Land Conservation Spending in Massachusetts in Relation to the State Wildlife Conservation Strategy

A REPORT PREPARED FOR THE NATIONAL COUNCIL FOR SCIENCE AND THE ENVIRONMENT

WILDLIFE HABITAT POLICY RESEARCH PROJECT

DEFENDERS OF WILDLIFE
TRUST FOR PUBLIC LAND

MaryBruce Alford, Frank Casey, Molly Cheatum, Andrew duMoulin, Mitchel Hannon, Janet Mackey, Katie Theoharides

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Table of Contents

List of Tables……..... iii

List of Maps ……..... iv

I. Introduction…….……..1

II. Description and Analysis of Land Conservation Expenditures in Massachusetts……..... 2
A. Conservation Expenditures in Massachusetts, 1998-2007…… 2
State Government Land Conservation Expenditures……2
Federal Conservation Programs…….....4
Federal Conservation Programs Implemented by State Agencies……..4
Federal Land Conservation Programs with Partners…….....7
Land Conservation by Federal Land Management Agencies……9
Land Conservation Expenditures through Local Governments……..10
Private Land Conservation……..11
Summary of Land Conservation Expenditures in Massachusetts……13
B. Spatial Analysis of Massachusetts Conservation Expenditures……....14

III. Policy Analysis of Massachusetts State Land Conservation……...22
A. Funding…….22
B. Land Protection Approaches…….23
C. Land Selection Approaches……....24
D. Level of Engagement with Non-State Funding Programs……..25
E. Management of Land Conservation Information……...26

IV. Estimated Costs of Conserving Natural Heritage and Endangered Species Program (NHESP) Biomap Core and Living Waters Conservation Priorities…….28
A. Cost Estimation Methods…….29
Fee-Simple Purchase Acquisitions…….29
Management Costs in Massachusetts…….30
Cost of Establishing Conservation Easements……....33
Easement Transaction Costs in Massachusetts…….. .33
Cost of Rental/Lease Agreements…….37
B. Estimated State Wide Land Protection Costs for Massachusetts……... .37

V. Policy Recommendations……. 39

VI. References……. 41

VII. Organizational Contacts…… 43

List of Tables

Table 2.1: Massachusetts State land Conservation Expenditures and Acreage, 1998-2007.. 4

Table 2.2: Federal Land Acquisition Funding Programs Managed Through State Agencies, 1998-2007……..... 5

Table 2.3: Federal and Partner Land Protection Programs in Massachusetts, 1998-2007.... 8

Table 2.4: Federal Land Conservation Programs Managed by Federal Agencies, 1998-2007…….. 9

Table 2.5: Local Land Acquisitions Funding Programs, 1998-2007……10

Table 2.6: Private Conservation Expenditures and Acres Protected, 1998-2007…….11

Table 2.7: Summary of Land Conservation and Acres Protected in Massachusetts, 1998-2007……..... 14

Table 2.8: Protected Acreage and Overlap with Massachusetts Conservation Priorities, 1998-2007…….19

Table 2.9: Conservation spending and overlap with Massachusetts Conservation Priorities, 1998-2007…….20

Table 4.1: Fee-Simple Costs per Acre in Massachusetts ($2007)…… 29

Table 4.2: Weighted Fee-Simple Costs for Massachusetts ($2007)……..……... 30

Table 4.3: Habitat Management Costs in Massachusetts……31

Table 4.4: Types of Habitat Management Activities for Massachusetts…….. 32

Table 4.5: Conservation Easement Costs per Acre in Massachusetts ($2007)……..... 33

Table 4.6: Easement Transaction Costs in Massachusetts ($2007)……..34

Table 4.6: Transaction Activities and Cost Elements for Massachusetts ($2007)……..... 36

Table 4.7: Land Rental / Lease Rates in Massachusetts ($2007)……37

Table 4.8: Per Acre and Total Costs by Land Conservation Strategy in Massachusetts ($2007)……..37

List of Maps

Map 2.1: Protected and unprotected conservation priorities indentified in the BioMap and Living Waters Core Habitat Layers…….15

Map 2.2: Protected and unprotected conservation priorities with land conservation activity from 1998 – 2007 and two areas highlighted for detailed analysis…….. 16

Map 2.3: Land conservation activity (fee-simple acquisitions and easements) by year overlaid with protected and unprotected conservation priorities and the level of government that provided funding…….17

Map 2.4: An example of a representative acquisition parcel and the attribute information that is recorded for each parcel……. 18

I. Introduction

This report describes and analyzes land conservation expenditures in the State of Massachusetts for 1998-2007. The report constitutes one of five state studies to examine how land conservation expenditures were aligned with each state's wildlife habitat Conservation Strategy (State Strategy). For Massachusetts, we investigate the extent to which land conservation expenditures and acreages overlap with the habitat conservation priorities laid out in state's Natural Heritage and Endangered Species (NHESP) BioMap Core and Living Waters (conservation priorities) that are a component of its State Strategy. The report addresses three topics: a spending efficiency analysis; a financial efficiency analysis of land protection costs; and a policy analysis.

Under federal legislation, each state was required to complete a state wildlife conservation strategy by October of 2005 in order to remain eligible for State Wildlife Grant funds. These strategies were required to address eight congressionally mandated elements which included identifying species and habitats of greatest conservation need. Many states took the opportunity to map conservation priorities that represented the best areas for conservation of multiple species and habitats. The states used various methods to identify conservation priorities. Many states made it clear that the conservation priorities were not intended solely for acquisition and emphasized that maps illustrate sites of high biological significance and opportunity for a variety of conservation actions. In Massachusetts, conservation priorities are composed of a range of habitat types and land uses, including natural and semi-natural landscapes, agricultural and forestry lands and existing developed or excavated areas. Developed and excavated lands are excluded in this analysis.

The spending efficiency analysis has three primary components: (1) to the degree possible, to describe and analyze public and private land conservation expenditures between 1998-2007; (2) to spatially map expenditures and acreages to determine the amount of geographic overlap with the conservation priorities identified in the State Strategy, and (3) to determine the percentage and amount of total conservation spending and acreage that aligned with the conservation priorities. The financial efficiency analysis examines the relative costs of protecting conservation priority lands that had not been conserved as of 2007. These costs were estimated by consulting public and private expenditure data associated with public and private land protection programs. Three types of land protection costs are compared: fee-simple purchase; permanent easements (known also as "conservation restrictions" in Massachusetts, but for the purposes of this report we will refer to them as easements), and land rentals. In addition, land management costs associated with fee-simple purchases and transaction costs for easements are included. The policy analysis looks at ways in which the state uses its resources, programs and policies to direct funding towards activities that will achieve the state's land and habitat conservation goals, including the State Strategy. The policy analysis also examines the extent to which a state is guiding conservation spending towards protecting areas defined as important habitat, including the conservation priority areas.

The next section reports our findings with respect to spending efficiency in Massachusetts by employing both descriptive and spatial analysis. Section III provides a policy analysis with respect to land conservation expenditures and their alignment with designated Focus Areas in Massachusetts. Section IV provides estimates of what it would cost to conserve remaining

Focus Areas that were not protected as of 2007. The last section offers some preliminary conclusions and recommendations with respect to aligning land conservation funding with the State Strategy, and which financial instruments may be more cost-effective in conserving unprotected conservation priority areas.

II. Description and Analysis of Land Conservation Expenditures in Massachusetts

The description and analysis of land conservation spending in Massachusetts is composed of two interrelated topics. First, we provide estimates of the amounts spent and acreages protected by various public and private entities for land conservation in Massachusetts for the 1998-2007 period. Second, we provide, to the extent possible, a spatial analysis that illustrates the amount of overlap between acres in land conservation and the location of Conservation Priorities identified in the Massachusetts State Strategy. It should be noted, however, that the State Strategy was only adopted in 2005, so any overlap between conserved lands from 1998-2007 would be relatively recent. Therefore, the description and analysis of alignment with the Conservation Priorities really serves more as a baseline rather than as an indicator of how strategic land conservation has been for the purpose of implementing the State Strategy.

A. Conservation Expenditures in Massachusetts, 1998-2007

This section provides descriptions of the public and private land conservation funding sources in Massachusetts and provides data on the size of protected areas, and related expenditures, by source of funding for 1998-2007. Major data sources include The Trust for Public Land's (TPL) Conservation Almanac, and TPL's LandVote database.

The following sections disaggregate the total funding and acreage reported above into five categories: state-level sources, federal programs that are and are not coordinated by state agencies, local funding sources, and private land trusts. Describing and analyzing expenditure data using these categories informs our policy proposals to improve the alignment of conservation funding with Massachusetts' Conservation Priorities**.**

State Government Land Conservation Expenditures

The Massachusetts Legislature authorizes bond expenditures for environmental programs, including open space acquisition. The Legislature authorized a three-year Open Space Bond Bill in 2002 for $753 million, $220 million of which is for land acquisition.

In August 2008, a new $1.64 billion environmental bond was passed by the legislature and signed into law by the governor. The new bond contains an annual dedication of $50 million for five years for open space. The funding appropriations include $25 million for a new Commonwealth Urban Parks initiative, $73 million for acquisition of wildlife habitat by the Department of Fish and Game (DFG), $56.9 million to purchase land for the Department of Conservation and Recreation (DCR) parks and reservations, $67.7 million to preserve agricultural lands through state purchase of development rights, and $21.3 million for Drinking Water Protection grants distributed to cities and towns by the Department of Environmental Protection (DEP).

From 1998 to 2007 Massachusetts spent more than $360 million and conserved roughly 100,000 acres of land using state bond funds and appropriations (Table 2.1). The Massachusetts Executive Office of Environmental Affairs is the state's coordinating agency

for all of the state funding programs. About 37% of the total land conservation funding came through the Department of Conservation and Recreation, with another 40% coming from the combined resources of the Executive Office of Environmental Affairs and the Department of Fish and Game. In terms of acreage, the Department of Fish and Game accounted for about 45% of all land conserved, with the Department of Conservation and Recreation conserving another 40% over the 1998-2007 time period. These data do not include projects that may have been authorized, but not completed at the time of this report.

Table 2.1: Massachusetts state land conservation expenditures and acreage, 1998-2007

State Funding Program	***Expenditures***	***Acres***
Executive Office of Environmental Affairs	$74,741,474	11,553
Department of Agricultural Resources	$48,959,955	454
Department of Conservation and Recreation	$135,511,874	40,989
Division of Conservation Services	$23,332,281	2,034*
Department of Fish and Game	$77,896,671	45,223
Total	**$360.4 million**	**100,253 acres**

Federal Conservation Programs

Federal government funding programs are broken into three categories: 1) federal land conservation programs coordinated solely by state agencies for which a state match may be necessary; 2) programs coordinated by the federal government that work with various partners, including state agencies; and 3) programs operated solely by federal land agencies with no state involvement. An example of federal funds coordinated by the state is the Coastal and Estuarine Land Conservation Program (CELCP), which issues grants to states for coastal conservation priorities. Individual projects are selected by a designated state agency. Examples of federal programs that involve public and private partners, and are coordinated by the federal government, are the USDA Farm and Ranchland Protection and the Wetland Reserve Programs. Under FRPP, the federal government must approve specific projects before funding is distributed. Lastly, there is federal funding used only by and for federal land agencies, such as the USDA Forest Service, to purchase land that add to the public domain and/or implement land management activities.

