HABITAT MAPPING & CONSERVATION PRIORITIZATION
Williamstown, MA

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For:
Williamstown Town Planner, Andrew Groff
Williamstown Rural Lands Foundation, Leslie Reed-Evans

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# TABLE OF CONTENTS

**SECTION 1** INTRODUCTION  
1.1 Project Goals  
1.2 Project Scope and Work Plan  
1.3 Physical Site Description  
1.4 Site History and Community Profile  
1.5 Relevant Law and Policy  
1.6 Project Background

**SECTION 2** DATA AND METHODS  
2.1 Data Sources  
2.2 Methods

**SECTION 3** RESULTS  
3.1 Habitat Mapping  
3.2 Conservation Prioritization Attributes  
3.3 Map of Conservation Priorities

**SECTION 4** CONCLUSIONS  
4.1 Reasons to Conserve Land in Williamstown  
4.2 Using Our Data  
4.3 Recommendation for the Conservation of Hopkins Memorial Forest

**SECTION 5** ACKNOWLEDGEMENTS

**SECTION 6** SOURCES
SECTION 1 - INTRODUCTION

1.1 Project Goals

We worked with Andrew Groff (Williamstown Town Planner) and Leslie Reed-Evans (Executive Director of the Williamstown Rural Lands Foundation). On a broad scale, Andrew viewed our project as an examination of the current state of natural resources in Williamstown and what the town’s challenges are moving forward in that respect. As the Town Planner, he is overseeing an effort to put together an updated version of an Open Space & Recreation Plan (OSRP). This will allow the town to obtain funding from the state for projects like the redevelopment of the Spruces. Andrew Groff hoped that we would put together data for a series of maps required for the OSRP, including characterizations of the landscape, vegetation, fisheries and wildlife resources and environmental challenges of the town. Overall, Mr. Groff wanted a summary of the town's resource protection needs and its land management needs. Leslie Reed-Evans’ goals for the project generally overlapped with Andrew Groff’s. She saw the aforementioned maps and information as being helpful for WRLF. She specifically emphasized acquiring knowledge of habitat diversity and what lands should be preserved.

1.2 Project Scope and Work Plan

There are three categories of the OSRP which we provided data for: Environmental Inventory and Analysis, Inventory of Lands of Conservation and Recreation, and Analysis of Needs. We commenced with an environmental inventory
and analysis of the town. An inventory of this sort was done in 2005, but that data was potentially out of date and not verified by fieldwork. We began with an analysis of existing data, including land use, conservation level, and aerial photography and topography. We produced GIS layers based on analysis of existing satellite and GIS data. These maps show the percentage of different habitat types, specific parcels with important attributes, and conservation priorities based on a combination of the habitat data and WRLF conservation requirements. We obtained a good foundation for understanding of the current status of open and recreation space in Williamstown, which allowed us to produce a series of detailed recommendations for land conservation and management (including recommendations for individual parcels, elevation ranges, and habitat types). In concert with this, we produced for Leslie an analysis of WRLF conservation and land acquisition goals.

1.3 Physical Site Description

Our project covered the entire area of Williamstown, consisting of 46.9 square miles (94,016 acres). In order to understand our context in its geographical and historical context, then, we needed to understand the history of both the land that made up the town and the community within it.

Geophysical Attributes/General Area

The geography of the Berkshires is connected to its geologic history. While today, we think of the area surrounded by Mt. Greylock, the tallest mountain in Massachusetts at 3,491 feet, Pine Cobble, the Dome, and Stone Hill, as a peaceful,
tree-filled valley, the entire area was once covered in water. The valley itself was first sculpted by an ice sheet 18,000 years ago. Four thousand years later, the ice sheet began to recede, leaving the Williamstown area itself under a glacial lake known as Lake Bascom. The glacial deposits left during this period continue to determine soil type and quality throughout the area. Of these soils, 61% were rated as unsuitable for development, while 11% were rated as prime for agriculture. These prime soils lie at the banks of the glacial lake.

The major water sources in the Williamstown area are the Green and Hoosic Rivers. The Hoosic River has its headwaters in Vermont and drains through New York State into the Hudson River. The Green River joins the Hoosic at a confluence in the Williamstown area.

Current Land Use

The most recent study done to consider land-use in Williamstown was completed in 1994. Since then, the Open Space and Recreation Plan for the town has not been updated to consider any changes in land-use, conservation acquisitions, etc. At the time of the report, 21.8% of the town had been protected into perpetuity. 9.7% was under partial protection through Chapter 61, 61A or 61B protection measures. Lastly 11.7% was privately-owned or quasi-public land that was protected by the owners. In addition, 6% of the land in 1994 was used for farms. There were many areas of concern in terms of conservation and recreation interests in the 1994, as well as environmentally vulnerable areas and recommendations for the areas that should be conserved. This
included the surrounding uplands, Stone Hill, and the Hoosic and Green River Corridors.

