This report and associated map provide information about important sites for biodiversity conservation in your area. 

This information is intended for conservation planning, and is not intended for use in state regulations.
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For more information on rare species and natural communities, please see our fact sheets online at www.mass.gov/nhesp.
Introduction

The Massachusetts Department of Fish & Game, through the Division of Fisheries and Wildlife’s Natural Heritage & Endangered Species Program (NHESP), and The Nature Conservancy’s Massachusetts Program developed BioMap2 to protect the state’s biodiversity in the context of climate change.

BioMap2 combines NHESP’s 30 years of rigorously documented rare species and natural community data with spatial data identifying wildlife species and habitats that were the focus of the Division of Fisheries and Wildlife’s 2005 State Wildlife Action Plan (SWAP). BioMap2 also integrates The Nature Conservancy’s assessment of large, well-connected, and intact ecosystems and landscapes across the Commonwealth, incorporating concepts of ecosystem resilience to address anticipated climate change impacts.

Protection and stewardship of BioMap2 Core Habitat and Critical Natural Landscape is essential to safeguard the diversity of species and their habitats, intact ecosystems, and resilient natural landscapes across Massachusetts.

What Does Status Mean?

The Division of Fisheries and Wildlife determines a status category for each rare species listed under the Massachusetts Endangered Species Act (MESA), M.G.L. c.131A, and its implementing regulations 321 CMR 10.00. Rare species are categorized as Endangered, Threatened, or of Special Concern according to the following:

- Endangered species are in danger of extinction throughout all or a significant portion of their range or are in danger of extirpation from Massachusetts.
- Threatened species are likely to become Endangered in Massachusetts in the foreseeable future throughout all or a significant portion of their range.
- Special Concern species have suffered a decline that could threaten the species if allowed to continue unchecked or occur in such small numbers or with such restricted distribution or specialized habitat requirements that they could easily become Threatened in Massachusetts.

In addition NHESP maintains an unofficial watch list of plants that are tracked due to potential conservation interest or concern, but are not regulated under the Massachusetts Endangered Species Act or other laws or regulations. Likewise, described natural communities are not regulated by any law or regulations, but they can help to identify ecologically important areas that are worthy of

For more information on rare species and natural communities, please see our fact sheets online at www.mass.gov/nhesp.
BioMap2: One Plan, Two Components

BioMap2 identifies two complementary spatial layers, Core Habitat and Critical Natural Landscape.

Protection. The status of natural communities reflects the documented number and acreages of each community type in the state:

- Critically Imperiled communities typically have 5 or fewer documented good sites or have very few remaining acres in the state.
- Imperiled communities typically have 6-20 good sites or few remaining acres in the state.
- Vulnerable communities typically have 21-100 good sites or limited acreage across the state.
- Secure communities typically have over 100 sites or abundant acreage across the state; however, excellent examples are identified as Core Habit to ensure continued protection.

In 2005 the Massachusetts Division of Fisheries and Wildlife completed a comprehensive State Wildlife Action Plan (SWAP) documenting the status of Massachusetts wildlife and providing recommendations to help guide wildlife conservation decision-making. SWAP includes all the wildlife species listed under the Massachusetts Endangered Species Act (MESA), as well as more than 80 species that need conservation attention but do not meet the requirements for inclusion under MESA. The SWAP document is organized around habitat types in need of conservation within the Commonwealth. While the original BioMap focused primarily on rare species protected under MESA, BioMap2 also addresses other Species of Conservation Concern, their habitats, and the ecosystems that support them to create a spatial representation of most of the elements of SWAP.

Core Habitat identifies key areas that are critical for the long-term persistence of rare species and other Species of Conservation Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth. Protection of Core Habitats will contribute to the conservation of specific elements of biodiversity.

Critical Natural Landscape identifies large natural Landscape Blocks that are minimally impacted by development. If protected, these areas will provide habitat for wide-ranging native species, support intact ecological processes, maintain connectivity among habitats, and enhance ecological resilience to natural and anthropogenic disturbances in a rapidly changing world. Areas delineated as Critical Natural Landscape also include buffering upland around wetland, coastal, and aquatic Core Habitats to help ensure their long-term integrity.

The long-term persistence of Massachusetts biological resources requires a determined commitment to land and water conservation. Protection and stewardship of both Critical Natural Landscapes and Core Habitats are needed to realize the biodiversity conservation vision of BioMap2.

Components of Core Habitat

Core Habitat identifies specific areas necessary to promote the long-term persistence of rare species, other Species of Conservation Concern, exemplary natural communities, and intact ecosystems.

Rare Species

There are 432 native plant and animal species listed as Endangered, Threatened or Special Concern under the Massachusetts Endangered Species Act (MESA) based on their rarity, population trends, and threats to survival. For
Table 1. Species of Conservation Concern described in the State Wildlife Action Plan and/or included on the MESA List and for which habitat was mapped in BioMap2. Note that plants are not included in SWAP, and that marine species such as whales and sea turtles are not included in BioMap2.

<table>
<thead>
<tr>
<th>Taxonomic Group</th>
<th>MESA-listed Species</th>
<th>Non-listed Species of Conservation Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammals</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Birds</td>
<td>27</td>
<td>23</td>
</tr>
<tr>
<td>Reptiles</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Amphibians</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Fish</td>
<td>10</td>
<td>17</td>
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<tr>
<td>Invertebrates</td>
<td>102</td>
<td>9</td>
</tr>
<tr>
<td>Plants</td>
<td>256</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>413</strong></td>
<td><strong>62</strong></td>
</tr>
</tbody>
</table>

BioMap2, NHESP staff identified the highest quality habitat sites for each non-marine species based on size, condition, and landscape context.

