Appendix A. Plan Contributors.

Name	Affiliation	Area of Expertise
	Department of Conservation and Recreation	
Backman, Andy	RMP Program	Planning
Berkland, Ellen	Office of Cultural Resources	Archeaology
Bertrand, Dan	Legislative Affairs	Legislative relations
Briere, Gary	Bureau of Recreation	Recreation
Brown, Maggi	Bureau of Ranger Services	Visitor education and safety
Bruce, Mike	Bureau of Ranger Services	Ranger services and enforcement
Cavanagh, Paul	RMP Program	Planning
Church, Peter	Bureau of Forestry	Operations / forestry
Crawford, Conrad	External Affairs	Partnerships
Driscoll, Dan	Recreational Facilities Planning	Planning
Echandi, Alexandra	South Region	Natural resources
Fiesinger, Anne	Office of External Affairs and Partnerships	Outreach
Fisher, Sean	Office of Cultural Resources	Archival material
Fox, Wendy	Office of External Affairs and Partnerships	Media relations
Garnett, Catherine	Ecology Program	Natural resources
Gove, Nick	Urban Parks, North Region	Operations and management
Greene, Judy	Office of Cultural Resources	Historic maps and plans
Guthro, Anthony	Fells District	Operations
Haglund, Karl	Bureau of Planning	Historian / editor
Harris, Jeffrey	Office of Cultural Resources	Cutural resources
Hunt, Dan	Legislative Affairs	Legislative relations
Jahnige, Paul	Greenways and Trails Program	Trail planning and maintenance
Karl-Carnahan, Kristin	Bureau of Ranger Services	Interpretive planning
Kimball, David	GIS Program	GIS and mapping
Kish, Patrice	Office of Cultural Resources	Cultural resources
Lahiri, Chandreyee	GIS Program	GPS
Lewis, Amanda	Greenways and Trails	Trails planning and GIS
Lloyd, Nathanael	GIS Program	GIS
Lowry, Kathleen	Universal Access Program	Universal access
McCarthy, Tom	Universal Access Program	Universal access
Moran, Barbara	Office of External Affairs and Partnerships	Web content
Nelson, Mike	Bureau of Ranger Services	Ranger services and education
Orfant, Joe	Bureau of Planning and Resource Protection	Planning
Overton, Samantha	Urban Parks, Director	Urban parks
Pearly, Brian	Permit Program Manager	Use agreements
Parr, Adam	Bureau of Ranger Services	Incident reporting
Plocinski, Loni	GIS Program	GIS /planning
Port, S.J.	Office of External Affairs and Partnerships	Media relations
Rayworth, Tim	Bureau of Interpretive Services	Interpretive planning
Rowcroft, Jessica	RMP Program	Cultural resources
Rotondo, Joe	External Affairs	Permits and special events
Rudge, Curt	Bureau of Ranger Services	Ranger operations

Continued on next page.

Name	Affiliation	Area of Expertise
	Department of Conservation and Recreation (continued)	
Straub, Jim	Lakes and Ponds Program	Pond ecology
Silva, Jason	Chief of Staff	Commisioner's office
Tipton, Nat	RMP Program	Demography/visitor surveys
Warchalowski, Heather	Coastal Ecologist	Ecology
Yeo, Jonathan	Bureau of Water Supply Protection	Water quality
Walsh, Thomas	Urban Parks, Fells District	Operations and management
Williams, Chris	Bureau of Ranger Services	Ranger services / enforcement
Zimmerman, Joel	Bureau of Water Supply Protection	Water Quality and Planning
	Other Affiliations	
Biscoe, Michele	FellsDog / Somerville Dog	Dog recreation
Borgal, Lt. A.	Animal Rescue League	Dog safety and enforcement
Breese, Courtney	Massachusetts Office of Public Collaboration	Public process facilitation
Brown, David	Wildlife Tracker and Naturalist	Wildlife resources
Burne, Matthew	Vernal Pool Society	Vernal pools
Clish, Heather	Appalachian Mountain Club	Trail design and development
Connolly, Bryan	NHESP	State Botanist
Della Porta, Loraine	Massachusetts Office of Public Collaboration	Public process facilitation
Elliman, Ted	New England Wildflower Society	Botanical survey
Favuzza, Lt. R	State Police	Enforcement
Gilmartan, David	Massachusetts Water Resources Authority	Water resources / security
Glick, Adam	Greater Boston NEMBA	Mountain Bike Recreation
Goodman, Nancy	Environmental League of Massachusetts	Resource protection
Goodrich, John	Massachusetts Office of Public Collaboration	Public process facilitation
Gregoire, John	Massachusetts Water Resources Authority	Water resources
Grimble, Tom	New England Mountain Bike Association	Mountain bike recreation
Hamlin, Bryan	New England Botanical Club, FOF	Botanical survey
Harper, Lynn	NHESP	Rare species
Jewell, Dana	Bird naturalist	Bird survey
Kittredge, Walter	New England Botanical Club, FOF	Botanical survey
McCaffrey, James	Sierra Club	Resource protection
Mello, Mark	Lloyd Center for the Environment	Insect survey
Nelson, Mike	NHESP	Rare invertebrates
Nichols, Dominica	Friends of the Fells	Visitor survey
Petersen, Wayne	Mass Audubon Society	Important Bird Areas
Pruitt, Ken	Environmental League of Massachusetts	Wetland resources
Rawinski, Thomas	USDA Forest Service	Flora, forest ecology
Ricci, Heidi	Mass Audubon Society	Resource protection
Rines, Marjory	Bird naturalist	Bird survey
Russell, Kimberly	University of New Hampshire	Visitor Survey
Ryan, Mike	Friends of the Fells (FOF)	History / recreation
Swain, Pat	NHESP	Natural communities
Swymer, Steve	Wichester Water Department	Water quality
Thompson, Doug	Massachusetts Office of Public Collaboration	Public process facilitation
Webber, Lt.	State Police CAT Team	Enforcement
Woolsey, Henry	NHESP	Rare species
Young, Harold	Saugus Animal Control	Dog safety and enforcement

Appendix B. Public Participation.

In accordance with Massachusetts General Law Chapter 21: Section 2F, the Resource Management Plan (RMP) for Middlesex Fells Planning Unit was developed in conjunction with a public participation process to ensure that interested stakeholders and individuals had an opportunity to review the draft RMP and offer input in its development. The Middlesex Fells RMP represents one of the most intensive public participation processes that the DCR has engaged in. This appendix details this process used to inform and review this RMP.

B.1. Public Input into the Trail System Plan

The Middlesex Fells RMP builds on a year-long public Trail System Planning Process, which was launched in September 2009 with a "stakeholders' briefing" to introduce the planning process and solicit feedback. Invitees to this meeting included Appalachian Mountain Club, Fells Dog, Friends of the Fells, Mass Audubon, Massachusetts Water Resources Authority, New England Mountain Bike Association, Sierra Club, State Police, Winchester Water Department, and area legislators.

Broad public notice of the DCR's intent to prepare a Trail System Plan for the Middlesex Fells was made on DCR's web site on November 19, 2009 with additional announcement to major stakeholder groups via email.

Public comment was solicited on the Fells trail system through a set of guiding questions also listed on DCR's web site.

A "public workshop" was held February 8, 2010 to solicit additional public and user input. This workshop was advertised via a press announcement to news outlets covering the Malden, Medford, Melrose, Stoneham and Winchester markets, and via emails announcements to key stakeholder groups. Over 200 people participated in the planning workshop providing feedback on the needs and potential solutions to key trail system issues through a small group workshop process. The workshop presentation, summary notes and a compilation public input map were completed based on this input.

A second stakeholders' briefing was held on May 4, 2010 to brief key stakeholders on preliminary recommendations being considered.

The draft plan was presented to the public on September 20, 2010 and advertised in the Environmental Monitor on September 9. The draft was made available for download on the internet. A 60 comment period ran until November 19, 2010. Following this public comment period, the DCR announced that it would hold the bulk of the Trail System Plan in draft until the completion of an RMP.

In total, over 2,000 individuals participated in the Trail System Planning process through meetings, workshops and written comments.

B.2. Input into Development of the RMP

The Middlesex Fells RMP began with an initial launch meeting on January 31, 2011. A notice of a public meeting and of the DCR's intent to prepare a Resource Management Plan for the Middlesex Fells Reservation was announced on the DCR web page and through press releases provided to area media.

An initial public meeting was convened at the McGlynn Middle School in Medford. Approximately 100 people attended the meeting, which ran from 6:30–9:00 p.m.

This initial public meeting was followed by a series of 6 public workshops facilitated by the Massachusetts Office of Public Collaboration, each on a separate topic related to the resources and management of the Middlesex Fells. These workshops included presenters from a variety of professional organizations and stakeholder groups. Workshops included:

- Flora and Fauna Workshop, February 9, 2011, 6:30 – 8:30 p.m., Botume House, Stoneham. Presenters included Bryan Hamlin and Walter Kittredge (Friends of the Fells and New England Botanical Club),

David Brown (Wildlife Naturalist), Wayne Petersen (Mass Audubon Important Bird Areas Program), and Lynn Harper (Massachusetts Natural Heritage and Endangered Speices Program).

- Wetlands and Water Resources Workshop, February 17, 2011, 6:30 – 8:30 p.m., Botume House, Stoneham. Presenters included David Gilmartin (Massachusetts Water Resources Authority), Ken Pruitt (Environmental League of Massachusetts) and Matthew Burne (Vernal Pool Association).
- Cultural Resources Workshop, February 23, 2011, 6:30 – 8:30 p.m., Botume House, Stoneham. Presenters included Mike Ryan (Friends of the Fells), Ellen Berkland (Archaeologist, DCR) and Jeffrey Harris (Preservation Planner, DCR).
- Recreation Workshop, March 2, 2011, 6:30 – 8:30 p.m., McGlynn Middle School, Medford. Presenters included Heather Clish (Appalachian Mountain Club), Mike Ryan (Friends of the Fells), Michele Biscoe (Fells Dog) and Tom Grimble (New England Mountain Bike Association). Presentations were followed by facilitated break-out group discussions on recreational issues.
- Education and Interpretation Workshop, March 16, 2011, 6:30 - 8:30 p.m., Botume House, Stoneham. Presenters included Mike Nelson (Bureau of Ranger Services, DCR) and Kristin Karl-Carnahan (Bureau of Interpretive Services, DCR).
- Enforcement Workshop, March, 23, 2011, 6:30 p.m. - 8:30 p.m., Breakheart Reservation, Saugus. Presenters included Mike Nelson (Bureau of Ranger Services, DCR), Curt Rudge (Chief Ranger, DCR), Harold Young (Saugus Animal Control Officer), Lt. Borgal (Animal Rescue League), Lt. Favuzza (State Police) and Lt. Weber (State Police).

At each of these workshops, the public was invited to ask questions and engage in a dialogue on the topic. Notes were recorded. All presentations and notes were posted publically at http://www.mass.gov/dcr/news/publicmeetings/rmppast.htm. Attendance at the workshops ranged from 25 to 80 with an average of 41.

Written input on the plan was also solicited at the initial public meeting, each workshop, through the Environmental Monitor announcement, on the DCR web page, and in press releases. This written comment period was open from January 31, 2011 to March 31, 2011. All this input was posted publically at http://www.mass.gov/dcr/news/publicmeetings/rmppast.htm.

Over 3,050 people participated in the public input phase of the Trail Plan and RMP.

B.3. Public Comment on the Draft RMP

Notice of the availability of the Draft RMP for the Middlesex Fells Planning Unit and a public meeting to present the draft was published in the September 7, 2011 Environmental Monitor, through a media advisory to area media outlets, via an email to participants and stakeholders in the RMP process, and through fliers posted on main DCR Middlesex Fells Reservation kiosks. The meeting was convened at the McGlynn Middle School, on September 14, 2011.

A 60-day public comment period on the draft RMP ran from September 14 through November 14, 2011. During this period, DCR received 278 comments via email and regular mail. These are posted at http://www.mass.gov/dcr/stewardship/rmp/rmp-midfells.htm.

B.4. Changes to the Final Middlesex Fells Planning Unit Resource Management Plan

All comments received during the final public comment period have been reviewed, compiled and considered. Comments that were consistent with the DCR's mission and policies, Massachusetts' laws and regulations, and the Management Principle and Goals of the planning unit were carefully considered for incorporation into the final RMP. Comments that were inconsistent with these or are best implemented by another agency are not included in the final RMP. For example, comments relating to the Town of Winchester's public access policies are not included. Changes to the final RMP in response to these public comments are described below.

DCR received no comments on the Management Principle and Goals, which form the framework for the plan and its recommendations.

DCR received only one comment relating to our process for evaluating consistency between recreation and resource protection.

The majority of the comments received dealt with the issues of mountain biking and pedestrian recreation, recreation with dogs, enforcement of rules and regulations, and the protection of natural and cultural resources. These issues were anticipated to be controversial by the RMP and are discussed in detail in Section 2.6 (Recreational Resources) and Section 4 (Issues Discussion) of the RMP. There were very few comments related to the issue of Land Stewardship Zoning and the establishment of Zone 1 areas and Zone 1 guidelines addressed in detail in the RMP. A chart showing the relative number of comments by themes is depicted in Figure B.4.1.

The public comment surrounding the issues of mountain biking and pedestrian uses and off-leash dog recreation reflected the breadth and sentiment of public comment and input received during the RMP planning process. While DCR received a significant number of comments from dog-owners expressing a desire for off-leash on-trail opportunities, DCR's evaluation of and approach to this issue remain substantively unchanged. The type and diversity of comments surrounding pedestrian and mountain biking recreational access was also substantively similar to the public input received during the planning process. As a result the final RMP does not reflect significant changes in the approach to or the recommendations surrounding these issues.

A number of public comments specifically asked DCR to:

- Remove provisions for off-leash dog access in the plan.
- Provide a funded plan for effective Fells enforcement staffing and trail-use management.
- Protect all sensitive natural areas in the Fells, including Vernal Pools throughout the Reservation.

It is difficult for DCR to know how to interpret these comments given that they do not accurately reflect the contents, management practices or recommendations published in the Draft RMP. Indeed, the draft and final RMPs do not contain any provision for off-leash dogs outside of the established off-leash area at the Sheepfold, they do provide for a funded enforcement and trail use management plan, and they go to great lengths to provide for the protection of sensitive natural resources, including vernal pools.

A number of public comments, including those from the three statewide environmental organizations, also expressed a desire to DCR to prioritize its resources on enforcement and trail repair and closure. DCR is pleased to be able to respond to this comment in our final RMP in a variety of ways described below. DCR notes, however, that enforcement and trail closure are only two components of the integrated compliance and resource protection strategy proposed by the plan, and that some changes in allowed uses (such as the off-leash recreation areas at the Sheepfold) and trail use designations are necessary to engage users and stakeholders, engage volunteers, reduce confusion and promote compliance.

DCR is also pleased to be able to respond to a number of other specific comments and suggestions made by individuals and stakeholder organizations. The summary below describes changes to the document in detail. Normal editing activities, such as correcting typographical errors or revising formatting, are not identified.

Executive Summary

The Executive Summary was revised to reflect changes in the priority recommendations, updated numbers of plant species, and new recommendations that were incorporated into the plan as a result of public input. The summary was also edited to note that, especially considering the final public comment, conflicting interests among stakeholders and some members of the public is the most significant issue facing the natural and social environment of the DCR Middlesex Fells.

Section 2, Existing Conditions

Information updating the history of the John W. Flynn Memorial Ice Skating Rink was added to *2.3 Description of Sites* and *2.7 Infrastructure, Buildings and Structures*.

Recognition of some pools such as the Shiner Pool was added to *2.4 Natural Resources, Ponds and Reservoirs*.

The numbers of native and non-native species found in the DCR Middlesex Fells Reservation was updated in *2.4 Natural Resources, Vegetation*.

Table 2.4.3. Watch-Listed Plants was updated to include two additional species.

Table 2.4.4. Sector Analysis of Native Plants was updated to reflect new numbers and the occurrence of watch-listed plants with information provided by Bryan Hamlin (2011e).

Section 2.4, Natural Communities section was updated to clarify that the new sugar maple-oak-hickory forest occurs in the north of the area also referred to elsewhere in the plan as the Dark Hollow area.

Section 2.4, Interior Forests and Forest Core and related references in *Section 4* were updated to correct a mathematical error in the percent of land in the Fells that is not within 50 meters of a trail. Less than 4% (rather than 1%) of the land area of the DCR Middlesex Fells Reservation is not within 50 meters of a trail.

The total number of bird species documented at the Fells was updated to 185 in *Birds*.

Section 2.5, Cultural Resources, Virginia Wood was updated to note that this parcel was donated to the Metropolitan District Commission in 1923.

Section 2.6, Recreational Resources, Nuisance Activities and other related references in the plan were updated to remove reference to "MSM" and replace these with references to "sexual activity" or "individuals engaged in sexual activity" to reflect to focus on the nuisance activity rather than single out a group of people.

"Engaging in recreational experiences as members of a family, especially parents with their children" was added to *2.6, Recreational Demand* and *Appendix N, Trail System Plan* as an important recreational experience at the DCR Middlesex Fells Reservation.

2.6 Recreational Demands was also edited to note that conflict among stakeholders and some members of the public is perhaps the most significant issue facing the social and natural environment of the Fells.

A paragraph describing "water supply management roads" and specifying that they are not necessarily part of the trail system and may have restricted access was added to *Section 2.7, Roads* and to *Appendix N, 2.5*.

Section 3, Management Resources and Practices

Section 3.2, Water Resources and *Appendix* D were updated to include guidelines for the protection and volunteer certification of vernal pools.