1.4 Site History and Community Profile

History

Williamstown was founded in 1753, though it did not take its current name until about ten years later. When Colonel Ephraim Williams died in 1765, he bequeathed the founding of a free school, provided that it and the town would be named after him. Thus, about thirty years later in 1793, Williams College was founded. While Williamstown began and continued to be predominantly rural (in 1863, an Alpine Club was founded to sponsor outings to enjoy the natural beauty of the area), the Industrial Revolution did bring some changes, including the founding of several mills along the Green River. By 1850, over half of the land had been cleared for agriculture, and though farmland persists to this day in Williamstown, the Industrial Revolution was the beginning of its decline.

Demographic/Socioeconomic

Williamstown has never grown drastically since its early years. An 1850 census has its population at 2,626. Since then, the population peaked at 8,741 with the 1980 census. The most recent Open Space and Recreation plan in 1994 listed 6,254 permanent residents, 2000 college students, and 1400 seasonal residents. Since then, Williamstown has seen a decline in the population— from a total population of 8,424 in 2000, there was a -7.95% population change down to 7,754 in 2010. The 2010 Census
also found that Williamstown was predominantly white, at 83.1%. The median household income was $72,125; however, 7.3% of the population was still below poverty level. The primary employer in Williamstown is Williams College, with other major businesses including Sweet Brook Nursing Home, Williamstown Medical Associates, and the Mount Greylock School District. Major cultural attractions include the Clark Art Institute and the annual Williamstown Theater Festival.

1.5 Relevant Law and Policy

The conservation recommendations we gave to our clients were in part informed by our knowledge of the legal and political structures under which our clients are operating.

Non-Profit Land Conservation

The Williamstown Rural Lands Foundation is a non-profit, member-supported land conservation trust. Land conservation trusts can own land and establish conservation easement/restrictions. WRLF holds 14 of these conservation restrictions.

With a conservation restriction, a landowner receives a tax credit as compensation for forfeiting any development rights for a parcel of land. The landowner also designates a land trust to monitor the parcel. A similar type of restriction and tax deduction exists for agricultural land (an Agricultural Preservation Restriction or APR), in which a landowner receives payment from the state for committing to keep the farmland as farmland. These restrictions are important because undeveloped land is much less profitable than developed land. To prevent development, landowners are
paid the difference in value between developed and undeveloped land. Landowners also receive tax credits for simply selling a parcel of land to a land trust (where conditions for land use are mutually established and binding). A conservation restriction is approved when the Conservation Commission of the town and the Massachusetts Secretary of Environmental Affairs determine that conservation of the land would have significant public benefit. This land is then protected into perpetuity by the land trust.

**Chapter 61 Tax Status**

Chapter 61 is another form of conservation protection for land. It is a piece of Massachusetts legislation which provides landowners with tax benefits for not developing land. Land is normally taxed at the rate associated with its "highest and best use," or most profitable use, usually considered residential land. In order to prevent landowners from essentially being penalized for not developing, the Massachusetts government employs a "current use" tax program which reduces property taxes on a land parcel by making taxation based on agricultural or forestry uses. This tax reduction can be significant. A 50-acre woodland in MA might normally be valued at $2000 dollars per acre, requiring a landowner to pay $1500 dollars with a $15 dollar tax rate. Under Chapter 61 or 61A, the land would be valued at only $43, and the entire tax bill would only be $32.

The law differentiates between agricultural and recreational lands. Chapter 61 is a "Classification and Taxation of Forest Lands and Forest Products," Chapter 61A is an "Assessment and Taxation of Agricultural and Horticultural Land," and Chapter 61B is a "Classification and Taxation of Recreational Land." Land can thus be protected under
Chapter 61A or 61B. In our maps, we have generally merged the two. This legislation is an important source of conserved land, but does not provide nearly the same level of protection as conservation easements or restrictions held by land trusts. This is primarily because a plot of land can be removed from Chapter 61 protection by paying 5 years’ worth of back-taxes, plus 5% interest. This poses little disincentive to anyone who is determined to develop the land.

Endangered Species Protection

Also relevant to us are the legal protections existing for endangered habitats and species. The Massachusetts Division of Fish and Wildlife (which is a division within the Massachusetts Department of Fish and Game) maintains a list of "Endangered, Threatened, and Special Concern" species, under the Massachusetts Endangered Species Act (MESA), enacted in December 1990. MESA also established that any proposed projects occurring within a "Priority Habitat of Rare Species" must undergo review. Priority Habitat is reviewed and regulated by Natural Heritage and Endangered Species Program.