Other Species of Conservation Concern

In addition to species on the MESA List described previously, the State Wildlife Action Plan (SWAP) identifies 257 wildlife species and 22 natural habitats most in need of conservation within the Commonwealth. BioMap2 includes species-specific habitat areas for 45 of these species and habitat for 17 additional species which was mapped with other coarse-filter and fine-filter approaches.

Priority Natural Communities

Natural communities are assemblages of plant and animal species that share a common environment and occur together repeatedly on the landscape. BioMap2 gives conservation priority to natural communities with limited distribution and to the best examples of more common types.

Vernal Pools

Vernal pools are small, seasonal wetlands that provide important wildlife habitat, especially for amphibians and invertebrate animals that use them to breed. BioMap2 identifies the top 5 percent most interconnected clusters of Potential Vernal Pools in the state.

Forest Cores

In BioMap2, Core Habitat includes the best examples of large, intact forests that are least impacted by roads and development, providing critical habitat for numerous woodland species. For example, the interior forest habitat defined by Forest Cores supports many bird species sensitive to the impacts of roads and development, such as the Black-throated Green Warbler, and helps maintain ecological processes found only in unfragmented forest patches.

Wetland Cores

BioMap2 used an assessment of Ecological Integrity to identify the least disturbed wetlands in the state within undeveloped landscapes—that with intact buffers and little fragmentation or other stressors associated with development. These wetlands are most likely to support critical wetland functions (i.e., natural hydrologic conditions, diverse plant and animal habitats, etc.) and are most likely to maintain these functions into the future.

Aquatic Cores

To delineate integrated and functional ecosystems for fish species and other aquatic
Species of Conservation Concern, beyond the species and exemplary habitats described above, BioMap2 identifies intact river corridors within which important physical and ecological processes of the river or stream occur.

Components of Critical Natural Landscape

Critical Natural Landscape identifies intact landscapes in Massachusetts that are better able to support ecological processes and disturbance regimes, and a wide array of species and habitats over long time frames.

Landscape Blocks

BioMap2 identifies the most intact large areas of predominately natural vegetation, consisting of contiguous forests, wetlands, rivers, lakes, and ponds, as well as coastal habitats such as barrier beaches and salt marshes.

Upland Buffers of Wetland and Aquatic Cores

A variety of analyses were used to identify protective upland buffers around wetlands and rivers.

Upland Habitat to Support Coastal Adaptation

BioMap2 identifies undeveloped lands adjacent to and up to one and a half meters above existing salt marshes as Critical Natural Landscapes with high potential to support inland migration of salt marsh and other coastal habitats over the coming century.

The conservation areas identified by BioMap2 are based on breadth and depth of data, scientific expertise, and understanding of Massachusetts’ biodiversity. The numerous sources of information and analyses used to create Core Habitat and Critical Natural Landscape are complementary, and outline a comprehensive conservation vision for Massachusetts, from rare species to intact landscapes. In total, these robust analyses define a suite of priority lands and waters that, if permanently protected, will support Massachusetts’ natural systems for generations to come.

Legal Protection of Biodiversity

BioMap2 presents a powerful vision of what Massachusetts would look like with full protection of the land most important for supporting the Commonwealth’s biodiversity. While BioMap2 is a planning tool with no regulatory function, all state-listed species enjoy legal protection under the Massachusetts Endangered Species Act (M.G.L. c.131A) and its implementing regulations (321 CMR 10.00). Wetland habitat of state-listed wildlife is also protected under the Wetlands Protection Act Regulations (310 CMR 10.00). The Natural Heritage Atlas contains maps of Priority Habitats and Estimated Habitats, which are used, respectively, for regulation under the Massachusetts Endangered Species Act and the Wetlands Protection Act. For more information on rare species regulations, and to view Priority and Estimated Habitat maps, please see the Regulatory Review page at http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/.

BioMap2 is a conservation planning tool that does not, in any way, supplant the Estimated and Priority Habitat Maps which have regulatory significance. Unless and until the BioMap2 vision is fully realized, we must continue to protect our most imperiled species and their habitats.
Understanding Core Habitat Summaries

Following the Town Overview, there is a descriptive summary of each Core Habitat and Critical Natural Landscape that occurs in your city or town. These summaries highlight some of the outstanding characteristics of each Core Habitat and Critical Natural Landscape, and will help you learn more about your city or town’s biodiversity. You can find out more information about many of these species and natural communities by looking at specific fact sheets at www.mass.gov/nhesp.

Additional Information

For copies of the full BioMap2 report, the Technical Report, and an interactive mapping tool, visit the BioMap2 website via the Land Protection and Planning tab at www.mass.gov/nhesp. If you have any questions about this report, or if you need help protecting land for biodiversity in your community, the Natural Heritage & Endangered Species Program staff looks forward to working with you.

Contact the Natural Heritage & Endangered Species Program

By phone  508-389-6360
By fax  508-389-7890
By email  natural.heritage@state.ma.us
By Mail  100 Hartwell Street, Suite 230
            West Boylston, MA 01583

The GIS datalayers of BioMap2 are available for download from MassGIS at www.mass.gov/mgis.
**Town Overview**

Holyoke lies within the Connecticut River Valley Ecoregion, the borders of which are primarily defined by the bedrock geology, has rich soils, a relatively mild climate and low rolling topography. The valley floor is primarily cropland and built land. Central hardwoods and transition hardwood forests cover the ridges.

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**Holyoke at a Glance**

- **Total Area:** 14,591 acres (22.8 square miles)
- **Human Population in 2010:** 39,880
- **Open space protected in perpetuity:** 4,800 acres, or 32.9% percent of total area*
- **BioMap2 Core Habitat:** 8,105 acres
- **BioMap2 Core Habitat Protected:** 4,212 acres or 52.0%
- **BioMap2 Critical Natural Landscape:** 4,615 acres
- **BioMap2 Critical Natural Landscape Protected:** 2,596 acres or 56.3%.