Federal Conservation Programs Implemented by State Agencies

There are several federal conservation programs whereby the states play coordinating roles with respect to land conservation activity and expenditures. Table 2.2 summarizes acreage conserved and expenditures for the programs active in Massachusetts for 1998-2007. For three of the four federal programs, land conservation acreage data could not be reported. In the case of the CELP and NCWC, the state agencies administering these programs could not provide this information. In the case of LWCF, acres are reported in other state programs such as the Department of Conservation (Table 2.1). In terms of expenditures, the four federal programs managed by the state had about equal funding for 1998-2007. The largest amount expended was using the Land and Water Conservation Fund through the state Division of Conservation Services (DCS), at about $8 million. About one-half of total expenditures were managed by the DCR.

Table 2.2: Federal land conservation programs implemented by state agencies, 1998-2007

Program Name	***State Agency***	***Program Spending ($)***	***Acres Protected***
Coastal and Estuarine Land Conservation Program	Massachusetts Office of Coastal Zone Management	$5,250,859	Not Available
Forest Legacy Program	Massachusetts Department of Conservation and Recreation	$5,723,800	4,244
Land and Water Conservation Fund	Division of Conservation Services	$8,029,000	Accounted for in Table 2.1
National Coastal Wetlands Conservation	Massachusetts Department of Conservation and Recreation	$7,328,937	Not Available
TOTAL		**$26.3 million**	**4,244 acres**

Coastal and Estuarine Land Conservation Program (National Oceanic and Atmospheric Administration)

The Coastal and Estuarine Land Conservation Program (CELCP) funds pass-through grants to states and local governments for land or easement acquisition in a state's coastal zone, and/or as provided for in a state's coastal conservation plan. CELCP was created in 2002 in order to "protect those coastal and estuarine areas with significant conservation, recreation, ecological, historical or aesthetic values, or those that are threatened by conversion from their natural state to other uses," and lands therefore purchased through this program must generally be maintained or restored to their natural state. Public access is a general requirement for this program, and the program requires a 1:1 non-federal match, which can

be in many forms, including restoration and land value donation. CECLP is administered through NOAA, which is a sub-agency of the Commerce Department. Land conservation funding through CELCP was approximately $5.3 million from 1998-2007.

Forest Legacy Program (U.S. Forestry Service)

The Forest Legacy Program (FLP) was established in 1990 to provide federal funding to states to assist in securing conservation easements on forestlands threatened with conversion to non-forest uses. Fee transactions are also used under the program, either for the whole transaction or combined with easements to achieve a state's highest conservation goals. A state voluntarily enters the program by submitting an Assessment of Need (AON) to the Secretary of Agriculture for approval. These plans establish the lead state agency, the state's criteria for Forest Legacy projects, and Forest Legacy Areas (FLA) within which proposed Legacy projects must be located. Once the AON is approved, the state lead agency can submit up to three grants each year for projects within the FLAs. The federal government may fund up to 75 percent of project cots, with at least 25 percent coming from private, state or local sources. The Massachusetts AON was approved in 1993. Between 1998 and 2007, the Massachusetts DCR spent about $5.7 million of FLP funds to conserve a little over 4,000 acres.

Land and Water Conservation Fund State Assistance Program (National Park Service)

The stateside Land and Water Conservation Fund (LWCF) program provides a 50 percent match to states for planning, developing and acquiring land and water areas for natural resource protection and recreation enhancement. Funds are distributed to states based on population and need. Once the funds are distributed to the states, it is up to each state to choose the projects, though the National Park Service has final approval. Eligible grant recipients include municipal subdivisions, state agencies and tribal governments, each of whom must provide at least 50 percent matching funds in either cash or in-kind contributions and a detailed plan for the proposed project. From 1998-2007, over $8 million was expended by the Massachusetts DCS.

National Coastal Wetlands Conservation Grants (U.S. Fish and Wildlife Service)

Established by the Coastal Wetlands Planning, Protection, and Restoration Act of 1990, the National Coastal Wetlands Conservation (NCWC) Grant Program is a matching grant program administered by the U.S. Fish and Wildlife Service to acquire, restore, and enhance the wetland ecosystems of coastal states and territories. Projects in states bordering the Atlantic, Gulf of Mexico, Pacific, and Great Lakes are eligible for funding of up to $1 million per fiscal year. The one exception is the state of Louisiana, which has its own coastal wetland program administered under the Act. Projects are given priority if consistent with the criteria and considerations outlined in the National Wetlands Priority Conservation Plan; are located in states with dedicated funding programs to acquire coastal wetlands and open spaces; are located in maritime forests on barrier islands; benefit endangered species; encourage cooperative efforts among diverse partnerships; and benefit other ongoing conservation

efforts. About $7.3 million of NCWC funds was spent on land conservation by the Massachusetts DCR from 1998 to 2007.

National Scenic Byways Program and the Recreational Trails Funds (U.S. Department of Transportation, Federal Highway Administration)[1]

The National Scenic Byways Program and the Recreational Trails Funds are coordinated by the Department of Transportation's Federal Highway Administration. Under the Byways program, the U.S. Secretary of Transportation recognizes specific roads as "National Scenic Byways" or "All-American Roads" based on significant archaeological, cultural, historic, natural, recreational, and scenic qualities." Discretionary grants are also provided for scenic byway projects to aid in planning, designing and developing a state scenic byway program.

Funding for Recreational Trails is derived from the Federal Highway Trust Fund, which is sustained in part through a portion of the motor fuel excise tax collected from non-highway recreational fuel use (i.e. fuel used by snowmobiles, all-terrain vehicles, off-highway motorcycles, off-highway light trucks). Funding is provided to states to develop and maintain recreational trails and facilities for all types of trail use, some of which include hiking, bicycling, in-line skating, equestrian, and snowmobiling. There is no available acreage or expenditure data for this program in Massachusetts.[2]

Federal Land Conservation Programs with Partners

There are three federal land conservation programs active in Massachusetts, which are managed by federal government authorities, but can involve an array of various partners. The federal agencies involved include the Departments of Agriculture and the Department of Interior U.S. Fish and Wildlife Service. These programs require state matching funds (Table 2.3). In the case of agriculture, land conservation programs involve individual crop and livestock producers as partners. For the time period this study covers, almost all of the funding (98%) through from the federal partner programs came from the Farm and Ranchland Protection Program (FRPP).

[1] This National program is not included in Table2.2 because acreage and expenditure data were not available.
[2] Although this program has contributed to the protection of important lands, whether they are scenic, natural, recreational, archaeological, historic or cultural the lack of their inclusion in this report does not skew conservation percentages for the state.

Table 2.3: Federal and partner land protection programs in Massachusetts, 1998-2007

Federal Program	*Program Spending*	*Acres Protected*
Farm and Ranch Lands Protection Program	$22,400,000	0[3]
North American Wetlands Conservation Act	$406,250	980
Wetlands Reserve Program	$3,900,000	332
TOTAL	**$26,706,250**	**1,312**

[3] Some of these easement acres could be double-counted in the state acquisition data

Farm and Ranch Lands Protection Program (USDA/National Resource Conservation Service)

The USDA Farm and Ranch Lands Protection Program (FRPP) provide matching funds for the purchase of development rights to keep productive farm and ranchland in agricultural uses. FRPP works with state, tribal, or local governments and non-governmental entities. Grants are awarded by the Natural Resource Conservation Service (NRCS) to states, local governments and non-governmental entities on a competitive basis, according to national and state criteria. The program requires up to a 50 percent non-NRCS match to cover the cost of an easement. Up to 25 percent of donated land value can be counted as the match. Between 1998 and 2007, $22.4 million was spent on FRPP easements. In Massachusetts, funds go through the National Resource Conservation Service (NRCS) state office.

North American Wetlands Conservation Act (U.S. Fish and Wildlife Service)

The North American Wetlands Conservation Act (NAWCA) was passed in 1989 to provide matching grants for the acquisition, restoration, and enhancement of wetland ecosystems for the benefit of waterfowl and other wetland dependent migratory species. Administered by the U.S. Fish and Wildlife Service, grants are available to nonprofit organizations, state and local agencies, tribes, and private individuals in the U.S., Canada, and Mexico. Two types of grants are awarded; small grants for up to $75,000 and standard grants for up to $1 million. There is a 1:1 non-federal match requirement for each grant although the average match of successful proposals is over 2:1. Between 1998 and 2007, about $406,250 of NAWCA funds were spent in Massachusetts to protect approximately 980 acres.

Wetlands Reserve Program (USDA/National Resource Conservation Service)

The Natural Resource Conservation Service (NRCS) administers the Wetlands Reserve Program (WRP), a voluntary program offering landowners the opportunity to "address

wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands in an environmentally beneficial and cost-effective manner."[3] The WRP offers agricultural landowners a choice of entering into either 30-year or permanent conservation easements and also provides cost-share assistance.

Between 2002 and 2007, approximately 332 acres were conserved under WRP through permanent easements in Massachusetts. Expenditure data is not available prior to 2002. The total amount appropriated was for wetland conservation was $3.9 million during the 2002-2007 time period for both easement acquisition and wetland restoration. We assume that all appropriated dollars were spent. Location information is not shown in the mapping analysis due to confidentiality reasons.

Land Conservation by Federal Land Management Agencies

The land conservation funding described in this section pertains to Federal agencies that protect land solely through their own agencies, with no involvement by the state of Massachusetts or private partners. These agencies include the Bureau of Land Management, the Bureau of Reclamation, the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service. Annual funding and acreage figures could not be obtained from the Bureaus of Land Management or Reclamation. The Bureau of Land Reclamation (BLR) is administered by the U.S. Department of the Interior and buys and owns land to build dams, power plants, and canals. However, expenditure and acreage data pertinent to these lands was not included because of their uncertain status as conserved lands. Funding levels and acres protected are shown in Table 2.4. There were only two federal agencies (the National Park Service and the US Fish and Wildlife Service) that made land conservation expenditures during the study period. The vast majority of the funds (79%) and acres conserved (95%) was through the US Fish and Wildlife Service.

Table 2.4: Land conservation programs managed by federal agencies, 1998-2007

Source of Funding	***Program Spending ($millions)***	***Acres Protected***
National Park Service	$4	270
U.S. Fish and Wildlife Service	$15	4,812
TOTAL	**$19 million**	**5,082 acres**

National Park Service (U.S. Department of Interior)

The National Park Service (NPS) was created in 1916 and now comprises 390 areas covering more than 84 million acres in every state (except Delaware), the District of Columbia,

[3] Natural Resource Conservation Service United States Department of Agriculture – Farm Bill 2002, Wetlands Reserve Program, Key Points - http://www.nrcs.usda.gov/Programs/WRP/2007_ContractInfo/2007WRPKeyPoints.pdf

American Samoa, Guam, Puerto Rico, and the Virgin Islands. These areas include national parks, monuments, battlefields, military parks, historical parks, historic sites, lakeshores, seashores, recreation areas, scenic rivers and trails, and the White House. Between 1998 and 2007, the NPS spent about $4 million and protected approximately 270 acres in Massachusetts through the Land and Water Conservation Fund.

U.S. Fish and Wildlife Service (U.S. Department of Interior)

The National Wildlife Refuge System of the U.S. Fish and Wildlife Service (FWS), established over 100 years ago, has grown to nearly 95 million acres. It now includes 540 refuges and more than 3,000 waterfowl production areas spread across the 50 states and several U.S. territories. From 1998 to 2007, approximately $15 million was spent by the FWS in Massachusetts, conserving over 4,800 acres.