3.2, Wildlife was updated to clarify that the included *Appendix M, Habitat Management Plan* approved by NHESP, provides an exemption from MESA review for identified and approved projects.

3.2, Roads was updated to specify that DCR is guided by ASSHTO "guidelines" not "standards."

3.2 Trails was updated to clarify that while DCR does not generally engage in a public process for new trails, changes in trail designation or trail closure decisions on our over 3,000 miles of trails, in certain cases, where high levels of public interest exist, such as at the Fells, or where changes could impact a significant portion of a trail system, DCR may seek public input on such changes.

Section 4, Issues Discussion

The criteria listed in *4.1, Evaluating Consistency between Recreation and Resource Protection* was updated to specify that "important resources" is not a criterion in and of itself, but rather it is the "Susceptibility of important natural and cultural resources at the facility scale to damage from the specific recreational activities" that is the criterion.

4.2, Environmental Impacts of Recreational Activities was updated to add alterations in species composition as a potential impact of passive, trail-based recreation.

4.2, Environmental Characteristics, Resistance was updated to note that the DCR Road and Trail Inventory logged all occurrences of trail damage including erosion and "wash-outs" and that the magnitude of these is in-line with other woodland trail systems state-wide. It was also updated to note that, within the Fells, both pedestrian and mountain biking uses on some segments of trail that intersect wetland soils where appropriate protective structures are not in place are negatively impacting those resources. Finally, a note was added to reiterate that all new project within "Priority Habitat" must be approved by NHESP.

4.2, User Characteristics, Use was updated to further recognize that user behaviors, such as skidding, spinning and a tendency to volunteer on trail stewardship, can also affect the type and magnitude of environmental impacts. The section was also updated to note some additional findings and methodological issues in some of the studies cited. It was updated to add a discussion and citation of two recent studies that became available during the RMP comment period. It was updated to clarify that DCR's analysis of trail damage on hiking-only versus mountain biking trails at the Fells should not suggest that mountain biking has fewer impacts than hiking. Finally, the section was updated to add a discussion of the similar pressures (g/cm2) exerted on soils by typical mountain bikers and hikers.

4.3, Land Stewardship Zoning Zone 1 guidelines were edited to specify that off-trail geo-caches should not be permitted in Zone 1.

Section 4.4, Pedestrian and Mountain Biking Recreation was edited to note that winter users have the potential to disturb certain species of wildlife more because of the stresses of winter conditions.

4.4, Management Considerations was updated to note the extensive knowledge, expertise and willingness to volunteer that the mountain biking community offers in Massachusetts.

4.4, Conclusion and *Sub-Appendix N.5* were updated to note that DCR desires to be responsive to concerns raised from organizations like the Sierra Club with respect to mountain biking. *Sub-Appendix N.5* describes in detail how DCR's evaluation of this issue is fully consistent with the Sierra Club's policy on off-road bicycling.

4.4, Conclusion was also updated to clarify that part of the goal of the integrated use, management and compliance recommendations of this RMP is to better protect, enforce and manage pedestrian-only opportunities at the DCR Middlesex Fells Reservation

Section 4.5, Recreation with Dogs was edited to refer to "effective voice command" rather than "full voice control."

Section 4.6, Rules Compliance and Enforcement was updated to note that state-wide environmental organizations have specifically called for enhanced enforcement of rules and regulations at the reservation.

The section was updated to note that DCR is committed to enhancing education and enforcement at the DCR Middlesex Fells Reservation to change the culture of non-compliance, and has committed resource to accomplish this goal.

This section was also updated to clarify that stakeholders must work collaboratively with each other and DCR to reduce levels of conflict and enhance compliance, and that those stakeholder organizations that believe that enhanced enforcement of reservations rules and regulations is critical, must also be prepared to bring their own resources, fundraising, advocacy and organizing to the table to support DCR in this expanded effort.

Section 4.6, Monitoring was updated to note that the DCR Road and Trail Inventory and this RMP (Section 2) establish a baseline and protocol for on-going monitoring of trail and environmental conditions.

Section 5, Recommendations

The *Introduction, 5.1* was updated to provide a description of how priority and resource levels were assigned to recommendations, to note that DCR will implement recommendations based on priorities and resources available, and may phase certain recommendations or implement some sets of recommendations together.

Recommendation G1.12 was edited to include reference to implementation of the recommendations of Appendix M, Habitat Management Plan, and to change its priority level to High and resource level to 1-2.

Recommendation G1.13 and *Appendix D* were added to call for the implementation of additional guidelines to protect vernal pools and their associated upland habitat. This recommendations was assigned a priority level of High, a resource level of 1 and may be implemented by DCR operations, ranger services and planning staff, and volunteers.

Recommendation G2.1 was edited to assign a resource level of 1-2 to clarify that some resource to accomplish this goal are already available, including DCR staff, volunteers and contractors; and that this recommendations is already being implemented.

Recommendation G2.10 was edited to assign a resource level of 1-3 to demonstrate that DCR has already prioritized staff resources and assigned a Natural Resource Specialist two days a week to the Fells. This also recognizes that a full-time staff person is recommended and that the resources may not be available for this person for up to 5 years.

Recommendations G2.12 was edited to include reference to implementation of the recommendations of Appendix M, Habitat Management Plan.

Recommendations G3.6, 7, 8 and 11 were all updated to assign a priority level of Medium and a resource level of 2.

Recommendation G4.2 was edited to add safety improvements as needed at the Sheepfold parking lot, especially in light of an accident this summer.

Recommendation G4.4 was edited to clarify that a day use fee for the Sheepfold should include an annual pass option.

Recommendations G2.3, G4.7 and G4.12 were all edited to assign a resource level of 1-2 to clarify that the resources for expanded enforcement of these rules and regulations are currently available, but also to recognize that enforcement of such rules at the Fells is a challenge and that resources for full enforcement will require additional commitments from legislative and stakeholder partners.

Recommendations G4.10 and G5.9 were updated to clarify that trails in the Dark Hollow area would be designated as multi-use.

Recommendation G4.13 was edited to assign a priority level of High.

Recommendation G4.17 was edited to specify the inclusion of winter trail use etiquette.

A new *Recommendation G4.18* was added to call for considering designation of an area or set of trails for cross-country skiing. This recommendation was assigned a priority level of Medium and a resource level of 2.

A new *Recommendation G7.4* was added to encourage and expect greater civility among users and stakeholders at the Middlesex Fells. This recommendation was assigned a priority of High and a resource level of 1. Responsible implementing parties include DCR operations, ranger services and external affairs staff, and partner organizations.

The footnote on *Availability of Resources* was edited to clarify that resource level 3 should read "funding is currently unavailable, but may become so within five years."

Appendix A, Plan Contributors

Adam Glick, GBNEMBA were added as plan contributors, and Lt. Borgal and Harold Young's area of expertise was edited.

Appendix B, Public Participation

B.3 Public Comment of Draft RMP was edited to reflect the number of public comments received and the location of their posting.

B.4 Changes to the Final Middlesex Fells Planning Unit RMP was updated with a discussion and summary of all of these changes.

Appendix D, Guidelines for Protection of Vernal Pools and Associated Habitat on DCR Lands

This appendix was added at the request of the state-wide environmental organizations. The guidelines were developed by the DCR Ecology Program and NHESP. They were reviewed by the NHESP vernal pool specialist and Matt Burne, President of the Vernal Pool Society.

Appendix F, Select Acts of the Massachusetts Legislature

This appendix was edited at the suggestions of the MWRA to add Acts of 1984, Chapter 372, An Act Pertaining to the Metropolitan Water District and the Metropolitan Sewer District of the Metropolitan District Commission.

Appendix G, Plants of the DCR Middlesex Fells Reservation

This appendix was edited with corrections and updates provided by Bryan Hamlin (2011c).

Appendix H, Birds of the DCR Middlesex Fells Reservation

This appendix was updated with 2 additional bird species documented by Dana Jewell, White-winged scoter and Northern raven.

Appendix M, Rare and Endangered Species Habitat Management Plan

The *Watch-Listed Plants* table in this plan was updated with additional information provided by Bryan Hamlin (2011d)

Appendix N, Trail System Plan

2.5, Current Trail System was edited to add a paragraph describing "water supply management roads" and specifying that they are not necessarily part of the trail system and may have restricted access. Also, language describing public access and allowed activities around the MWRA Fells Reservoir was edited.

2.8, Current Uses and *3.4 Recreational Experiences and Expectations* was edited to note the importance of families as a user group at the Fells and the importance of experiences shared by families, and especially parents with their children.

Recommendation 6.4.2 was edited to reference the new RMP Appendix D.

Recommendation 6.6.1 was edited to specify the inclusion of winter trail use etiquette.

Recommendation 6.10.2 recommending consideration of a "certified dog" program was included in error and was deleted.

Recommendations 6.9.2 and 3 were edited to be consistent with RMP Recommendations G4.10 and G4.11.

Sub-Appendix N.5 Evaluation of Mountain Biking and Hiking Recreation Consistent with the Sierra Club's Policy on Off Road Use of Bicycles was added detailing how DCR's evaluation of this issue is fully consistent with the Sierra Club's policy on off-road bicycling.

Appendix T, MWRA – DCR Memoranda of Understanding

At the suggestion of the MWRA, selected text of the full MOU's was included in this appendix.

MWRA's comment letter on the draft Trail System Plan from November 18, 2010 was included.

Appendix X, Land Stewardship Zoning Guidelines

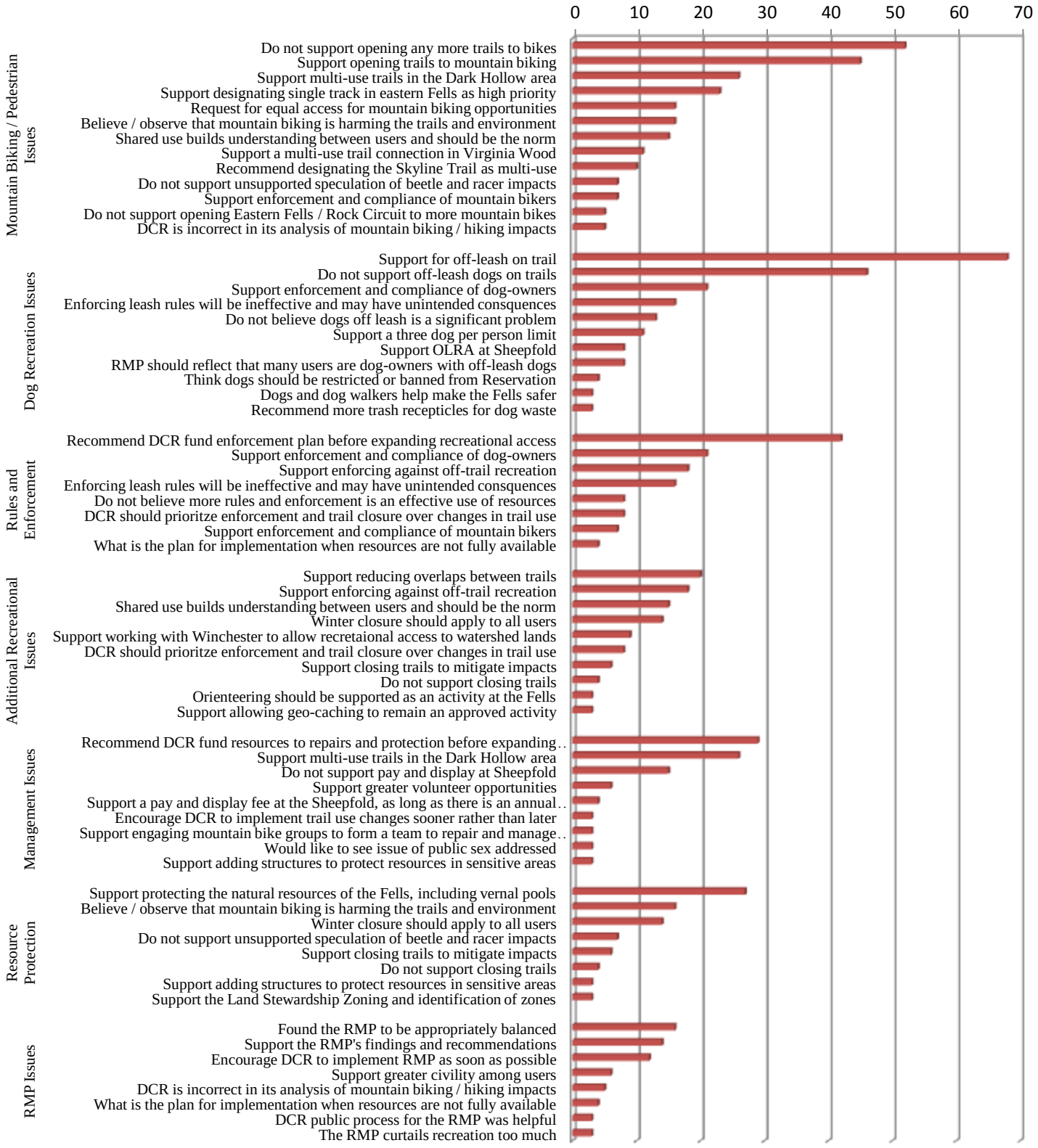
This appendix was edited to note that DCR is undertaking a further revision of these Guidelines to clarify the criteria for establishing zones and ensure that the Guidelines are consistent with the Landscape Designation guidelines.

The Special Management Guidelines were edited so that they are consistent with the RMP Section 4.3.

Appendix Y, Bibliography

This appendix was updated to add additional references including Hamlin 2011c, d and e, and Jewell 2011.

Figure B.4.1. Compilation of Public Comments on Draft Middlesex Fells Planning Unit RMP



Appendix C. GIS Supplemental Information.

METHODOLOGY

The following is a summary of the GIS methodology used by the Department of Conservation and Recreation (DCR) GIS Program to generate and present data within the Middlesex Fells Planning Unit Resource Management Plan (RMP).

Demographics

The demographic information presented in the RMP was generated by buffering the Middlesex Fells Reservation by ½, 1, 5 and 10 miles using the buffer tool. Next, the 2000 Census Block Group datalayer was analyzed to determine the characteristics of the population surrounding the Reservation. Each Census Block Group that intersected with the ½, 1, 5 and 10 mile buffer was selected using the select by location tool. Data for the selected Census Block Groups are summarized in Table C1, below.

Table C1. Summary of 2000 Census Block Groups within ½, 1, 5 and 10 miles of Middlesex Fells Reservation.

	½ mi	1 mi	5 mi	10 mi
Sample Population	76,357	139,104	848,121	1,835,795
Households	31,576	55,746	343,828	731,243
Age [1]				
M Children	7,846	14,606	83,759	191,229
M Adults	23,665	42,730	279,978	597,597
M Seniors	4,968	8,563	46,348	93,557
F Children	7,229	13,962	77,591	180,689
F Adults	24,572	45,291	288,484	628,113
F Seniors	8,077	13,952	71,961	144,610
Total Children	*15,075*	*28,568*	*161,350*	*371,918*
Total Adults	*48,237*	*88,021*	*568,462*	*1,225,710*
Total Seniors	*13,045*	*22,515*	*118,309*	*238,167*
Race				
White	67,580	121,228	695,625	1,397,618
Black or African American	2,117	5,193	39,633	171,027
American Indian or Alaskan Native	90	252	2,168	5,183
Asian	4,735	8,394	52,455	120,824
Native Hawaiian or Other Pacific Islander	10	21	292	706
Some Other Race (Alone)	510	1,354	31,159	81,309
Two or More Races	1,315	2,662	26,789	59,128
Ethnicity				
Hispanic or Latino	1,548	3,354	68,043	159,387
Language				
English	24,864	43,839	252,144	532,365
Spanish	794	1,586	23,058	56,532
European	4,265	7,591	50,116	98,246
Asian	1,250	2,120	13,896	34,155
Other	403	610	4,614	9,945
Income [2]				
Low	6,516	11,960	81,708	182,686
Medium	14,006	24,683	150,198	312,433
High	11,054	19,103	111,922	236,124
Education [3]				
M Pop. >25	26,274	46,028	279,687	585,340
M < H.S.	2,859	5,493	41,812	87,703
M H.S.	6,490	12,015	66,836	135,800
M < Bach.	5,740	10,293	53,124	112,647
M Bach.	6,484	10,784	61,468	129,950
M > Bach.	4,701	7,443	56,447	119,240
F Pop. >25	30,438	54,040	314,330	661,855
F < H.S.	3,320	6,356	46,896	100,555
F H.S.	8,648	15,790	83,149	166,572
F < Bach.	7,223	13,111	65,564	141,642
F Bach.	6,717	11,197	65,037	139,743
F > Bach.	4,530	7,586	53,684	113,343
Total >25	*56,712*	*100,068*	*594,017*	*1,247,195*
Total < H.S.	*6,179*	*11,849*	*88,708*	*188,258*
Total H.S.	*15,138*	*27,805*	*149,985*	*302,372*
Total < Bach.	*12,963*	*23,404*	*118,688*	*254,289*
Total Bach.	*13,201*	*21,981*	*126,505*	*269,693*
Total > Bach.	*9,231*	*15,029*	*110,131*	*232,583*

[1] M = Male; F = Female; Children = <18; Adults = 18-64, Seniors = >65.

[2] Low = <$10K - $24,999; Medium = $25K - $74,999, High = $75K - >$200K.

[3] M = Male, F = Female; < H.S. = No school, < 11th grade, 12th grade no diploma; < Bach. = College < 1 year, college > 1 year no diploma, Assoc.; > Bach. = Master, professional school degree, PhD.