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**BioMap2 Components**

**Core Habitat**

- 7 Exemplary or Priority Natural Community Cores
- 1 Forest Core
- 3 Wetland Cores
- 8 Aquatic Cores
- 2 Vernal Pool Cores
- 8 Species of Conservation Concern Cores**
  - 2 birds, 3 reptiles, 5 amphibians, 1 fish, 11 insects, 2 mussels, 3 plants

**Critical Natural Landscape**

- 3 Landscape Blocks
- 2 Wetland Core Buffers
- 7 Aquatic Core Buffers

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* Calculated using MassGIS data layer “Protected and Recreational Open Space—March, 2012”.

** See next pages for complete list of species, natural communities and other biodiversity elements.

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For more information on rare species and natural communities, please see our fact sheets online at [www.mass.gov/nhesp](http://www.mass.gov/nhesp).
BioMap2 Core Habitat and Critical Natural Landscape in Holyoke
Species of Conservation Concern, Priority and Exemplary Natural Communities,
and Other Elements of Biodiversity in Holyoke

Mussels
Yellow Lampmussel, (Lampsilis cariosa), E
Tidewater Mucket, (Leptodea ochracea), SC

Insects
Moths
Orange Sallow Moth, (Pyrrhia aurantiago), SC
New Jersey Tea Inchworm, (Apodrepanulatrix liberaria), E
Pine Barrens Speranza, (Speranza exonerata), SC

Dragonflies
Spine-crowned Clubtail, (Gomphus abbreviatus), SC
Midland Clubtail, (Gomphus fraternus), E
Cobra Clubtail, (Gomphus vastus), SC
Skillet Clubtail, (Gomphus ventricosus), T
Stygian Shadowdragon, (Neurocordulia yamaskanensis), SC
Riverine Clubtail, (Stylurus amnicola), E
Arrow Clubtail, (Stylurus spiniceps), Non-listed SWAP species
Zebra Clubtail, (Stylurus scudder), Non-listed SWAP species

Amphibians
Jefferson Salamander, (Ambystoma jeffersonianum), SC
Marbled Salamander, (Ambystoma opacum), T
Four-toed Salamander, (Hemidactylium scutatum), Non-listed SWAP
Northern Leopard Frog, (Rana pipiens), Non-listed SWAP
Spring Salamander, (Gyrinophilus porphyriticus), Non-listed SWAP

Fishes
Shortnose Sturgeon, (Acipenser brevirostrum), E

Reptiles
Wood Turtle, (Glyptemys insculpta), SC
Eastern Box Turtle, (Terrapene carolina), SC
Northern Black Racer, (Coluber constrictor), Non-listed SWAP

Birds
Peregrine Falcon, (Falco peregrinus), E
Bald Eagle, (Haliaeetus leucocephalus), T

Plants
Hairy Agrimony, (Agrimonia pubescens), T
Linear-leaved Milkweed, (Asclepias verticillata), T
Wall-rue Spleenwort, (Asplenium ruta-muraria), T

For more information on rare species and natural communities, please see our fact sheets online at www.mass.gov/nhesp.
Smooth Rock-cress, \((Boechera leavigata)\), SC
Green Rock-cress, \((Boechera missouriensis)\), T
Glaucocent Sedge, \((Carex glaucoidea)\), E
False Hop-sedge, \((Carex lupuliformis)\), E
Purple Clematis, \((Clematis occidentalis)\), SC
Autumn Coralroot, \((Corallorhiza odontorhiza)\), SC
Houghton's Flatsedge, \((Cyperus houghtonii)\), E
Large-bracted Tick-trefoil, \((Desmodium cuspidatum)\), T
Cornel-leaved Aster, \((Doellingeria infirma)\), E
New England Blazing Star, \((Liatris scariosa var. novae-angliae)\), SC
Dwarf Bulrush, \((Lipocarpha micrantha)\), T
Red Mulberry, \((Morus rubra)\), E
Upland White Aster, \((Oligoneuron album)\), E
Violet Wood-sorrel, \((Oxalis violacea)\), E
Philadelphia Panic-grass, \((Panicum philadelphicum ssp. philadelphicum)\), SC
Swamp Lousewort, \((Pedicularis lanceolata)\), E
Toothcup, \((Rotala ramosior)\), E
Wapato, \((Sagittaria cuneata)\), T
Sandbar Willow, \((Salix exigua ssp. interior)\), T
Shining Wedgegrass, \((Sphenopholis nitida)\), T
Tradescant's Aster, \((Symphyotrichum tradescantii)\), T
False Pennyroyal, \((Trichostema brachiatum)\), E
Narrow-leaved Vervain, \((Verbena simplex)\), E
Lily-leaf Twayblade, \((Liparis liliifolia)\), T
Midland Sedge, \((Carex mesochorea)\), E
Spiked False-oats, \((Trisetum spicatum)\), E
Threadfoot, \((Podostemum ceratophyllum)\), recently de-listed
Tufted Hairgrass, \((Deschampsia cespitosa ssp. glauca)\), E

Priority Natural Communities
- Major-river Floodplain Forest, S2
- Hickory - Hop Hornbeam Forest/Woodland, S2
- Circumneutral Rocky Summit/Rock Outcrop Community, S2S3
- Circumneutral Talus Forest/Woodland, S3

Exemplary Natural Communities
- Hemlock-Hardwood Swamp
Other *BioMap2* Components

- Forest Core
- Aquatic Core
- Wetland Core
- Vernal Pool Core
- Landscape Block
- Aquatic Core Buffer
- Wetland Core Buffer

- **E** = Endangered
- **T** = Threatened
- **SC** = Special Concern
- **S1** = Critically Imperiled communities, typically 5 or fewer documented sites or very few remaining acres in the state.
- **S2** = Imperiled communities, typically 6-20 sites or few remaining acres in the state.
- **S3** = Vulnerable communities, typically have 21-100 sites or limited acreage across the state.