Land Conservation Expenditures through Local Governments

All municipalities in Massachusetts have bonding/taxing authority for the purposes of land conservation. The Community Preservation Act (CPA) was signed into law in September 2000 and is statewide enabling legislation to allow cities and towns to provide new funding for open space protection, affordable housing and historic preservation. It enables a municipality to impose a voter-approved surcharge of up to 3 percent on a local real property levy.[4] In return, communities receive state matching funds derived from a $20 surcharge on all real estate transactions at registry of deeds and land court. The state revenue source has generated about $25 million annually, however it has declined in recent years. Table 2.5 shows the amount of funding and acres conserved through CPA between 1998 and 2007. Between 2000 and 2007, local CPAs spend almost $275 million to conserve 16,000 acres. Voters in 142 of 351 communities in Massachusetts have approved the CPA.[5]

Table 2.5: Local land acquisition funding programs, 1998-2007

Local Government	*Program Spending on Conservation*	*Acres Protected*	*Funding Mechanism*	*Year Approved*
Community Preservation Act (142 Communities)	$ 274.6 million	16,007	Property Tax/Deed Recording Fee	2000

It should be noted that many towns with and without CPA have a history of passing bonds for land conservation at local town meetings. Because of time and money limits it was not possible to gather a comprehensive view of this non-CPA conservation spending.

It should also be noted that not all dollars expended through these programs are used to acquire conservation land. Funds may be used for restoration and/or management of habitat, or for the acquisition of urban parkland (and park improvements), which may have minimal impact on wildlife habitat. The degree of impact of this program on wildlife habitat is a topic for further research.

[4] General Laws of Massachusetts Chapter 44B§1-17

[5] http://commpres.env.state.ma.us/publications/cpa-status-map.pdf

Because many local governments that pass the CPA take advantage of state and federal conservation funding, we run the risk of double counting acres acquired. The same acquired parcel may appear on local, state and federal government ledgers, simultaneously. To avoid double-counting, credit for parcel acquisitions is given to the entity providing the majority of funding for that parcel.

Private Land Conservation

Private funding sources consist of various land trusts and/or private donors throughout the state. In Massachusetts, The Nature Conservancy was the most active private entity for private land conservation. Land trusts do accept donated land, but also spend a considerable amount for fee-simple and easement purchased. Conservation activity for TPL was not included because it does not use organization dollars to acquire land for easement or purchase. Acres that TPL helps protect have likely been captured in other program and/or agency data. Acres and dollars that we were able to identify solely as land trust acquisitions are provided in Table 2.6. From 1998 to 2007, the largest private land conservation organizations in Massachusetts spent about $185.4 million dollars protected over 27,000 acres. Over one half of expenditures were made by The Nature Conservancy. Unaffiliated private contributions accounted for over $69 million in expenditures (about 37% of the total, but we could not match these to a specific organization. Acreages are included in the state data (Table 2.1).

Table 2.6: Private conservation expenditures and acres protected, 1998-2007

Conservation Organization	***Program Spending***	***Acres Protected***
TNC, Massachusetts Chapter	$105,492,428	6,315
Trustees of Reservations	Not Available	7,458
Massachusetts Audubon Society	$8,345,794	6,307
Sudbury Valley Trustees	$1,620,000	1,426
Essex County Greenbelt Assoc.	$783,701	3,435
Mount Grace Land Trust	$32,000	2,250
Unaffiliated Private Contributions included in state acquisition data	$69,125,043	Acres counted under EOEA totals: Table 2.1
Total	**$185,398,966**	**27,191**

The Nature Conservancy

Since 1962, the Conservancy has played an active role in land conservation in Massachusetts and has protected more than 22,000 acres of important habitat around the state. Currently, the Conservancy owns and manages a network of preserves across the state that are open to visitors. TNC has on-the-ground presence through its offices in the Berkshires, along the Westfield River, on Martha's Vineyard and in Southeast Massachusetts. The Massachusetts Chapter works jointly with numerous state and federal agencies, land trusts, community groups and other private organizations. Between 1998 and 2007, TNC conserved about 6,000 acres with an expenditure of nearly $105.5 million.

The Trustees of Reservations

The Trustees of Reservations (TTOR) is a non-profit land conservation and historic preservation organization dedicated to preserving natural and historical places in Massachusetts. It is the oldest regional land trust in the world, founded in 1890. In addition to land stewardship, the organization is also active in conservation partnerships, community supported agriculture (CSA), environmental and conservation education, community preservation and development, and green building. The Trustees of Reservations own title to over 100 properties on 25,000 acres in Massachusetts, all of which are open to the public; it maintains conservation restrictions on 200 more properties. Properties include historic mansions, estates, and gardens; woodland preserves; waterfalls; mountain peaks; wetlands and river ways; coastal bluffs, beaches, and barrier islands; farmland and CSA projects; and archaeological sites.

TTOR did not provide spending figures for our study. The number would be substantial and quite possibly many of these dollars might be found in the “Private Contributions” category, but we were unable to confirm this. Over the 1998-2007 period, TTOR protected over 7,400 acres.

Massachusetts Audubon Society

Since first acquiring land in 1922, Massachusetts Audubon (Mass Audubon) land conservation efforts have resulted in a system of wildlife sanctuaries that is now the largest private ownership of conserved land in Massachusetts. Mass Audubon acquires land, or rights to land, for the protection of wildlife habitat and for places for people to enjoy nature. A number of tools are used including receiving land as gifts and bequests, raising money to buy land (often at bargain prices), partnering with other conservation organizations and government agencies to protect areas of mutual importance, and providing technical expertise to other conservation organizations. Over the time period of this study, Mass Audubon spent over $8.3 million and protected over 6,000 acres.

Sudbury Valley Trustees

Sudbury Valley Trustees (SVT) is a regional land trust, founded in 1953. For over 50 years, SVT has been dedicated to conserving land and protecting wildlife habitat in the Concord,

Assabet, and Sudbury river basin. Currently, SVT is responsible for the protection and care of over 100 properties totaling more than 3,600 acres of diverse conservation lands that include wetlands, sensitive habitats, trails and other open spaces including major reservations. They have partnered with other entities in preserving an additional 6,000 acres now under the permanent protection of public agencies, including the Great Meadows National Wildlife Refuge. From 1998-2007, SVT protected about 1,430 acres and has spent over $1.6 million.

Essex County Greenbelt Association

The Essex County Greenbelt Association (Greenbelt) is a member-supported nonprofit land trust that has conserved nearly 13,000 acres of land in Essex County. Greenbelt works with local communities and landowners to acquire and protect ecological areas, farmland and scenic vistas. One of our major goals is the creation of "greenbelts" consisting of river, trail, and other natural corridors, coastal systems and visually intact landscapes. Greenbelt provided over $784 million to protect approximately 3,435 acres from 1998-2997.

Mount Grace Land Trust

The Mount Grace Land Trust (Mount Grace) was incorporated in 1986. The base area of their conservation efforts is a 23-town region in north central and western Massachusetts, but they occasionally work with landowners outside of these towns. Mount Grace has protected over 22,000 acres through the completion of over 200 projects. During the period of our study, Mount Grace spent $32,000 to protect about 2,250 acres.

Summary of Land Conservation Expenditures in Massachusetts

Overall, we estimate that approximately $892 million was spent to conserve over 144,000 acres in Massachusetts from 1998 to 2007 (Table 2.7). Land conservation programs involving the federal government accounted for 8% of all expenditures and about 7% of all acres protected. State funding, primarily through the use of state environmental bonds and appropriations, accounted for 40% of all expenditures and was used to protect about 70% of all conserved lands. Local funding, which captures spending in the 142 communities in Massachusetts that have passed the CPA accounted for 31% of all expenditures and 11% of the acreage protected. Private foundations and land trusts accounted for 21% of all expenditures and 12% of the acreage protected. Fifty three percent of the total acres conserved were through fee simple purchase.

Due to the lack of data for some funding sources, both expenditures and acres protected are somewhat underestimated. For example, we were not able to get the significant conservation spending done by the Trustees of Reservations. Likewise, we could not include acreage data for three large federal programs that the state is implementing: CELCP, LWCF, and NCWC.

Table 2.7: Summary of land conservation funding in Massachusetts, 1998-2007

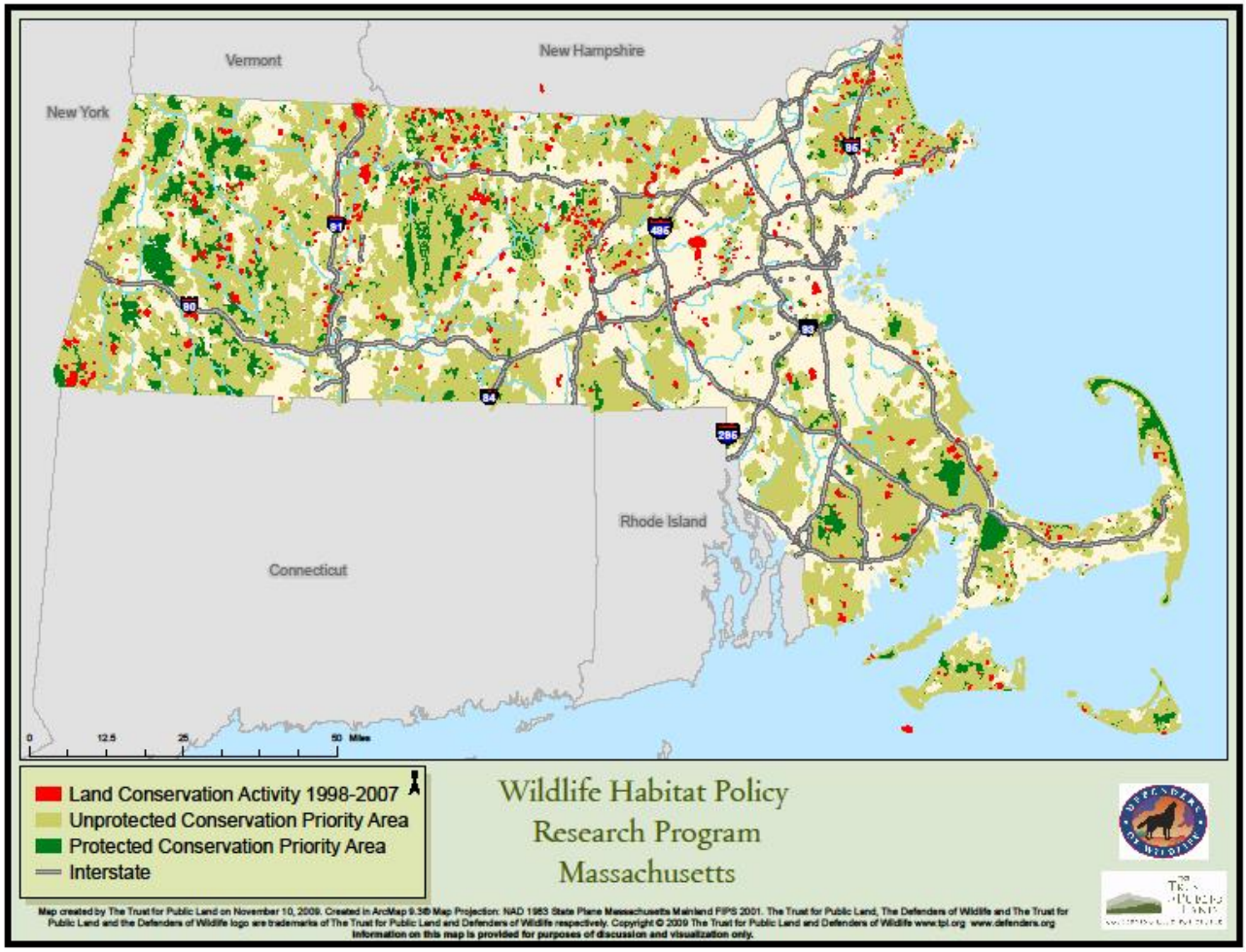
Source of Funding	***Program Spending ($millions)***	***Program Spending as a % of Total***	***Acres Protected***	***Acres Protected as a % of Total***
State Funding	$360.4	40%	100,253	70%
Federal Funding with State Coordination	$26.3	3%	4,244	3%
Federal Funding with Partners	$26.7	3%	1,312	1%
Federal Agency Only	$19.0	2%	5,082	3%
Local	$274.6	31%	16,007	11%
Private	$185.4	21%	17,191	12%
TOTAL	**$892.4 million**		**144,089 acres**	

B. Spatial Analysis of Massachusetts Conservation Expenditures

This section provides a description and analysis of the spatial efficiency of land conservation in Massachusetts with respect to implementation of the Comprehensive Wildlife Conservation Strategy (State Strategy). We measure spatial efficiency as the geographic alignment between Massachusetts' conservation priorities identified in the Natural Heritage and Endangered Species Program (NHESP) Biomap Core and Living Waters project with land conservation activity from 1998-2007, *for those expenditures and acreages that could be mapped.* To investigate this alignment we first collected spatial parcel data for lands conserved from 1998 to 2007 and overlaid these parcels with the states conservation priorities. The methods used for this spatial analysis and our results are described below.