It is important to note that by using the select by location tool, an acceptable amount of error was introduced into the demographic information presented in the RMP. Census Block Groups that extended beyond each buffer, similar to what is depicted in Figure C1, were included in the analysis. As a result, the demographic information for each buffer likely includes individuals who live farther away from the Reservation than indicated.

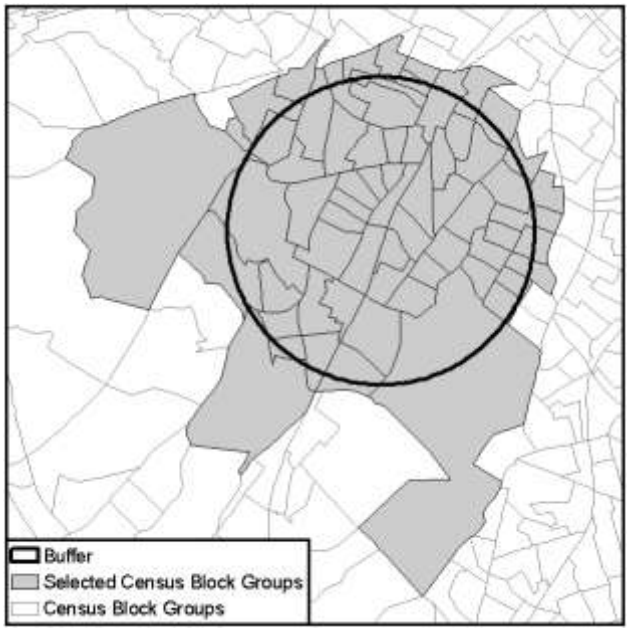


Figure C1. Selected Census Block Groups.

Education and Interpretation Survey Respondents

The 2000 Census Block Group datalayer was also used to create the Education and Interpretation Survey Respondents, by ZIP Code map. First, the calculate geometry feature was used to determine the area, in acres, of each Census Block Group. The area was then divided into the population of each Census Block Group, using the field calculator feature, to obtain the number of individuals per acre (i.e. the population density) of each Census Block Group. This information is displayed in the background of the map, while the information related to survey respondents is displayed as an overlay.

The distance between the survey respondents' ZIP Codes and the Reservation was calculated using the feature to point and point distance tools. The feature to point tool created a point in the geographic center of each ZIP Code and the Reservation. The point distance tool measured the distance, in miles, between each point or from the middle of each ZIP Code to the middle of the Reservation. Once the distance representing 25%, 50%, 75% and 95% of the survey respondents was determined (using Microsoft Excel), the Reservation was buffered in ArcGIS by 2, 4, 7 and 40 miles, using the buffer tool.

It is important to note that the dot density feature was used to ensure that the survey respondent points were displayed at random within each ZIP Code.

Historic Resources

The historic resource data were collected by the DCR's Office of Cultural Resources over the course of several days in April, 2011. A GPS application developed by the DCR GIS Program was used to inventory and standardize the data.

The extent of the planning unit's historic parkways was determined through National Register of Historic Places nomination forms.

Hydrography

The Hydrography datalayer was edited by a DCR GIS Specialist, using ArcGIS, to reflect the addition of the Massachusetts Water Resources Authority's (MWRA) covered water storage tank at the Fells Reservoir.

Infrastructure

The Reservation's parking areas, skating rink and swimming pool were digitized in ArcGIS by a DCR GIS Specialist. The 2008/2009 Color Orthophotography datalayer and field verified documentation of the resources were used as references.

Land Stewardship Zoning

A DCR GIS Specialist digitized the Land Stewardship Zoning datalayer in ArcGIS. The NHESP BioMap2, NHESP Priority Habitat, NHESP Priority Natural Communities, NHESP Watch-listed Plants and Trail-free Areas datalayers, as well as the National Register of Historic Places nomination form for the Spot Pond Brook Archaeological District were used as a guide for defining the Zone 1 areas within the Middlesex Fells Planning Unit. The 2008/2009 Color Orthophotography datalayer was used to determine the existing developed areas and in turn, the planning unit's Zone 3 areas and a

portion of its Zone 2 areas (the Bellevue Pond parking area). Every attempt was made to use "on the ground features," such as trails or streams, as the boundary for each land stewardship zone in an effort to make the areas easily identifiable for DCR field staff.

Zone 1. Nearly all of the Zone 1 areas are defined by the Reservation's boundaries or existing roads and trails, with the following exceptions:

Bear Hill – The northern boundary is a straight line from the existing open field to the existing trail; the southeastern boundary is the extent of the Priority Natural Community, as defined by the NHESP; and the southern boundary connects three large pine trees through a wetland.

South Reservoir – The eastern and westernmost ends of the northern boundary are connected, via a straight line, from existing trails to the Reservation's boundaries.

East Border Road – The northern boundary follows a noteworthy rock outcrop/ledge; the southeastern boundary is an existing trail, which is visible on the 2008/2009 Color Orthophotography datalayer, but was not collected in the GPS data.

Zone 3. All of the Zone 3 areas, plus the Bellevue Pond parking area (Zone 2), are defined by the Reservation's boundaries, existing roads and trails or existing footprint.

Property Boundaries

The digital boundaries for each property within the Middlesex Fells Planning Unit can be described, based on the source data, one of three ways: highly accurate, reasonably accurate and less than accurate. Approximately 14% of the digital boundaries are based on highly accurate data, e.g. surveys and/or hydrographic or town boundaries. The rest of the digital boundaries (86%) are based on less than accurate data, e.g. a digital sketch or an undocumented source.

Trails

The trail and associated point data (e.g. gates) were collected by consultants over the course of days in the summer of 2008 and fall of 2009. A GPS application was developed by the DCR GIS Program in an attempt to standardize the data. However, it is important to note that several of the trails attributes are qualitative and subjective, e.g. trail width and condition. It is assumed that the individual collecting the data used their best judgment when populating these attributes.

The Reservation's trail-free areas were identified by buffering all roads by 100 feet and all trails by 50 feet, using the ArcGIS buffer tool. These two datasets were then merged and clipped from the boundaries of the Reservation, using the merge and clip tools, respectively. The area of the remaining polygons – areas not within 100 feet of a road or 50 feet of a trail – was calculated using the calculate geometry feature.

DATALAYERS

A summary of the GIS datalayers used by the DCR GIS Program to generate and display data within the Middlesex Fells Planning Unit RMP is presented below, in Table C2.

Table C.2. Summary of datalayers used to create the Middlesex Fells Planning Unit RMP.

Datalayer Name	Source	Additional Information
100-Year Flood Zone	MassGIS	http://www.mass.gov/mgis/q3.htm
2000 Census Block Groups	MassGIS	http://www.mass.gov/mgis/census2000.htm
2008/2009 Color Orthophotography	MassGIS	http://www.mass.gov/mgis/colororthos2008.htm
500-Year Flood Zone	MassGIS	http://www.mass.gov/mgis/q3.htm
Buffers (1/2mi, 1mi, 2mi, 4mi, 5mi, 7mi, 10mi and 40mi)	DCR GIS	
DCR Water Supply Land	MassGIS	http://www.mass.gov/mgis/osp.htm
Elevation Contour	MassGIS	http://www.mass.gov/mgis/hp.htm
Gate	DCR GIS	
Historic Resources	DCR GIS	
Hydrography	MassGIS	http://www.mass.gov/mgis/wetdep.htm
John W. Flynn Memorial Ice Skating Rink	DCR GIS	
Land Stewardship Zoning	DCR GIS	
Middlesex Fells Reservation	MassGIS	http://www.mass.gov/mgis/osp.htm
Neighboring State Boundary	MassGIS	http://www.mass.gov/mgis/newnglnd.htm
NHESP BioMap2 Core Habitat	MassGIS	http://www.mass.gov/mgis/biomap2.htm
NHESP BioMap2 Critical Natural Landscape	MassGIS	http://www.mass.gov/mgis/biomap2.htm
NHESP BioMap2 Vernal Pool Core	MassGIS	http://www.mass.gov/mgis/biomap2.htm
NHESP Certified Vernal Pool	MassGIS	http://www.mass.gov/mgis/cvp.htm
NHESP Estimated Habitats of Rare Wildlife	MassGIS	http://www.mass.gov/mgis/esthab.htm
NHESP Priority Natural Communities	NHESP	
NHESP Potential Vernal Pool	MassGIS	http://www.mass.gov/mgis/pvp.htm
NHESP Priority Habitats of Rare Species	MassGIS	http://www.mass.gov/mgis/prihab.htm
NHESP Watch-listed Plants	NHESP	
Outstanding Resource Waters	MassGIS	http://www.mass.gov/mgis/orw.htm
Parking Area	DCR GIS	
Roads	MassGIS	http://www.mass.gov/mgis/eotroads.htm
Sergeant George J. Hall Memorial Pool	DCR GIS	
Soils	MassGIS	http://www.mass.gov/mgis/soi.htm
Spot Pond Brook	MassGIS	http://www.mass.gov/mgis/osp.htm
Survey Respondents, by ZIP Code	DCR GIS	
Town Boundary	MassGIS	http://www.mass.gov/mgis/townssurvey.htm
Trails	DCR GIS	
Trail-free Areas	DCR GIS	
U.S. ZIP Codes	DCR GIS	
Walter D. Stone Memorial Zoo	MassGIS	http://www.mass.gov/mgis/osp.htm
Winchester Water Supply Land	MassGIS	http://www.mass.gov/mgis/osp.htm

Appendix D. Guidelines for Protection of Vernal Pools and Associated Habitat on DCR Lands

General guidelines for vernal pool management:

- **Support vernal pool certification.** Vernal pools are one of many interesting and important natural resources that DCR seeks to protect and promote, so DCR should support public collaboration toward inventorying and certifying these resources.
- **Maintain water quality.** Every effort should be made to maintain water quality in the vernal pool. Erosion of sediments into the pool (or the dry pool basin) should be avoided. This is particularly important for pools adjacent to trails on steep slopes.
- **Close or re-route trails impacting vernal pools.** Trails that go through vernal pools should be closed or re-routed. Trails that are eroding into vernal pools should be closed or re-routed. Erosion control should be used during trail construction and maintenance near vernal pools.
- **Do not alter hydrology.** Do not drain water from, channel water too, or change the flow of water near vernal pools.
- **Maintain habitat structure within the pool.** Salamanders and frogs anchor their egg masses to branches in the water column of vernal pools. Do not remove branches from a pool and do not pile branches into a pool. The vernal pool basin or depression should be left undisturbed, as well as the margin (or boundary) of the vernal pool. Native vegetation should be encouraged and invasive plant species may be removed or controlled.
- **Maintain shading immediately surrounding the pool.** While trimming of vegetation along trails will most likely not impact a nearby vernal pool, the general amount of shading over a pool should be maintained, including both canopy trees as well as the understory (e.g., shrubs and herbaceous vegetation).
- **Maintain habitat structure in adjacent uplands.** Adult amphibians traveling to and from a pool often use rocks, logs and coarse woody debris in the vicinity of a pool as refuges during their journeys. Recently metamorphosed tadpoles and salamander larvae also use these refuges when they leave the pool for the first time. Do not remove or collect rocks, tree trunks, and large branches from the vicinity of the pool (within 50 feet). These materials may be removed from a trail corridor, but they should be left near a trail as amphibian refuges; however, do not pile debris and create a barrier to amphibian movements.
- **Monitor heavily used trails for impacts.** Trails with deep ruts (> 6 inches) within 50 feet of a vernal pool should be considered for closure or re-location away from the pool. Closed trail segments should be restored to a non-compacted and rutted state. Vernal-pool amphibians may lay eggs in the ruts, which are likely to dry out before eggs hatch or larvae develop enough to leave the water; therefore, ruts may have a negative impact on the local population of vernal pool species. In addition, some amphibian species can get "stuck" in ruts and follow them for long distances away from key habitat areas.
- **Limit pesticide use in and near vernal pools.** Use the minimum amount of chemicals necessary when using fertilizers, herbicides, or pesticides to achieve management goals and objectives.
- **Limit Off-Trail Use.** Adult amphibians are active in the uplands adjacent to vernal pools during the spring, summer, and fall, while tadpoles/larvae are developing in the vernal pool itself. Off-trail activities can impact these amphibian species. Encourage all users to behave responsibly by promoting outdoor ethics and providing information about sensitive natural resources and species.
- **Limit Night Time Use.** Direct mortality of amphibians by recreational users is a concern in general, but especially during spring migration to vernal pools and metamorph emergence in the late summer to early fall; however, both of these events typically occur on rainy nights. Limit night time activity on trails during these movements to reduce the direct mortality of migrating animals.

Guidelines for Staff and Volunteers Certifying Vernal Pools

Thank you for your interest and time in helping the DCR certify our qualified potential vernal pools. Your hard work will ultimately assist the DCR to protect, promote, and enhance our common wealth's natural, cultural, and recreational resources. These guidelines have been developed to help preserve the sensitive ecosystem you will be venturing in and around. See http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm for required state Vernal Pool (VP) certification materials and instructions.

1. You must contact the parks' supervisor or the DCR Ecology Program prior to any VP certification activity on state land. A DCR permit or specific instructions may be issued prior to the activity.
2. The vegetation surrounding a VP is sensitive and often used by the species within the pool. Please respect this area and minimize any impacts to it.
3. No Bug Spray on your hands or body parts touching the water. Perhaps the most difficult of recommendations, but important for the species utilizing the pool. Mosquito netting can be useful and layering clothing can help, but bug spray is damaging to the sensitive species using the pool.
4. If there are large pieces of trash (i.e. tires, oil drums) please take note of it, but don't remove it. These objects may be used by the species in the VP. Large trash items should be reported to the DCR for removal in the fall;
5. If you travel to different parks for similar work, please clean equipment (waders, nets) with a 10% bleach solution and allow the gear to dry to potentially reduce the spread of disease and invasive species.
6. Finding a rare species is fun and a wonderful educational experience. Some pools may contain rare species subject to illegal collection, so please be careful who you share your data with but please share this important data with the MA Natural Heritage and Endangered Species Program as well as the DCR.
7. Your hard work should not go unnoticed! Please share your data with the DCR Ecology Program to help expand our database for our planning and resource protection efforts. Even vernal pools which do not meet certification criteria are important to report to DCR. Also, please inform us with the number of volunteer hours you have provided the DCR for your efforts.

Please use the following address when submitting paperwork to the DCR:
DCR – Attention Ecology Program, 251 Causeway Street, Suite 700, Boston, MA 02114
Or email Catherine.garnett@state.ma.us

Appendix E. Select Regulations Applicable to the Middlesex Fells Planning Unit.[a]

CMR[b]	Title	Comments
105 CMR 435.000	Minimum Standards for Swimming Pools (State Sanitary Code, Chapter V)	Includes regulations for Semi-Public Pools, such as the one at the YMCA Ponkapoag Outdoor Center.
301 CMR 11.00	Massachusetts Environmental Policy Act (MEPA)	Requires the systematic review of any work or activity undertaken by an agency (e.g., the DCR); involving state permitting or financial assistance; or a transfer of state land.
302 CMR 10.00	Dam Safety	Includes information on the size and hazard classification of dams, as well as dam inspection, repair, alteration, and removal.
310 CMR 10.00	Wetlands Protection Act	Regulates many activities within 100-feet of wetlands and certified vernal pools, and within 200-feet of perennial streams and rivers.
310 CMR 22.00	Drinking Water	Includes regulations for Transient Non-community Water Systems, which provide water to 25 or more persons at least 60 days/year.
314 CMR 4.00	Massachusetts Surface Water Quality Standards	These standards "secure to the Commonwealth the benefits of the Clean Water Act." They designate the most sensitive uses for which the waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria; and contain regulations necessary to achieve designated uses and maintain water quality. These standards include the identification and regulation of Outstanding Resource Waters.
321 CMR 2.00	Miscellaneous Regulations Relating to Division of Fisheries and Wildlife	Addresses a variety of fish and wildlife issues, including scientific collecting permits and the importation, liberation, and transportation of fish, amphibians, reptiles, birds, and mammals.
321 CMR 3.00	Hunting	Regulates hunting and trapping in Massachusetts.
321 CMR 4.00	Fishing	Regulates the taking of freshwater fish in Massachusetts.
321 CMR 10.00	Massachusetts Endangered Species Act (MESA)	MESA protects rare species and their habitats by prohibiting the "Take" of any plant or animal species listed as Endangered, Threatened, or Special Concern. Activities that may alter rare species habitat (e.g., trail maintenance, vista pruning, digging archaeological test pits) are subject to regulatory review. On state-owned land, "all practicable means and measures shall be taken to resolve conflicts between the protection, conservation, and restoration of state-listed species…and other uses of such lands in favor of the listed species."
333 CMR 10.00	Certification and Licensing of Pesticide Applicators	Requires that anyone applying herbicides, insecticides, or other pesticides on non-residential property (i.e., all DCR properties) must be certified and licensed.
350 CMR 2.00	Use of Reservations and Parkways	Regulations for former MDC reservations and parkways; detailed below. An updated version of these regulations is in development.
350 CMR 3.00	Pedestrian Rules	Regulations for former MDC properties related to pedestrian compliance with traffic signals, traffic control devices, traffic pavement markings, police, and rangers. An updated version of these regulations is in development.
350 CMR 4.00	Traffic Rules	Regulations for former MDC properties related to vehicle operator's compliance with traffic signals, traffic control devices, traffic pavement markings, police, and rangers. Provides rangers the authority to have cars towed. An updated version of these regulations is in development.
350 CMR 5.00	Parking and Penalties Thereof	Regulations for former MDC properties related to parking. Specifies the amount of fines. An updated version of these regulations is in development.
521 CMR 19.00	Architectural Access Board; Recreational Facilities	Accessibility standards for rinks, pools, beaches, playgrounds, picnic areas, campsites, and other indoor and outdoor facilities. Requires that 5% of picnic facilities be accessible.