For more information on rare species and natural communities, please see our fact sheets online at [www.mass.gov/nhesp](http://www.mass.gov/nhesp).
BioMap2 Core Habitat in Holyoke

Core IDs correspond with the following element lists and summaries.
Elements of BioMap2 Cores

This section lists all elements of BioMap2 Cores that fall entirely or partially within Holyoke. The elements listed here may not occur within the bounds of Holyoke.

Core 1389
Species of Conservation Concern
A data-sensitive species

Core 1526
Species of Conservation Concern
Orange Sallow Moth  Pyrrhia aurantiago  SC

Core 1656
Forest Core
Wetland Core
Aquatic Core
Vernal Pool Core
Priority & Exemplary Natural Communities
  Circumneutral Rocky Summit/Rock Outcrop Community  S2S3
  Circumneutral Talus Forest/Woodland  S3
  Hemlock-Hardwood Swamp
  Hickory - Hop Hornbeam Forest/Woodland  S2
Species of Conservation Concern
  Autumn Coralroot  Corallorhiza odontorhiza  SC
  Cornelian-leaved Aster  Doellingeria infirma  E
  Dwarf Bulrush  Lipocarpha micrantha  T
  False Hop-sedge  Carex lupuliformis  E
  Glaucescent Sedge  Carex glaucodea  E
  Green Rock-cress  Boechera missouriensis  T
  Hairy Agrimony  Agrimonia pubescens  T
  Houghton's Flatsedge  Cyperus houghtonii  E
  Large-bracted Tick-trefoil  Desmodium cuspidatum  T
  Linear-leaved Milkweed  Asclepias verticillata  T
  Midland Sedge  Carex mesochorea  E
  Narrow-leaved Vervain  Verbena simplex  E
  New England Blazing Star  Liatris scariosa var. novae-angliae  SC
  Nodding Chickweed  Cerastium nutans  E
  Philadelphia Panic-grass  Panicum philadelphicum ssp. philadelphicum  SC
  Purple Clematis  Clematis occidentalis  SC
  Red Mulberry  Morus rubra  E
  Shining Wedgegrass  Sphenopholis nitida  T

For more information on rare species and natural communities, please see our fact sheets online at www.mass.gov/nhesp.
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Conservation Status</th>
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<tbody>
<tr>
<td>Smooth Rock-cress</td>
<td>Boechera laevigata</td>
<td>SC</td>
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<tr>
<td>Spiked False Oats</td>
<td>Trisetum spicatum</td>
<td>E</td>
</tr>
<tr>
<td>Swamp Lousewort</td>
<td>Pedicularis lanceolata</td>
<td>E</td>
</tr>
<tr>
<td>Toothcup</td>
<td>Rotala ramosior</td>
<td>E</td>
</tr>
<tr>
<td>Violet Wood-sorrel</td>
<td>Oxalis violacea</td>
<td>E</td>
</tr>
<tr>
<td>Wapato</td>
<td>Sagittaria cuneata</td>
<td>T</td>
</tr>
<tr>
<td>New Jersey Tea Inchworm</td>
<td>Apodrepanulatrix liberaria</td>
<td>E</td>
</tr>
<tr>
<td>Orange Sallow Moth</td>
<td>Pyrrhia aurantiago</td>
<td>SC</td>
</tr>
<tr>
<td>Pine Barrens Speranza</td>
<td>Speranza exonerata</td>
<td>SC</td>
</tr>
<tr>
<td>Pine Barrens Zanclognatha</td>
<td>Zanclognatha martha</td>
<td>T</td>
</tr>
<tr>
<td>Four-toed Salamander</td>
<td>Hemidactylum scutatum</td>
<td>Non-listed SWAP</td>
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<tr>
<td>Jefferson Salamander</td>
<td>Ambystoma jeffersonianum</td>
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<tr>
<td>Marbled Salamander</td>
<td>Ambystoma opacum</td>
<td>T</td>
</tr>
<tr>
<td>Spring Salamander</td>
<td>Gyrinophilus porphyriticus</td>
<td>Non-listed SWAP</td>
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<tr>
<td>Eastern Box Turtle</td>
<td>Terrapene carolina</td>
<td>SC</td>
</tr>
<tr>
<td>Northern Black Racer</td>
<td>Coluber constrictor</td>
<td>Non-listed SWAP</td>
</tr>
<tr>
<td>Spotted Turtle</td>
<td>Clemmys guttata</td>
<td>Non-listed SWAP</td>
</tr>
<tr>
<td>Wood Turtle</td>
<td>Glyptemys insculpta</td>
<td>SC</td>
</tr>
<tr>
<td>Peregrine Falcon</td>
<td>Falco peregrinus</td>
<td>E</td>
</tr>
</tbody>
</table>

Core 2943N

**Wetland Core**

**Aquatic Core**

**Priority & Exemplary Natural Communities**

- Black Gum-Pin Oak-Swamp White Oak “Perched” Swamp S2
- Calcareous Rock Cliff Community S3
- Calcareous Talus Forest/Woodland S3
- Circumneutral Rock Cliff Community S3
- High-energy Riverbank S3
- High-Terrace Floodplain Forest S2
- Low-energy Riverbank
- Major-river Floodplain Forest S2
- Sandplain Grassland S1
- Small-river Floodplain Forest S2
- Transitional Floodplain Forest S2
- Wet Meadow

