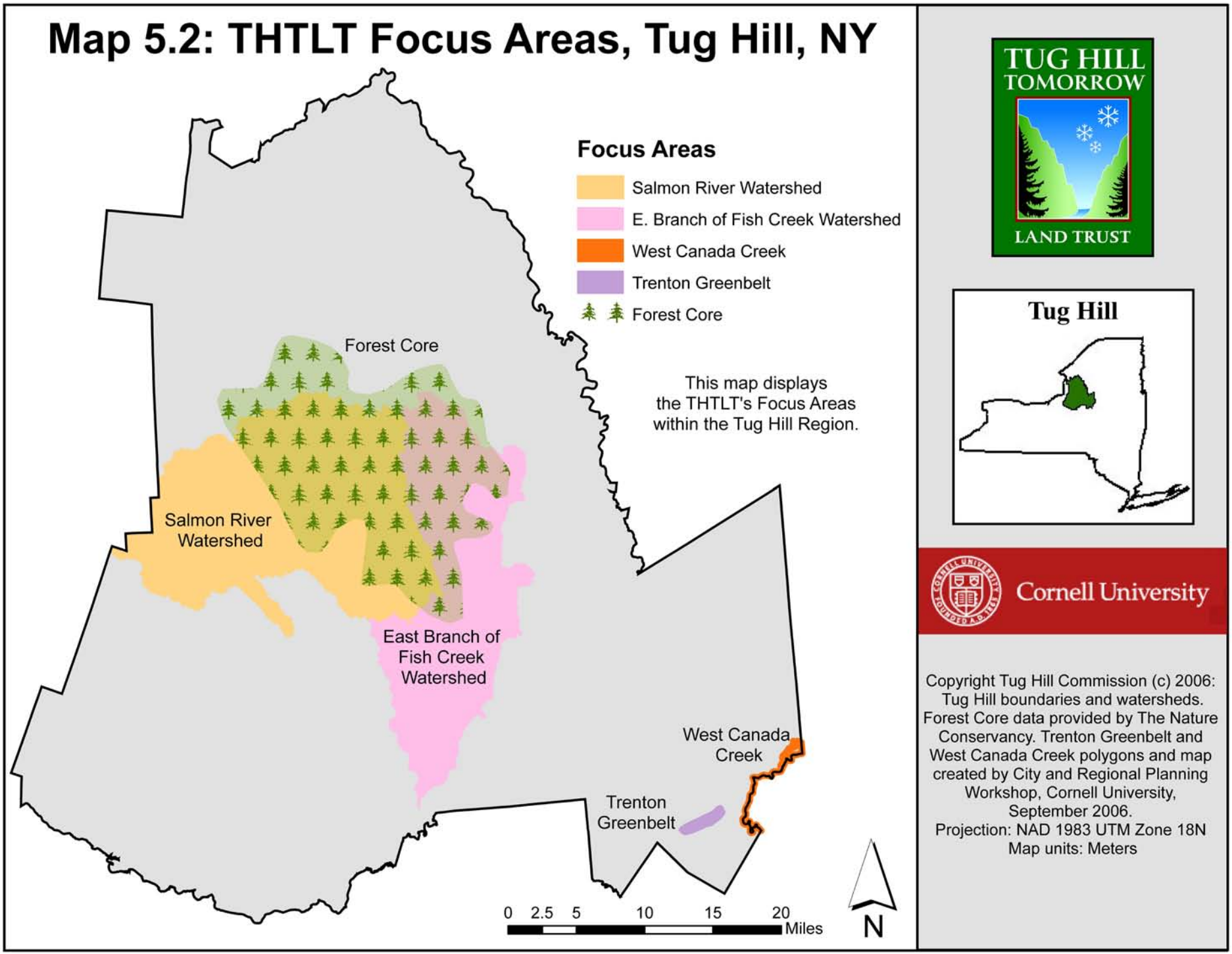
TUG HILL TOMORROW LAND TRUST

Cornell University

Projection: NAD 1983 UTM Zone 18N
Map units: Meters

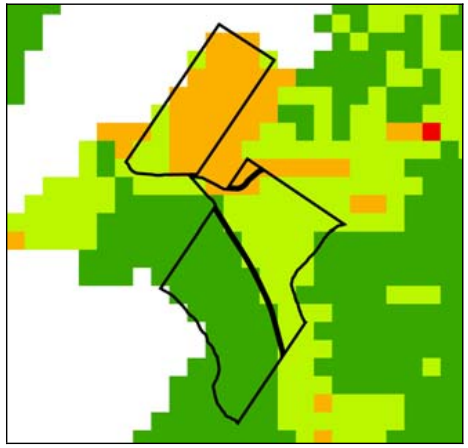
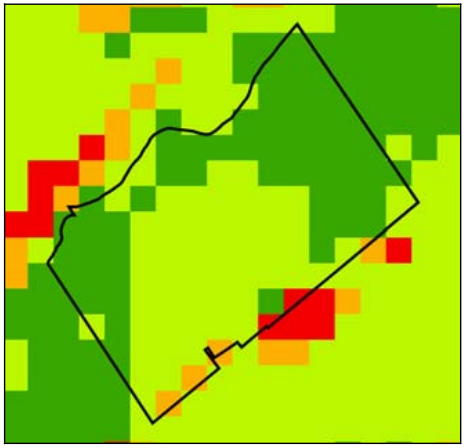
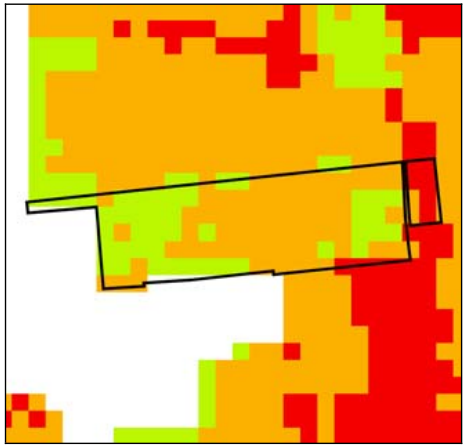
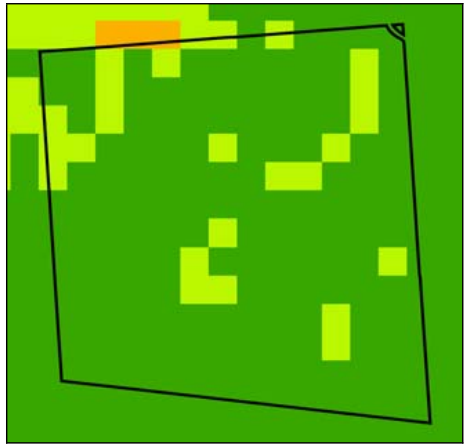
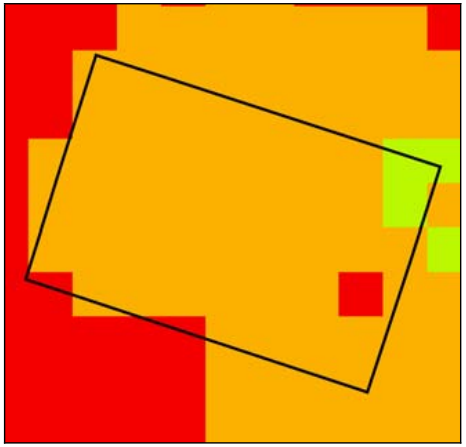
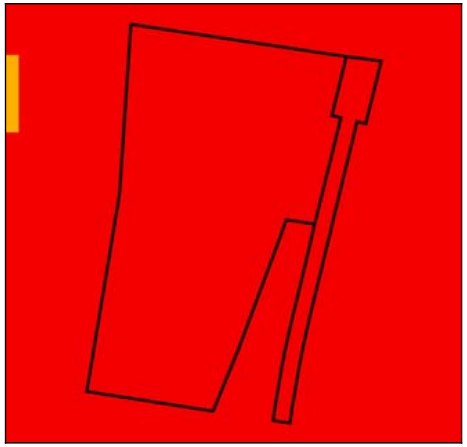
Suitability Classification	Acres	% of Total
Most Suitable	109,491	10
Highly Suitable	241,733	22
Moderately Suitable	372,726	34
Least Suitable	372,679	34
Total	*1,096,629*	*100*