Continued on next page.

CMR[b]	Title	Comments
521 CMR 19.00	Architectural Access Board; Parking and Passenger Loading Zones	Specifies dimensional, pavement marking, and sign requirements for accessible parking spaces and passenger loading zones.
950 CMR 71.00	Protection of Properties Included in the State Register of Historic Places	Requires Massachusetts Historical Commission notification of projects undertaken, funded, or licensed by a state body.

a. A variety of state regulations apply to both the operation of state parks and the behavior of visitors to these parks. This table includes only those regulations directly related to topics addressed in the main body of this RMP.

b. The Code of Massachusetts Regulations, or CMR, "contains regulations promulgated by state agencies" (Massachusetts Trial Court Law Libraries 2010). These regulations "have the force and effect of law like statutes."

350 CMR 2.01: Government and Use of the Reservations and Parkways Under the Care and Control of the Department of Conservation and Recreation.

(1) Definition of Reservations and Parkways

Reservations and Parkways shall include all boulevards, roadways, driveways, bridges, structures, land, beaches, ponds, lakes, rivers, and other waters under the care and control of the Department of Conservation and Recreation.

(2) Rules and Regulations

(a) Entrance on and exit from reservations, parkways or waterways by vehicular traffic shall be made over designated areas only.

(b) No person is allowed on DCR Reservations except during the hours from dawn to dusk unless specified otherwise at the site or by permit. Use of parkways and bridges is not restricted.

(c) The Commission may post rules restricting recreational activity to designated areas and times.

(d) Cookouts shall be allowed only in places designated; and the use of grills, hibachis and other apparatus for cooking is permitted subject to the direction of an Authorized Police Officer or DCR Ranger. Picnics are allowed except in those areas where expressly prohibited. Open fires are prohibited except by permit from the Commissioner or his designee.

(e) Drunkenness, breach of peace, profanity, amplified sound, or disorderly conduct offensive to the general public are strictly forbidden. Possession of alcoholic beverages is forbidden, except when authority has been granted by the Commissioner in writing.

(f) No person shall willfully obstruct the free passage of vehicles or persons.

(g) No person shall cause or permit any animal owned by him or in his custody or under his control, except a dog when restrained by a leash not exceeding seven feet in length, to roam or be at large in, on, or through any reservation or parkway, or to be hitched or tied to a fence, tree, bush, shrub, or any object or structure except as otherwise provided; nor ride or drive a horse or animal not well broken and under proper control and then only on such roadways or bridle paths where authorized; nor neglect or refuse to stop, place, change, or move the position of said horse or animal as directed by an Authorized Police Officer or DCR Ranger. Owners are required to properly dispose of their dog's animal waste.

(h) The use of bicycles, and other means of transportation including in-line skating may be prohibited in areas so designated on a site by site basis.

(i) No person, except in an emergency, shall bring, land, or cause to descend within any reservation or parkway any airplane, parachute or other apparatus of aviation, except by written permit from the Commissioner or his designee.

(j) No person shall injure, deface, destroy, remove or carry off any sign, structure, facility, tree or any other property or equipment, real or personal, under the care and control of the Department of Conservation and Recreation.

(k) Parades, games, fairs, carnivals, bazaars, gifts or solicitations for raising or collecting funds shall not be permitted without written Commissioner approval.

(l) Lotteries, raffles, gambling and games of chance are prohibited; and no person shall have possession of machinery, instruments or equipment of any kind for use for these purposes on DCR property.

(m) Public assemblies of more than 25 persons shall not be allowed without a written permit from the Commissioner or his designee.

(n) No person shall engage in any business, sale, or display of goods or wares without a written permit from the Commissioner or his designee.

(o) All signs and advertising are prohibited on DCR property without a written permit from the Commissioner.

(p) No person, unless authorized by law or permit, shall have possession of or discharge any weapon, firearm, fireworks or other explosive.

(q) Hunting or trapping of animals or birds shall not be permitted unless specifically authorized by law, including the Colonial ordinance of 1641-47, or by the Commissioner. Injuring or otherwise disturbing animals or birds or their habitat is prohibited.

(r) No person shall drop, throw, or place and allow to remain any litter, garbage, or other refuse, except in the receptacles provided; nor throw a lighted match, cigarette butt or any other burning substance on the ground or in said receptacles; nor bring or cause to be brought within any reservation or parkway any garbage, refuse or material for the purpose of dumping, or depositing same within said receptacles.

(s) No person shall drop, throw or place any litter, garbage or refuse in any of the rivers or waters under the care and control of the Commission, or in any other way pollute or contribute to the pollution of such rivers or waters.

(t) No person shall refuse or neglect to obey any posted regulatory sign or the lawful directions of an Authorized Police Officer, DCR Ranger or person in charge.

(u) Public use allowed on established park trails in woodland areas. No off-trail use allowed except by permit from the Commissioner or his/her designee.

Appendix F. Select Acts of the Massachusetts Legislature Applicable to the Middlesex Fells Planning Unit.

Year	Chapter	Title	Comments
1893	407	An Act To Establish A Metropolitan Park Commission.	This act established the first regional metropolitan park commission with the power to power to acquire, maintain and make available to the inhabitants of said district open spaces for exercise and recreation.
1907	449	An Act To Authorize The Establishment Of A Zoological Garden In The Middlesex Fells Reservation.	Authorized the establishment of the Middlesex Zoo at the Fells.
1908	321	An Act Making Appropriations For The Care Of Reservations Under The Control Of The Metropolitan Park Commission.	For resurfacing roads in the Middlesex Fells reservation, a sum not exceeding ten thousand dollars.
1910	447	An Act Making Appropriations For The Care Of Reservations Under The Control Of The Metropolitan Park Commission.	For construction of sidewalks in the Middlesex Fells parkway.
1923	219	An Act To Enable The Trustees Of Public Reservations To Transfer Virginia Wood In Stoneham To The Metropolitan District Commission.	The Trustees of Reservations is authorized and empowered to transfer in fee or for care, maintenance and control to the commonwealth of Massachusetts, acting through its metropolitan district commission, a parcel of land known as Virginia Wood adjacent to the Middlesex Fells reservation
1925	324	An Act Authorizing The Metropolitan District Commission To Acquire Certain Land Of The Estate Of Samuel C Lawrence, Late Of The City Of Medford, As An Addition To The Middlesex Fells Reservation.	Authorizes the MDC to acquire Lawrence Woods.
1930	426	An Act In Addition To The General Appropriation Act Making Appropriations To Supplement Certain Items Contained Therein, And For Certain New Activities And Projects.	For the cost of reconstructing a section of boulevard in the Middlesex Fells reservation.
1938	501	An Act Relative To The Purchase Of Lands And The Construction Of Works For Improving The Distribution Of Water From The Sources Of Supply To The Metropolitan Water District And More Adequately Preventing Pollution Of The Sources Of Water Supply	For enlargement of the Middlesex Fells distributing reservoir of the district.
1946	511	An Act Providing For The Construction By The Department Of Public Health In The Middlesex Fells Reservation Of A Hospital For The Care Of Persons Suffering From Chronic Diseases.	Authorizes and directs the Department of Public Health to construct on land owned by the commonwealth in the Stoneham section of the Middlesex Fells reservation an eight hundred bed hospital for the care of persons suffering from chronic diseases.
1946	617	An Act In Addition To The General Appropriation Act Making Appropriations To Supplement Certain Items Contained Therein, And For Certain New Activities And Projects.	For the construction of a swimming pool, including suitable buildings, pumps, piping and other equipment, in the Middlesex Fells, so-called, to be assessed as part of the cost of maintenance of parks reservations.
1948	608	An Act Authorizing The Metropolitan District Commission To Construct An Additional "Water Main From The Middlesex Fells Reservoir Through The Cities And Towns Of Melrose, Saugus, Lynn And Swamp-Scott To Marblehead.	Authorizes and directs the MDC to construct an additional water main from the Middlesex Fells Reservoir.
1948	699	An Act In Addition To The General Appropriation Act Making Appropriations To Supplement Certain Items Contained Therein, And For Certain New Activities And Projects.	For reconditioning of the bridle paths, Middlesex Fells Reservation, to be assessed as part of the cost of maintenance of parks reservations.

Continued on next page.

Year	Chapter	Title	Comments
1950	503	An Act Designating The Swimming Pool In The Middlesex Fells Reservation As The Sergeant George J. Hall Memorial Pool.	Designates the name of the George J. Hall Memorial Pool.
1953	371	An Act Designating The Soap Box Derby Track In Middlesex Fells As The Frank Taylor Memorial Track.	Designates the name of the Frank Taylor Memorial Track.
1969	75	An Act designating the zoo at the Middlesex fells Reservation As The Walter D. Stone Memorial Zoo.	Designates the name of the Walter D. Stone Memorial Zoo.
1975	385	An Act Authorizing the Metropolitan District Commission to Transfer Certain Park Land in the Town of Stoneham to the Water Division of said Commission for Water Supply Purposes.	Transfers land from MDC Parks Division to Water Supply Division.
1979	786	An Act Authorizing the Metropolitan District Commission to Construct a Covered Water Storage Facility in the Town of Stoneham and Water Mains in the Towns of Stoneham, Wakefield, Winchester and the City of Woburn for the Purpose of Improving Service Pressure to said Communities.	Authorizes the construction of the Fells Reservoir covered storage tank.
1984	372	An Act Pertaining To The Metropolitan Water District And The Metropolitan Sewer District Of The Metropolitan District Commission.	Creates the Massachusetts Water Resources Authority and establishes its purpose, goals and authority.
1992	286	An Act Making Certain Corrective Changes In Certain General And Special Laws.	Establishes the Commonwealth Zoological Corporation and transfers care, custody and control of the Stone Zoo to this corporation.
2007	183	An Act relative to volunteers at state parks.	Allows non-profit organizations to “charge, solicit or receive donations or funds” at an event or activity on a state park if those funds are used “only for supporting or improving a facility or program” of the DCR. This Act also allows the DCR to enter into agreements with non-profit organizations “regarding volunteers participating in the stewardship on department property.”

Appendix G. Plants of the DCR Middlesex Fells Reservation.

The following plants have been identified on the Middlesex Fells Reservation by Hamlin et al. (2010) with corrections provided by Hamlin (2011*c*). The sequence of plants is presented alphabetically by family and scientific name. Taxonomy and common names follow United States Department of Agriculture (USDA 2009).

Family	Common Name	Scientific Name	MESA[a]	Invasive[a]
Aceraceae	Amur maple	*Acer ginnala*		
Maple Family	Boxelder	*Acer negundo*		
	Japanese maple	*Acer palmatum*		
	Striped maple	*Acer pensylvanicum*		
	Norway maple	*Acer platanoides*		I
	Red maple	*Acer rubrum*		
	Silver maple	*Acer saccharinum*		
	Sugar maple	*Acer saccharum*		
Alismataceae	American water plantain	*Alisma subcordatum*		
Water Plantain Family	Grassy arrowhead	*Sagittaria graminea*		
	Broadleaf arrowhead	*Sagittaria latifolia*		
Amaranthaceae	Purple amaranth	*Amaranthus blitum*		
Amaranth Family	Slim amaranth	*Amaranthus hybridus*		
	Powell's amaranth	*Amaranthus powellii*		
	Redroot amaranth	*Amaranthus retroflexus*		
Anacardiaceae	Winged sumac	*Rhus copallinum*		
Sumac Family	Smooth sumac	*Rhus glabra*		
	Staghorn sumac	*Rhus typhina*		
	Eastern Poison ivy	*Toxicodendron radicans*		
	Poison sumac	*Toxicodendron vernix*		
Apiaceae	Bishop's goutweed	*Aegopodium podagraria*		I
Carrot Family	Fool's parsley	*Aethusa cynapium*		
	Bulblet-bearing water hemlock	*Cicuta bulbifera*		
	Spotted water hemlock	*Cicuta maculata*		
	Queen Anne's lace	*Daucus carota*		
	American marsh pennywort	*Hydrocotyle americana*		
	Clayton's sweetroot	*Osmorhiza claytonii*		
	Maryland sanicle	*Sanicula marilandica*		
	Hemlock waterparsnip	*Sium suave*		
Apocynaceae	Spreading dogbane	*Apocynum androsae milfolium*		
Dogbane Family	Common periwinkle	*Vinca minor*		
Aquifoliaceae	American holly	*Ilex opaca*		
Holly Family	Common winterberry	*Ilex verticillata*		
Araceae	Calamus	*Acorus calamus*		
Arum Family	Jack in the pulpit	*Arisaema triphyllum* ssp. *triphyllum*		
	Water arum	*Calla palustris*		
	Green arrow arum	*Peltandra virginica*		
	Skunk cabbage	*Symplocarpus foetidus*		
Araliaceae	Japanese angelica tree	*Aralia elata*		
Ginseng Family	Bristly sarsaparilla	*Aralia hispida*		
	Wild sarsaparilla	*Aralia nudicaulis*		
	American spikenard	*Aralia racemosa*		
	Five leaf aralia	*Eleutherococcus pentaphyllus*		
	English ivy	*Hedera helix*		
	Downy swamp milkweed	*Asclepias incarnate ssp. pulchra*		

Continued on next page.

Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Arailaceae	Japanese angelica tree	*Aralia elata*		
Ginseng Family	Bristly sarsaparilla	*Aralia hispida*		
	Wild sarsaparilla	*Aralia nudicaulis*		
	American spikenard	*Aralia racemosa*		
	Ginseng	*Eleutherococcus pentaphyllus*		
	English ivy	*Hedera helix*		
Asclepiadaceae	Poke milkweed	*Asclepias exaltata*		
Milkweed Family	Fourleaf milkweed	*Asclepias quadrifolia*		
	Showy milkweed	*Asclepias speciosa*		
	Common milkweed	*Asclepias syriaca*		
	Butterfly milkweed	*Asclepias tuberosa*		
	Louise's swallow-wort	*Cynanchum louiseae*		I
Aspleniaceae Spleenwort Family	Ebony spleenwort	*Asplemium platyneuron*		
Asteraceae	Common yarrow	*Achillea millefolium*		
Aster Family	White snakeroot	*Ageratina altissima*		
	Lesser snakeroot	*Ageratina aromatica*	E	
	Annual ragweed	*Ambrosia artemisiifolia*		
	Western pearly everlasting	*Anaphalis margaritacea*		
	Woman's tobacco	*Antennaria plantaginifolia*		
	Greater burdock	*Arctium lappa*		
	Lesser burdock	*Arctium minus*		
	White sagebrush	*Artemisia ludoviciana*		
	Common wormwood	*Artemesia vulgaris*		
	Nodding beggartick	*Bidens cernua*		
	Purplestem beggarticks	*Bidens connata*		
	Small beggarticks	*Bidens discoidea*		
	Devil's beggartick	*Bidens* frondosa		
	Big devils beggartick	*Bidens vulgata*		
	Spotted knapweed	*Centaurea stoebe* ssp. *microanthos*		L
	Lesser knapweed	*Centaurea nigra*		
	Chicory	*Cichorium intybus*		
	Canada thistle	*Cirsium arvense*		
	Bull thistle	*Cirsium vulgare*		
	Canadian horseweed	*Conyza canadensis*		
	Lanceleaf tickseed	*Coreopsis lanceolata*		
	Pink topseed	*Coreopsis rosea*		
	Parasol whitetop	*Doellingeria umbellata*		
	Pale purple coneflower	*Echinacea pallida*		
	American burnweed	*Erechtites hieracifolia*		
	Eastern daisy fleabane	*Erigeron annuus*		
	Prairie fleabane	*Erigeron strigosus*		
	Coastal plain Joe Pye weed	*Eupatoriadelphus dubius*		
	Boneset	*Eupatorium perfoliatum*		
	Sweetsecneted Joe Pye weed	*Eupatorium purpureum*		
	Upland boneset	*Eupatorium sessilifolium*		
	White wood aster	*Eurybia divaricata*		
	Bigleaf aster	*Eurybia macrophylla*		
	Schreber's aster	*Eurybia schreberi*		
	Flat-top goldentop	*Euthamia graminifolia*		
	Shaggy soldier	*Galinsoga quadriradiata*		
	Low cudweed	*Gnaphalium uliginosum*		

Continued on next page.

Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Asteraceae (continued)	Common sunflower	*Helianthus annuus*		
Aster Family	Woodland sunflower	*Helianthus divaricatus*		
	Jerusalem artichoke	*Helianthus tuberosus*		
	Meadow hawkweed	*Hieracium caespitosum*		
	A hawkweed	*Hieracium xfloribundum*		
	Kalm's hawkweed	*Hieracium kalmii*		
	Common hawkweed	*Hieracium lachenalii*		
	Allegheny hawkweed	*Hieracium paniculatum*		
	Mouseear hawkweed	*Hieracium pilosella*		
	New England hawkweed	*Hieracium sabaudum*		
	Rough hawkweed	*Hieracium scabrum*		
	Rattlesnakeweed	*Hieracium venosum*		
	Flaxleaf whitetop aster	*Ionactis linariifolius*		
	Virginia dwarfdandelion	*Krigia virginica*		
	Tall blue lettuce	*Lactuca biennis*		
	Canada lettuce	*Lactuca canadensis*		
	Prickly lettuce	*Lactuca serriola*		
	Common nipplewort	*Lapsana communis*		
	Fall dandelion	*Leontodon autumnalis*		
	Oxeye daisy	*Leucanthemum vulgare*		
	Climbing hempvine	*Mikania scandens*		
	Disc mayweed	*Matricaria discoides*		
	Whorled wood aster	*Oclemena acuminata*		
	Golden ragwort	*Packera aurea*		
	Tall rattlesnakeroot	*Prenanthes altissima*		
	Gall-of-the-earth	*Prenanthes trifoliolata*		
	Cankerweed (i.e. Lion's foot)	*Prenanthes serpentaria (Nabalus serpentarius)*	E	
	Rabbit-tobacco	*Pseudognaphalium obtusifolium*		
	Blackeyed Susan	*Rudbeckia hirta var. pulcherrima*		
	Old-man-in-the-Spring	*Senecio vulgaris*		
	Toothed whitetop aster	*Sericocarpus asteroides*		
	Narrowleaf whitetop aster	*Sericocarpus linifolius*		
	Canada goldenrod	*Solidago altissima*		
	Atlantic goldenrod	*Solidago arguta*		
	White goldenrod	*Solidago bicolor*		
	Wreath goldenrod	*Solidago caesia*		
	Canada goldenrod	*Solidago canadensis*		
	Zigzag goldenrod	*Solidago flexicaulis*		
	Giant goldenrod	*Solidago gigantea*		
	Early goldenrod	*Solidago juncea*		
	Gray goldenrod	*Solidago nemoralis*		
	Anisescented goldenrod	*Solidago odora*		
	Downy goldenrod	*Solidago puberula*		
	Wrinkleleaf goldenrod	*Solidago rugosa*		
	Seaside goldenrod	*Solidago sempervirens*		
	Elmleaf goldenrod	*Solidage ulmifolia*		
	Field sowthistle	*Sonchus arvensis*		
	Spiny sowthistle	*Sonchus asper*		
	Common sowthistle	*Sonchus oleraceus*		
	Common blue wood aster	*Symphyotrichum cordifolium*		
	Rice button aster	*Symphyotrichum dumosum*		
	White heath aster	*Symphyotrichum ericoides*		
	White panicle aster	*Symphyotrichum lanceolatum*		
	Calico aster	*Symphyotrichum lateriflorum*		

Continued on next page.

Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Asteraceae (continued)	New England aster	*Symphyotrichum novae-angliae*		
Aster Family	New York aster	*Symphyotrichum novi-belgii*		
	Late purple aster	*Symphyotrichum patens*		
	Pringle's aster	*Symphyotrichum pilosum* var. *pringlei*		
	Crookedstem aster	*Symphyotrichum prenanthoides*	T	
	Purplestem aster	*Symphyotrichum puniceum*		
	Smooth white oldfield aster	*Symphyotrichum racemosum*		
	Wavyleaf aster	*Symphyotrichum undulatum*		
	Common tansy	*Tanacetum vulgare*		
	Common dandelion	*Taraxacum officinale*		
	Jack-go-to-bed-at-noon	*Tragopogon lamottei*		
	Colt's foot	*Tussilago farfara*		L
Balsaminaceae Touch-me-not Family	Jewelweed	*Impatiens capensis*		
Berberidaceae	Japanese barberry	*Berberis thunbergii*		I
Barberry Family	Common barbery	*Berberis vulgaris*		L
	Hollyleaved barberry	*Mahonia aquifolium*		
Betulaceae	European alder	*Alnus glutinosa*		
Birch Family	Speckled alder	*Alnus incana* ssp. *rugosa*		
	Hazel alder	*Alnus serrulata*		
	Yellow birch	*Betula alleghaniensis*		
	Sweet birch	*Betula lenta*		
	River birch	*Betula nigra*		
	Paper birch	*Betula papyrifera*		
	Gray birch	*Betula populifolia*		
	American hophornbeam	*Carpinus caroliniana*		
	American hazelnut	*Corylus americana*		
	Beaked hazelnut	*Corylus cornuta*		
	Hophornbeam	*Ostrya virginiana*		
Bignoniaceae	Trumpet creeper	*Campsis radicans*		
Trumpet Creeper Family	Southern catalpa	*Catalpa bignonioides*		
Blechnaceae Chain Fern Family	Virginia chainfern	*Woodwardia virginica*		
Boraginaceae	Bay forget-me-not	*Myosotis laxa*		
Borage Family	Strict forget-me-not	*Myosotis stricta*		
	Spring forget-me-not	*Myosotis verna*		
Brassicaceae	Garlic mustard	*Alliaria petiolata*		I
Mustard Family	Mouseear cress	*Arabidopsis thaliana*		
	Sicklepod	*Arabis canadensis*		
	Tower rockcress	*Arabis glabra*		
	Garden yellowrocket	*Barbarea vulgaris*		
	Hoary alyssum	*Berteroa incana*		
	Shepherd's purse	*Capsella bursa-pastoris*		
	Cutleaf toothwort	*Cardamine concatenata*		
	Sand bittercress	*Cardamine parviflora*		
	Pennsylvania bittercress	*Cardamine pensylvanica*		
	Hare's ear mustard	*Conringia orientalis*		
	Swinecress	*Coronopus didymus*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Brassicaceae (continued)	Spring draba	*Draba verna*		
Mustard Family	Dames rocket	*Hesperis matronalis*		I
	Field pepperweed	*Lepidium campestre*		
	Broadleaved pepperweed	*Lepidium latifolium*		I
	Roadside pepperweed	*Lepidium ruderale*		
	Virginia pepperweed	*Lepidium virginicum*		
	Annual honesty	*Lunaria annua*		
	Watercress	*Nasturtium officinale*		
	Wild radish	*Raphanus raphanistrum*		
	Charlock mustard	*Sinapsis arvensis*		
	Hedgemustard	*Sisymbrium officinale*		
Buxaceae Boxwood Family	Japanese pachysandra	*Pachysandra terminalis*		
Cabombaceae Water-shield Family	Watershield	*Brasenia schreberi*		
Callitrichaceae	Twoheaded water-starwort	*Callitriche heterophylla*		
Water-starwort Family	Vernal water-starwort	*Callitriche palustris*		
Campanulaceae	Rampion bellflower	*Campanula rapunculoides*		
Bellflower Family	Cardinalflower	*Lobelia cardinalis*		
	Indian tobacco	*Lobelia inflata*		
	Great blue lobelia	*Lobelia siphilitica*	E	
	Clasping Venus' looking-glass	*Triodanis perfoliata*		
Cannabaceae Hemp Family	Common hop	*Humulus lupulus*		
Caprifoliaceae	Northern bush honeysuckle	*Diervilla lonicera*		
Honeysuckle Family	Showy fly honeysuckle	*Lonicera xbella*		I
	Japanese honeysuckle	*Lonicera japonica*		I
	Morrow's honeysuckle	*Lonicera morrowii*		I
	Trumpet honeysuckle	*Lonicera sempervirens*		
	Tatarian honeysuckle	*Lonicera tatarica*		L
	Dwarf honeysuckle	*Lonicera xylosteum*		
	American black elderberry	*Sambucus nigra* ssp. *canadensis*		
	Mapleleaf viburnum	*Viburnum acerifolium*		
	Northern arrowood	*Viburnum dentatum var. lucidum*		
	Linden arrowwood	*Viburnum dilatatum*		
	Nannyberry	*Viburnum lentago*		
	Withe rod	*Viburnum nudum* var. *cassinoides*		
	European cranberrybush	*Viburnum opulus* var. *opulus*		
Caryophyllaceae	Big chickweed	*Cerastium fontanum* ssp. *vulgare*		
Pink Family	Deptford pink	*Dianthus armeria*		
	Sweetwilliam	*Dianthus barbatus*		
	Maiden pink	*Dianthus deltoides*		
	Rose campion	*Lychnis coronaria*		
	Ragged robin	*Lychnis flos-cuculi*		
	Smooth forked nailwort	*Paronychia canadensis*		
	Bouncingbet	*Saponaria officinalis*		
	German knotgrass	*Scleranthus annuus*		
	Sleepy silene	*Silene antirrhina*		
	Sweet William silene	*Silene armeria*		
	Bladder campion	*Silene latifolia* ssp. *alba*		
	Maidenstears	*Silene vulgaris*		
	Red sandspurry	*Spegularia rubra*		
	Grass-like starwort	*Stellaria graminea*		
	Common chickweed	*Stellaria media*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Celastraceae	Oriental bittersweet	*Celastrus orbiculatus*		I
Bittersweet Family	Burningbush	*Euonymus alatus*		I
	European spindletree	*Euonymus europaeus*		
	Winter creeper	*Euonymus fortunei*		
	Hamilton's spindletree	*Euonymus hamiltonianus* ssp. *maackii*		
	Scarlet euonymus[c]	*Euonymus sachalinensis*		
Chenopodiaceae	Lambsquarters	*Chenopodium album*		
Goosefoot Family	Mexican tea	*Chenopodium ambrosioides*		
	Jerusalem oak goosefoot	*Chenopodium botrys*		
	Oakleaf goosefoot	*Chenopodium glaucum*		
	Mapleleaf goosefoot	*Chenopodium simplex*		
Cistaceae	Longbranch frostweed	*Helianthemum canadense*		
Rock-rose Family	Largepod pinweed	*Lechea intermedia*		
	Hairy pinweed	*Lechea mucronata*		
	Narrowleaf pinweed	*Lechea tenuifolia*		
Clethraceae Clethra Family	Coastal sweetpepperbush	*Clethra alnifolia*		
Clusiaceae	Lesser Canadian St. Johnswort	*Hypericum canadense*		
Mangosteen Family	Orangegrass	*Hypericum gentianoides*		
	Large St. Johnswort	*Hypericum majus*		
	Dwarf St. Johnswort	*Hypericum mutilum*		
	Common St. Johnswort	*Hypericum perforatum*		
	Virginia marsh St. Johnswort	*Triadenum virginicum*		
Commelinaceae	Asiatic dayflower	*Commelina communis*		
Spiderwort Family	Virginia spiderwort	*Tradescantia virginiana*		
Convolvulaceae	Hedge false bindweed	*Calystegia sepium*		
Morning Glory Family	Field bindweed	*Convolvulus arvensis*		
Cornaceae	Alternateleaf dogwood	*Cornus alternifolia*		
Dogwood Family	Silky dogwood	*Cornus amomum*		
	Bunchberry dogwood	*Cornus canadensis*		
	Flowering dogwood	*Cornus florida*		
	Gray dogwood	*Cornus racemosa*		
	Roundleaf dogwood	*Cornus rugosa*		
	Redosier dogwood	*Cornus sericea* cultivar		
	Blackgum	*Nyssa sylvatica*		
Crassulaceae	Witch's moneybags	*Hylotelephium telephium*		
Stonecrop Family	Ditch stonecrop	*Penthorum sedoides*		
	Goldmoss stonecrop	*Sedum acre*		
	Stringy stonecrop	*Sedum sarmentosum*		
	Hen-and-chickens	*Sempervivum tectorum*		
Cucurbitaceae Cucumber Family	Wild cucumber	*Echinocystis lobata*		
Cupressaceae	Common juniper	*Juniperus communis* var. *depressa*		
Cypress Family	Eastern redcedar	*Juniperus virginiana*		
	Arborvitae	*Thuja occidentalis*	E[d]	
Cuscutaceae Dodder Family	Scaldweed	*Cuscuta gronovii*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Cyperaceae	Densetuft hairsedge	*Bulbostylis capillaris*		
Sedge Family	Whitetinge sedge	*Carex albicans* var. *albicans*		
	Emmon's sedge	*Carex albicans* var. *emmonsii*		
	Yellowfruit sedge	*Carex annectens*		
	Hay sedge	*Carex argyrantha*		
	Eastern woodland sedge	*Carex blanda*		
	Brome-like sedge	*Carex bromoides*		
	Brownish sedge	*Carex brunnescens*		
	Oval-leaf sedge	*Carex cephalophora*		
	Longhair sedge	*Carex comosa*		
	Fringed sedge	*Carex crinita*		
	White edge sedge	*Carex debilis var. rudgei*		
	Slender woodland sedge	*Carex digitalis*		
	Northern long sedge	*Carex folliculata*		
	Graceful sedge	*Carex gracillima*		
	Spreading sedge	*Carex laxiculmis* var. *laxiculmis*		
	Broad loseflower sedge	*Carex laxiflora*		
	Nerveless woodland sedge	*Carex leptonervia*		
	Blue Ridge sedge	*Carex lucorum*		
	Hop sedge	*Carex lupulina*		
	Shallow sedge	*Carex lurida*		
	Greater straw sedge	*Carex normalis*		
	Woolly sedge	*Carex pellita*		
	Pennsylvania sedge	*Carex pensylvanica*		
	Necklace sedge	*Carex projecta*		
	Eastern star sedge	*Carex radiata*		
	Reflexed sedge	*Carex retroflexa*		
	Rosy sedge	*Carex rosea*		
	Broom sedge	*Carex scoparia*		
	Weak stellate sedge	*Carex seorsa*		
	Awlfruit sedge	*Carex stipata*		
	Eastern straw sedge	*Carex straminea*		
	Upright sedge	*Carex stricta*		
	Swan's sedge	*Carex swanii*		
	Parasol sedge	*Carex umbellata*		
	Northwest Territory sedge	*Carex utriculata*		
	Velvet sedge	*Carex vestita*		
	Ribbed sedge	*Carex virescens*		
	Fox sedge	*Carex vulpinoidea*		
	Great Plains flatsedge	*Cyperus lupulinus* ssp. *macilentus*		
	Yellow nutsedge	*Cyperus esculentus* var. *leptostachyus*		
	Strawcolored flatsedge	*Cyperus strigosus*		
	Threeway sedge	*Dulichium arundinaceum*		
	Needle spikerush	*Eleocharis acicularis*		
	Blunt spikerush	*Eleocharis obtusa*		
	Bright green spikerush	*Eleocharis olivacea* var. *olivacea*		
	Common spikerush	*Eleocharis palustris*		
	Slender fimbry	*Fimbristylis autumnalis*		
	Brownish beaksedge	*Rhynchospora capitellata*		
	Common threesquare	*Schoenoplectus pungens* var. *pungens*		
	Softstem bulrush	*Schoenoplectus tabernaemontani*		
	Green bulrush	*Scirpus atrovirens*		
	Woolgrass	*Scirpus cyperinus*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Dennstaedtiaceae	Eastern hayscented fern	*Dennstaedtia punctilobula*		
Bracken Fern Family	Brackenfern	*Pteridium aquilinum*		
Droseraceae Sundew Family	Roundleaf sundew	*Drosera rotundifolia*		
Dryopteridaceae Wood Fern Family	Subarctic ladyfern	*Athyrium filix-femina* ssp. *angustum*		
	A woodfern	*Dryopteris* x*boottii*		
	Spinulose woodfern	*Dryopteris carthusiana*		
	Clinton's woodfern	*Dryopteris clintoniana*		
	Crested woodfern	*Dryopteris cristata*		
	Intermediate woodfern	*Dryopteris intermedia*		
	Marginal woodfern	*Dryopteris marginalis*		
	Slosson's woodfern	*Dryopteris xslossoniae*		
	A woodfern	*Dryopteris xtriploidea*		
	Sensitive fern	*Onoclea sensibilis*		
	Christmas fern	*Polystichum acrostichoides*		
Elatinaceae Waterwort Family	Small waterwort	*Elatine minima*		
Equisetaceae	Field horsetail	*Equisetum arvense*		
Horsetail Family	Scouringrush horsetail	*Equisetum hyemale* var. *affine*		
Ericaceae	Bearberry	*Arctostaphylos uva-ursi*		
Heath Family	Leatherleaf	*Chamaedaphne calyculata*		
	Swamp doghobble	*Eubotrys racemosa*		
	Eastern teaberry	*Gaultheria procumbens*		
	Black huckleberry	*Gaylussacia baccata*		
	Blue huckleberry	*Gaylussacia frondosa*		
	Sheep laurel	*Kalmia angustifolia*		
	Mountain laurel	*Kalmia latifolia*		
	Highland doghobble	*Leucothoe fontanesiana*		
	Maleberry	*Lyonia lingustrina*		
	Swamp azalea	*Rhododendron viscosum*		
	Lowbush blueberry	*Vaccinium angustifolium*		
	Highbush blueberry	*Vaccinium corymbosum*		
	Blue Ridge blueberry	*Vaccinium pallidum*		
Euphorbiaceae	Slender threeseed mercury	*Acalypha gracilens*		
Spurge Family	Common threeseed mercury	*Acalypha rhomboidea*		
	Spotted sandmat	*Chamaesyce maculata*		
	Cypress spurge	*Euphorbia cyparissias*		L
	Leafy spurge	*Euphorbia esula*		I
Fabaceae	Silk tree[c]	*Acacia julibrissima*		
Pea Family	Desert false indigo	*Amorpha fruticosa*		
	American hogpeanut	*Amphicarpaea bracteata*		
	Groundnut	*Apios americana*		
	Horseflyweed	*Baptisia tinctoria*		
	Kentucky yellowwood	*Cladrastis kentukea*		
	Showy ticktrefoil	*Desmodium canadense*		
	Largebract ticktrefoil	*Desmodium cuspidatum*	T	
	Pointedleaf ticktrefoil	*Desmodium glutinosum*		
	Eastern trailing ticktrefoil	*Desmodium humifusum*		
	Nakedflower ticktrefoil	*Desmodium nudiflorum*		
	Stiff ticktrefoil	*Desmodium obtusum*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Fabaceae (continued)	Panicledleaf ticktrefoil	*Desmodium paniculatum*		
Pea Family	Perplexed ticktrefoil	*Desmodium perplexum*		
	Prostrate ticktrefoil	*Desmodium rotundifolium*		
	Dyer's greenweed	*Genista tinctoria*		
	Honeylocust	*Gleditsia triacanthos*		
	Golden chain tree	*Laburnum anagyroides*		
	Perennial pea	*Lathyrus latifolius*		
	Roundheaded lespedeza	*Lespedeza capitata*		
	Hairy lespedeza	*Lespedeza hirta*		
	Shrubby lespedeza	*Lespedeza frutescens*		
	Trailing lespedeza	*Lespedeza procumbens*		
	Violet lespedeza	*Lespedeza violacea*		
	Slender lespedeza	*Lespedeza virginica*		
	Bird's-foot trefoil	*Lotus corniculatus*		
	Lupine	*Lupinus* sp.		
	Black medick	*Medicago lupulina*		
	Alfalfa	*Medicago sativa* ssp. *sativa*		
	White sweetclover	*Melilotus albus*		
	Yellow sweetclover	*Melilotus officinalis*		
	Bristly locust	*Robinia hispida*		
	Black locust	*Robinia pseudoacacia*		I
	Crownvetch	*Securigera varia*		
	Rabbitfoot clover	*Trifolium arvense*		
	Golden clover	*Trifolium aureum*		
	Field clover	*Trifolium campestre*		
	Suckling clover	*Trifolium dubium*		
	Alsike clover	*Trifolium hybridum*		
	Red clover	*Trifolium pratense*		
	White clover	*Trifolium repens*		
	Bird vetch	*Vicia cracca*		
	Lentil vetch	*Vicia tetrasperma*		
	Chinese wisteria	*Wisteria sinensis*		
Fagaceae	American chestnut	*Castanea dentata*		
Beech Family	American beech	*Fagus grandifolia*		
	European beech	*Fagus sylvatica*		
	White oak	*Quercus alba*		
	Swamp white oak	*Quercus bicolor*		
	Scarlet oak	*Quercus coccinea*		
	Bear oak	*Quercus ilicifolia*		
	Pin oak	*Quercus palustris*		
	Chestnut oak	*Quercus prinus*		
	Northern red oak	*Quercus rubra*		
	An oak	*Quercus xsaulii*		
	Black oak	*Quercus velutina*		
Fumariaceae Fumitory Family	Rock harlequin	*Corydalis sempervirens*		
Gentianaceae Gentian Family	Yellow screwstem	*Bartonia virginica*		
Geraniaceae	Bicknell's geranium	*Geranium bicknellii*		
Geranium Family	Carolina geranium	*Geranium carolinianum*		
	Spotted geranium	*Geranium maculatum*		
	Robert geranium	*Geranium robertianum*		
Grossulariaceae	Hairystem gooseberry	*Ribes hirtellum*		
Currant Family	European black currant	*Ribes nigrum*		
	Cultivated currant	*Ribes rubrum*		