**Species of Conservation Concern**

- American Waterwort Elatine americana E
- Appalachian Bristle-fern Trichomanes intricatum E
- Cat-tail Sedge Carex typhina T
- Climbing Fern Lygodium palmatum SC
- False Pennyroyal Trichostema brachiatum E
- Frank’s Lovegrass Eragrostis frankii SC
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Gray's Sedge</td>
<td>Carex grayi</td>
<td>T</td>
</tr>
<tr>
<td>Green Dragon</td>
<td>Arisaema dracontium</td>
<td>T</td>
</tr>
<tr>
<td>Green Rock-cress</td>
<td>Boechera missouriensis</td>
<td>T</td>
</tr>
<tr>
<td>Intermediate Spike-sedge</td>
<td>Eleocharis intermedia</td>
<td>T</td>
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<td>Low Bindweed</td>
<td>Calystegia spithamaea</td>
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<td>Many-fruit False-loosestrife</td>
<td>Ludwigia polycarpa</td>
<td>E</td>
</tr>
<tr>
<td>Michaux's Sandwort</td>
<td>Minuartia michauxii</td>
<td>T</td>
</tr>
<tr>
<td>Mountain Alder</td>
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<td>Narrow-leaved Spring Beauty</td>
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<td>Nodding Chickweed</td>
<td>Cerastium nutans</td>
<td>E</td>
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<td>Philadelphia Panic-grass</td>
<td>Panicum philadelphicum ssp. philadelphicum</td>
<td>SC</td>
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<td>Clematis occidentalis</td>
<td>SC</td>
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<td>Putty-root</td>
<td>Aplectrum hyemale</td>
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<td>Pygmyweed</td>
<td>Crassula aquatica</td>
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</tr>
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<td>Red Mulberry</td>
<td>Morus rubra</td>
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<tr>
<td>Sand Violet</td>
<td>Viola adunca</td>
<td>SC</td>
</tr>
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<td>Sandbar Cherry</td>
<td>Prunus pumila var. depressa</td>
<td>T</td>
</tr>
<tr>
<td>Sandbar Willow</td>
<td>Salix exigua ssp. interior</td>
<td>T</td>
</tr>
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<td>Shore Sedge</td>
<td>Carex lenticularis</td>
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<td>Swamp Dock</td>
<td>Rumex verticillatus</td>
<td>T</td>
</tr>
<tr>
<td>Tiny Cow-lily</td>
<td>Nuphar microphylla</td>
<td>E</td>
</tr>
<tr>
<td>Tradescant's Aster</td>
<td>Symphyotrichum tradescantii</td>
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</tr>
<tr>
<td>Tuckerman's Sedge</td>
<td>Carex tuckermanii</td>
<td>E</td>
</tr>
<tr>
<td>Tufted Hairgrass</td>
<td>Deschampsia cespitosa ssp. glauca</td>
<td>E</td>
</tr>
<tr>
<td>Upland White Aster</td>
<td>Oligoneuron album</td>
<td>E</td>
</tr>
<tr>
<td>White Adder's-mouth</td>
<td>Malaxis monophylllos var. brachypoda</td>
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</tr>
<tr>
<td>Winged Monkey-flower</td>
<td>Mimulus alatus</td>
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<tr>
<td>Wright's Spike-rush</td>
<td>Eleocharis diandra</td>
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<tr>
<td>Sunderland Spring Planarian</td>
<td>Polycelis remotae</td>
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<tr>
<td>Brook Floater (Swollen Wedgemussel)</td>
<td>Alasmidonta varicosa</td>
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</tr>
<tr>
<td>Creeper</td>
<td>Strophitus undulatus</td>
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<td>Dwarf Wedgemussel</td>
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<td>Eastern Pondmussel</td>
<td>Liguria nasuta</td>
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<td>Tidewater Mucket</td>
<td>Leptodea ochracea</td>
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<td>Triangle Floater</td>
<td>Alasmidonta undulata</td>
<td>Non-listed SWAP</td>
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<tr>
<td>Yellow Lampmussel</td>
<td>Lampsilis cariosa</td>
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<tr>
<td>Barrens Buckmoth</td>
<td>Hemileuca maia</td>
<td>SC</td>
</tr>
<tr>
<td>New Jersey Tea Inchworm</td>
<td>Apodrepanulatrix liberaria</td>
<td>E</td>
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<tr>
<td>Orange Sallow Moth</td>
<td>Pyrrhia aurantiago</td>
<td>SC</td>
</tr>
<tr>
<td>Pine Barrens Speranza</td>
<td>Speranza exonera</td>
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<tr>
<td>Pine Barrens Zale</td>
<td>Zale lunifera</td>
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<tr>
<td>Pine Barrens Zanclognatha</td>
<td>Zanclognatha martha</td>
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</tr>
<tr>
<td>Pink Sallow</td>
<td>Psectraglaea carnosa</td>
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BioMap2
Conserving the Biodiversity of Massachusetts in a Changing World