Map 5.2: THTLT Focus Areas, Tug Hill, NY

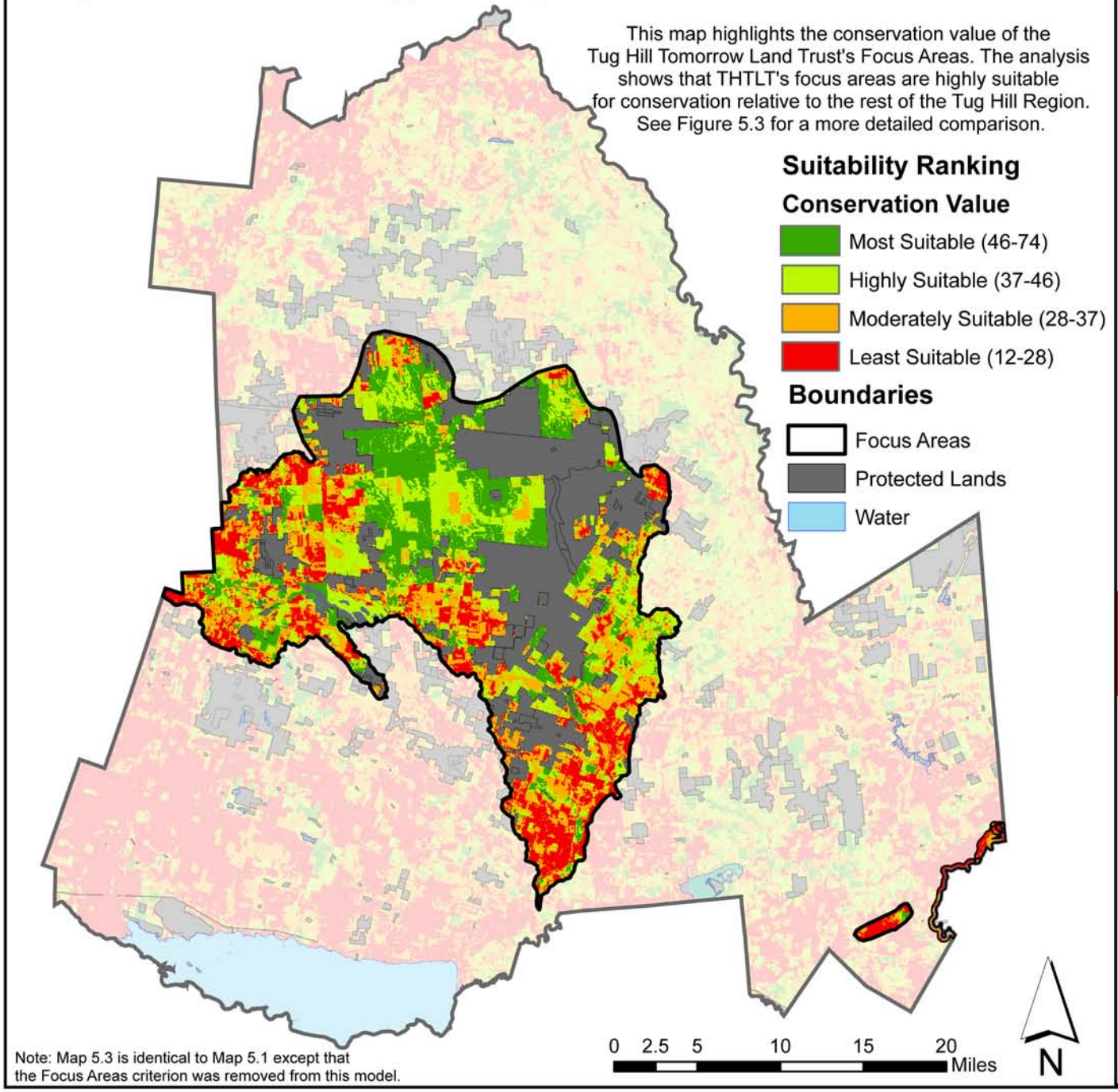


Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Figure 5.4: Test Parcel Comparison between THTLT ranking & Suitability Analysis Score

West Turin		Denmark		Lee	
					
THTLT Ranking #1 (Highest) **Suitability Analysis Score** 48 (Highly Suitable)	**Ranking Compatibility** Medium	**THTLT Ranking** #2 (Highest) **Suitability Analysis Score** 52 (Most Suitable)	**Ranking Compatibility** High	**THTLT Ranking** #3 (High) **Suitability Analysis Score** 38 (Moderately Suitable)	**Ranking Compatibility** Medium
Redfield		**Williamstown**		**Adams**	
					
THTLT Ranking #4 (Medium) **Suitability Analysis Score** 54 (Most Suitable)	**Ranking Compatibility** Low	**THTLT Ranking** **#**5 (Medium) **Suitability Analysis Score** 36 (Moderately Suitable)	**Ranking Compatibility** High	**THTLT Ranking** #6 (Low) **Suitability Analysis Score** 20 (Least Suitable)	**Ranking Compatibility** High

Map 5.3: Suitability Analysis of THTLT Focus Areas



TUG HILL TOMORROW LAND TRUST

Cornell University

Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Suitability Classification	Acres	% of Total
Most Suitable	49,916	23
Highly Suitable	62,481	28
Moderately Suitable	60,032	27
Least Suitable	47,481	22
Total	219,911	100

Photo: McNamara

Introduction

Using a suite of implementation tools and strategies is crucial to the continued success of the Tug Hill Tomorrow Land Trust (THTLT). The preceding chapters identified areas for future conservation efforts and methods for defining parcels of interest. In this chapter the Cornell team identifies several tools that are appropriate for implementation of the Strategic Conservation Plan, based on the specific conditions of four geographic areas in Tug Hill.