Continued on next page.

Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Haloragaceae	Twoleaf watermilfoil	*Myriophyllum heterophyllum*		I
Water Milfoil Family	Low watermilfoil	*Myriophyllum humile*		
	Marsh mermaidweed	*Proserpinaca palustris*		
Hamamelidaceae Witch-hazel Family	American witchhazel	*Hamamelis virginiana*		
Hippocastanaceae Horse-chestnut Family	Horse chestnut	*Aesculus hippocastanum*		
Hydrangeaceae Hydrangea Family	Panicled hydrangea	*Hydrangea paniculata*		
	Sweet mock orange	*Philadelphus coronarius*		
	Mock orange	*Philadelphus xvirginalis*		
Hydrocharitaceae Tape-grass Family	Canadian waterweed	*Elodea canadensis*		
Iridaceae	Harlequin blueflag	*Iris versicolor*		
Iris Family	Paleyellow iris	*Iris pseudacorus*		I
	Strict blue-eyed grass	*Sisyrinchium montanum*		
Isoetaceae Quillwort Family	Spiny-spore quillwort	*Isoetes tenella*		
Juglandaceae	Mockernut hickory	*Carya alba*		
Walnut Family	Bitternut hickory	*Carya cordiformis*		
	Pignut hickory	*Carya glabra*		
	Shagbark hickory	*Carya ovata*		
Juncaceae	Tapertip rush	*Juncus acuminatus*		
Rush Family	Toad rush	*Juncus bufonius*		
	Canadian rush	*Juncus canadensis*		
	Common rush	*Juncus effusus*		
	Greene's rush	*Juncus greenei*		
	Grassleaf rush	*Juncus marginatus*		
	Brownfruit rush	*Juncus pelocarpus*		
	Woodland rush	*Juncus subcaudatus*		
	Poverty rush	*Juncus tenuis*		
	Common woodrush	*Luzula multiflora*		
Lamiaceae	Common bugle	*Ajuga reptans*		
Mint Family	Splitlip hempnettle	*Galeopsos bifida*		
	Ground ivy	*Glechoma hederacea*		
	American false pennyroyal	*Hedeoma pulegioides*		
	Yellow archangel	*Lamiastrum galeobdolon*		
	Purple deadnettle	*Lamium purpureum*		
	Common motherwort	*Leonurus cardiaca*		
	American water horehound	*Lycopus americanus*		
	Northern bugleweed	*Lycopus uniflorus*		
	Virginia water horehound	*Lycopus virginicus*		
	Wild mint	*Mentha arvensis*		
	Peppermint	*Mentha xpiperita*		
	Wild bergamot	*Monarda fistulosa*		
	Catnip	*Nepeta cataria*		
	Oregano	*Origanum vulgare*		
	Common selfheal	*Prunella vulgaris*		
	Hoary mountainmint	*Pycnanthemum incanum*		
	Torrey's mountainmint	*Pycnanthemum torrei*		
	Blue skullcap	*Scutellaria lateriflora*		
	Lemon thyme	*Thymus pulegioides*		
	Forked blue curls	*Trichostema dichotomum*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Lauraceae	Northern spicebush	*Lindera benzoin*		
Laurel Family	Sassafras	*Sassafras albidum*		
Lemnaceae	Common duckweed	*Lemna minor*		
Duckweed Family	Brazilian watermeal	*Wolffia brasiliensis*		
Lentibulariaceae	Humped bladderwort	*Utricularia gibba*		
Bladderwort Family	Common bladderwort	*Utricularia macrorhiza*		
	Little floating bladderwort	*Utricularia radiata*		
Liliaceae	Meadow garlic	*Allium canadense*		
Lily Family	Wild garlic	*Allium vineale*		
	Glory-of-the-snow	*Chionodoxa forbesii*		
	European lily-of-the-valley	*Convallaria majalis*		
	Dogtooth violet	*Erythronium americanum*		
	Snowdrop	*Galanthus nivalis*		
	Orange daylily	*Hemerocallis fulva*		
	Plantain lily	*Hosta* sp.		
	Common goldstar	*Hypoxis hirsuta*		
	Canada lily	*Lilium canadense*		
	Canada mayflower	*Maianthemum canadense*		
	Feathery false lily of the valley	*Maianthemum racemosum*		
	Indian cucumber	*Medeola virginiana*		
	Common grape hyacinth	*Muscari botryoides*		
	Daffodil	*Narcissus pseudonarcissus*		
	Sleepydick	*Ornithogalum umbellatum*		
	Hairy Solomon's seal	*Polygonatum pubescens*		
	Siberian squill	*Scilla siberica*		
	Whip-poor-will flower	*Trillium cernuum*		
	White trillium	*Trillium grandiflorum*		
	Sessileleaf bellwort	*Uvularia sessilifolia*		
	Green false hellebore	*Veratrum viride*		
Linaceae Flax Family	Blue Flax	*Linum perenne*		
Lycopodiaceae	Shining clubmoss	*Huperzia lucidula*		
Club-moss Family	Fan clubmoss	*Lycopodium digitatum*		
	Pennsylvania clubmoss	*Lycopodium hickeyi*		
	Rare clubmoss	*Lycopodium obscurum*		
Lythraceae	Swamp loosestrife	*Decodon verticillatus*		
Loosestrife Family	Purple loosestrife	*Lythrum salicaria*		I
Malvaceae Mallow Family	Common mallow	*Malva neglecta*		
Melastomataceae Melastome Family	Handsome Harry	*Rhexia virginica*		
Menyanthaceae Buckbean Family	Little floatingheart	*Nymphoides cordata*		
Molluginaceae Carpet-weed Family	Green carpetweed	*Mullugo verticillata*		
Monotropaceae	Pinesap	*Monotropa hypopithys*		
Indian Pipe Family	Indianpipe	*Monotropa uniflora*		
Moraceae Mulberry Family	White mulbery	*Morus alba*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Myricaceae	Sweet fern	*Comptonia peregrina*		
Bayberry Family	Northern bayberry	*Morella pensylvanica*		
Najadaceae Water-nymph Family	Nodding waternymph	*Najas flexilis*		
Nymphaeaceae	Variegated yellow pond-lily	*Nuphar lutea* ssp. *variegata*		
Water-lily Family	American white waterlily	*Nymphaea odorata*		
Oleaceae	Weeping forsythia	*Forsythia suspensa*		
Olive Family	White ash	*Fraxinus americana*		
	Black ash	*Fraxinus nigra*		
	Green ash	*Fraxinus pennsylvanica*		
	Border privet	*Ligustrum obtusifolium*		L
	European privet	*Ligustrum vulgare*		
	Common lilac	*Syringa vulgaris*		
Onagraceae	Broadleaf enchanter's nightshade	*Circaea lutetiana* ssp. *canadensis*		
Evening Primrose Family	Fringed willowherb	*Epilobium ciliatum*		
	Purpleleaf willowherb	*Epilobium coloratum*		
	Codlins and cream	*Epilobium hirsutum*		L
	Marsh seedbox	*Ludwigia palustris*		
	Common evening primrose	*Oenothera biennis*		
Ophioglossaceae Adder's Tongue Family	Rattlesnake fern	*Botrychium virginianum*		
Orchidaceae	Yellow coralroot	*Corallorhiza trifida*		
Orchid Family	Moccasin flower	*Cypripedium acaule*		
	Broadleaf helleborine	*Epipactis helleborine*		
	Green fringed orchid	*Platanthera lacera*		
	Lesser purple fringed orchid	*Platanthera psycodes*		
	Nodding lady's tresses	*Spiranthes cernua*		
Orobanchaceae	American cancer root	*Conopholis americana*		
Broom-rape Family	Beechdrops	*Epifagus virginiana*		
	Oneflowered broomrape	*Orobanche uniflora*		
Osmundaceae	Cinnamon fern	*Osmunda cinnamomea*		
Royal Fern Family	Interrupted fern	*Osmunda claytoniana*		
	Royal fern	*Osmunda regalis var. spectabilis*		
Oxalidaceae Wood-sorrel Family	Common yellow oxalis	*Oxalis stricta*		
Papaveraceae	Celandine	*Chelidonium majus*		
Poppy Family	Bloodroot	*Sanguinaria canadensis*		
Phytolaccaceae Pokeweed Family	American pokeweed	*Phytolacca americana*		
Pinaceae	Balsam fir	*Abies balsamea*		
Pine Family	European larch	*Larix decidua*		
	Norway spruce	*Picea abies*		
	White spruce	*Picea glauca*		
	Blue spruce	*Picea pungens*		
	Austrian pine	*Pinus nigra*		
	Red pine	*Pinus resinosa*		
	Pitch pine	*Pinus rigida*		
	Eastern white pine	*Pinus strobus*		
	Scots pine	*Pinus sylvestris*		
	Douglas fir	*Pseudotsuga menziesii*		
	Eastern hemlock	*Tsuga canadensis*		

Continued on next page.

Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Plantiginaceae Plantain Family	Largebracted plantain	*Plantago aristata*		
	Narrowleaf plantain	*Plantago lanceolata*		
	Common plantain	*Plantago major*		
	Blackseed plantain	*Plantago rugellii*		
Platanaceae Plane-tree Family	American sycamore	*Platanus occidentalis*		
Poaceae Grass Family	Redtop	*Agrostis gigantea*		
	Upland bentgrass	*Agrostis perennans*		
	Rough bentgrass	*Agrostis scabra*		
	Creeping bentgrass	*Agrostis stolonifera*		
	Broomsedge bluestem	*Andropogon virginicus*		
	Sweet vernalgrass	*Anthoxanthum odoratum*		
	Churchmouse threeawn	*Aristida dichotoma*		
	Tall oatgrass	*Arrhenatherum elatius*		
	Northern shorthusk	*Brachyelytrum aristosum*		
	Fringed brome	*Bromus ciliatus*		
	Hairy woodland brome	*Bromus pubescens*		
	Cheatgrass	*Bromus tectorum*		
	Bluejoint	*Calamagrostis canadensis*		
	Arctic reedgrass	*Calamagrostis coarctata*		
	Feathertop	*Calamagrostis epigeios*		
	Sweet woodreed	*Cinna arundinacea*		
	Orchardgrass	*Dactylis glomerata*		
	Flattened oatgrass	*Danthonia compressa*		
	Poverty oatgrass	*Danthonia spicata*		
	Wavy hairgrass	*Deschampsia flexuosa*		
	Western panicgrass	*Dicanthelium acuminatum* var. *fasciculatum*		
	Deertongue	*Dichanthelium clandestinum*		
	Variable panicgrass	*Dichanthelium commutatum*		
	Starved panicgrass	*Dichanthelium depauperatum*		
	Cypress panicgrass	*Dichanthelium dichotomum*		
	Broadleaf rosette grass	*Dichanthelium latifolium*		
	Slimleaf panicgrass	*Dichanthelium linearifolium*		
	Scribner's rosette grass	*Dicanthelium oligosanthes* ssp. *scribnerianum*		
	Rounded panicgrass	*Dichanthelium sphaerocarpon*		
	Hairy crabgrass	*Digitaria sanguinalis*		
	Barnyardgrass	*Echinochloa crus-galli*		
	Rough barnyardgrass	*Echinochloa muricata* var. *muricata*		
	Eastern bottlebrush grass	*Elymus hystrix*		
	Quackgrass	*Elymus repens*		
	Lace grass	*Eragrosits capillaris*		
	Indian lovegrass	*Eragrostis pilosa*		
	Purple lovegrass	*Eragrostis spectabilis*		
	Fineleaf sheep fescue	*Festuca filiformis*		L
	Sheep fescue	*Festuca ovina*		
	Red fescue	*Festuca rubra*		
	Creeping mannagrass	*Glyceria acutiflora*		
	Rattlesnake mannagrass	*Glyceria canadensis*		
	American mannagrass	*Glyceria grandis*		
	Fowl mannagrass	*Glyceria striata*		
	Common velvetgrass	*Holcus lanatus*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Poaceae	Rice cutgrass	*Leersia oryzoides*		
Grass Family	Whitegrass	*Leersia virginica*		
	Perennial ryegrass	*Lolium perenne*		
	Wirestem muhly	*Muhlenbergia frondosa*		
	Nimblewill	*Muhlenbergia schreberi*		
	Rock muhly	*Muhlenbergia sobolifera*		
	Witchgrass	*Panicum capillare*		
	Fall panicgrass	*Panicum dichotomiflorum*		
	Redtop panicgrass	*Panicum rigidulum*		
	Thin paspalum	*Paspalum setaceum*		
	Reed canarygrass	*Phalaris arundinacea*		I
	Timothy	*Phleum pratense*		
	Common reed	*Phragmites australis*		I
	Sweetshoot bamboo	*Phyllostachys dulcis*		
	Blackseed speargrass	*Piptochaetium avenaceum*		
	Annual bluegrass	*Poa annua*		
	Canada bluegrass	*Poa compressa*		
	Wood bluegrass	*Poa nemoralis*		
	Fowl bluegrass	*Poa palustris*		
	Kentucky bluegrass	*Poa pratensis*		
	Kentucky bluegrass	*Poa pratensis* ssp. *pratensis*		
	Meadow fescue	*Schedonorus pratensis*		
	Little bluestem	*Schizachyrium scoparium*		
	Japanese bristlegrass	*Setaria faberi*		
	Yellow foxtail	*Setaria pumila*		
	Green bristlegrass	*Setaria viridis*		
	Pale false mannagrass	*Torreyochloa pallida* var. *pallida*		
	Purpletop tridens	*Tridens flavus*		
	Rat-tail fescue	*Vulpia myuros*		
Polygalaceae	Racemed milkwort	*Polygala polygama*		
Milkwort Family	Purple milkwort	*Polygala sanguinea*		
Polygonaceae Buckwheat Family	Longroot smartweed	*Polygonum amphibium* var. *emersum*		
	Halberdleaf tearthumb	*Polygonum arifolium*		
	Prostrate knotweed	*Polygonum aviculare*		
	Carey's smartweed	*Polygonum careyi*		
	Oriental lady's thumb	*Polygonum cespitosum* var. *longisetum*		
	Black bindweed	*Polygonum convolvulus* var. *convolvulus*		
	Japanese knotweed	*Polygonum cuspidatum*		I
	Marshpepper knotweed	*Polygonum hydropiper*		
	Swamp smartweed	*Polygonum hydropiperoides*		
	Curlytop knotweed	*Polygonum lapathifolium*		
	Pennsylvania smartweed	*Polygonum pensylvanicum*		
	Spotted lady's thumb	*Polygonum persicaria*		
	Dotted smartweed	*Polygonum punctatum* var. *punctatum*		
	Arrowleaf tearthumb	*Polygonum sagittatum*		
	Climbing false buckwheat	*Polygonum scandens* var. *scandens*		
	Pleatleaf knotweed	*Polygonum tenue*		
	Jumpseed	*Polygonum virginianum*		
	Common sheep sorrel	*Rumex acetosella*		
	Curly dock	*Rumex crispus*		
	Bitter dock	*Rumex obtusifolius*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Polypodiaceae	Appalachian polypody	*Polypodium appalachianum*		
Polypody Family	**A polypody**	*Polypodium xincognitum*		
	Rock polypody	*Polypodium virginianum*		
Pontederiaceae	Pickerelweed	*Pontederia cordata*		
Water-Hyacinth Family				
Portulacaceae	Little hogweed	*Portulaca oleracea*		
Purslane Family				
Potamogetonaceae	Largeleaf pondweed	*Potamogeton amplifolius*		
Pondweed Family	Hairlike pondweed	*Potamogeton bicupulatus*		
	Curly pondweed	*Potamogeton crispus*		I
	Ribbonleaf pondweed	*Potamogeton epihydrus*		
	Leafy pondweed	*Potamogeton foliosus*		
	Floating pondweed	*Potamogeton natans*		
	Claspingleaf pondweed	*Potamogeton perfoliatus*		
	Spotted pondweed	*Potamogeton pulcher*		
	Small pondweed	*Potamogeton pusillus*		
	Sago Pondweed	*Stuckenia pectinata*		
Primulaceae	American featherfoil	*Hottonia inflata*		
Primrose Family	Fringed loosestrife	*Lysimachia ciliata*		
	Creeping Jenny	*Lysimachia nummularia*		I
	Whorled yellow loosestrife	*Lysimachia quadrifolia*		
	Earth loosestrife	*Lysimachia terrestris*		
	Tufted loosestrife	*Lysimachia thyrsiflora*		
	Starflower	*Trientalis borealis*		
Pyrolaceae	Striped prince's pine	*Chimaphila maculata*		
Shinleaf Family	Pipsissewa	*Chimaphila umbellata* ssp. *cisatlantica*		
	American wintergreen	*Pyrola americana*		
	Waxflower shinleaf	*Pyrola elliptica*		
Ranunculaceae	White baneberry	*Actaea pachypoda*		
Buttercup Family	Wood anemone	*Anemone quinquefolia*		
	Tall thimbleweed	*Anemone virginiana*		
	Red columbine	*Aquilegia canadensis*		
	Yellow marsh marigold	*Caltha palustris*		
	Devil's darning needles	*Clematis virginiana*		
	Threeleaf goldthread	*Coptis trifolia*		
	Roundlobe hepatica	*Hepatica nobilis* var. *obtusa*		
	Tall buttercup	*Ranunculus acris*		
	Allegheny Mountain buttercup	*Ranunculus allegheniensis*		
	Littleleaf buttercup	*Ranunculus abortivus*		
	St. Anthony's turnip	*Ranunculus bulbosus*		
	Early buttercup	*Ranunculus fascicularis*		
	Fig buttercup	*Ranunculus ficaria*		I
	Yellow water buttercup	*Ranunculus flabellaris*		
	Blisterwort	*Ranunculus recurvatus*		
	Creeping buttercup	*Ranunculus repens*		L
	Cursed buttercup	*Ranunculus sceleratus*		
	Early meadow-rue	*Thalictrum dioicum*		
	King of the meadow	*Thalictrum pubescens*		
	Waxyleaf meadow-rue	*Thalictrum revolutum*		
	Rue anemone	*Thalictrum thalictroides*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Rhamnaceae	New Jersey tea	*Ceanothus americanus*		
Buckthorn Family	Glossy buckthorn	*Frangula alnus*		I[e]
	Common buckthorn	*Rhamnus cathartica*		I
Rosaceae	Tall hair agrimony	*Agrimonia gryposepala*		
Rose Family	Canadian serviceberry	*Amelanchier canadensis*		
	A serviceberry	*Amelanchier xintermedia*		
	Running serviceberry	*Amelanchier stolonifera*		
	Keep's hawthorn[c]	*Crataegus keepii*		
	Oneseed hawthorn	*Crataegus monogyna*		
	Fleshy hawthorn	*Craetagus succulenta*		
	Virginia strawberry	*Fragaria virginiana*		
	White avens	*Geum canadense*		
	Japanese rose	*Keria japonica*		
	Japanese flowering crabapple	*Malus floribunda*		
	Siberian crab apple	*Malus baccata*		
	Paradise apple	*Malus pumila*		
	Toringo crab	*Malus toringo*		
	Red chokeberry	*Photnia pyrifolia*		
	Purple chokeberry	*Photinia floribunda*		
	Black chokeberry	*Photinia melanocarpa*		
	Silver cinquefoil	*Potentilla argentea*		
	Dwarf cinquefoil	*Potentilla canadensis*		
	Norwegian cinquefoil	*Potentilla norvegica*		
	Sulphur cinquefoil	*Potentilla recta*		
	Common cinquefoil	*Potentilla simplex*		
	Sweet cherry	*Prunus avium*		
	Pin cherry	*Prunus pensylvanica*		
	Black cherry	*Prunus serotina*		
	Chokecherry	*Prunus virginiana*		
	Common pear	*Pyrus communis*		
	Jetbead	*Rhodotypos scandens*		
	Multiflora rose	*Rosa multiflora*		I
	Swamp rose	*Rosa palustris*		
	Rugosa rose	*Rosa rugosa*		
	Virginia rose	*Rosa virginiana*		
	Allegheny blackberry	*Rubus allegheniensis*		
	Northern dewberry	*Rubus flagellaris*		
	Bristly dewberry	*Rubus hispidus*		
	Gray red raspberry	*Rubus idaeus* ssp. *strigosus*		
	Black raspberry	*Rubus occidentalis*		
	Pennsylvania blackberry	*Rubus pensilvanicus*		
	Wine blackberry	*Rubus phoenicolasius*		L
	Dwarf red blackberry	*Rubus pubescens*		
	Setose blackberry	*Rubus setosus*		
	European mountain ash	*Sorbus aucuparia*		
	White meadowsweet	*Spiraea alba* var. *latifolia*		
	Japanese meadowsweet	*Spiraea japonica*		
	Steeplebush	*Spiraea tomentosa*		