In an effort to strategically focus resources and efforts, the Massachusetts NHESP identified geographic conservation priorities in the landscape that contain fish and wildlife communities identified as sites critical for the long-term survival of biodiversity. Four data layers were created; of the four, this analysis used two – BioMap Core Habitat and Living Waters Core Habitats. The BioMap and Living Waters core habitat layer focuses primarily on state-listed rare species and exemplary terrestrial and aquatic communities. These data layers were created by NHESP scientists using field data, ancillary literature, and infrared aerial photographs with the intention of promoting strategic land protection. Map 2.1 displays the conservation priorities identified in BioMap and Living Waters Core Habitats.

Protected conservation priorities are shown in dark green and unprotected areas are shown in light green.



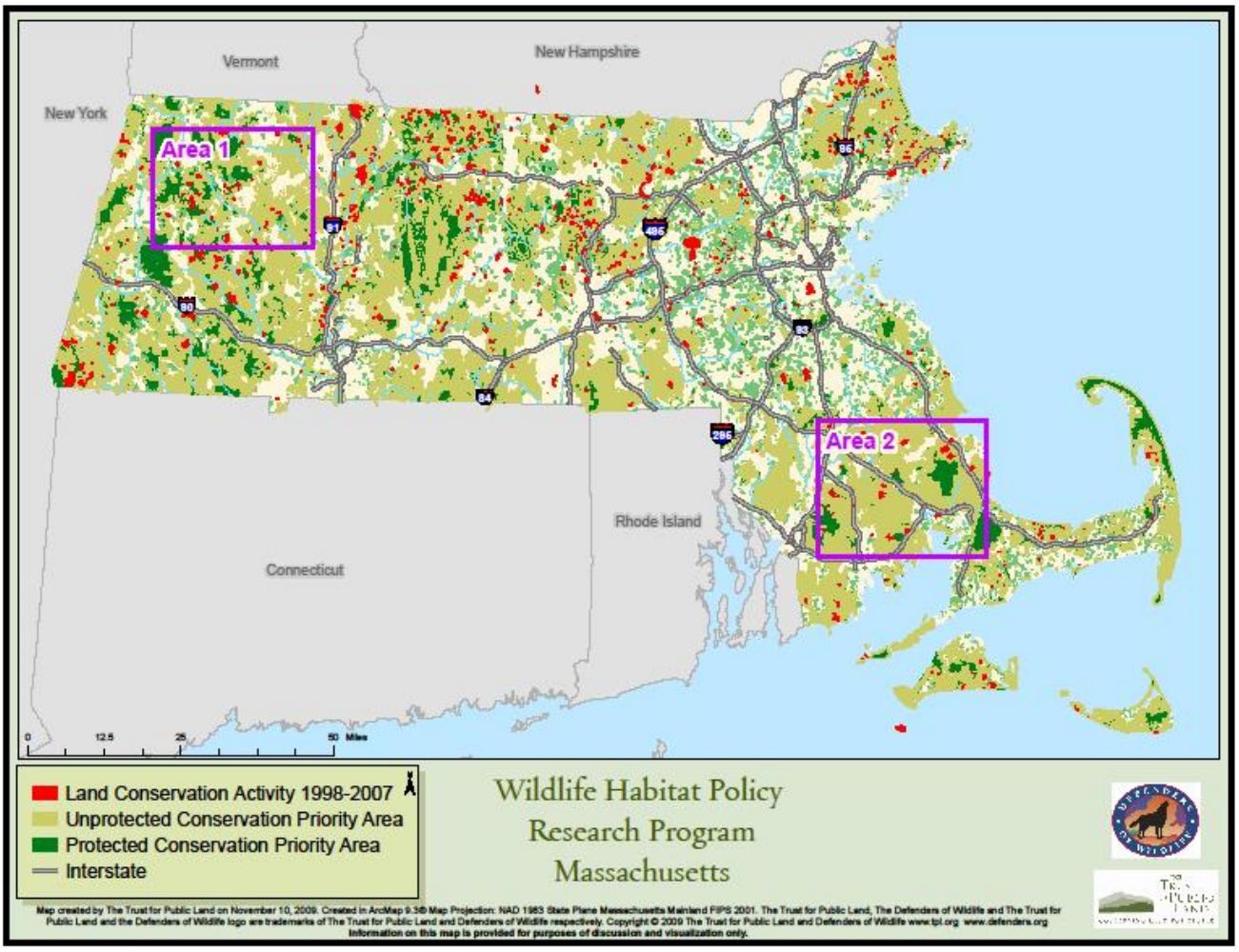
Map 2.1: Protected and unprotected conservation priorities identified in the BioMap and Living Waters Core Habitat layers.

In order to overlay land acquisitions with Massachusetts' conservation priorities, a digital spatial dataset was created that delineated property boundaries acquired through fee-simple purchase and easements. The cost, date of completion, type of purchase, management entity, total amount of funding and funding by level of government were recorded for each property. Assembling this database required a variety of approaches due to structural differences in the spatial data provided between management entities and the ease to which a spatial data record could be matched to its corresponding transactional data.

Property boundary spatial data were provided by the Massachusetts Audubon Society, Sudbury Valley Trustees, the Essex County Greenbelt Association, the Mount Grace Land Trust, The Nature Conservancy and the U.S. Fish and Wildlife Service. Spatial data was also provided by the Trustees of Reservations and the Franklin Land Trust, but because these groups could not provide transaction information, they are not included in this analysis. The

Executive Office of Environmental Affairs (EOEA) program provided us a state open space dataset that was not aligned with their transactional data. Of 1500 transaction records, we were able to align about 500. The Community Preservation Act (CPA) provided point data that was often inaccurate in placement. Therefore, alignment with transaction data and spatial property boundaries could not be made with lands conserved through the CPA. We were unable to obtain spatial data for any of the federal programs that operate through a state agency or with partners. The USDA Forest and National Park Services could not provide any parcel level spatial data.

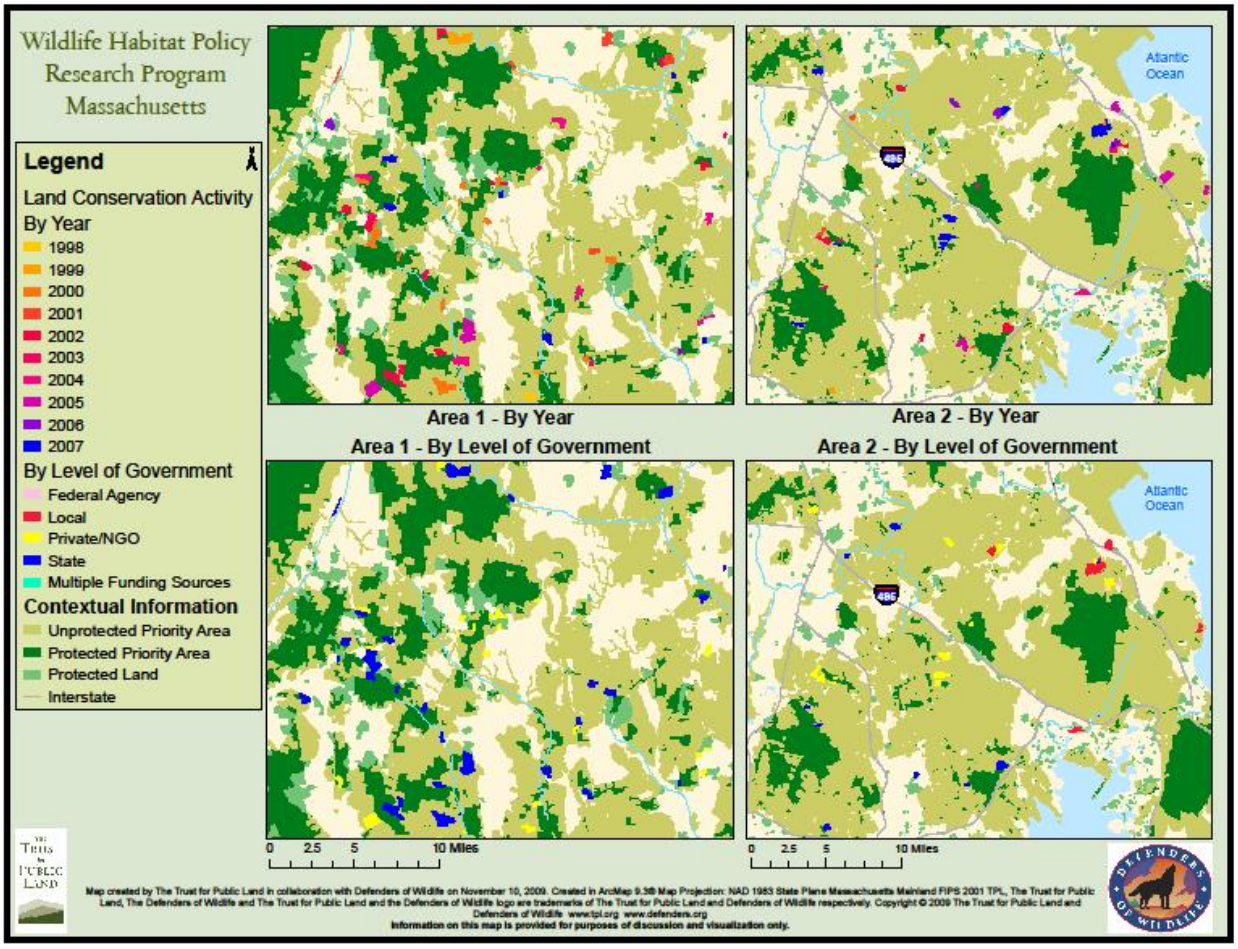
Once the available spatial database was compiled, all the corresponding cost data were entered, then a quality control process was instituted to make sure that there were no duplicate records from different sources. This was completed by using the Geographical Information System (GIS) "select by location" tool to identify any projects that overlapped. Once overlaps were identified, the duplicate records were removed and noted in a work log.



Map 2.2: Protected and unprotected conservation priorities with land conservation activity from 1998-2007 and two areas highlighted for detailed analysis.