Conservation Implementation by Geographic Area

Growth in Tug Hill comes mainly in the form of single parcel developments. After conversations with the four county planning departments and regional research, the Cornell team determined that Tug Hill is currently facing low development pressure, particularly in Jefferson and Lewis Counties. Building permit data for new home construction for Lewis and Jefferson Counties showed an average of 50-80 permits per county in each year over the 2003-2005 period.[1]

However, two potential future sources of pressure in Tug Hill are second-home development and in-migration of residential users. The size and diversity of the Tug Hill Region make implementation of conservation goals difficult. Although THTLT has been successful with conservation easements, there are other implementation strategies that can expand THTLT's overall conservation portfolio when chosen in accordance with the specific needs and conditions of the immediate area.

Based on the priorities of THTLT and previous research findings, the Cornell team decided to examine four geographic areas: agricultural districts concentrated in Lewis and Jefferson Counties, the Fort Drum northern boundary area, the forest core, and the north side of Oneida Lake (Map 6.1). For each of these areas, the team recommends specific tools to guide conservation planning and to integrate local needs and constraints with the overarching goals of THTLT. (Table 6.1) Given varying levels of regulation and local and state coordination involved in adopting such tools, not all of the measures featured here can be directly implemented by THTLT. However, collaboration and coordination with entities at the local and state levels could facilitate the adoption of a broad range of tools in the future and secure conservation outcomes (Figure 6.3).

Agricultural Districts in Lewis and Jefferson Counties

Farmland preservation increases the likelihood that agriculture-related or farm-support businesses will remain in operation and sustain agriculture as a local and regional industry.[2] However, throughout the region, these businesses alone are not strong enough to encourage farms to remain in operation; thus, many farmers in Tug Hill have transitioned from intensive vegetable farming to dairy and beef operations with highly exportable, value-added products. With several hundred dairy farms in the region, counties within Tug Hill are among the top 10 dairy and beef producers in the state.[3] Therefore, the high concentration of municipalities with agricultural and large-lot zoning in place in Lewis and Jefferson Counties may offer the strongest potential for farm conservation.

There are a range of techniques available to local municipalities and counties for protecting farmland. Villages, towns and counties must first determine the extent to which they want to protect farmland and then choose protection techniques accordingly. However, the municipality's planning framework will partially determine the capacity for enacting these techniques. The use of land use regulations varies throughout the region (Map 6.2). Municipalities that do have planning in place tend not to undertake large-scale comprehensive planning. While zoning appears to play a strong role at the local level in several municipalities, provisions for agricultural protection in zoning ordinances have been limited.

Comprehensive Plans

For communities in which farming remains important, comprehensive plans can be an important tool.[4] According to the American Farmland Trust, "comprehensive plans can form the basis of a local land protection strategy by identifying areas to be protected for farming and forestry as well as areas where development will be encouraged."[5] Comprehensive planning efforts, though time-consuming, also enable farmers and other local residents to engage in discussions of a community's future and may be less expensive than other farmland protection tools.

Purchase of Development Rights

Other tools for farmland conservation that do not require an extensive planning framework include Purchase of Development Rights (PDRs) and conservation easements. PDR, or Purchase of Agricultural Conservation Easements (PACE), is a voluntary approach to farmland protec-

tion that pays landowners for permanently protecting their land for agriculture through the sale or transfer of some of the rights to the property, such as the right to harvest timber or develop the property.[6] Projects are often funded through various state and federal farmland protection programs or through town bonds, property taxes, or real estate transfer taxes. PDRs work well in situations where there is weak development pressure and limited planning and zoning. Cheaper land values make the acquisition of development rights more cost-efficient and landowners may be more willing to donate land instead of selling it for development.

PDR programs place a deed restriction, commonly known as a conservation easement, on the property. Conservation easements are permanent agreements tied to the land that apply to all future owners. Land can still be farmed or used for forestry, recreation, or other uses compatible with agricultural activities. The value of a conservation easement equals the fair market value of a property minus its restricted value, as determined by a certified real estate appraiser.

Overlay District

Agriculture and residential development tend to be incompatible uses; therefore, any residential zones surrounding agriculture zones pose a threat to continued farm operations. Agricultural overlay districts protect farm operations by preventing non-agricultural uses from negatively impacting agriculture as the primary land use (Table 6.2 in the Technical Appendix). An overlay district is a zoning requirement that is placed on a geographic area but does not change the underlying zoning. This approach allows a town to maintain or update current codes while addressing the special needs of particularly sensitive areas.[7] Overlay districts work well when there are sufficient land use planning and zoning mechanisms in place, and work with both strong and weak development pressure. State law also allows for intermunicipal overlay districts, which encompass all or a portion of multiple municipalities for the purpose of providing additional protection in areas straddling municipal boundaries.[8]

Within the region, the Town of Lowville, whose economy is dependent upon agriculture, has proactively zoned much of the lands bordering agricultural districts as open space or conservation, recognizing the need to allow farmers to operate loud machinery or raise livestock. Additionally, the option to rezone the land area along the highway to industrial through the use of an overlay district may not pose as great of a threat as allowing the area to become dominated by residential development.

Lowville's zoning ordinance includes other measures that can be adopted by communities considering farmland protection strategies for either agricultural or open space amenities.

Lowville: Best Practices for Agricultural Zoning

Performance standards in Lowville's zoning ordinance exclude lands "…within county agricultural districts if they would unreasonably restrict or regulate farm structures or farm practices in contravention to the purposes of New York State Agricultural District Law." The majority of Lowville's municipal agricultural zones are included within one of the state-designated agricultural districts protected under NYS Agricultural Law; however, municipalities that do not enjoy this protection may need to pursue legislation that safeguards farm operations in these areas.

Lowville permits temporary roadside stands for the sale of agricultural products grown on the premises through the issuance of temporary zoning permits. Temporary permits are authorized on approval of the Planning Board for a period no longer than twelve months. This clause could be modified to allow for roadside stands as a temporary or permanent accessory permitted in all agricultural and commercial zones, offering yet another viable outlet for farm production.

Source: Town of Lowville Zoning Ordinance

Agricultural Zoning

Municipalities may also consider redefining limited agricultural services as agricultural enterprises which include a variety of farm retail sales and service provision. Providing opportunities for alternative income generating activities based on farm operations is a viable strategy for municipalities facing a reduction in farm activity. The provision of agricultural services and revenue generation through zoning may also offer farmers alternatives to selling their land for development purposes; however, regulations must ensure that retail operations directly promote local farm activity rather than non-farm retail operations.[9]

To be successful in protecting farmland, each of these tools requires ongoing investment of time and resources in the form of monitoring and

enforcement. Fortunately for the region, THTLT is experienced at coordinating conservation easements. However, in order to diversify its land conservation strategy, THTLT must build capacity by educating local officials and farmers about the benefits of the other available conservation programs.