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Scientific Name</th>
<th>Category</th>
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<tbody>
<tr>
<td>Sandplain Euchlaena</td>
<td>Euchlaena madusaria</td>
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<tr>
<td>Frosted Elfin</td>
<td>Callophrys irus</td>
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<tr>
<td>Cobblestone Tiger Beetle</td>
<td>Cicindela marginipennis</td>
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<tr>
<td>Twelve-spotted Tiger Beetle</td>
<td>Cicindela duodecimguttata</td>
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<tr>
<td>Tule Bluet</td>
<td>Enallagma carunculatum</td>
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<tr>
<td>Arrow Clubtail</td>
<td>Stylurus spiniceps</td>
<td>Non-listed SWAP</td>
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<tr>
<td>Brook Snaketail</td>
<td>Ophiogomphus aspersus</td>
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<tr>
<td>Cobra Clubtail</td>
<td>Gomphus vastus</td>
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<tr>
<td>Midland Clubtail</td>
<td>Gomphus fraternus</td>
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<tr>
<td>Rapids Clubtail</td>
<td>Gomphus quadricolor</td>
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<tr>
<td>Riverine Clubtail</td>
<td>Stylurus annicola</td>
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<tr>
<td>Skillet Clubtail</td>
<td>Gomphus ventricosus</td>
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<tr>
<td>Spine-crowned Clubtail</td>
<td>Gomphus abbreviatus</td>
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<td>Stygian Shadowdragon</td>
<td>Neurocordulia yamaskanensis</td>
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<tr>
<td>Zebra Clubtail</td>
<td>Stylurus scudder</td>
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<tr>
<td>Eastern Spadefoot</td>
<td>Scaphiopus holbrookii</td>
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<tr>
<td>Jefferson Salamander</td>
<td>Ambystoma jeffersonianum</td>
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<tr>
<td>Marbled Salamander</td>
<td>Ambystoma opacum</td>
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<td>Northern Leopard Frog</td>
<td>Rana pipiens</td>
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<tr>
<td>Wood Turtle</td>
<td>Glyptemys insculpta</td>
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<td>Burbot</td>
<td>Lota lota</td>
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<tr>
<td>Eastern Silvery Minnow</td>
<td>Hybognathus regius</td>
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<td>Longnose Sucker</td>
<td>Catostomus catostomus</td>
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<tr>
<td>Shortnose Sturgeon</td>
<td>Acipenser brevirostrum</td>
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<tr>
<td>American Bitter</td>
<td>Botaurus lentiginosus</td>
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</tr>
<tr>
<td>Bald Eagle</td>
<td>Haliaeetus leucocephalus</td>
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<tr>
<td>Grasshopper Sparrow</td>
<td>Ammodramus savannarum</td>
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<tr>
<td>Least Bitter</td>
<td>Ixobrychus exilis</td>
<td>E</td>
</tr>
<tr>
<td>Vesper Sparrow</td>
<td>Pooecetes gramineus</td>
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</tr>
</tbody>
</table>

For more information on rare species and natural communities, please see our fact sheets online at [www.mass.gov/nhesp](http://www.mass.gov/nhesp).
Core Habitat Summaries

Core 1389
A <1-acre Core Habitat featuring a data-sensitive Species of Conservation Concern.
The Natural Heritage & Endangered Species Program does not release information on particularly vulnerable species.

Core 1526
A 35-acre Core Habitat featuring a Species of Conservation Concern.
Orange Sallow Moths inhabit dry, open oak woodlands on rocky uplands. Their eggs are laid on false foxgloves (*Aureolaria* spp.) where the larvae feed on the flowers and developing seeds.

Core 1656
A 9,525-acre Core Habitat featuring Forest Core, Wetland Core, Aquatic Core, Vernal Pool Core, Priority Natural Communities, and Species of Conservation Concern.
The basalt bedrock of Mt. Tom and East Mountain juts up out of the lower Connecticut River valley in Massachusetts. These striking mountains are one of the most important sites for rare species in western Massachusetts, supporting 41 rare and uncommon plants and animals, five of them globally rare. Surprisingly, these ridges have numerous vernal pools, in which several excellent breeding populations of Marbled and Jefferson Salamanders are found. The unusual circumneutral bedrock, in addition to small ecological disturbances such as wildfires and ice storms, supports many rare plants, such as Purple Clematis and Narrow-leaved Vervain on the talus slopes, or the Glaucescent Sedge and Shining Wedgegrass in the Hickory-Hop Hornbeam Woodland.

Circumneutral Rocky Summit/Rock Outcrops are small, open communities of grasses, sedges and herbaceous plants occurring on rocky summits, ridges or outcrops with exposed circumneutral (neither acidic nor calcareous) bedrock. This Core has two examples of Circumneutral Rocky Summit in excellent condition, and very well buffered within a naturally vegetated landscape.

Circumneutral Talus Forest communities develop on boulder strewn slopes below slightly acidic cliffs or rock outcrops. There is often a gradient of vegetation density as the slope changes, with more trees on the lower slope. This Core has two examples of Circumneutral Talus Forest that are in good condition, with good diversity, no exotic invasive species, and are located within a large block of natural vegetation.

Hemlock-Hardwood Swamps are acidic forested swamps that have hemlock as the dominant canopy species. These forested wetlands occur on saturated soils in poorly drained basins throughout the state. This example of Hemlock-Hardwood Swamp, though small, has good species diversity and is well buffered by surrounding upland forest.

Hickory-Hop Hornbeam Forests are open, hardwood forests dominated by various hickory species with significant hop hornbeam in the subcanopy. This community is characterized by a sparse shrub layer, and a nearly continuous cover of grasses and sedges. This large example of Hickory-Hop-hornbeam Forest is of excellent quality and is associated with many state-listed rare species.
Forest Cores are the best examples of large, intact forests that are least impacted by roads and development. Forest Cores support many bird species sensitive to the impacts of roads and development and help maintain ecological processes found only in unfragmented forest patches.

Wetlands Cores are the least disturbed wetlands in the state within undeveloped landscapes—those with intact buffers and little fragmentation or other stressors associated with development. These wetlands are most likely to support critical wetland functions (i.e., natural hydrologic conditions, diverse plant and animal habitats, etc.) and are most likely to maintain these functions into the future.