The spatial database was used to determine how acquired conservation lands acquired in Massachusetts overlapped with the state's conservation priorities. Map 2.2 shows land

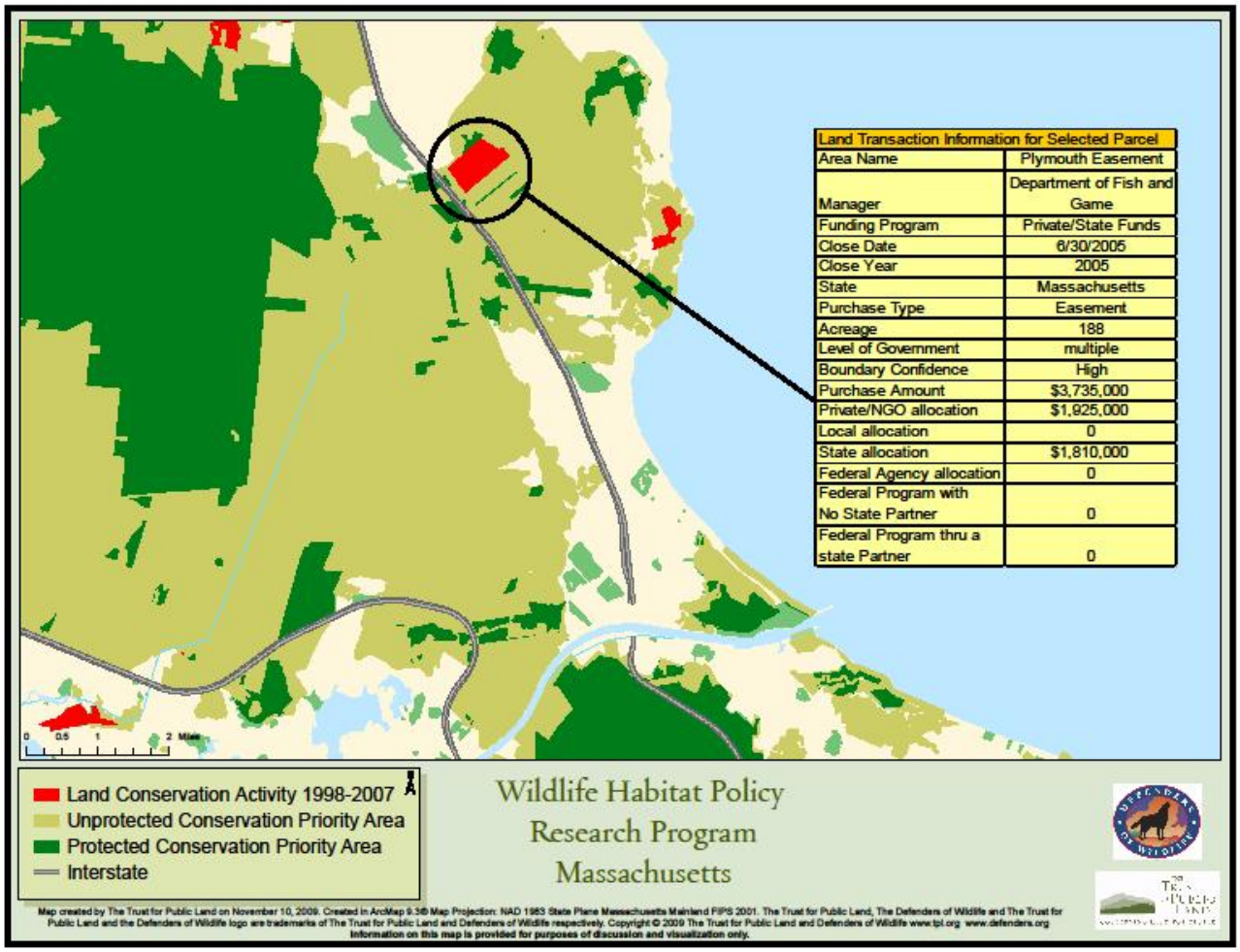
conservation activity from 1998-2007 (in red) in relation to the conservation priorities and highlights two areas that will be examined in more detail in Map 2.3. We used the intersect tool, which allows the user to calculate the acreage of land conserved (in red in Maps 2.2 and 2.3) within Massachusetts' conservation priorities. It is important to note that the State Strategy was not completed until 2005. Thus, there is no a priori reason to expect that conservation spending and Massachusetts' conservation priorities will align. It is likely a diversity of objectives, priorities, and opportunities have determined the spatial pattern of conservation in Massachusetts between 1998 and 2007. Land acquisition through easements and fee-simple purchases may have occurred in areas for a number of reasons, including prior recognition that these areas were important for conservation, landowner donation or interest in easement programs, or other conservation interests in these areas.



Map 2.3: Land conservation activity (fee-simple acquisitions and easements) by year overlaid with protected and unprotected conservation priorities and the level of government that provided funding.

We analyzed the percentage of total acreages protected and dollars spent on land acquisitions within the conservation priorities by year (1998-2007) and by funding source. Funding sources were categorized as private/NGO source, local government, state agency or program, federal agency budget, a federal program with no state partner, and federal programs with state partners. All information on funding source, management agency,

purchase type, etc was recorded as attribute information for each parcel recorded in the GIS database (Map 2.4).



Map 2.4: An example of a representative acquisition parcel and the attribute information that is recorded for each parcel.

Expenditures and acres conserved were calculated using the GIS intersect tool to identify the segments of each property that overlapped with Massachusetts's conservation priorities. The overlap percentage was then used to calculate the percent of the total cost of the property which aligned with those conservation priorities. For example, if 100% of a property was designated as a wildlife habitat conservation priority, then the entire project cost was credited to that property. However, if only 50% of the property fell within a conservation priority, then only 50% of the project costs were applied. The dollars spent on conservation priorities were then calculated by year and by type of conservation organization.

Applying acreages by type of conservation organization was more difficult, as many projects received funding from multiple parties. In this analysis, we applied project acreages to the largest funding entity. For example, if 100 acres were protected using funds from a private donor that gave $50,000, and the state allocated $100,000, then the 100 acres were credited

to the state. If two funding programs provided equal funding, then the acres were credited to the more local level government entity, as local dollars were required for a state match.

We recorded a total of about 154,000 acres that were protected between 1998 and 2007 in Missouri through fee-simple purchases and permanent easements (Table 2.8). Of this area we were able to map approximately 31% of the total (about 48,200 acres).

Table 2.8: Protected acreage and overlap with Massachusetts conservation priorities, 1998-2007

Source of Funding	***Protected Acreage***	***Acreage with Spatial data***	***Percent Acreage with Spatial Data***	***Mapped Conservation Priority Acreage***	***Percent Conservation Priority Acreage Mapped***
Fed thru State	4,244	69	1.6%	21	30%
Fed with Partners	1,312	0	0%	N/A	N/A
Fed Agency	5,082	4,879	96%	3,404	70%
Total Federal	**10,638**	**4,948**	**46.5%**	**3,425**	**69%**
State	100,253	24,221	24.2%	17,699	73%
Local	16,007	1,647	10.3%	719	44%
Private	27,191	17,355	64%	12,824	74%
TOTAL	**154,089**	**48,171**	**31.3%**	**34,637**	**72%**

Of the total acres that could be spatially mapped, about 35,000 acres (or 72%) overlapped with Massachusetts' Conservation Priorities. When improved spatial data is available to track land acquisitions it is likely that alignment will increase.

For total federal protected acreage (about 10,630 acres) we could map about 47% of all acquisitions, with nearly all of these coming from the federal agency category. There was no spatial acreage information available for the federal partnerships category. Only a small percentage (less than 2%) of the acres conserved within the federal thru state category could be mapped. For all federal acres that could be spatially mapped, 69% (about 3,400 acres) aligned with Massachusetts' conservation priorities.

About twenty-five percent of all acres acquired by the state (24,000) could be mapped. Of the acres that could be mapped, 73% (about 17,700 acres) aligned with the state's conservation priorities.

Local government land conservation efforts accounted for about 16,000 acres, but only about 10% of these acres could be spatially mapped. Of these, 44% fell within areas defined by the conservation priorities.

Private land acquisitions (i.e. land trusts) accounted for the second largest category of protected acres at about 27,000 acres. About 64% of these acres could be spatially located. Of the land area that could be mapped (more than 17,000 acres), almost 74% fell within Massachusetts' conservation priorities.

Table 2.9 shows the total amount of expenditures by source of funding over the 1998-2007 timeframe, the dollars and percent of funding that we were able to map and include in our spatial analysis, and the amount and percentage of the mapped funding that aligned with Massachusetts' conservation priorities.

Table 2.9: Conservation spending and overlap with Massachusetts conservation priorities, 1998-2007

Source of Funding	***Total Spent ($millions)***	***Spending with Spatial Data ($millions)***	***Percent Spending with Spatial Data***	***Expenditures with Spatial Data in Conservation Priorities ($millions)***	***Percent Conservation Priority Expenditures with Spatial Data***
Fed thru State	$26.3	$0.029	0.001%	$0.008	30.5%
Fed Partners	$26.7	$0	0%	N/A	N/A
Fed Agency	$19.0	$16.9	89%	$10.800	64%
Total Federal	**$72**	**$16.929**	**24%**	**$10.808**	**64%**
State	$384.8	$80.6	21%	$43.800	54%
Local	$274.6	$40.9	15%	16.500	40.4 %
Private	$185.4	$128	69%	$111.000	87%
TOTAL	**$916.8 million**	**$267 million**	**29.1%**	**$182 million**	**68%**

For total conservation expenditures which we could record from 1998 to 2007 (over $917 million), about 29% could be mapped. Of those expenditures that could be mapped, 68% fell within the state's conservation priorities.

All federal land conservation programs combined spent a little over $72 million over the 1998-2007 timeframe. However, only about 24% of those expenditures could be mapped. This was mostly due to either the unavailability or the inaccessibility of spatial data for federal conservation expenditures that were managed by state agencies or in which the federal government partnered (e.g. the NRCS conservation programs or those programs administered by the US Fish and Wildlife Service). Sixty-four percent of the spending data that could be mapped aligned with state conservation priority areas. Nearly all of the mapped expenditures at the federal level are associated with federal agency land conservation programs (89%).

Of the nearly $385 million spent by the state of Massachusetts between 1998 and 2007, we could spatially depict about $81 million, or about 21% of total state expenditures. Of the $81 million, about $44 million (54%) aligned with the conservation priorities of Massachusetts.

Conservation spending at the local government level was estimated to be about $275 million, but only about 15% of this amount could be spatially represented. Of the $41 million that could be mapped, about $16.5 million (40%) was aligned with the state's conservation priorities.

The private sector (i.e. land trusts) provided over $185 million from 1998 to 2007 for land protection in Massachusetts. The percentage of expenditures that could be spatially aligned ($128 million) was approximately 69%. Of those expenditures which could be mapped, 87% (about $111 million) aligned with the Massachusetts' conservation priorities.

III. Policy Analysis of Massachusetts State Land Conservation

A key component of land conservation is the way in which states use policies and programs to direct funding towards activities that will achieve their conservation goals. In this section, we examine Massachusetts' land conservation policies and programs to help explain spatial patterns of land protection. We seek to determine the degree to which state land conservation policies are used to align expenditures for land acquisition in Massachusetts with protection of key habitats identified in Massachusetts' Comprehensive Wildlife Conservation Strategy (the Natural Heritage and Endangered Species Bio-Map and Living Waters). In other words, we examine whether the state is guiding spending towards protecting the areas it considers the most important habitat areas.

This study looks at funding from all sources – including the state, the federal government, local governments, and private entities such as land trusts and other Non-Governmental Organizations (NGOs) – although, as we pointed out earlier in the report, we were not able to collect spending and spatial data associated with all of those sources. The scope of the policy analysis is limited to the *state's* policies, which includes ways the *state* can influence other land conservation partners.

We look at a state's conservation policy environment in terms of a policy framework that considers: (1) funding; (2) land protection approaches; (3) land selection approaches; (4) the level of engagement of the state with non-state funding programs; and (5) management of land conservation information. Each of these factors is discussed below.