Photo: Aatisha Singh

Forest Core

The forest core is experiencing very limited development pressure, mostly related to seasonal recreational uses. Municipalities must finance road maintenance and snow removal in areas where there may be few year-round residents, but seasonal use has caused the conversion of former public rights-of-way into marginal grade roads. Once these road networks, formerly used only locally and irregularly, become designated as county and municipal roads, the responsibility for upkeep transfers to the municipality, which must then finance road maintenance and snow removal.

Limiting Road Access

In Tug Hill's forest core, road maintenance primarily supports recreational use of ATVs and snowmobiles, and provides access for camps and hunting clubs. Limiting services to those areas in the forested core where seasonal camps and recreational organizations exist may be one effective way to reduce the local tax burden throughout the region.

Limiting infrastructure services in these areas is challenging because of health and safety rationales for road maintenance expansions. However, if a community has a comprehensive plan and a strong justification for limiting services to preserve community character, it may have a better chance of limiting their service burden and thereby directing growth to better-serviced areas.

Under such circumstances, municipalities may be able to shift road maintenance to the county through a functional transfer to relieve this fiscal burden. Transfers are typically enabled by state statutes and effected by intergovernmental negotiation. Another option, the use of intermunicipal service agreements, includes a wide variety of contracts and arrangements from shared road equipment and mutual aid pacts for fire fighting to extraterritorial planning review and water treatment services.[10]

Finally, seasonal road designations are a third way to limit development. Rather than shift maintenance to the county, these designations temporarily stop all road maintenance during the winter months. Pursuant to Article 8 (Town Highways) of NYS Consolidated Highway Law, a town's highway superintendent is permitted to designate a seasonal limited-use highway before November 1st of each year. Once a road is declared a seasonal limited-use highway, the town is authorized to temporarily discontinue snow and ice removal and maintenance from December 1st until April 1st.[11]

Short of regionalization, through working with the county, municipalities could then contribute to a county-wide road inventory and formulate criteria for road plowing and routine maintenance. This framework can then enable jurisdictions to guide development to areas adjacent to more established roads through the comprehensive plan.

This requires a strong political will and public education on the need for targeted development along more established roads; however, the fiscal argument in favor of such a decision—that it would free some municipal funds for other high-priority local needs—should be compelling to constituencies concerned with their high tax rates.

North of Oneida Lake

Although Tug Hill faces less development pressure than other areas in New York State, fragmentation of the landscape by individual home construction and residential developments remains a concern. If construction increases in the future, the use of Conservation and Limited Development Projects (CLDPs), conservation subdivisions, and infrastructure planning (described below in the Fort Drum section) may all become practical and viable strategies for protecting this amenity-rich area. Cluster subdivisions are most appropriate in cases where development is expected and residents are willing to increase the density in one area in order to consolidate that development and preserve surrounding land. In addition, strong planning frameworks support cluster subdivisions and CLDPs where areas are facing moderate development pressure.

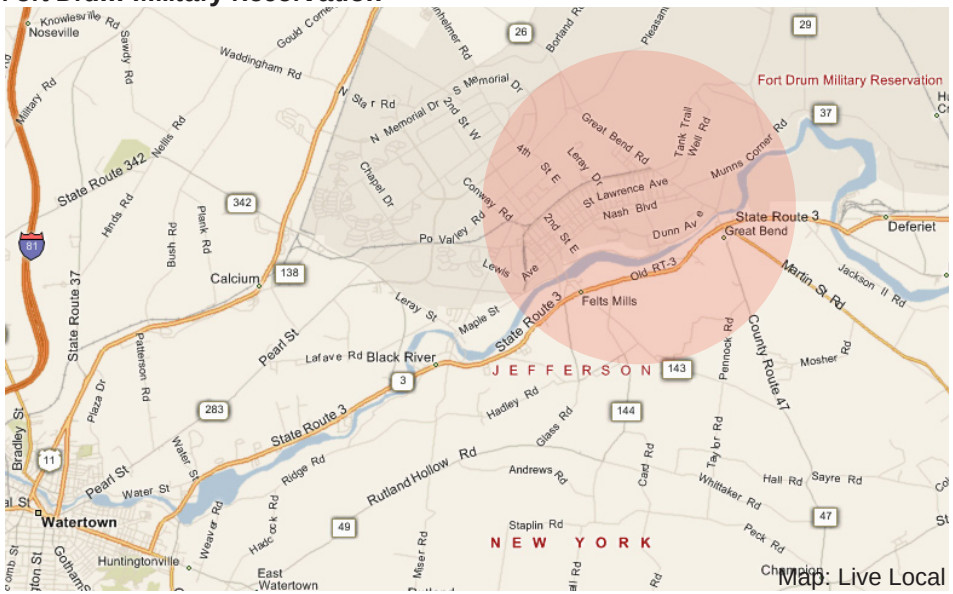
Fort Drum

Fort Drum has guided the structural and economic changes in the North Country for many years. Its location abutting Tug Hill to the north is of special concern for the future of THTLT. In recent years, the population of Fort Drum has increased from 10,000 to 17,000 soldiers. While the land area of the base is not increasing, more intensive use of the land already owned by Fort Drum is occurring. Fort Drum's retention of retiring soldiers is the highest in the nation. With an increase in troops of almost 50%, there will be an expansion of residential units in Tug Hill to accommodate those soldiers and their families who want to remain in the area after they retire. With two of the three brigades that are based at Fort Drum currently on mission, expansion of the structural facilities has started and environmental conservation is a serious priority.

Fort Drum is located in an area of ecological significance, with two endangered species (the federally threatened Bald Eagle and the federally endangered Indiana Bat) and 11 New York State endangered species. Fortunately, the Fort partners with a range of agencies and institutions, including the US Fish and Wildlife Service, the Department of Defense, and Cornell University Biological Control in its stewardship efforts. In addition, Fort Drum has been recognized as one of the best installations in the country for its conservation of natural resources in the planning and design processes.

Currently, Fort Drum is putting together a proposal to be submitted to the Army Compatible Use Buffer (ACUB) program, which grants federal money to army bases to be used to purchase conservation easements on neighboring lands. The acquisition and monitoring of the easements can be carried out by a land trust or other state agency. In the case of Tug Hill, THTLT is the obvious partner for this program.

Fort Drum Military Reservation



Fort Drum's proposal for the ACUB program focuses on 80,000 acres of training grounds, which must be buffered in order to be effective. These are bounded by the Route 11 corridor to the north, the Route 26 corridor to the east, and the Route 3 corridor to the south[12] (Map 6.1). Only a small portion of these grounds are considered to be inside the Tug Hill Region. Within this acreage, Fort Drum planners are beginning to develop criteria to identify the parcels that are the highest priority for acquisition or conservation easements. The ACUB program would use money to ensure that lands surrounding Fort Drum would enable the dual goals of protection of the environment as well as buffering citizens from military training grounds. If the proposal receives approval, Fort Drum would be eligible for funds by the end of the fiscal year in September 2007. As the projected increase in the Fort's population will likely have spillover development effects on the surrounding region, it may benefit from the following implementation measures, aimed at accommodating development strategically to preserve nearby areas rich in natural amenities.