The Wetlands Protection Act additionally lends NHESP reviewing power. If proposed projects are near wetland habitats of rare animal species, NHESP is given oversight. NHESP’s other responsibilities include researching and inventorying species and habitats ("natural communities") for conservation purposes and providing information concerning land management and conservation (for instance, tools like the "Biomap2" layer which we used in this analysis).
The Open Space and Recreation Plan

As previously stated, one of the goals of our project was to provide information and recommendations which will aid Andrew Groff in updating Williamstown's OSRP. The OSRP is a summary, assessment, and inventory of open space and recreation areas in Williamstown. OSRPs are not legally required by the state, but they are recommended. Approval of an updated OSRP would come through submission to the Williamstown Conservation Commission and Board of Selectmen, followed by a review by the Massachusetts Executive Office of Energy and Environmental Affairs. If the updated plan were approved, Williamstown would be eligible (or in some cases, made more likely to) receive funding from the state in the form of grants.

1.6 Project Background

This project was in several ways part of a much larger whole. As mentioned, our project had two goals. Through our habitat mapping efforts, we hoped, first, to provide data, maps and analyses for the Williamstown Open Space and Recreation Plan, and second, to provide an analysis of conservation needs in Williamstown. Each of these aims has noteworthy precedents. The following is a summary of how our work follows from and is grounded in prior efforts in open space planning and conservation prioritization.

Williamstown Open Space and Recreation Planning

Our habitat map will be used to update several sections of the Williamstown OSRP that the town is currently putting together. In the autumn of 2013, four students in
Environmental Studies 302: Environmental Planning completed a project to catalogue the town’s recreational facilities, survey townspeople to assess perceived needs in terms of recreational facilities and finally, to make recommendations for the future development of the town’s recreational facilities. Their project provided information pertaining to several sections of the OSRP; ours aim is to address certain others.

In a larger sense, however, our open space planning work is part of a direct lineage stretching back at least to the 1970s. A 1977 honors thesis titled *Williamstown: a Master Plan for Development* under the Department of Environmental Studies here at Williams College, provided the first assessment of open space in Williamstown. Many of the recommendations outlined in the Plan were subsequently followed by the town.

About a decade later, amid tensions within the town between growth and preservation, the town formed a Growth Management Task Force. This group produced a comprehensive set of recommendations on land use and development. Included in this was an Open Space Plan for the town. This plan was then updated and revised in the period of 1991-1994, under the direction of the WRLF, with contributions from a 1991 environmental planning class at the college. Williamstown’s OSRP was further updated through the efforts of the WRLF and several of its interns in the 2002-2005 period, but this updated plan floundered in the town approval process and was never submitted to the Commonwealth.

Where our project differs from previous attempts at open space mapping of Williamstown is the level of detail regarding specific habitats. Instead of simply designating land as open, or not, conserved, or not, we hope our more detailed and quantitative analysis will allow for more specific reporting on the current state of open
space and natural resources in town. This in turn will enable us to produce more substantively supported recommendations. These, along with other work done similar issues over the last couple of years, will form a strong backbone for a strong OSRP for Williamstown, and allow access to various Commonwealth of Massachusetts funding sources.

**Habitat Mapping**

Updating the town’s OSRP is only one of our aims. A vital element in the past, present and future of conservation, management, and development of the town’s natural resources, are small land conservancies like the Williamstown Rural Lands Foundation. Considerable amounts of land are controlled by various state organizations, including the Department of Conservation and Recreation, the Division of Fisheries and Wildlife, the Department of Natural Resources, and the Division of State Parks and Recreation. However, these public institutions do not have the flexibility and spontaneity of small local non-profit land conservancies. There are three of these with holdings in Williamstown, specifically the Williamstown Rural Lands Foundation, the Berkshire Natural Resources Council and the Trustees of the Reservation. The second part of our project involves recommendations for land conservation priorities. These will inform the “Analysis of Needs” section of the OSRP, but will primarily serve as a plan for future conservation efforts for the Williamstown Rural Lands Foundation, and other non-profits.
Habitat Mapping Techniques

To guide us in our habitat mapping and prioritization of conservation lands and goals, we have examined a range of similar projects. In general, habitat mapping efforts tend to be broader in scale than what we are attempting here. Even where the scale is comparable, the resolution is not. An excellent example of larger scale habitat mapping is the Nature Conservancy’s Northeast Terrestrial Habitat Mapping Project. The Northeast Terrestrial Habitat map provides a consistent map of ecosystems and habitats across 13 states. This broad mapping effort allowed habitat abundances and distributions to be compared within and across states, but the major unit of spatial analysis used was a 100 hectare (1 square kilometer) hexagon. Williamstown, given its area of about 45 square miles would be encompassed by only 125 analysis units. This broad of an analysis is not useful for conservation planning.