A. Funding

The state of Massachusetts uses several mechanisms for raising money for land protection. The largest source is the Environmental Bond which, under the current administration, provides $50 million a year. During the period of this study, funding from the Environmental Bond averaged around $30 million a year. The Wildlife or Land Stamp, a $5 fee assessed on each hunting or fishing license, brought in more than $1 million per year. Bonds issued by the Massachusetts Water Resources Authority also provided several million dollars in land protection funds. All of these sources receive dedicated funds, and the stability of the funding sources allows conservationists in the state to plan land conservation projects with confidence that the money will be available when needed. The predictable flow of state funds is important when gaining the confidence of landowners, and it gives NGOs the opportunity to conduct fund-raising campaigns to leverage state money.

The Community Preservation Act (CPA), authorized in 2000, has been very successful at creating incentives for local governments to raise money with property tax surcharges to fund open space, historic preservation, and affordable housing. More than 140 communities have opted into the program, out of 350 cities and towns in the commonwealth. The state collects fees from document filings for the Community Preservation Trust Fund that provides a match for local CPA funds. With the match included, CPA yielded $275 million during the study period that was spent on land conservation. In addition, some local jurisdictions have passed open space bonds to fund local land protection.

Massachusetts enjoys a very high level of private funding for land conservation – from NGOs, such as The Nature Conservancy, the Trustees of Reservations, and Mass Audubon, and land trusts – totaling more than $185 million during the study period. This is a difficult category from which to collect data, because there are so many individual funding sources, they often are small organizations without staff resources to provide the data, and they often are concerned about protecting the privacy of their donors and the landowners with whom they work. This high level of private funding may be explained by a number of factors, including the long history of private land protection in Massachusetts. For example, Mass Audubon has been working in the area since 1896. Also, many conservation organizations have been cultivating relationships with landowners, foundations, and individual donors. Other factors that explain the high level of private funding include the large number of local land trusts that are active in their communities (including the 130 member land trusts, watershed associations, open space committees, and advocacy groups that are members of the Massachusetts Land Trust Coalition), the relatively small size of the state given its population, and the very visible loss of open space due to development in recent years which is a very personal thing to many individuals. People in other states may be interested in trying to understand what they could do to tap similar resources in their own states.

The relatively high level of funding by state and local governments and private organizations is counter-balanced by a relatively low level of funding by the federal government for land protection in Massachusetts. Of the three categories of federal programs, spending by federal agencies to acquire additional land for their own programs, such as the National Park Service or the Fish and Wildlife Service, is lower than in other states in the study. This can be explained by the small amount of federal land in Massachusetts – about 100,000 acres - compared to between 2 and 30 million acres of federal land in the other states examined in this study. Massachusetts is one of the few states without a National Forest, though there has been work exploring the possibility of attracting USDA Forest Service interest. Frequently federal agencies acquire land adjacent to existing property or in-holdings to make management more efficient. With little existing federally-owned land, it is not surprising that federal agency spending on acquisitions is relatively low.

The level of spending in the category of funding through state agencies (such as the Coastal and Estuarine Land Conservation or Forest Legacy Programs) is in line with funding levels in the other states in the study. The 3rd category of federal funding - funding by federal programs that are not coordinated by a state agency (such as the North American Wetlands Conservation Act (NAWCA) and Farm Bill Programs like the Wetlands Reserve Program) is relatively low compared to the amount of funds attracted to other states. These funding sources would not be affected by the amount of federal land in the state nor influenced directly by state agency action since they generally offer grants to private organizations or individual landowners, though some allow state agencies to compete for funding as well. It may be worth exploring what it would take to attract more money from some of these sources.

B. Land protection approaches

The amount of land protected in Massachusetts during our study period was fairly evenly divided between fee simple acquisitions and acquisitions of conservation easements. State agencies noted that they preferred acquisitions to easements because of the greater control

the state could maintain and monitor property conditions and provide stewardship. Yet, the state also recognizes the financial benefits of being able to protect more acreage for the same money by employing easements, keeping the property on the tax rolls, and maintaining working landscapes in communities.

Massachusetts' easement law was passed by the legislature in 1969 and requires an easement to be reviewed by the Massachusetts Secretary of Energy and Environmental Affairs to determine that the land under easement has a public benefit and that the easement will protect the conservation values of the land. Following successful review, the easement is called a conservation restriction (CR) that provides the strongest protection for the land. Massachusetts also allows other forms of easements including watershed preservation restrictions (approved by the Department of Conservation and Recreation) agricultural preservation restrictions (approved by the Massachusetts Department of Agricultural Resources), and preservation restrictions (approved by the Massachusetts Historical Commission).

Easements properties do not have to allow public access in Massachusetts. If the easement is held by the state, there is a presumption that public access will be allowed, including hunting or fishing, unless there is concern about protecting rare species or water supply.

In 2008, Massachusetts passed a bill to establish a state income tax credit for landowners who donate conservation land or easements. The Conservation Tax Incentive is capped at $2 million per year, and it will create a state incentive, in addition to the federal tax incentive, for private landowners to conserve their property.

C. Land selection approaches

How organizations select which lands to protect with scarce acquisition funds is key to determining whether high priority habitat gets conserved. As discussed earlier, we were not able to collect sufficient spatial information on spending to determine the degree of alignment between spending by different funding sources and Massachusetts' Conservation Priorities. We did review the approaches used by the different funding sources to understand the extent to which their decisions were driven by strategic considerations or opportunism.

In Massachusetts, land selection by state agencies is focused by strategy, however not all land conservation strategy is focused on habitat protection. This project seeks to understand the degree of alignment of all land conservation funding with the states Conservation Priorities, but we recognize those are not the only priorities that guide decisions. There are competing priorities, such as parks and recreation, historic preservation and protecting important agricultural soils. The Division of Fisheries and Wildlife describes the process it uses for acquisitions in an appendix to the Comprehensive Wildlife Conservation Strategy which is focused on habitats and biodiversity. Other state agencies rely on BioMap and Living Waters as part of their land selection process, but they also consider other priorities that support their missions. There is little evidence of opportunism driving state decisions about which land to protect.

Local government spending of CPA funds – the property tax revenues collected locally and the match from the Community Preservation Trust Fund – must be used for open space,

historic resources, and community housing, with at least 10% of each year's funds directed towards each of the three project types. CPA is seen as a complement to Community Development Planning, providing funds to implement the local Community Development Plans which are intended to preserve the character of local communities. Land selection is left to the communities. Copies of BioMap were provided to all towns in Massachusetts, but anecdotal information indicates that it has not played a significant role in land selection by Community Preservation Committees.

Many NGOs in Massachusetts recognize the value of being strategic, rather than opportunistic, in their land selection. Mass Audubon, for example, switched from a reactive mode to a proactive approach involving outreach to owners of priority parcels identified in the organization's statewide land protection strategy that considers priority habitats identified in BioMap. The Trustees of Reservations recently issued a 10-year strategic plan that has as its first goal to focus and accelerate land protection efforts. The Massachusetts Land Trust Coalition provides a valuable service to the large number of local land trusts throughout the state, encouraging members to be proactive and reach out to priority landowners.

An interesting actor among land protection groups in Massachusetts is the Religious Lands Conservancy which is a joint program between the Massachusetts Land Trust Coalition and the Crystal Spring Center for Earth Living, a project of the Dominican Sisters of Kentucky. The Religious Lands Conservancy recognized that there were similar interests and values between religious organizations that own important lands in the commonwealth and conservation organizations. The Conservancy provides a bridge between the two. One example of the success of this approach is a partnership between the community of the National Shrine of Our Lady of La Salette in Attleboro, Mass Audubon, the City of Attleboro, and the Attleboro Land Trust that resulted in creation of a 117-acre wildlife sanctuary. While the Conservancy is not a significant funding source, it represents innovation in private land protection that might be of interest to other states.

D. Level of engagement with non-state funding programs

Massachusetts has a close-knit conservation community covering both public and private organizations. Many people spoke of the value this brings to conservation efforts because people share tips about land that may become available, they can leverage relationships that have been built with landowners and funding agencies throughout the state.

The Division of Fisheries and Wildlife (DFW) has worked to inform others in the conservation community about its land protection priorities, not only by producing the SWAP, but also by publishing the criteria DFW uses to select land for protection and the acquisition process used for planning, decision-making, and implementation. There seems to be widespread knowledge of the BioMap and Living Waters throughout public and private organizations, and this seems to have focused conservation work in the state quite effectively. Ongoing efforts to improve BioMap could contribute to higher levels of alignment going forward.

In an effort to influence how federal NRCS funds are used in Massachusetts, the state has hired personnel to provide technical assistance to NRCS programs and to reinforce the state's priorities. There are other federal programs providing funding for land protection on

a competitive basis to individuals, non-profits, local governments, and/or state agencies that have not been used extensively in Massachusetts. It may be worth exploring what it would take to attract more money from some of these federal sources to the commonwealth.

At the level of local governments, the state has not had a lot of involvement in guiding land protection spending towards its priorities. While decisions about which land to protect are left to communities under CPA, there may be opportunity for the state to influence community priorities. The state might consider presenting information on the BioMap to Community Preservation Committees, perhaps focusing on those in areas with priority habitat or those that have had high levels of spending, and encourage communities to consider protecting priority habitats in their local area.

Private funding for land protection is a significant factor in Massachusetts. DCR's Conservation Partnership Grant program, which provides grants to land trusts, enables the state to leverage the success that non-profit organizations have demonstrated with local landowners. The Massachusetts Land Trust Coalition also provides a voice for the local land trust community with the state and enables a degree of interaction that would be difficult if state agencies worked one-on-one with land trusts.

The state has the greatest opportunity to influence what land is selected for protection when state funds are used. If Massachusetts wants more alignment with BioMap and Living Waters, it could consider creating financial incentives for local decision makers to protect priority habitat, either through its grant programs or with the new Conservation Tax Incentive.

E. Management of land conservation information

It has been difficult to assemble the data required to answer the question posed by the project: How well-aligned is spending on land conservation with the priorities in the State Wildlife Action Plans? To answer the question, a state needs a good baseline of what lands should have the highest priority when selecting land for protection and they need ongoing data collection and analysis to assess progress towards the state's goal.

Massachusetts' BioMap provides a good framework to understand where habitat needs to be protected to preserve the state's biodiversity. Unfortunately, Massachusetts has not done as well at creating a process to gather spending and spatial data about ongoing land protection by all sources – public and private – in a systematic way to be able to assess progress towards the state's goal. None of the states in our study has accomplished this. Although we did get access to a lot of spending and spatial data related to land protection in Massachusetts, we had to struggle to put together the data set, as explained earlier. This has been a common experience with all the states in the study. No state has a centralized collection of spending and spatial data for all levels of government.

Why is this type of data set important? There is a management adage that you can't manage what you don't measure. If you don't measure something, you can't assess your current performance or set goals for improvement. This holds for land conservation activities. If people know what sources are supplying the money that is protecting land in a state, they can put together strategies to influence where the money is spent or to go after sources that

might not have been tapped fully in the past. Having data of this sort also enables agencies to let the public – as taxpayers, funding sources, and owners of potential conservation lands – know how well Massachusetts is progressing with plans to protect priority lands.

EEA's 2008 Land Protection Report provides an example of how this type of data can be used in a very compelling manner. The report focuses on state spending, with a few references to the amount of leverage the state money brought in from other public and private sources. If a broader range of funding sources were included, tied to spatial data, the state would be able to report a wider range of conservation effort.

Assembling historical data can be difficult and time consuming, but it is necessary to some extent to establish a baseline of conservation activity. Standardizing a set of data that should be reported about each future transaction is not as onerous, and we encourage the conservation community to consider ways to build on this idea to create a robust data set to use to better understand the patterns of conservation in the commonwealth and thus to be better able to guide land conservation.