Conservation and Limited Development Projects (CLDP)
CLDPs combine conservation and development, using part or all of the revenues from development to fund the conservation portion of the deal. There are various roles a land trust can play in a CLDP depending on their risk threshold, expertise with land development, and desired level of control over conservation decision making. CLDPs and cluster subdivisions work well where there is a lack of water and sewer infrastructure development and some development pressure (pre existing small-scale subdivisions).

According to Jeffery Milder, a conservation specialist from Cornell University, "CLDPs are beneficial only when the resource is under foreseeable threat of development or degradation. Otherwise, limited development may serve only to introduce negative impacts."[13] Also, there must be sufficient infrastructure levels in the areas experiencing the pressure to accommodate moderate increases in density. The use of limited development projects by THTLT is not advisable at present, given the relatively low development pressure in the region. However, if residential development in the Fort Drum area and second home residential development from the Adirondack and Thousand Islands Regions spill over into Tug Hill, CLDPs may become viable measures to harness this growth for conservation purposes. Similarly, the use of cluster subdivisions would keep properties on the tax roll, developed at maximum allowable densities, while protecting land through various methods of stewardship (Table 6.2 in the Technical Appendix).

Infrastructure Planning
Infrastructure planning is meant to provide the necessary tools to support continued agricultural and forestry uses, while limiting the likelihood of unwanted and incompatible neighboring uses. Focusing infrastructure developments such as high volume roads, sewer, and water lines to existing hamlets and towns will not only concentrate development in those areas, thereby protecting surrounding natural resources, but will also help to assuage tax rates for existing rural land uses by limiting their development potential.[15] By focusing growth in areas with access to sufficient infrastructure, communities can promote fiscal efficiency while preserving farmland and open space and limiting sprawl (Table 6.2)

Cost Scenarios

Cost/benefit models can be a helpful tool for evaluating the relative values of potential parcels for conservation. This technique may be more relevant in the future if THTLT develops an acquisition fund or receives an endowment to pursue fee simple purchases. It may also be useful in determining the viability of "partial" conservation strategies such as CLDPs, in which only part of a parcel is conserved. While a large parcel with a strong cost/benefit value may be too expensive to conserve in full, if the dollar per acre value is a reasonable amount, a portion of the property could be conserved, while the rest of it sold for profit and developed.

To measure the cost/benefit of conserving the test parcels previously used by the suitability analysis team, the Cornell team divided the parcels' assessed values by the level of assessment for that town to derive an estimation of fair market value. From there, they divided fair market value by the parcel's benefit (identified through the suitability analysis); smaller quotients indicate higher cost/benefit value. The team also calculated the price (based on fair market value) per acre to identify which parcels were highest and lowest cost on a per acre basis. The lower ($/acre)/benefit values indicate parcels that are the most cost-effective overall.

According to this model, the test parcel in the Town of Lee would be the most cost-effective conservation target, followed by the parcel located in the Town of Redfield (Table 6.4). The ranking presented here differs from the suitability analysis in Chapter 5 because this model incorporates cost-effectiveness. Table 6.5 in the Technical Appendix includes an expanded version of the Cost/Benefit model and explanation of methodology and caveats.

Table 6.4: Cost/benefit model using test parcels

Municipality	Test Parcel Acreage	$/Acre	($/Acre)/ Benefit
Lee	272.20	$101.55	$2.64
Redfield	392.12	$292.26	$5.40
Denmark	263.90	$318.68	$6.15
West Turin	247.20	$332.20	$6.94
Adams	26.00	$185.52	$9.36
Willamstown	108.79	$577.26	$16.11


Photo: Joshua Lathan

Implementation Challenge: High Taxes

High tax rates are a primary challenge to conservation efforts in Tug Hill. The tax rates for each municipality are shown on Map 6.3. Taxes throughout New York State tend to be higher than in other states. However, tax rates may be especially high in municipalities with low levels of assessment (LOA), a measure of the proportion of market value represented by assessed value. Map 6.4 shows adjusted tax rates, presenting an alternate way of evaluating municipal tax burdens.

In response to high tax rates, a common perception is that land taken off the tax rolls, either through a tax abatement program or easement, significantly increases the tax burden on the surrounding property owners. Similarly, there is the misconception that keeping farms in towns and villages limits the local tax base since farmland contributes less in property taxes than residences; however, farms' requirements for public services and infrastructure are significantly lower. National "Cost of Community Services" studies demonstrate that farm and forest land generate a net property tax "profit" while development causes a property tax "loss" due to the respective land users' demand for services[16] (Maps 6.3, 6.4). Similar to the planning framework map, the tax rate maps suggest which towns are likely to have the greatest and least capacity for implementing certain conservation strategies. Although there is no clear threshold of municipal tax rates that will determine whether a particular conservation strategy will be feasible, the tax rate maps can be considered loose guidelines for the fiscal suitability of strategies that impact tax rolls. For instance, the Town of Ava's high tax rates would probably make it less suitable for strategies like fee simple acquisition or agricultural tax abatement programs.

Public Outreach and Stakeholder Involvement

The mission of THTLT is two-fold: land protection and education.[17] In support of the education goal, THTLT has initiated or may pursue a range of outreach strategies, including the creation of a teacher resource directory, establishment of field guides, the development of special events and exhibits, as well as pursuing a certified published school curriculum involving conservation of local Tug Hill ecology.[18] These activities can increase THTLT's influence and capacity with a variety of constituencies.

Tug Hill Youth

The schools in Tug Hill are one of the region's strongest assets. Some of the educated youth in the region will go on to higher education and return to the region while others will pursue economic opportunity elsewhere. Regardless, incorporating THTLT's mission into the local school curriculum reinforces the importance of protecting the region's resources for future generations. Field trips to local natural amenities, historical sites, and major natural resource-dependent industries within Tug Hill will raise their awareness at an early age.

Out-of-State Landowners

Out-of-state landowners currently own approximately 113,500 acres throughout Tug Hill. Controlling 8% of the region's landholdings, members of this group will continue to be a major stakeholder in the land conservation process. Landowners with large landholdings seeking to build retirement homes may also be candidates for conservation whereby only a portion of their land is placed under an easement for recreational use or the protection of scenic value. Educating these landowners about conservation options with limited home development could be a priority for THTLT.

"Gray" Landowners

As mentioned in the Natural Resources chapter, acreage held by gray landowners makes up approximately 2% of the unprotected lands in the Tug Hill Region. Gray landowners and their landholdings have been identified for their conservation potential. Ownership patterns and recent sales in the region, along with THTLT's difficulty to date in cultivating this group, indicate that some of these landowners may be interested in selling their land for profit due to development pressures as need arises. However, it is in the interest of THTLT to continue working proactively with the membership and broader citizenry that make up these organizations. Providing a forum for education on the additional benefits provided through the long-term preservation of their land could be one of the goals of THTLT.