Localized habitat mapping efforts more nearly resemble our mapping goals. Many towns, counties, and watershed areas around the country have undertaken mapping initiatives. Often, these are part of a Natural Resources Inventory for the area, but sometimes are part of more direct assessments of conservation needs. Examples of both will be discussed here.

Dennis Township, NJ is a municipal district similar in size to Williamstown. As part of its 2007 Natural Resources Inventory, a planning firm produced a set of habitat maps. The most basic of these, shown below, is based off of widely available land use data. This is a useful starting point, and indeed, much of the basic habitat information we are using is derived from land use data. The Dennis Township Natural Resources Inventory also provided more maps separating out wetland and forest areas, but the
level of detail on these is only slightly greater than on the map below. Given their lack of resolution, habitat maps like these are of only limited use to us as models for our project.

Figure 1. A map of Dennis Township, NJ based on land use data. Detail is lacking, resulting in limited usefulness in conservation prioritization. Produced by Maser Consulting, Red Bank NJ, 2007.
Conservation analyses, usually on a scale slightly larger than that of Williamstown, in many ways provide a more useful guide for our project. This is in part because a habitat map is only one of our goals; although habitat information is useful in and of itself, its true power is in the way it can inform conservation decisions. Conservation analyses treat habitat data as just one element in a matrix of factors which determine conservation priority.

An excellent example of conservation prioritization, admittedly on a much larger scale, is the Nature Conservancy’s report Systematic Conservation Planning in the Wyoming Basins. The Wyoming Basin is an ecoregion spanning multiple states that is expected to see considerable oil and gas industry development in the coming decades. Consequently, conservation efforts must be coordinated and prioritized to achieve maximum effect. Most impressive was the way the study integrated habitat information on a broad scale, with a whole host of other factors in order to determine conservation goals. This is a useful planning approach because it recognizes the limited quality of habitat data, but by incorporating other information, is still able to produce specific land conservation priorities. Figure 2, below, shows ecoregion habitat data. This indicates the scale on which habitat information was integrated into their analysis.
The study also incorporated information on disturbance from industry, extraction (oil, gas, mining), development and roadedness. A compilation of these disturbances is illustrated below in Figure 3.
Figure 3. Disturbance index for the Wyoming Basin. A range of disturbance factors was integrated to produce this figure. Blue indicates relatively undisturbed areas, orange indicates highly disturbed areas. Produced by the Nature Conservancy, Kei Sochi et al, 2013.
The study produced an iterative modeling system to rank land by conservation priority. The model inputs included habitat data, disturbance data, projections of future disturbances, and knowledge of already conserved areas. The model also includes feasibility. For example, areas away from prime oil and gas regions were viewed as easier to conserve, and, other things being equal, were thus higher priority. This represents a highly utilitarian approach to conservation. Given a set of targets, the

Figure 4. Optimacy of land for conservation. This map, produced using iterative modeling, indicates areas which should be the focus of conservation. Blue indicates high priority, green is low priority. Produced by the Nature Conservancy, Kei Sochi et al, 2013.
model produces hundreds of scenarios for which land areas to conserve in order to achieve those targets. Land areas which are found most often in the most successful scenarios are judged most ideal for conservation. This is quantified through the metric, called 'optimicity,' which is illustrated below for the Wyoming Basin ecoregion. Darker colors indicate more optimal targets of land conservation.

SECTION 2 - DATA AND METHODS

Our project drew on preexisting data from the local, state and regional levels. In this section, we will discuss each of the data sources that we used, our reasons for including it, and our methods for processing it.

2.1 Data Sources

Figure 6 shows a map of all of our data layers overlain on one another. This demonstrates the sheer volume of data that we acquired. In the following section, we consider each of these data sources individually, and discuss the methodology we developed with which to analyze this information in a way that was useful to our clients.

*Conservation Assessment and Prioritization System (CAPS)*

The Conservation Assessment and Prioritization System was developed by the University of Massachusetts, Amherst. The goal of this project was to provide a statewide assessment of land of “ecological integrity”, that is, areas with the highest potential to sustain biodiversity. The researchers used a host of metrics to select these areas for several different land types (forest, open lands, and water), including proximity
to roads, habitat loss, invasive plants, development, hydrology, connectedness, and many others. The land was divided into percentiles based on level of ecological integrity. The CAPS 10% land is the areas with the highest 10%, or 90th percentile, of ecological integrity in the state. See statewide and town-wide CAPS maps in Figures 7 and 8.

**NHESP Recommendations**

We obtained data on the state of biodiversity and endangered habitat protection in Williamstown through communication with Massachusetts’ Natural Heritage and Endangered Species Program (NHESP), a program run by the MA Division of Fisheries and Wildlife, which is part of a network (NatureServe) across the country committed to protecting biodiversity and species under threat of endangerment. Through email correspondence, Patricia C. Swain, Ph.D, an ecologist working for the program, gave us the program's perspective on what the focus of conservation in this area should be.