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Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Rubiaceae	Common buttonbush	*Cephalanthus occidentalis*		
Madder Family	Stickywilly	*Galium aparine*		
	Rough bedstraw	*Galium asprellum*		
	Licorice bedstraw	*Galium circaezans*		
	Lanceleaf wild licorice	*Galium lanceolatum*		
	False baby's breath	*Galium mollugo*		
	Common marsh bedstraw	*Galium palustre*		
	Stiff marsh bedstraw	*Galium tinctorium*		
	Threepetal bedstraw	*Galium trifidum*		
	Fragrant bedstraw	*Galium triflorum*		
	Azure bluets	*Houstonia caerulea*		
	Partridgeberry	*Mitchella repens*		
Salicaceae	Eastern cottonwood	*Populus deltoides*		
Willow Family	Bigtooth aspen	*Populus grandidentata*		
	Quaking aspen	*Populus tremuloides*		
	Large gray willow	*Salix atrocinerea*		
	Pussy willow	*Salix discolor*		
	Missouri River willow	*Salix eriocephala*		
	Crack willow	*Salix fragilis*		
	Prairie willow	*Salix humilis*		
	Prairie willow	*Salix humilis* var. *tristis*		
	Black willow	*Salix nigra*		
	Meadow willow	*Salix petiolaris*		
	Silky willow	*Salix sericea*		
Santalaceae Sandalwood Family	Bastard toadflax	*Comandra umbellata*		
Saxifragaceae	American golden saxifrage	*Chrysosplenium americanum*		
Saxifrage Family	Early saxifrage	*Saxifrage virginiensis* var. *virginiensis*		
Scrophulariaceae	Smallflower false foxglove	*Agalinis paupercula*		
Figwort Family	Slenderleaf false foxglove	*Agalinis tenuifolia*		
	Smooth yellow false foxglove	*Aureolaria flava*		
	Fernleaf yellow false foxglove	*Aureolaria pedicularia*		
	Downy yellow false foxglove	*Aureolaria virginica*		
	White turtlehead	*Chelone glabra*		
	Golden hedgehyssop	*Gratiola aurea*		
	Butter and eggs	*Linaria vulgaris*		
	Yellowseed false pimpernel	*Lindernia dubia*		
	Yellowseed false pimpernel	*Lindernia dubia* var. *anagallidea*		
	Allegheny monkeyflower	*Mimulus ringens*		
	Narrowleaf cowwheat	*Melampyrum lineare*		
	Canada toadflax	*Nuttallanthus canadensis*		
	Canadian lousewort	*Pedicularis canadensis*		
	Talus slope penstemon	*Penstemon digitalis*		
	Lanceleaf figwort	*Scrophularia lanceolata*		
	Carpenter's square	*Scrophularia marilandica*		
	Moth mullein	*Verbascum blattaria*		
	Common mullein	*Verbascum thapsus*		
	Corn speedwell	*Veronica arvensis*		
	Common gypsyweed	*Veronica officinalis*		
	Neckweed	*Veronica peregrina*		
	Skullcap speedwell	*Veronica scutellata*		
	Thymeleaf speedwell	*Veronica serpyllifolia*		
	Culver's root	*Veronicastrum virginicum*	T	

Continued on next page.

Plants of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Invasive[b]
Selaginellaceae Spike-moss Family	Meadow spikemoss	*Selaginella apoda*		
	Northern selaginella	*Selaginella rupestris*		
Simaroubaceae Quassia Family	Tree of Heaven	*Ailanthus altissima*		I
Smilacaceae Catbrier Family	Smooth carrionflower	*Smilax herbacea*		
	Roundleaf greenbrier	*Smilax rotundifolia*		
	Flowering tobacco	*Nicotiana sp.*		
Solanaceae Potato Family	Clammy groundcherry	*Physalis heterophylla*		
	Carolina horsenettle	*Solanum carolinense*		
	Climbing nightshade	*Solanum dulcamara*		
	West Indian nightshade	*Solanum ptycanthum*		
Sparganiaceae Bur-reed Family	American bur-reed	*Sparganium americanum*		
Styracaceae Storax Family	Carolina silverbell	*Halesia carolina*		
Taxaceae Yew Family	Canada yew	*Taxus canadensis*		
	Japanese yew	*Taxus cuspidata*		
Thelypteridaceae Marsh Fern Family	New York fern	*Thelypteris noveboracensis*		
	Eastern marsh fern	*Thelypteris palustris* var. *pubescens*		
	Bog fern	*Thelypteris simulata*		
Tiliaceae Linden Family	American basswood	*Tilia americana*		
Typhaceae Cat-tail Family	Narrowleaf cattail	*Typha angustifolia*		
	Broadleaf cattail	*Typha latifolia*		
Ulmaceae Elm Family	Common hackberry	*Celtis occidentalis*		
	American elm	*Ulmus americana*		
	English elm	*Ulmus procera*		
	Wych elm	*Ulmus glabra*		
Utricaceae Nettle Family	Smallspike false nettle	*Boehmeria cylindrica*		
	Canadian clearweed	*Pilea pumila*		
	Stinging nettle	*Urtica dioica* ssp. *dioica*		
	California nettle	*Urtica dioica* ssp. *gracilis*		
Verbenaceae Verbena Family	Bigbract verbena	*Verbena bracteata*		
	Swamp verbena	*Verbena hastata* var. *hastata*		
	White vervain	*Verbena urticifolia*		
Violaceae Violet Family	Marsh blue violet	*Viola cucullata*		
	Bog white violet	*Viola lanceolata*		
	Small white violet	*Viola macloskeyi* ssp. *pallens*		
	Birdfoot violet	*Viola pedata*		
	Arrowleaf violet	*Viola sagittata* var. *ovata*		
	Common blue violet	*Viola sororia*		
	Amur peppervine	*Ampelopsis brevipedunculata*		L
Vitaceae Grape Family	Virginia creeper	*Parthenocissus quinquefolia*		
	Summer grape	*Vitis aestivalis*		
	Fox grape	*Vitis labrusca*		
	River-bank grape	*Vitis riparia*		

a. Status of plants listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.
b. These species have been evaluated by the Massachusetts Invasive Plant Advisory Group (MIPAG 2005) and determined to be invasive (I) or likely invasive (L).
c. This scientific name of this species is not included in the PLANTS database (USDA 2010); the scientific name in this table is presented as listed in the original document.
d. The native form of this plant, which is known only from Berkshire County, is state-endangered in Massachusetts. Most arborvitae, such those recorded on the Blue Hills Reservation, are escaped cultivated varieties and are not state-listed.

Appendix H. Birds of the DCR Middlesex Fells Reservation.

This list includes species observed on the DCR Middlesex Fells Reservation. Family, common, and scientific names and the sequence in which they are presented follow AOU (2011).

Family	Common Name	Scientific Name	MESA[a]	Source[b]	BBA[c]
Anatidae	Canada goose	*Branta canadensis*		2, 17	x
Geese, Swans, and Ducks	Mute swan	*Cygnus olor*		17	x
	Wood duck	*Aix sponsa*		17	x
	American black duck[d]	*Anas rubripes*		17	x
	Mallard	*Anas platyrhynchos*		17	x
	Blue-winged teal	*Anas discors*		17	
	Green-winged teal	*Anas crecca*		17	
	Ring-necked duck	*Aythya collaris*		11, 17	
	Black scoter	*Melanitta americana*		17	
	White-winged scoter	*Melanitta fusca*		19	
	Surf scoter	*Melanitta perspicillata*		17	
	Bufflehead	*Bucephala albeola*		11, 17	
	Hooded merganser	*Lophodytes cucullatus*		2, 11	
	Common merganser	*Mergus merganser*		2, 11, 17	
	Ruddy duck	*Oxyura jamaicensis*		2, 17	
Phasianidae	Ring-necked pheasant	*Phasianus colchicus*		17	
Pheasants and Turkeys	Ruffed grouse[d]	*Bonasa umbellus*		17	
	Wild turkey	*Meleagris gallopavo*		4, 17	x
Gaviidae Loons	Common loon[d]	*Gavia immer*	SC	2, 17	
Podicipedidae	Horned grebe	*Podiceps auritus*		17	
Grebes	Pied-billed grebe	*Podilymbus podiceps*	E	18	
Phalacrocoracidae Cormorants	Double-crested cormorant	*Phalacrocorax auritus*		17	x
Ardeidae	Great blue heron	*Ardea herodias*		11, 17	x
Bitterns and Herons	Green heron[d]	*Butorides virescens*		17	x
	Black-crowned night-heron[d]	*Nycticorax nycticorax*		17	x
Cathartidae	Black vulture	*Coragyps atratus*		17	x
American Vultures	Turkey vulture	*Cathartes aura*		1, 17	x
Pandionidae Osprey	Osprey	*Pandion haliaetus*		1, 17	x
Accipitridae	Bald eagle[d]	*Haliaeetus leucocephalus*	E	1, 17	
Kites, Eagles, and Hawks	Northern harrier[d]	*Circus cyaneus*	T	1, 17	
	Sharp-shinned hawk[d]	*Accipiter striatus*	SC	1, 17	
	Cooper's hawk	*Accipiter cooperii*		1, 17	x
	Red-shouldered hawk	*Buteo lineatus*		1, 9, 17	
	Broad-winged hawk[d]	*Buteo platypterus*		1, 17	
	Red-tailed hawk	*Buteo jamaicensis*		1, 2, 17	x
	Golden eagle	*Aquila chrysaetos*		1, 17	
Falconidae	American kestrel[d]	*Falco sparverius*		1, 17	
Falcons	Merlin	*Falco columbarius*		1, 17	
	Peregrine falcon[d]	*Falco peregrinus*	E	1, 17	
Rallidae Rails, Gallinules, and Coots	Virginia rail	*Rallus limicola*		17	
Charadriidae Plovers and Lapwings	Killdeer	*Charadrius vociferus*		17	x

Continued on next page.

Birds of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Source[b]	BBA[c]
Scolopacidae	Solitary sandpiper	*Tringa solitaria*		17	
Sandpipers and Allies	Spotted sandpiper	*Actitis macularius*		17	
	Wilson's snipe	*Gallinago gallinago*		17	
	American woodcock[d]	*Scolopax minor*		7, 17	x
Laridae	Ring-billed gull	*Larus delawarensis*		2, 17	x
Jaegers, Gulls, Terns,	Herring gull	*Larus argentatus*		2, 11, 17	x
and Skimmers	Great black-backed gull	*Larus marinus*		2, 11, 17	
Columbidae	Rock pigeon	*Columba livia*		17	x
Pigeons and Doves	Mourning dove	*Zenaida macroura*		2, 17	x
Cuculidae	Black-billed cuckoo	*Coccyzus erythropthalmus*		12, 17	x
Cuckoos and Allies	Yellow-billed cuckoo	*Coccyzus americanus*		17	x
Strigidae	Eastern screech-owl	*Megascops asio*		2, 17	x
Typical Owls	Great horned owl	*Bubo virginianus*		17	x
	Barred owl	*Strix varia*		17	
	Northern saw-whet owl	*Aegolinus acadicus*		17	
Caprimulgidae	Common nighthawk	*Chordeiles minor*		17	
Goatsuckers	Eastern Whip-poor-will[d]	*Caprimulgus vociferus*		7	
Apodidae Swifts	Chimney swift	*Chaetura pelagica*		17	x
Trochilidae Hummingbirds	Ruby-throated hummingbird	*Archilochus colubris*		9, 17	x
Alcedinidae Kingfishers	Belted kingfisher	*Megaceryle alcyon*		17	x
Picidae	Red-bellied woodpecker	*Melanerpes carolinus*		17	x
Woodpeckers	Yellow-bellied sapsucker	*Sphyrapicus varius*		17	
	Downy woodpecker	*Picoides pubescens*		2, 17	x
	Hairy woodpecker	*Picoides villosus*		2, 17	x
	Northern flicker	*Colaptes auratus*		2, 17	x
	Pileated woodpecker	*Dryocopus pileatus*		17	x
Tyrannidae	Olive-sided flycatcher	*Contopus cooperi*		17	
Tyrant Flycatchers	Eastern wood-pewee	*Contopus virens*		17	x
	Yellow-bellied flycatcher	*Empidonax flaviventris*		17	
	Acadian flycatcher	*Empidonax virescens*		17	
	Alder flycatcher	*Empidonax alnorum*		17	
	Willow flycatcher[d]	*Empidonax traillii*		17	
	Least flycatcher	*Empidonax minimus*		3, 17	
	Eastern phoebe	*Sayornis phoebe*		17	x
	Ash-throated flycatcher	*Myiarchus cinerascens*		17	
	Great crested flycatcher	*Myiarchus crinitus*		3, 4, 17	x
	Eastern kingbird	*Tyrannus tyrannus*		17	x
Vireonidae	White-eyed vireo	*Vireo griseus*		17	
Vireos	Blue-headed vireo	*Vireo solitarius*		4, 5, 6	
	Yellow-throated vireo	*Vireo flavifrons*		18	
	Warbling vireo	*Vireo gilvus*		4, 6	x
	Philadelphia vireo	*Vireo philadelphicus*		17	
	Red-eyed vireo	*Vireo olivaceus*		17	x
Corvidae	Blue jay	*Cyanocitta cristata*		2, 17	x
Jays, Magpies, and Crows	American crow	*Corvus brachyrhynchos*		2, 17	x
	Northern raven	*Corvus corax*		19	
	Fish crow	*Corvus ossifragus*		5, 17	

Continued on next page.