Massachusetts made a significant investment in the creation of its Comprehensive Wildlife Conservation Strategy and continues to invest in implementation of the strategy. We offer our analysis and suggestions, focused on all sources of funding available to Massachusetts for land conservation in the effort to achieve greater alignment in the future.

IV. Estimated Costs of Conserving Natural Heritage and Endangered Species Program Biomap Core and Living Waters Conservation Priorities

The purpose of this section is to provide a general (average), statewide cost estimate for conserving lands identified as lying within Massachusetts' Conservation Priorities yet as of the end of FY 2007 had not yet been protected. Because we are not including 2008 and 2009 land conservation activity, the costs reported here may be somewhat overestimated.

To determine the cost of conserving the unprotected Conservation Priorities we calculated the acreage of protected and unprotected areas using the Protected Areas Database of the United States (PAD-US). PAD-US is a digital map of steward boundaries that combines attributes of ownership, management, and a measure of intent to manage for biodiversity. The map includes: (1) geographic boundaries of public land ownership and voluntarily provided private conservation lands; (2) land owner/manager, management designation descriptor, parcel name, and source of geographic information of each mapped land unit; (3) GAP Status Code conservation measure of each parcel based on USGS National Gap Analysis Program (GAP) protection level categories which are intended to provide a measurement of management commitment for long-term biodiversity conservation derived from land management plans or land manager interviews; and (4) IUCN category for a protected area's inclusion into UNEP-World Conservation Monitoring Centre's World Database for Protected Areas. With the PAD-US database we completed an overlay analysis with the Natural Heritage and Endangered Species (NHESP) BioMap Core and Living Waters layer using the Geographical Information System (GIS) intersect function to determine the acreage of total unprotected conservation priorities across the state. All lands with a GAP status from 1-3 were considered already protected, while lands with a GAP status of 4-5 or lands not included in the PAD-US database were considered unprotected. Unprotected conservation priorities acreage was estimated to be approximately 1.2 million acres as of 2007.[6]

Following this analysis, we estimated land conservation costs based on three separate investment strategies: fee simple purchases, conservation easements, and land rentals. We estimated the costs associated with these three strategies on both a one-time basis and over a thirty-year time period. For the thirty-year time period we assumed that the total amount of acres to be protected are done so in 30 equal increments and assumed a 3% annual increase in land prices over-and-above inflation. For our fee-simple purchase estimates we added annual management costs. For the easement strategy, we account for up-front, one-time transaction costs.

We first discuss the methods we used for estimating state wide average prices for the three conservation strategies and then report the results.

[6] This excludes open water, developed, and barren land-cover categories because we consider them unsuitable for terrestrial wildlife habitat.

A. Cost Estimation Methods

Fee-Simple Purchase Acquisitions

Cost data for fee-simple purchase acquisitions comes from three sources: (1) expenditure data that TPL collected from federal, state, local, and private sources; (2) data compiled by the National Agricultural Statistics Service (NASS) on private commercial transactions involving farm real estate; and (3) data compiled by the Massachusetts Department of Revenue on cropland, pastured, and other cropland (Table 4.1).

The TPL data consists of 240 acquisitions in Massachusetts between 2006 and 2007. The number includes donated lands, which were not calculated in the cost analysis. All 2006 acquisitions were adjusted to reflect 2007 price levels.

Table 4.1: Fee-simple costs per acre in Massachusetts ($2007)

Data Source	***Cost per Acre***
TPL Spending Data	$14,683
NASS Farm Real Estate Data	$11,800

Calculating Statewide Fee-Simple Costs

We estimated statewide average per acre fee-simple costs by weighting costs by land cover types found within the unprotected conservation priorities. For this analysis we used the National Land Cover Database 2001 (NLCD 2001) which has been compiled across all 50 states and Puerto Rico as a cooperative mapping effort of the Multi-Resolution Land Characteristics 2001 Consortium. This land cover database was created using mapping zones and contains 28 standardized land cover types. Total acreage of forest, shrub, grassland, cropland, pastureland, and wetlands were calculated within the unprotected conservation priorities.

To estimate fee-simple costs by land cover types we overlaid the TPL land acquisition parcels from 2006 and 2007 with the conservation priorities and used the subset of parcels that fell within the Conservation Priority areas. We then determined the land cover for each parcel using the NLCD database described above. Spending data was only collected from acquisitions that had over 65 percent of one land cover type.[7] From this analysis we were able to calculate acreage costs for forest and wetland, but not for cropland and pastureland because not enough parcels within this category matched our criteria. The cost per acre for cropland and pastureland was calculated by using the NASS Farm Real Estate data shown in Table 4.1. We consolidated all other land cover categories into an "other" category and used the average cost per acre of the TPL spending data, since the majority of acquisitions within this data set had mixed land cover. The land cover percentages are as follows: cropland and pasture at 7.4%; forest at 75.1%[8]; wetlands at 15.5%[9]; and "other" at 2.0%[10] (Table 4.2).

[7] For a more complete analysis of how the spending and spatial data was collected, see Section II.
[8] This includes deciduous forest, evergreen forest, and mixed forest as defined within the GIS land cover data.

Table 4.2: Weighted fee-simple costs for Massachusetts ($2007)

Land Cover	*Percentage*	*Acres*	*Cost per Acre*	*Total Cost*
Cropland and Pastureland	7.4%	92,153	$11,800	$1,087,405,400
Forest	75.1%	934,645	$6,820	$6,374,609,206
Wetlands	15.5%	192,322	$5,896	$1,133,930,512
Other	2.0%	25,283	$14,683	$371,230,289
Total	**100.0%**	**1,244,404**	**$7,206**	**$8,967,175,407**

Across all land types, we estimated the average cost for fee-simple land purchase in Massachusetts to be about $7,206 per acre.

Management Costs in Massachusetts

We define management costs as all practices/investments which contribute to the overall integrity of the habitat protected, including site construction, biotic surveys, habitat restoration, habitat maintenance, public services, reporting, office maintenance, field equipment, operations, as well as contingency and administration (unforeseen costs and overhead).[11]

To estimate habitat management costs of protecting unprotected conservation priorities we contacted land trusts, local governments, state agencies, and the National Wildlife Refuge System. Table 4.3 shows per acre cost estimates for various sources. Due to time and budget constraints, we could not run an in-depth analysis of every cost involved in managing fee-simple purchases. As a result, we relied on annual budgets and management plans. Some land management entities, however, could not provide management cost data because: (1) they did not keep track of these types of costs as separate from other expenditures; (2) management costs varied significantly from one property to another for a variety of reasons (i.e. land cover, organization's goals); and/or (3) the available data only represented the portion of the properties' total management cost that a particular agency funded.

We estimate the average statewide management costs by weighting the costs reported from each organization by the total acreage managed by that organization. Based on these calculations, the average annual costs of managing land acquired through fee-simple purchases in Massachusetts is about $17-$20/acre (Table 4.3). Given the wide range in management costs, we caution that per acre costs in specific locations could be significantly higher than the estimated state average.

[9] This includes woody-dominated wetland and herbaceous-dominated wetland as defined within the GIS land cover data.
[10] This includes shrub/scrub and grassland/herbaceous as defined within the GIS land cover data.
[11] Personal communication, Joanne Rodriguez, Center for Natural Lands Management, August, 2008.

Table 4.3: Habitat management costs in Massachusetts ($2007)

Data Source	*Total Costs*	*Total Acres*	*Cost per Acre*
Land Owner Incentive Program/MA Division of Fisheries and Wildlife[1]	$96,543	91	$1,067
MA Division of Fisheries and Wildlife[2]	$215,280	124,079	$1.74
Berkshire Natural Resources Council[3]	No Data	No Data	$29.75
Mass Audubon[4]	$713,600 - $1,569.920	28,544	$25-$55
Sheffield Land Trust[5]	$3,000 – 50,000	28	$429 - $2,381
USFWS/National Wildlife Refuge System[6]	$3,867,154	21,880	$173
MA Department of Fish and Game[7]	$224,149	124,000	$1.81
Total Cost per Acre	**$5,119,725 - $6,023,045**	**298,622**	**$17.14 - $20.17**

[1]Personal communication, John O'Leary, MA Division of Fisheries and Wildlife, June, 2009. The total cost includes real costs to do habitat restoration on four private parcels.
[2] Personal communication, John O'Leary, MA Division of Fisheries and Wildlife, June, 2009.
[3] Personal communication, Tadd Ames, Berkshire Natural Resources Council, September, 2009.
[4] Personal communication, Dinah Rowbotham, Mass Audubon, September, 2009.
[5] Personal communication, Kathy Orlando, Sheffield Land Trust, September, 2009.
[6]Personal communication, Genevieve LaRouche, NWRS, September, 2008.
[7] Personal communication, Celia Riechel, Executive Office of Energy and Environmental Affairs, September, 2009.

For nearly all sources in Table 4.3, estimated costs are adjusted to 2007 dollars. Some of the costs, however, could not be associated with a particular year and were not adjusted.

While illustrated management costs provide adequate estimates necessary to manage the habitat in Massachusetts, there are a few limitations with the data. First, the level of detail varied significantly from one source to another. Some organizations provided general management costs with little or no detail. Other organizations provided a very detailed breakdown of the costs of funded activities. There is little uniformity between the information sources, making it difficult to compare the costs and understand why some costs are higher or lower than others. Table 4.4 shows the range of activities/investments for the management costs for each organization estimated in Table 4.3. The second limitation is that some organizations may exclude certain activities, which we believe are necessary for the proper management of habitat, or they include activities which are not directly relevant to protecting wildlife habitat.

Table 4.4: Types of habitat management activities for Massachusetts

Data Source	*Form of Data*	*Management Activities/Investments*
Land Owner Incentive Program/MA Division of Fisheries and Wildlife	Real costs for habitat restoration on private grasslands, shrublands, and forests	- Invasive / brush removal - Removal of trees - Chipping, grapple excavator, grubbing, hydroseed, herbicide, follow-up herbicide - Site preparation and project monitoring
MA Division of Fisheries and Wildlife	An annual report of project activities from July 2007 – June 2008	- Maintenance, development, and management - Tree and shrub planting - Herbaceous planting - Vegetation control - Administration
Berkshire Natural Resources Council	This is an estimate given by field staff. Data is not associated with a particular year	- Boundary report and markings - Stewardship plans
Massachusetts Audubon	This is an estimate calculated by staff based on total acreage and 2007 expenditures	- Initial identification and posting of property boundaries - Maintenance of existing trail networks - Plowing of snow, mowing, removal of fallen trees on trails - Responding to natural disasters such as wind, ice, or flood damage - Meeting with neighbors, resolving boundary disputes, addressing vandalism, removing illegally dumped debris, monitoring, interacting with community officials and local media - Ecological inventories and plans, invasive species management, visitor maps and educational signs - Responding to development proposals and encroachments
Sheffield Land Trust	Costs on two fee simple lands in 2007	- Restoration - General management - Transaction costs - Financing and legal costs
USFWS/National Wildlife Refuge System	2008 Estimated base budget and permanent positions by refuge complex	Did not break down the management costs by activity
MA Department of Fish and Game	Land management expenditures in the DFG bond cap for FY2009	- Marking boundaries - ATV trespass repair - Personnel time spent on management

Cost of Establishing Conservation Easements

Cost data for establishing conservation easements is based on expenditure data that TPL collected from federal, state, local, and private sources, and from the USDA FRPP program. There were nine FRPP easements established in 2006. In the TPL data set there were 71 non-donated easements and 27 donated in 2006 and 2007. We calculated the average cost for conservation easements by weighting the total cost of easements in each data source by the total acreage of land protected.