Local Officials and Landowners

Landowners, the local citizenry, and tax payers in the region also have a major stake in the success of THTLT. Its position in the region's evolving conservation arena has historically involved public participation. The region's focus areas established by THTLT were in part developed through a participatory process whereby citizens were asked to identify geographical areas which require the greatest protection efforts. Efforts mirroring and building upon past participatory practices will enable THTLT, the Tug Hill Commission, and other agencies to continue pursuing their conservation mission in the region.

Local officials in management and advisory positions are often well-connected to their constituents and will be open to the idea of mobilizing publics for potential policies through citizen involvement.[19] Educating local officials may come in a variety of forms including informational meetings and workshops whereby the benefits of local and regional conservation as well as comprehensive planning may be demonstrated by THTLT and the Tug Hill Commission. There are also opportunities for "peer-to-peer" events through which local leaders from neighboring jurisdictions can share their success stories.

Involvement of all of these groups in the visioning process for developing local comprehensive plans results in a stronger planning framework under which goals are more likely to be implemented.

Emerging Funding Sources

The conservation goals of THTLT must be supported by a range of funding sources. Government partnerships through available Federal Grants are listed in Table 6.6 in the Technical Appendix.

Partnerships with small local landholders, as well as with larger ones like GMO and the Fort Drum Military Base, could also help THTLT achieve its conservation goals. Government bonds, government program funding, and foundation programs and funds are all options for generating the financial support necessary to achieve THTLT's conservation goals.

Foundations and agencies like the Trust for Public Land can help communities and regions work with local and federal governments on generating conservation bonds. In addition, the Department of Environmental Conservation, the New York State Department of Agriculture and Markets, and others can provide potential funds through conservation and working lands protection programs.

Conclusion

Not all of the tools discussed in this chapter are appropriate for use in every area in Tug Hill. The areas identified as valuable for land conservation by the suitability analysis and scenic viewshed analysis present parcels that could benefit from various forms of regulatory and voluntary conservation protection. The Cornell team hopes that THTLT will use their local support base to work with the broader range of voluntary and regulatory measures presented here.

Endnotes

[1] 2003-2005 Building permit data from Jefferson County Planning Department and Lewis County Planning Department.

[2] Daniels, Thomas L. and Karen Daniels. The Environmental Planning Handbook for Sustainable Communities and Regions. The American Planning Association.

[3] New York State Tug Hill Commission Information Packet.

[4] Daniels, Thomas L. Where does cluster zoning fit in farmland protection? Journal of the American Planning Association. Winter 1997, Vol.63, Issue 1. 5

[5] American Farmland Trust. Guide to Local Planning for Agriculture in New York.

[6] *ibid*

[7] Church, David. Overlay Districts. Community and Rural Development Institute at Cornell University. Community and Economic Development Tool-Box. http://www.cdtoolbox.net/development_issues/000191.html

[8] NYS Consolidated Town Laws, Article 16: Zoning and Planning, Sec 284, http://public.leginfo.state.ny.us/menugetf.cgi

[9] A Strategic Plan for Preserving Agricultural Lands and Revitalizing the Agricul tural Economy in the Town of Porter, New York. Comprehensive Plan Imple mentation Committee and George Franz and Associates, Inc. 2006.

[10] The Governance Project. Governance in Erie County: A Foundation for Understanding and Action. http://regional-institute.Auburn.edu/gove_repo/chapter_10.html

[11] http://public.leginfo.state.ny.us/menugetf.cgi

[12] Interview with David Cutter, Fort Drum Community Planner, November 9th, 2006.

[13] Milder, Jeffrey C. Using Limited Development to Conserve Land and Natural Resources. Land Trust Alliance.

[14] Milder, Jeffrey C. Conservation Development: A Tool to Conserve Land and Natural Resources. PowerPoint presentation, 10/17/2006.

[15] American Farmland Trust. Guide to Local Planning for Agriculture in New York.

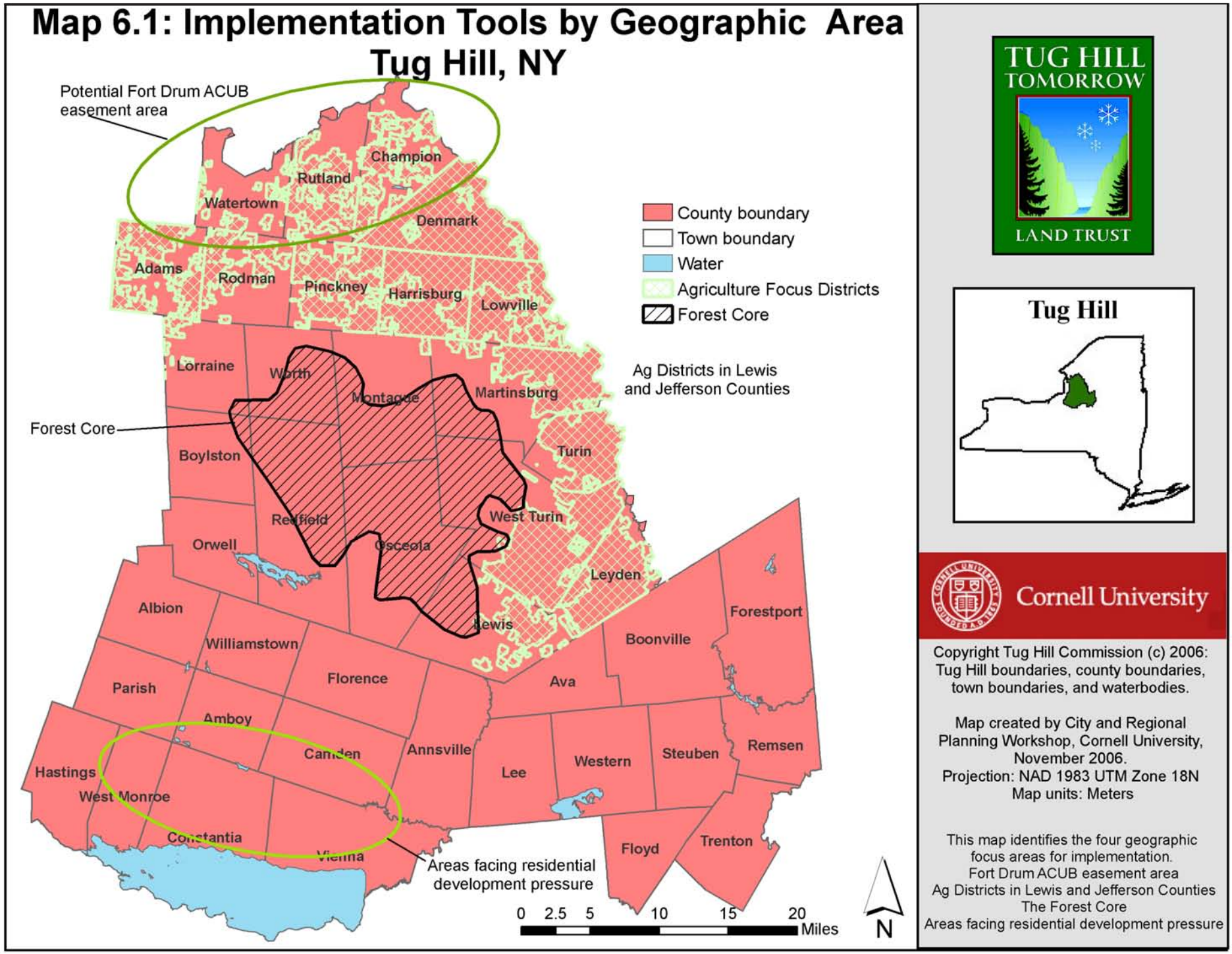
[16] *ibid*

[17] Tug Hill Tomorrow Land Trust Strategic Conservation Plan: 2006-2008. Adopted March, 2006.