Through their analyses of habitats and species distribution, and assessments of levels of biodiversity and important habitat, NHESP has concluded that Williamstown houses a number of important species and habitats worth protecting. Important areas they specifically referenced included lands with calcareous habitats and high elevation spruce-fir forests. Calcium rich areas that support specialized species are extremely uncommon in Massachusetts, so these lands are an important focus area for biodiversity protection. They also referred to lands around Mt. Greylock as especially important to protect, because they support an exceptional amount of biodiversity that includes species habitats uncommon in the state.
NHESP pushed the importance of managing and monitoring conserved land. They mentioned the importance of wetlands in maintaining their natural water regime, as well as controlling invasive species in conserved lands. Ultimately, their strongest recommendations involved the prevention of habitat fragmentation. To accomplish this, they recommended the conservation of all areas with designated by their Biomap 2 layer and the lands adjacent to these areas, if possible.

*BioMap 2*, completed in 2010 was meant to be a way of identifying important sites of biodiversity within the state, with the goal of coordinating future conservation efforts. The data consists of two parts. The first, Core Habitat, identified critical areas for endangered or threatened species, and divided these areas roughly into forest, aquatic areas, wetlands and vernal pools. The second, Critical Natural Landscapes, was concerned with broader landscape uses, including areas of land that are valuable because they have remained in relatively large contiguous units. See a map of BioMap2 areas of endangered species and habitat concern in Figure 9.

*Land-Use, Trails, Contours*

MassGIS provided basic land-use maps which we used to differentiate conserved, unconserved, and Chapter 61 land parcels from other land in Williamstown. This data was last updated in 2005. We also acquired basic trail and road maps and contour lines.
**Old Forest Growth**

Professor Henry Art of the Center for Environmental Studies recommended based on his research that the oldest forests in Williamstown are the most biodiverse, particularly with regards to wildflowers such as spring ephemerals. Density and diversity are greatest in those patches that were never farmed. These are slow to return as most have ant-dispersed seeds.

We compiled historic data on forest coverage in Williamstown, including an 1830 map produced by the Harvard Forest, and historic land use from 1971, 1985 and 1999 from MassGIS. 1830 was around the peak of agricultural production in this area, meaning that little additional land has been cleared for farming since then. We then identified which areas have remained forested throughout the whole time period, as far as can be judged from existing data (Figures 10 and 11).

**Coniferous Stands**

Professor Art also stressed that stands of conifers, particularly Hemlocks, are an important habitat and are very slow to regrow. We identified all the stands of conifers in Williamstown using satellite imagery. Leslie Reed-Evans was able to identify or ground-truth most of these stands to denote particular species. The distribution of conifers relative to 1830s forest in Williamstown is shown in Figure 12.

**Watershed**

We consulted Richard Schlesinger of the Williamstown Conservation Commission about water resource protection in town. He had done a detailed mapping
of the headwaters in Williamstown as part of research done for a protection bylaw under consideration of the Conservation Commission. The layer included bordering vegetated wetlands, perennial streams and intermittent streams covered by the Wetlands Protection Act. It also included isolated wetlands, intermittent streams, and small pond areas not protected under the WPA. These are potentially important targets for conservation. Non-WPA-protected streams located on unconserved land are the most threatened (Figures 13 and 14).

All of this information was merely the foundation. After accumulating data, we processed it based on the following methodology.

### 2.2 Methods

**WRLF Criteria**

The Williamstown Rural Lands Foundation (WRLF) has created a document of conservation prioritization criteria. This includes a list of attributes, two of which should be fulfilled by every parcel of land considered for conservation. These attributes include:

- Linking areas of existing protection
- Protecting water resources - rivers, streams and wetlands; watersheds; aquifers
- Protecting species diversity, rare species habitat and other significant habitat, or enhancing the protection of these ecosystems
- Protecting working farm and forest lands
- Enhancing the protection of ridge tops (Taconics, Pine Cobble, Brodie Mt., Greylock area)
• Promoting or protecting existing greenways and trails, provide access
to now inaccessible significant parcels and new trail development and
expanded recreational opportunities

Our first goal was to differentiate parcels of land that fulfilled two or more of these
criteria using the data we had acquired. We first separated unconserved land from
conserved, by selecting and exporting relevant land-use parcels from the MassGIS data
(Figure 5).

WRLF Criteria Methods

We then created layers based on each of the criteria, as follows:

• Linking areas of existing protection:
  Select by Location tool, Relationship: Share_a_Line_Segment_With
  Merge tool to combine selected parcels with unconserved parcels.
  We further edited by hand any mistakes made by the ArcGIS tool.