Aquatic Cores are intact river corridors within which important physical and ecological processes of the river or stream occur. They delineate integrated and functional ecosystems for fish species and other aquatic Species of Conservation Concern.

Vernal pools are small, seasonal wetlands that provide important wildlife habitat, especially for amphibians and invertebrate animals that use them to breed. BioMap2 identifies the top 5 percent most interconnected clusters of Potential Vernal Pools in the state.

Core 2943N

A 27,102-acre section of a larger 93,990-acre Core Habitat featuring Wetland Core, Aquatic Core, Priority Natural Communities, and Species of Conservation Concern.

The mainstem of the Connecticut River is the spine of a much more extensive Core Habitat that connects many of the most biologically important sites in the river valley. Just in the mainstem and adjacent uplands, 91 rare and uncommon species have been found. This large, meandering river hosts seven species of rare dragonflies, including the globally rare Skillet Clubtail and the Midland Clubtail, which is found nowhere else in the state. Below the Turners Dam, the river supports the federally Endangered Shortnose Sturgeon, the state's only population of Burbot, and Eastern Silvery Minnows. High above the river Bald Eagles soar; this river is a key breeding and wintering site for this bird in Massachusetts. On the Connecticut border, the extensive floodplain forests of the Fanny Stebbins Wildlife Refuge are home to seven rare and uncommon plants, including the Endangered Winged Monkey-flower.

Black Gum-Pin Oak-White Oak "Perched" swamps are an unusual type of wetland found in Massachusetts in one area of the Connecticut River Valley. This community type is dominated by red maple, with black gum, pin oak, and swamp white oak. This moderate-sized example of Black Gum-Pin Oak- Swamp White Oak "Perched" Swamp is of high-quality and is surrounded by both forested upland and agricultural fields.

Calcareous Rock Cliffs are sparsely vegetated cliff communities. Unusual, highly specialized plants and ferns grow in cracks and ledges in the calcium-rich cliff face. This type of cliff community has more species diversity than Acidic Rock Cliffs. This Core includes two small examples of Calcareous Rock Cliff in good condition, largely free of exotic invasive species and with several unusual plant species present. One is well buffered by natural vegetation, the other has a minimal buffer to human disturbances.

Calcareous Talus Forest communities develop on loose rocky slopes below calcareous cliffs or rock outcrops. The soil between the boulders is usually moist and loamy. Trees are usually best established on lower slopes. This example of Calcareous Talus Forest is in good condition, despite its proximity to development. It is of moderate size and an invasive exotic species is present.
Circumneutral Rock Cliff communities consist of extremely sparse plants growing on small ledges and in crevices on a circumneutral cliff face. These communities tend to support a greater diversity of species than do Acidic Rock Cliff communities. This example of Circumneutral Rock Cliff is open, dry, and west-facing, with many associated rare plants. Although these popular cliffs are somewhat disturbed by trampling, they remain a good-quality natural community.

High-Energy Riverbank communities are sparse, open graminoid communities found on cobble and sand deposits along fast-flowing rivers that experience severe flooding and ice scour. This Core has four small examples and one large example of High-Energy Riverbank. Each is pristine with good species diversity and two in particular are well-buffered and influenced by intact natural processes that perpetuate them.

High-Terrace Floodplain Forests are deciduous hardwood forests that occur along riverbanks, above the zone of annual flooding. Although they do not flood annually, they flood often enough for the soil to be moderately enriched. This Core has two examples of High-Terrace Floodplain Forest. A moderate-sized example is well-developed, with good structure and diversity and moderate levels of disturbance. The other is quite small and in somewhat degraded condition.

Low-Energy Riverbanks are open herbaceous communities occurring on sandy or silty mineral soils of river and streambanks that do not experience severe flooding or ice scour. One example is a high-quality, species-rich Low-energy Riverbank community, a different community with more grasses than is found on more northern islands in the Connecticut River. Another example is moderate-sized and is an unusual variant of this community type that experiences periodic flooding, resulting in an unusual species composition.

Major-River Floodplain Forests are dominated by silver maple. This community is found along the floodplains of large rivers. The soils here are enriched with nutrients brought by annual floods, resulting in a diversity of plants and insects. Seven examples of Major-River Floodplain Forest ranging from an extremely small remnant of a once larger forest, somewhat degraded by exotic invasive species, to a large example in excellent condition with good floral diversity, with the exception of some recreational use areas that have been trampled and are being invaded by exotic species. This Core includes the largest and highest-quality examples of Major-River Floodplain Forest currently known in Massachusetts.

Sandplain Grasslands are open, essentially treeless, grass-dominated communities that generally occur on sand or other dry, poor soils. Occurrences are maintained by fire, salt spray, and, now, mowing. This Sandplain Grassland is an unusual Connecticut River Valley variant of this community, which is found primarily in the Cape and Islands. It is succeeding to forest and is threatened by human disturbances including ORV use.

Small-River Floodplain Forests are silver maple/green ash forests occurring on alluvial soils of small rivers and streams. They occur on small tributaries of the Connecticut and Nashua Rivers and along some small rivers of eastern Massachusetts. This Core includes three of the top four examples of Small-River Floodplain Forest in Massachusetts. They are in excellent condition, with good structure and diversity.

Transitional Floodplain Forests are riverside silver maple-green ash-American elm forests that experience annual floods. Of the three floodplain forest community types, these communities are intermediate in vegetation and soils. This Core includes three examples of Transitional Floodplain Forest including the largest and best quality of its kind in Massachusetts. There are only five locations of this community type known in Massachusetts.
Wet Meadows are graminoid communities similar to Deep and Shallow Emergent Marshes except that they are temporarily rather than seasonally flooded. They occur in lake basins, wet depressions, along streams, and in sloughs along rivers. This small wet meadow is in very good condition, with high floristic diversity.