[18] Interview with Linda Garrett on September 8th, 2006.

[19] Burby, Richard J. Making Plans that Matter: Citizen Involvement and Government Action. Journal of the American Planning Association. Winter 2003. Vol.69. No.1.

Map 6.1: Implementation Tools by Geographic Area
Tug Hill, NY



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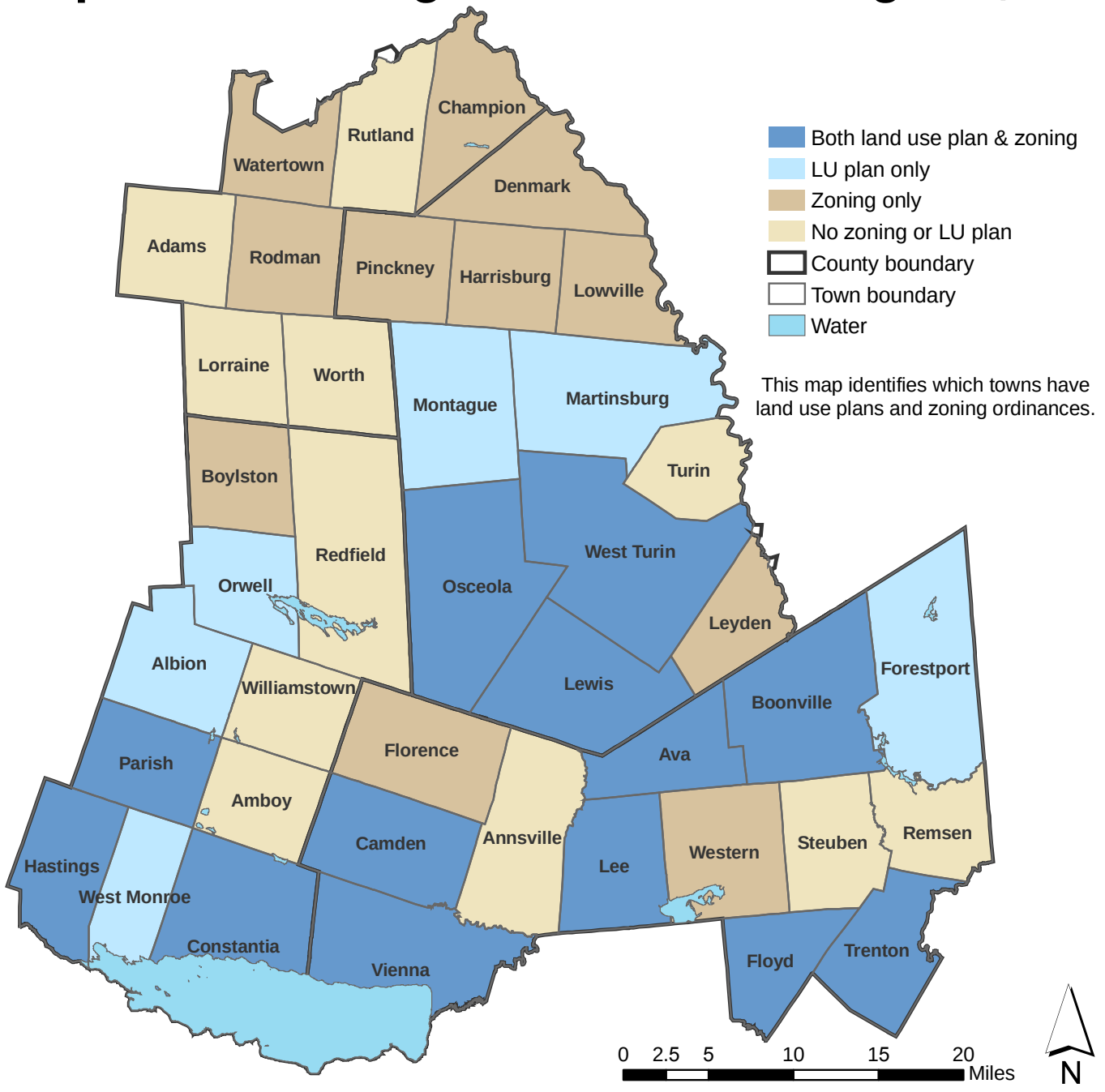
Map created by City and Regional Planning Workshop, Cornell University, November 2006.
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

This map identifies the four geographic focus areas for implementation.
Fort Drum ACUB easement area
Ag Districts in Lewis and Jefferson Counties
The Forest Core
Areas facing residential development pressure