• Protecting water resources:
  Merge tool to combine watershed data with unconserved parcels

• Protecting species diversity:
  Merge tool to combine BioMap2 data with unconserved parcels

• Protecting working farm and forest lands:
  Select and export farm and forest data from 2005 MassGIS land-use data. Merge
  with unconserved parcels

• Enhancing the protection of ridge tops:
Select contours >1300’ from MassGIS contour data. Create polygons from contour lines using Feature to Polygon or Editor hand-tracing. Merge with unconserved parcels.

- Promoting or protecting existing greenways and trails:

  Merge trails data from MassGIS with unconserved parcels

For all layers: Add Field to each attribute table. Fill all rows with the value of 100. Spatial Join each layer cumulatively. Sum total values for each parcel. Any parcel with a value > 200 will become part of the Base Parcel layer, fulfilling the basic WRLF Requirements.

Other Criteria

The parcels that fulfilled the WRLF requirements now became the base parcels that we evaluated for how well they fulfilled other criteria that we mentioned above (Figure 15). In addition, we only considered parcels of over 50,000m², or 12.5 acres. We considered 11 attributes total.

Rubric Development

We used the WRLF Criteria alongside our habitat data to create a conservation priority rubric on which to rank our base parcels (Table 1). This rubric assigns each attribute an importance level and a corresponding point value. This allowed us to consider not only which parcels have which attributes, but the relative priority of different attributes.
However, one of the most important things to note is that these points can be altered. Table 1 shows two different examples of rankings that can be assigned to each attribute. If a group like WRLF was more interested in certain criteria—in this case, less interested adjoining or connecting protected areas, more interested in containing trails, and having high-elevation parcels and less interested in the largest parcels—they could adjust the rankings accordingly.

*Rubric Methods*

We added a field to the attribute table of each of the eleven layers. We filled the rows of the attribute with the value we gave the parcel in the rubric above. We joined each of our eleven layers individually to the Base Parcels map using *Spatial Join*. The results from this analysis are shown in Figures 16-25.

Lastly, in the same way that we used ArcGIS to join our initial data to each parcel, we used *Spatial Join* to merge all of the maps in Figures 16-25. We then summed the total conservation points for each parcel to create a conservation priority map. We used the *Symbology* property of ArcGIS (using *Categories* and selecting the attribute field that held all of the points summed) to display these points along a gradient. Two versions of this map are shown in Figures 27 and 28.
SECTION 3 – RESULTS

3.1 Land Use and Habitats

The following figures and captions show the results of the above analyses. The first set of figures shows the land use and habitat data. The second set of figures shows the conservation prioritization attributes based on WRLF.

Figure 5. Areas of Williamstown under conservation protection. Chapter 61 is a current use tax status, not a form of conservation! There is no guarantee of any future protection. Non-profit-owned land is the best protected, followed by state land. State land makes up approximately 20% of Williamstown, and non-profit about 4%. Data from Town of Williamstown, 2013.
Figure 6. This map presents an overview of much of the known habitat information for Williamstown. See Legend for details. Endangered species habitat, vernal pools and priority natural communities (rare habitats) are modified from NHESP’s BioMap 2. Old Forest cover modified from Harvard Forest. Streams and Wetlands data courtesy of Richard Schlesinger. Coniferous cover was produced by us. All other land cover is modified from MassGIS 2005 Land Use.
Figure 7. Top 50% CAPS integrity land for Massachusetts. CAPS (Conservation Assessment Prioritization System) is a UMass Amherst mapping effort which ranks habitat by ecological integrity, based on numerous factors including development, fragmentation, presence of invasive species, etc. The top 50% in the state are colored here, and are concentrated in the western portion of the state. Data from UMass Amherst’s CAPS program.
Figure 8. CAPS provides data on the integrity of forest, aquatic and open-land habitats. Above is a map of all land in Williamstown which falls into the highest 50% integrity level for the state of Massachusetts. Darker shades represent higher integrity. Green is forest, blue is aquatic and brown is open-lands. 28% of land in Williamstown is graded in the top 10% (darkest shades) in the state. This is three times what would be expected from a random distribution. Data modified from UMass Amherst’s CAPS program.
Figure 9. Areas of Conservation Concern under NHESP BioMap2.
Figure 10. Areas that have been forested since the 1830s are likely to have higher levels of biodiversity than areas cleared for farming. Forest that has never been cleared has increased biodiversity, particularly in regard to species such as spring ephemeral flowers and hemlocks. The dark green areas are areas of forest that have remained forested since the 1830s.
Figure 11. The majority of old forest in Williamstown is already conserved, but there are important old forests at high elevations which are currently not conserved. Conserved forest is in dark green, unconserved forest in light green.
Figure 12. The distribution of coniferous forests in Williamstown, relative to the distribution of old forest that has existed since the 1830s. Conifers, particularly hemlocks, are slow to return once they are lost. Consequently, native conifer stands should receive protection.
Figure 13. Total water resources in Williamstown.
Figure 14. First order and intermittent streams are not protected by the Wetlands Protection Act, nor are vernal pools which have not been certified ("Potential Vernal Pools").
3.2 Conservation Prioritization Attributes