Wetlands Cores are the least disturbed wetlands in the state within undeveloped landscapes—those with intact buffers and little fragmentation or other stressors associated with development. These wetlands are most likely to support critical wetland functions (i.e., natural hydrologic conditions, diverse plant and animal habitats, etc.) and are most likely to maintain these functions into the future.

Aquatic Cores are intact river corridors within which important physical and ecological processes of the river or stream occur. They delineate integrated and functional ecosystems for fish species and other aquatic Species of Conservation Concern.
BioMap2 Critical Natural Landscape in Holyoke

Critical Natural Landscape IDs correspond with the following element lists and summaries.
Elements of *BioMap2* Critical Natural Landscapes

This section lists all elements of *BioMap2* Critical Natural Landscapes that fall *entirely or partially* within Holyoke. The elements listed here may not occur within the bounds of Holyoke.

**CNL 682**  
Aquatic Core Buffer  
Landscape Block  
Wetland Core Buffer

**CNL 696**  
Aquatic Core Buffer

**CNL 783**  
Aquatic Core Buffer  
Landscape Block

**CNL 825**  
Aquatic Core Buffer  
Landscape Block  
Wetland Core Buffer

**CNL 1322**  
Aquatic Core Buffer  
Landscape Block  
Wetland Core Buffer
Critical Natural Landscape Summaries

CNL 682

A 1,475-acre Critical Natural Landscape featuring Aquatic Core Buffer, Wetland Core Buffer and Landscape Block.

A variety of analyses were used to identify protective upland buffers around wetlands and rivers. One, the variable width buffers methodology, included the most intact areas around each wetland and river, by extending deeper into surrounding unfragmented habitats than into developed areas adjacent to each wetland. Other upland buffers were identified through the rare species habitat analysis. In this way, the conservation of wetland buffers will support the habitats and functionality of each wetland, and also include adjacent uplands that are important for many species that move between habitat types.

Landscape Blocks, the primary component of Critical Natural Landscapes, are large areas of intact predominately natural vegetation, consisting of contiguous forests, wetlands, rivers, lakes, and ponds, as well as coastal habitats such as barrier beaches and salt marshes. Pastures and power-line rights-of-way, which are less intensively altered than most developed areas, were also included since they provide habitat and connectivity for many species. Collectively, these natural cover types total 3.6 million acres across the state. An Ecological Integrity assessment was used to identify the most intact and least fragmented areas. These large Landscape Blocks are most likely to maintain dynamic ecological processes such as buffering, connectivity, natural disturbance, and hydrological regimes, all of which help to support wide-ranging wildlife species and many other elements of biodiversity.

In order to identify critical Landscape Blocks in each ecoregion, different Ecological Integrity thresholds were used to select the largest intact landscape patches in each ecoregion while avoiding altered habitat as much as possible. This ecoregional representation accomplishes a key goal of BioMap2 to protect the ecological stages that support a broad suite of biodiversity in the context of climate change. Blocks were defined by major roads, and minimum size thresholds differed among ecoregions to ensure that BioMap2 includes the best of the best in each ecoregion.

CNL 696

A 56-acre Critical Natural Landscape featuring Aquatic Core Buffer.

A variety of analyses were used to identify protective upland buffers around wetlands and rivers. One, the variable width buffers methodology, included the most intact areas around each wetland and river, by extending deeper into surrounding unfragmented habitats than into developed areas adjacent to each wetland. Other upland buffers were identified through the rare species habitat analysis. In this way, the conservation of wetland buffers will support the habitats and functionality of each wetland, and also include adjacent uplands that are important for many species that move between habitat types.

CNL 783

A 1,170-acre Critical Natural Landscape featuring Aquatic Core Buffer and Landscape Block.
A variety of analyses were used to identify protective upland buffers around wetlands and rivers. One, the variable width buffers methodology, included the most intact areas around each wetland and river, by extending deeper into surrounding unfragmented habitats than into developed areas adjacent to each wetland. Other upland buffers were identified through the rare species habitat analysis. In this way, the conservation of wetland buffers will support the habitats and functionality of each wetland, and also include adjacent uplands that are important for many species that move between habitat types.

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**CNL 825**

A 2,279-acre Critical Natural Landscape featuring Aquatic Core Buffer, Wetland Core Buffer and Landscape Block.

A variety of analyses were used to identify protective upland buffers around wetlands and rivers. One, the variable width buffers methodology, included the most intact areas around each wetland and river, by extending deeper into surrounding unfragmented habitats than into developed areas adjacent to each wetland. Other upland buffers were identified through the rare species habitat analysis. In this way, the conservation of wetland buffers will support the habitats and functionality of each wetland, and also include adjacent uplands that are important for many species that move between habitat types.

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CNL 1322

A 288,370-acre Critical Natural Landscape featuring Aquatic Core Buffer, Wetland Core Buffer and Landscape Block.

A variety of analyses were used to identify protective upland buffers around wetlands and rivers. One, the variable width buffers methodology, included the most intact areas around each wetland and river, by extending deeper into surrounding unfragmented habitats than into developed areas adjacent to each wetland. Other upland buffers were identified through the rare species habitat analysis. In this way, the conservation of wetland buffers will support the habitats and functionality of each wetland, and also include adjacent uplands that are important for many species that move between habitat types.

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Help Save Endangered Wildlife!

Please contribute on your Massachusetts income tax form or directly to the Natural Heritage & Endangered Species Fund.

To learn more about the Natural Heritage & Endangered Species Program and the Commonwealth’s rare species, visit our web site at www.mass.gov/nhesp.