Map 6.2: Planning Framework of Tug Hill, NY



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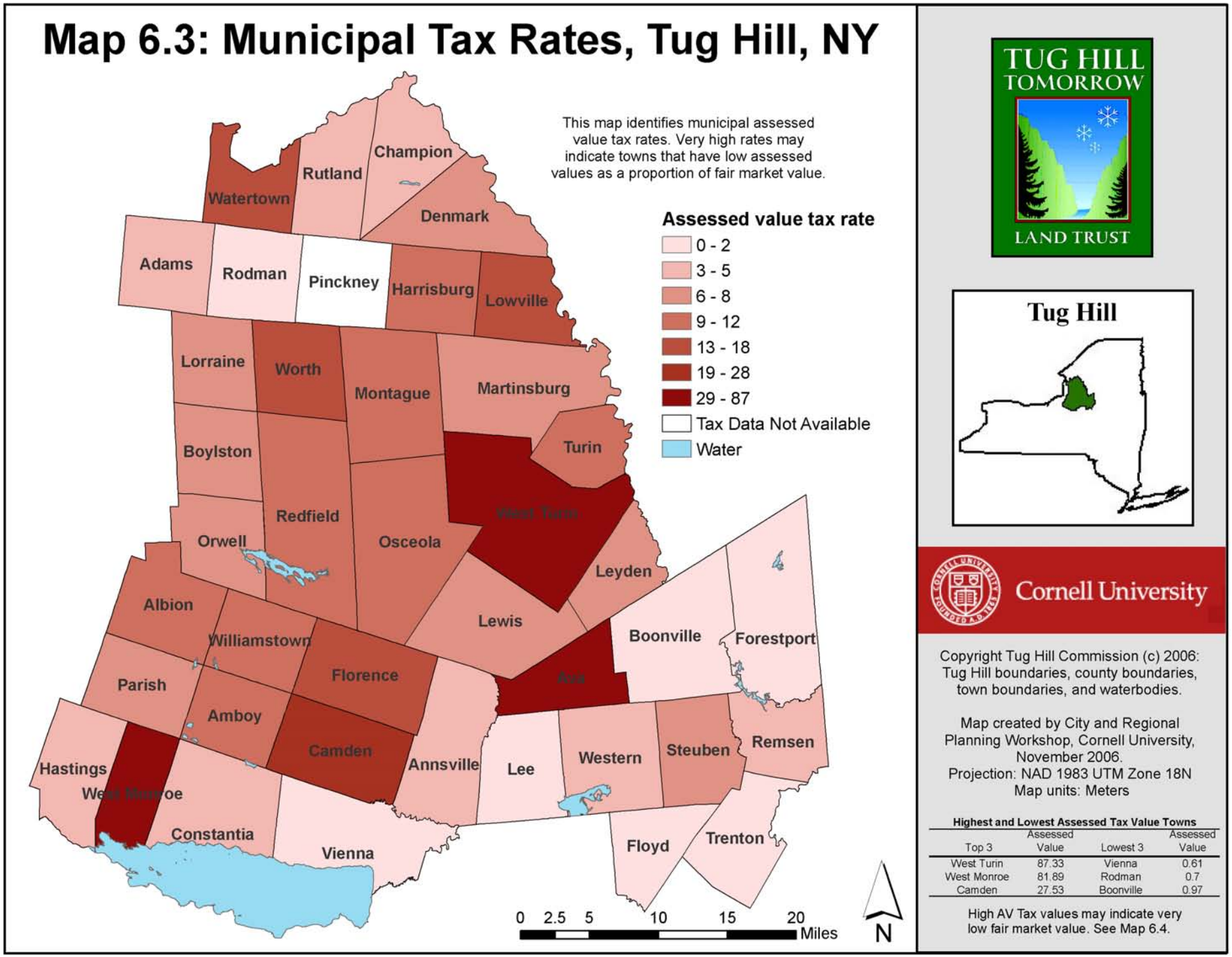
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Regulatory Framework by County: Tug Hill, NY

County	LU Plan	Percent	Zoning	Percent
Jefferson	0	0%	3	43%
Lewis	5	45%	8	73%
Oneida	8	62%	9	69%
Oswego	6	60%	4	40%

Map 6.3: Municipal Tax Rates, Tug Hill, NY



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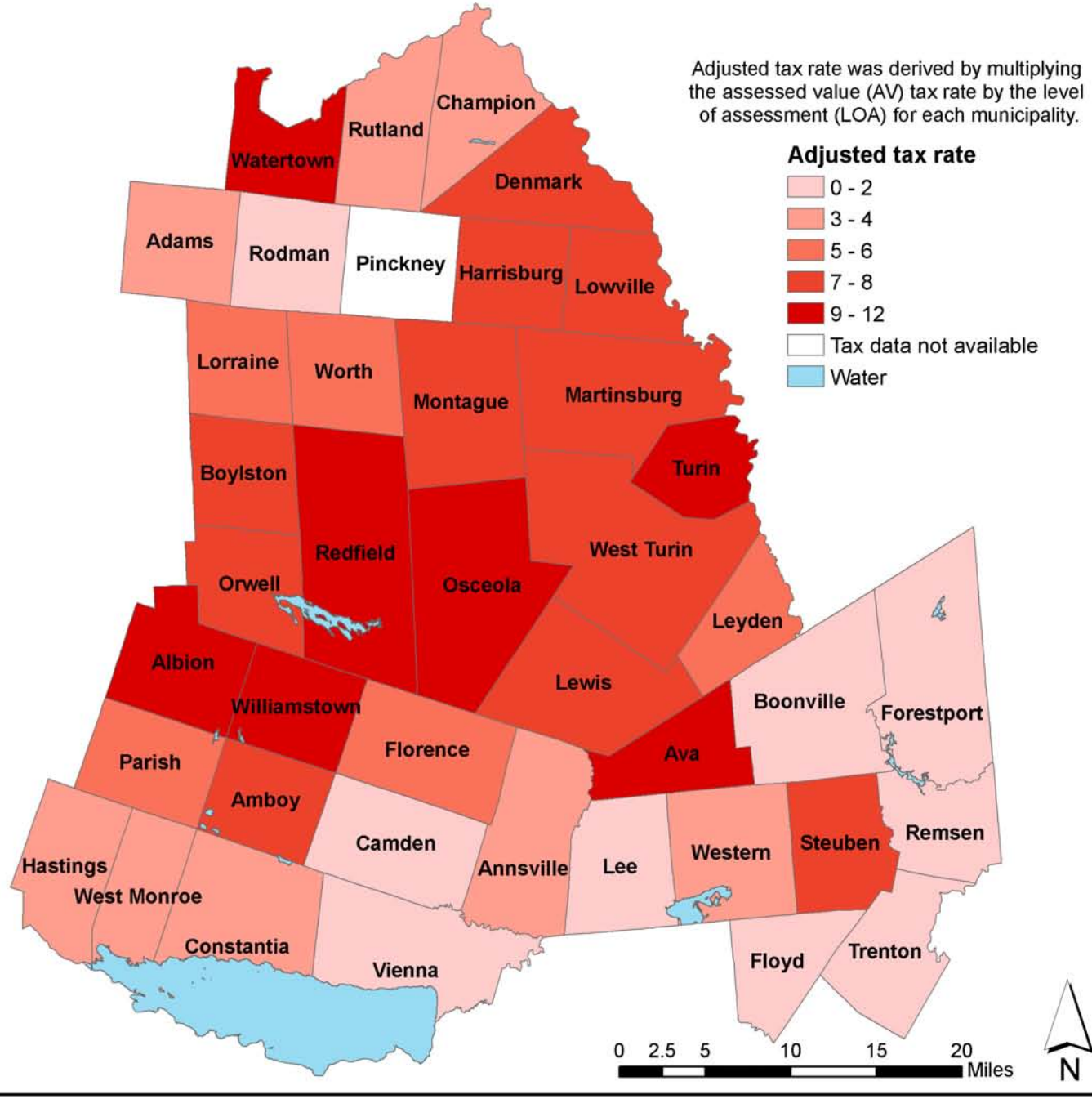
Projection: NAD 1983 UTM Zone 18N
Map units: Meters

Highest and Lowest Assessed Tax Value Towns

Top 3	Assessed Value	Lowest 3	Assessed Value
West Turin	87.33	Vienna	0.61
West Monroe	81.89	Rodman	0.7
Camden	27.53	Boonville	0.97

High AV Tax values may indicate very low fair market value. See Map 6.4.

Map 6.4: Adjusted Tax Rates, Tug Hill, NY



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Map units: Meters