Figure 9. Base map of parcels under consideration. These parcels are all over 12.5 acres in size, and fulfill at least two of the four top priorities of the WRLF: adjoin or connect already conserved land, contain farm or forest land, contain habitat of species of conservation concern, and contains rivers, streams, wetlands or vernal pools. 282 parcels in total.
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<th>V8</th>
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<td>Adjoins or connects protected area(s)</td>
<td>Very high 4</td>
<td>Low 1</td>
</tr>
<tr>
<td>Contains rare species/significant habitat</td>
<td>Very high 4</td>
<td>Very high 4</td>
</tr>
<tr>
<td>Contains rivers, streams and wetlands, vernal pools</td>
<td>Medium 2</td>
<td>Medium 2</td>
</tr>
<tr>
<td>Contains farm and forest lands</td>
<td>Medium 2</td>
<td>Medium 2</td>
</tr>
<tr>
<td>Contains coniferous stands</td>
<td>Low 1</td>
<td>Low 1</td>
</tr>
<tr>
<td>Conservation status (already Ch. 61)</td>
<td>Low 1</td>
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</tr>
<tr>
<td>Contains old forest</td>
<td>Medium 2</td>
<td>Medium 2</td>
</tr>
<tr>
<td>Contains trails/greenways</td>
<td>Medium 2</td>
<td>Very high 4</td>
</tr>
<tr>
<td>Parcel size over 100,000 square meters</td>
<td>Medium 2</td>
<td>Low 1</td>
</tr>
<tr>
<td>Contains ridge top (elevation above 1300 feet)</td>
<td>High 3</td>
<td>Very high 4</td>
</tr>
<tr>
<td>In top 10% CAPS integrity</td>
<td>Very high 4</td>
<td>Very high 4</td>
</tr>
</tbody>
</table>

Table 1. Conservation prioritization attributes used in our analysis, with two different potential rubrics (Version 7 and Version 8), each having its own specific set of importance rankings assigned to the attributes. Attributes required by WRLF outlined in green. Red highlights changes in attribute weightings from V7 to V8.
Figure 10. The parcels in gold share at least one boundary line with an already-conserved land parcel. 101 of 282 parcels.
Figure 11. The parcels in gold contain farmland or forest. 282 of 282 parcels.
Figure 12. Parcels that are not currently conserved which contain trails and greenways are shown in gold. 54 of 282 parcels. Note: This layer from MassGIS does not show many of the town's trails.
Figure 13. Large parcels are important to conserve because they help prevent habitat fragmentation. The plots in gold are over 100,000m², or 25 acres, in size. 154 of 282 parcels.
Figure 14. Ridgetop parcels are important to conserve because the town’s aquifers recharge from rain that falls on the upper elevation lands. The plots in gold are entirely or partly above 1300’ in elevation. 53 of 282 parcels.
Figure 15. The parcels in gold are completely or partly composed of habitat in the top 10% of integrity across the state. Data from UMass CAPS. 96 of 282 parcels.
Figure 16. The plots in gold are partly or entirely within sections of forest that have remained forest since the 1830s. 166 of 282 parcels.
Figure 23. The plots in gold are partly or entirely within coniferous forest stands. 100 of 282 parcels.
Figure 24. The plots in gold contain streams, wetlands, or vernal pools. 245 of 282 parcels.
Figure 25. The plots in gold contain core habitats for endangered species and Priority Natural Community habitats, as designated by NHESP’s BioMap 2 layer. 106 of 282 parcels.
3.3 Maps of Conservation Priorities

Figure 26. All colored parcels are ones that our analysis has identified as valuable assets for conservation. All parcels are over 12.5 acres in size. They are colored in a continuum of shades from green to red. Red parcels scored highest on our rubric.
Figure 27. An alternative conservation prioritization map, resulting from a different rubric. From the version resulting in Figure 26 to this version, the adjoining conserved areas attribute was changed from very high to low, the trails and greenways attribute changed from medium to very high, the parcel size attribute from medium to low, and the elevation attribute high to very high.
SECTION 4 - CONCLUSIONS

4.1 Reasons to Conserve Land in Williamstown

Why land should be conserved in Williamstown can be broken down into three primary reasons. First, we have undeveloped land in town. Second, much of this land is poorly suited to development, because of access, slope etc. Thirdly, we have an extraordinary amount of habitat that is important on a state level. Very little of the land area of Williamstown is densely settled or developed. This area is limited to the residential, commercial and industrial land use shown in grey in Figure 6. One effect of this is the large number of parcels (282) deemed to fit at least two of the top four WRLF conservation criteria, as shown in our base parcels map, Figure 15. Of this undeveloped land, much of it is excellent quality in terms of ecological integrity, as demonstrated by the CAPS data shown in Figure 8. Almost 30% of the land area of Williamstown falls in the top 10% of most ecologically intact land in the State of Massachusetts. For these reasons, we feel Williamstown offers excellent opportunities for land conservation.