Table 4.5: Conservation easement cost per acre in Massachusetts ($2007)

Data Source	*Number of Easements*	*Total Acreage*	*Total Cost*	*Cost per Acre*
Farm and Ranchlands Protection Program (FRPP)	9	601	$3,021,292	$5,027
TPL Spending Data	71	5,039	$34,500,849	$6,846
Total	**80**	**5,640**	**$37,522.142**	**$6,653**

The average cost of a conservation easement is estimated to be approximately $6,653/acre (Table 4.5). Compared to the costs of fee-simple purchases, our estimated easement costs are quite high (about 92% of our estimated $7,206/acre fee-simple cost). Two factors may explain this. First, our estimated fee-simple cost is heavily weighted by relatively low value forest and wetland lands (see Table 4.2). Second, many private lands are maintained in small tracts with significant frontage and access that increase the price of development rights and therefore easements. A possible third and fourth factor is that due to land scarcity in Massachusetts, the costs of fee-simple purchases and easements may be converging. Also, projects such as the Wildlands and Woodlands Land Aggregation Pilot that pay landowners in western Massachusetts 75% of the appraised value of land for an easement may contribute to increasing costs of easements in this area.

Easement Transaction Costs in Massachusetts

We define transaction costs as all those practices involved in the establishment of a conservation easement. These include initial site visits/pre-closure "walk through"; landowner negotiations; appraisals; project planning, coordination, and documentation; agency coordination; title evaluation; escrow; legal assistance: drafting and recording of the easement; and initial baseline property report.[12]

Two other types of easement-related costs to consider are stewardship endowment and enforcement costs. A stewardship endowment is the amount of money necessary to insure that the land being put in easement will be managed properly in the future. Many land conservation organizations will not even consider holding an easement if there is not a proper endowment. Enforcement costs are incurred when a dispute or violation of an easement agreement arises. According to the Land Trust Alliance a land conservation

[12] Personal communication, Joanne Rodriguez, Center for Natural Land Management, August, 2008.

organization should set aside a minimum of $50,000 for a legal defense fund to effectively enforce approximately fifteen easements. An additional $1,500 to $3,000 is needed for every easement above this (Doscher 2007). While our analysis does not consider stewardship endowments or enforcement costs, these are significant to the overall financial viability of conservation easements.

Transaction costs associated with establishing conservation easements were obtained by contacting land trusts and state conservation programs. As with management costs some land trusts could not provide transaction cost data either because they did not keep track of these as separate from other expenditures, or because costs varied significantly from one property to another. Thus, an "average" cost would be misleading. The issue of a reliable "average" cost is underlined by the fact that there is such a large range in costs both between and within organizations. Table 4.6 illustrates transaction costs per organization.

Table 4.6: Easement transaction costs in Massachusetts ($2007)

Organization	***Costs per Easement***
Sudbury Valley Trustees[1]	$3,500 - $64,000
Mass Audubon[2]	$300 - $33,800
Massachusetts Division of Fisheries and Wildlife[3]	$6,000
The Compact of Cape Cod Conservation Trusts[4]	$900 - $2,700
Mount Grace Land Conservation[5]	$75 - $58,000
Department of Agricultural Resources[6]	$11,335
Sheffield Land Trust[7]	$46,000 - $138,000
Average Transaction Cost per Easement in Massachusetts	**$9,730 - $44,834**

[1] Personal communication, Christa Hawryluk Collins, Sudbury Valley Trustees, September, 2009.
[2] Personal communication, Dinah Rowbotham, Mass Audubon, September, 2009.
[3] Personal communication, John O'Leary, MA Division of Fisheries and Wildlife, August, 2009.
[4] Personal communication, Mark Robinson, The Compact of Cape Cod Conservation Trusts, August, 2009.
[5] Personal communication, Leigh Youngblood, Mount Grace Land Conservation, October, 2009.
[6] Personal communication, Celia Riechel, Executive Office of Energy and Environmental Affairs, September, 2009.
[7] Personal communication, Kathy Orlando, Sheffield Land Trust, September, 2009.

We calculated the statewide transaction cost per easement by adding up the costs provided by each organization and then dividing it by the number of these organizations. When necessary, we adjusted the costs to 2007 dollars.

Our original intent was to identify transaction costs on a per acre basis. However, the majority of agents with whom we spoke indicated that there is little relationship between the acreage of an easement property and associated transaction costs. Most organizations provided an average cost or range of costs per project. While several factors influence the

level of transaction costs (relationship with the landowners, permitted rights, distance of property from office, how extensive the baseline survey is, to name a few) overall costs tend to be within the same range for each project within an organization. Because of the difficulty in estimating per acre transaction costs, the figures reported in Table 4.6 are not incorporated into our overall estimate of the costs of conserving unprotected conservation priorities via the easement strategy. However, it should be noted that transaction costs per easement property can be substantial and should be recognized as an additional cost element when comparing different conservation strategies.

Table 4.7 shows the types of activities and administrative requirement associated with preparing easements, as identified by various organizations.

Table 4.7: Transaction activities and cost elements for Massachusetts

Data Source	*Form of Data*	*Administrative Activities/Investments*
Sudbury Valley Trustees	An example of a high transaction cost and a low transaction cost	- Due diligence - Legal, title, financing - Closing costs - Organizational expenses (baseline survey, materials, labor, staff time and expenses
Massachusetts Audubon	An example of a high transaction cost and a low transaction cost	- Legal expenses - Appraisal and land planning - Survey - Environmental Assessment - Baseline and miscellaneous closing costs
Massachusetts Division of Fish and Wildlife	Average transaction costs per easement	- Title - Appraisal - Staff time
The Compact of Cape Cod Conservation Trusts	Average transaction costs per easement	- Baseline survey - Negotiation - Editing - Shepherding review - Recording and post-recording fees
Mount Grace Land Conservation	An example of a high transaction cost and a low transaction cost	- Title exam - Appraisal and survey - Environmental Assessment - Engineering, legal, and recording fees - Inspections - Miscellaneous expenses
Department of Agricultural Resources	Average transaction costs per easement	- Appraisal - Title reports and insurance - Survey costs and closing fees
Sheffield Land Trust	An example of a high transaction cost and a w transaction cost in 2006 and 2007	- Legal - Title - Due diligence - Appraisal - Managing the lease - Reports - Administration

Cost of Rental/Lease Agreements

Rental/lease rates for Massachusetts were estimated using data compiled from the USDA Conservation Reserve (CRP) and Grassland Reserve Programs (Table 4.8). The CRP data is specifically for General Sign-up enrollment in Fiscal Year 2007.

Table 4.8: Land rental / Lease rates in Massachusetts ($ 2007)

Source	*Rental rate $/acre*
Conservation Reserve Program	$13.37
Grassland Reserve Program	$83.65
Average	**$48.51**

Comprehensive data on land area rented by land use type was not available. As a result, a weighted average statewide rental rate based on land cover type could not be estimated. Information on Massachusetts land rental rates is limited to agricultural and grasslands, and does not, for the most part, include land cover types such as forestlands, wetlands, etc. As a result, the statewide average rental rate may be biased toward the cost of renting croplands and grasslands. We estimated an average rental/lease rate at about $49/acre.

B. Estimated State Wide Costs for Massachusetts

Table 4.9 summarizes the estimated per acre and total costs for conserving currently unprotected conservation priorities in Massachusetts. The figures in the second and third cost columns represent the cost of protecting the unprotected conservation priorities, based on the costs per acre figures in the first column. The figures in the second column represent the estimated cost of these lands if they were all purchased, had an easement, or were rented in one year. The figures in the third column represent the estimated cost of protecting these lands over a 30-year period. For the 30-year costs, we assumed that the total acreage to be protected would be divided into 30 equal annual increments. With the exception of the base year, we also assumed a 3% annual increase in land costs and that all protection strategies are equally viable in all parts of the state.

Table 4.9: Per acre and total costs by land conservation strategy in Massachusetts ($ 2007)

Protection Strategy	*Cost per Acre*	*Total One-Time Cost ($Millions)*	*Total 30-Year Costs ($Millions)*
Fee-Simple Purchase	$7,206	$8,967	$14,221
Management Costs	$18.66	$23	$37
Purchase + Management Costs	$7,225	$8,990	$14,258
Conservation Easement	$6,653	$8,278	$13,128
Rental Agreements	$48.51	$60	$96

The estimated 30-year cost of protecting all currently unprotected conservation priorities within the NHESP Biomap Core and Living Waters through fee-simple acquisitions (including management costs) is the most expensive option at approximately $14 billion. Conservation easements would cost about $13 billion and rental agreements $96 million over 30 years. However, rental costs would continue to be incurred after the 30-year time period. In contrast, land protected through fee-simple purchases and perpetual conservation easements require no further payments, with the exception of the cost of land management. The least cost option would be to pay existing landowners to manage for biodiversity values. Management costs, over a 30-year period, would be approximately $37 million.

V. Policy Recommendations

Within the time frame of this study, federal programs with state coordination and with various partners spent about $48 million on permanent land conservation via fee-simple purchases and easements. Despite this significant investment, the state may want to explore what it would take to attract more money from federal funding sources that are coordinated by a state agency (CELCP, FLP, LWCF, and the NCWC programs), and those sources that partner with individuals in the state (USDA conservation programs and NAWCA). These sources are not tied directly to activities of state agencies, though in many cases state agencies may compete with NGOs and local governments for the funds.

Ongoing work on BioMap and Living Waters is being well-received by the conservation community. Having the state continuing to clarify which lands it believes are the most important to be protected seems to be one of the best ways to ensure that the high priority habitats are considered by all funding sources when they make land selection decisions. This process of outreach and coordination should continue to operate and receive funding.

Local governments do not seem to have taken into account the high priority habitats when making land selection decisions using Community Preservation Act (CPA) funds. Although the CPAs only protected about 10% of the total acreage over 1998-2007, they accounted for nearly 30% of total funding. While decisions about which land to protect are left to communities under CPA, there may be opportunity for the state to influence community priorities. The state might consider presenting information on the BioMap to Community Preservation Committees, perhaps focusing on those in areas with important areas of priority habitat or those that have had high levels of spending, and encourage communities to consider protecting priority habitats in their local area. In addition, if Massachusetts wants more alignment with BioMap and Living Waters, it could consider creating financial incentives for local decision makers to protect priority habitat, either through its grant programs or with the new Conservation Tax Incentive.

As we showed in Section II, there is not a high percentage of acreage or expenditures for 1998-2007 that could be spatially represented: 31% and 29%, respectively. Having the capacity to determine where land conservation and associated expenditures are taking place over time is critical if the state is to be strategic in the selection of Conservation Priorities to protect. The current lack of spatial information is a limiting factor for federal, state, and local government institutions. Private groups (i.e. land trusts) have the best spatial data with respect to acres conserved and conservation expenditures. Although we found that assembling historical data can be difficult and time consuming, standardizing on a set of data that should be reported about each future transaction is not as onerous. We encourage the conservation community in Massachusetts to consider ways to build on this study and create a robust data set to use to better understand the patterns of conservation in the commonwealth and thus to be better able to guide land conservation. The state should take on the coordination of a land conservation information system and may want consider using the Conservation Registry that is already in existence.

We have presented average state-level estimates of what it would cost to protect all of the unprotected Conservation Priorities over the next 30 years using various conservation

priorities. However, these estimates are based on a wide range of land use types and cost estimates that are averaged over many observations across the state and should not necessarily be applied to specific sites. In addition, we found that there is a real lack of data, at both the federal and state levels, for agricultural lands. We would encourage the state to institute a rigorous data gathering project to track agricultural land prices by crop type. This is important because Conservation Priorities that will be important to protect in the future will most likely be found on agricultural lands.

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