4.2 Using Our Data

We see our data and maps being used in two ways. First, we hope the data and maps we have produced and collected here will provide the Town with the information needed to complete an update of the Williamstown OSRP. This will help guide planning decisions in Williamstown, serving an important role in the master-plan for the development of the town. This will also make the town eligible for several sources of funding which can be used for upcoming projects such as the redevelopment of The
Spruces mobile home park. To this end, we will hand over to the Town not just this report, but also the interactive GIS maps off of which all the maps shown here are based. Additionally, we will pass on the geodatabase of GIS individual map layers that were used and produced by this project.

Secondly, we hope our maps can help guide conservation prioritization and decision-making for land conservation agencies including, but not limited to, the WRLF. This can be done most powerfully by organizations with GIS capabilities, and the data will be available either through the town or from Williams College. However, we designed our methodology and deliverables in order that GIS manipulations would not be necessary. On a basic level, we have produced a set of maps that can act as an easy preliminary tool in the analysis of land under consideration for conservation. The several versions of our final “Conservation Priority” maps presented here can be used to quickly assess a parcel’s conservation value, or as a benchmark for comparing several parcels. However, these maps have built into them a range of subjective decisions regarding the importance of each conservation attribute, as detailed in our Conservation Prioritization Rubric (Table 1). However, even without GIS capabilities, these priorities are not binding. By presenting parcel maps of each attribute separately, future users of our data can produce their own comparisons of parcel conservation value. By deciding on the relative importance of each attribute, and then comparing, attribute by attribute, two or more parcels, an idea of their relative conservation values can be gained.

We must caution, however, against overreliance on this data and these maps. We certainly do not see these maps as a conservation plan, that the top scoring parcels should be targeted for conservation. Instead, these maps are a tool for preliminary
comparison and analysis. In the nature of our methods, and perhaps even in the nature of GIS is a certain insensitivity or lack of nuance. For example, in our system, a parcel that has 30 feet of stream cutting across one corner gets the same number of conservation points for streams as a parcel with 3000 feet of stream. Likewise, whether a patch of old forest is a quarter-acre or dozens of acres, the parcel that contains it gets the same number of points. In short, these maps are not a replacement for on-the-ground examination of a parcel or parcels.

4.3 Recommendation for the Conservation of Hopkins Memorial Forest

One parcel in Williamstown consistently scores the highest of all parcels in our conservation prioritization analysis, no matter how we change the importance values in our rubric. That parcel is the Hopkins Memorial Forest, owned by Williams College. Hopkins forest is actually composed of multiple parcels, each of which is treated separately in our analysis. Had they been treated together, much of the Northwest corner of Williamstown would have shown up as bright red. Hopkins Forest contains high elevation ridge-top land on the Taconic Crest. It contains BioMap2 endangered species habitat. It is composed almost entirely of CAPS top 50% habitat, including a large amount of CAPS top 10% habitat. It contains very high quality aquatic habitat. It has excellent trails. It contains coniferous stands and forest that has not been cleared since the 1830s. And, although this lies outside the main parcel, Hopkins forest also contains the Beinecke Stand, one of the only intact pre-colonial forest stands in town. It is adjacent to conserved land to the south. It is also the largest parcel left in
Williamstown, even if only the main parcel is considered. In short, Hopkins Forest has all of the important conservation attributes we looked for.

However, the Hopkins Memorial Forest is not under any form of permanent conservation protection. The current uses of the Forest, for field research, recreation and in certain parcels, extractive management, are perfectly compatible with permanent conservation. Parts of the forest have been threatened by housing development in the past, so although the current use of the Forest is very sensitive to the ecological importance and conservation value of the area, there is currently no guarantee that it will remain so. Consequently, we would like to use this report as an opportunity to state that of any parcel or set of parcels in Williamstown, the Hopkins Memorial Forest is most in need of permanent conservation. We would like to take this opportunity to begin a conversation in the College and town communities about the future preservation of the Hopkins Forest.

SECTION 5 - ACKNOWLEDGEMENTS

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SECTION 6 - SOURCES


Executive Office of Energy and Environmental Affairs. http://www.mass.gov/eea/ (for information on MA Division of Fish and Wildlife law and policy)


Williams Rural Lands Foundation, “Williamstown Rural Lands Foundation criteria for prioritizing land protection”