Birds of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Source[b]	BBA[c]
Hirundinidae	Tree swallow	*Tachycineta bicolor*		17	x
Swallows	Northern rough-winged swallow	*Stelgidopteryx serripennis*		17	x
	Barn swallow	*Hirundo rustica*		17	x
Paridae	Black-capped chickadee	*Poecile atricapillus*		2, 17	x
Titmice	Tufted titmouse	*Baeolophus bicolor*		2, 11, 17	x
Sittidae	Red-breasted nuthatch	*Sitta canadensis*		17	x
Nuthatches	White-breasted nuthatch	*Sitta carolinensis*		2, 17	x
Certhiidae Creepers	Brown creeper	*Certhia americana*		17	x
Troglodytidae	Carolina wren	*Thryothorus ludovicianus*		2, 17	x
Wrens	House wren	*Troglodytes aedon*		4, 6, 17	x
	Winter wren	*Troglodytes hiemalis*		17	
Regulidae	Golden-crowned kinglet	*Regulus satrapa*		2, 11, 17	
Kinglets	Ruby-crowned kinglet	*Regulus calendula*		3, 4, 5, 6, 17	
Silviidae Gnatcatchers	Blue-gray gnatcatcher	*Polioptila caerulea*		3, 17	
Turdidae	Eastern bluebird	*Sialis sialis*		17	
Bluebirds and Thrushes	Veery	*Catharus fuscescens*		17	x
	Gray-cheeked thrush	*Catharus minimus*		17	
	Swainson's thrush	*Catharus ustulatus*		17	
	Hermit thrush	*Catharus guttatus*		6, 17	
	Wood thrush[d]	*Hylocichla mustelina*		17	x
	American robin	*Turdus migratorius*		2, 17	x
Mimidae	Gray catbird	*Dumetella carolinensis*		4, 6, 17	x
Mimic Thrushes	Northern mockingbird	*Mimus polyglottos*		2, 17	x
	Brown thrasher[d]	*Toxostoma rufum*		4, 5, 6, 17	x
Sturnidae Starlings	European starling	*Sturnis vulgaris*		2, 17	x
Bombycillidae Waxwings	Cedar waxwing	*Bombycilla cedrorum*		17	x
Parulidae	Blue-winged warbler[d]	*Vermivora cyanoptera*		3, 17	
Wood Warblers	Golden-winged warbler[d]	*Vermivora chrysoptera*	E	17	
	Tennessee warbler	*Oreothlypis peregrina*		17	
	Orange-crowned warbler	*Oreothlypis celata*		4, 17	
	Nashville warbler	*Oreothlypis ruficapilla*		3, 6, 17	
	Northern parula[c]	*Parula americana*	T	3, 4, 6, 17	
	Yellow warbler	*Dendroica petechia*		3, 4, 17	x
	Chestnut-sided warbler	*Dendroica pensylvanica*		3, 17	
	Magnolia warbler	*Dendroica magnolia*		3, 17	
	Black-throated blue warbler	*Dendroica caerulescens*		3, 6, 17	
	Yellow-rumped warbler	*Dendroica coronata*		2, 3, 4, 5, 6, 17	
	Black-throated gray warbler	*Dendroica nigrescens*		13	
	Black-throated green warbler	*Dendroica virens*		3, 5, 6, 17	
	Blackburnian warbler	*Dendroica fusca*		3, 6, 17	
	Yellow-throated warbler	*Dendroica dominica*		17	
	Pine warbler	*Dendroica pinus*		3, 4, 5, 6, 17	x
	Prairie warbler[d]	*Dendroica discolor*		3, 17	
	Palm warbler	*Dendroica palmarum*		3, 4, 5, 6, 17	

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Birds of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Source[b]	BBA[c]
Parulidae	Bay-breasted warbler	*Dendroica castanea*		17	
Wood Warblers (continued)	Blackpoll warbler[d]	*Dendroica striata*	SC	17	
	Cape May warbler	*Dendroica tigrina*		18	
	Black-and-white warbler	*Mniotilta varia*		3, 4, 5, 6, 17	x
	American redstart	*Setophaga ruticilla*		3, 6, 17	x
	Prothonotary warbler	*Protonotaria citrea*		8, 17	
	Worm-eating warbler	*Helmitheros vermivorum*		17	
	Ovenbird	*Seiurus aurocapilla*		3, 4, 6, 17	x
	Northern waterthrush	*Parkesia noveboracensis*		3, 4, 6, 9, 17	
	Louisiana waterthrush[d]	*Parkesia motacilla*		16, 17	
	Kentucky warbler	*Oporornis formosus*		17	
	Mourning warbler	*Oporornis philadelphia*	SC	17	x
	MacGillivray's warbler	*Oporornis tolmiei*		17	
	Common yellowthroat	*Geothlypis trichas*		3, 17	x
	Hooded warbler	*Wilsonia citrina*		15, 17	
	Wilson's warbler	*Wilsonia pusilla*		17	
	Canada warbler[d]	*Wilsonia canadensis*		17	
	Yellow-breasted chat	*Icteria virens*		17	
Emberizidae	Eastern towhee[d]	*Pipilo erythrophthalmus*		4, 5, 6, 17	x
Towhees, Sparrows, and Allies	American tree sparrow	*Spizella arborea*		2, 17	
	Chipping sparrow	*Spizella passerina*		17	x
	Field sparrow[d]	*Spizella pusilla*		17	
	Vesper sparrow[d]	*Pooecetes gramineus*	T	4, 17	
	Savannah sparrow	*Passerculus sandwichensis*		4, 17	x
	Grashopper sparrow[d]	*Ammodramus savannarum*	T	17	
	Fox sparrow	*Passerella iliaca*		17	
	Song sparrow	*Melospiza melodia*		17	x
	Lincoln's sparrow	*Melospiza lincolnii*		17	
	Swamp sparrow	*Melospiza georgiana*		17	x
	White-throated sparrow[d]	*Zonotrichia albicollis*		2, 6, 17	
	White-crowned sparrow	*Zonotrichia leucophrys*		17	
	Dark-eyed junco	*Junco hyemalis*		2, 17	x
Cardinalidae	Summer tanager	*Piranga rubra*		15, 17	
Cardinals	Scarlet tanager	*Piranga olivacea*		3, 17	x
	Western tanager	*Piranga ludoviciana*		14	
	Northern cardinal	*Cardinalis cardinalis*		2, 17	x
	Rose-breasted grosbeak	*Pheucticus ludovicianus*		3, 4, 17	x
	Indigo bunting	*Passerina cyanea*		3, 17	x
	Dickcissel	*Spiza americana*		17	
Icteridae	Bobolink	*Dolichonyx oryzivorus*		17	
Blackbirds, Orioles, and Allies	Red-winged blackbird	*Agelaius phoeniceus*		17	x
	Rusty blackbird	*Euphagus carolinus*		10, 17	
	Common grackle	*Quiscalus quiscula*		17	x
	Brown-headed cowbird	*Molothrus ater*		17	x
	Orchard oriole	*Icterus spurius*		6, 17	x
	Baltimore oriole	*Icterus galbula*		4, 6, 12, 17	x
Fringillidae	Purple finch	*Carpodacus purpureus*		17	
Fringilline Finches	House finch	*Carpodacus mexicanus*		2, 17	x
	Common redpoll	*Acanthis flammea*		17	
	Pine siskin	*Spinus pinus*			x
	American goldfinch	*Spinus tristis*		2, 17	x

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Birds of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Source[b]	BBA[c]
Passeridae Old World Finches	House Sparrow	*Passer domesticus*		2, 17	x
Estrildidae Waxbills and Allies	Nutmeg mannikin	*Lonchura punctulata*		17	

a. Status of birds listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Information on birds recorded on the reservation was obtained from the following sources:
   1. Jackson 2008 (2008)
   2. Jewell and Jewell (2008)
   3. Rines (2008*a*).
   4. Rines (2009*a*).
   5. Rines (2009*b*).
   6. Rines (2010*a*).
   7. Birch (2008).
   8. Davies (2008).
   9. Devaney (2010*a*).
   10. Devaney (2010*b*).
   11. Joslin (2008).
   12. Labato (2009).
   13. Pirro (2010).
   14. Rines (2008*b*).
   15. Rines (2009*c*).
   16. Rines (2010*b*).
   17. Jewell et al. (2009).
   18. Rines (2011)
   19. Jewell (2011)

c. Breeding Bird Atlas (BBA) data for the Boston North - 07 and Boston North - 08 blocks; nearly all of the reservation is located within these blocks. These birds were recorded on or near the reservation during the 2007 – 2010 breeding seasons and represent species with the potential to breed on the reservation.

d. This species has been designated a "Species in Greatest Need of Conservation" by MassWildlife (2006; Table 4).

Appendix I. Mammals of the DCR Middlesex Fells Reservation.

The following mammals occur, or may occur, on the DCR Middlesex Fells Reservation. Family, common, and scientific names and the sequence in which they are presented follow Cardoza et al. (2009).

Family	Common Name	Scientific Name	Status[a]
Didelphidae	Virginia opossum	*Didelphis virginiana*	Confirmed
New World Opossums			
Sciuridae	Eastern gray squirrel	*Sciurus carolinensis*	Confirmed
Tree Squirrels and Marmots	Red squirrel	*Tamiasciurus hudsonicus*	Confirmed
	Northern flying squirrel	*Glaucomys sabrinus*	Possible
	Southern flying squirrel	*Glaucomys volans*	Confirmed
	Eastern chipmunk	*Tamias striatus*	Confirmed
	Woodchuck	*Marmota monax*	Confirmed
Castoridae	American beaver	*Castor canadensis*	Confirmed
Beavers			
Dipodidae	Meadow jumping mouse	*Zapus hudsonius*	Possible
Jumping Mice			
Cricetidae	Meadow vole	*Microtus pennsylvanicus*	Confirmed
Mice, Voles, and Lemmings	Woodland vole	*Microtus pinetorum*	Confirmed
	Southern red-backed vole	*Myodes gapperi*	Possible
	Common muskrat	*Ondatra zibethicus*	Possible
	White-footed deermouse	*Peromyscus leucopus*	Confirmed
	North American deermouse	*Peromyscus maniculatus*	Possible
Muridae	House mouse	*Mus musculus*	Possible
Old World Rats and Mice	Brown rat	*Rattus norvegicus*	Possible
Erethizontidae	North American porcupine	*Erethizon dorsatum*	Possible
New World Porcupines			
Leporidae	Eastern cottontail	*Sylvilagus floridanus*	Confirmed
Hares and Rabbits	New England cottontail[b]	*Sylvilagus transitionals*	Possible
Soricidae	Northern short-tailed shrew[c]	*Blarina brevicauda*	Possible
Shrews	Cinereus shrew[c]	*Sorex cinereus*	Possible
Talpidae	Star-nosed mole	*Condylura cristata*	Possible
Moles and Shrew-moles	Hairy-tailed mole	*Parascalops breweri*	Possible
Vespertilionidae	Big brown bat	*Eptesicus fuscus*	Possible
Vesper Bats	Eastern red bat[b]	*Lasiurus borealis*	Possible
	Hoary bat[b]	*Lasiurus cinereus*	Possible
	Eastern pipistrelle	*Pipistrellus subflavus*	Possible
	Silver-haired bat[b]	*Lasionycteris noctivagans*	Possible
	Little brown myotis	*Myotis lucifugus*	Confirmed
	Northern myotis	*Myotis septentrionalis*	Possible
Felidae	Domestic cat (feral)	*Felis catus*	Possible
Cats	Bobcat[b]	*Lynx rufus*	Confirmed[d] Possible
Canidae	Coyote	*Canis latrans*	Confirmed
Dogs, Foxes, and Wolves	Domestic dog (feral)	*Canis lupus familiaris*	Possible
	Gray fox	*Urocyon cinereoargenteus*	Confirmed
	Red fox	*Vulpes vulpes*	Confirmed
Ursidae	Black bear[b]	*Ursus americanus*	Possible
Bears			

Continued on next page.

Family	Common Name	Scientific Name	Status[a]
Mustelidae	North American river otter	*Lontra canadensis*	Possible
Weasels, Minks, Martens, and	Fisher	*Martes pennanti*	Confirmed
Otters	Ermine	*Mustela erminea*	Possible
	Long-tailed weasel	*Mustela frenata*	Confirmed
	American mink	*Neovison vison*	Confirmed
Mephitidae Skunks	Striped skunk	*Mephitis mephitis*	Confirmed
Procyonidae Raccoons, Coatis, and Ringtails	Raccoon	*Procyon lotor*	Confirmed
Cervidae	Moose	*Alces americanus*	Possible
Deer, Elk, and Moose	White-tailed deer	*Odocoileus virginianus*	Confirmed[e]

a. Species classified as Confirmed have been recorded on the Reservation (Brown 2009). Species classified as Possible are known to occur in appropriate habitat in eastern and/or northeastern Massachusetts (Cardoza et al. 2009) and may occur on the reservation. This category includes mammals that: occur on the reservation but have not yet been recorded; migrate through the reservation (i.e., bats); are vagrant and dispersing on an irregular and unpredictable basis; or occur near, but not on, the reservation.
b. This species has been designated a "Species in Greatest Need of Conservation" by MassWildlife (2006; Table 4).
c. Brown (2009) identifies "shrew" as being present, but does not differentiate between species.
d. Brown (2011) reports that a young bobcat, likely a dispersing individual, was photographed in the southwest Fells in 2008; no other sign has been found or reported.
e. A dispersing young moose was found in the Fells during the 1990's; it was removed by wildlife officials.

Appendix J. Reptiles of the DCR Middlesex Fells Reservation.

The following reptiles occur, or may occur, on the DCR Middlesex Fells Reservation. Family, common, and scientific names follow NatureServe (2010); the sequence in which they are presented follows Cardoza and Mirick (2009).

Family	Common Name	Scientific Name	MESA[a]	Status[b]
Chelydridae Snapping Turtles	Snapping turtle	*Chelydra serpentina*		Confirmed
Kinosternidae American Mud and Musk Turtles	Common musk turtle	*Sternotherus odoratus*		Possible[c]
Emyididae Pond Turtles	Northern painted turtle	*Chrysemys picta*		Confirmed
	Spotted turtle[d]	*Clemmys guttata*		Possible[c]
	Wood turtle[d]	*Glyptemys insculpta*	SC	Possible[c]
	Blanding's turtle[d]	*Emydoidea blandingii*	T	Possible[c]
	Eastern box turtle[d]	*Terrapene carolina*	SC	Possible
Colubridae Harmless Snakes	North American racer[d]	*Coluber constrictor*		Confirmed
	Ring-necked snake	*Diadophis punctatus*		Possible[c]
	Milksnake	*Lampropeltis triangulum*		Confirmed
	Northern watersnake	*Nerodia sipedon*		Confirmed
	Smooth greensnake	*Opheodrys vernalis*		Possible[c]
	Brownsnake	*Storeria dekayi*		Possible[c]
	Red-bellied snake	*Storeria occipitomaculata*		Possible
	Eastern ribbonsnake[d]	*Thamnophis sauritus*		Confirmed
	Common gartersnake	*Thamnophis sirtalis*		Confirmed

a. Status of reptiles listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Species classified as Confirmed have been recorded on the Reservation (Friends of the Middlesex Fells 2009). Species classified as Possible are known to occur in appropriate habitat in eastern and/or northeastern Massachusetts (Cardoza and Mirick 2009) and may occur on the reservation. This category includes reptiles that: occur on the reservation but have not yet been recorded; are vagrant and dispersing on an irregular and unpredictable basis; or occur near, but not on, the reservation.

c. This species was confirmed to occur within the 7.5-minute quadrangle in which the DCR Middlesex Fells Reservation is located (Jackson et al. 2010).

d. This species has been designated a "Species in Greatest Need of Conservation" by MassWildlife (2006; Table 4).

Appendix K. Amphibians of the DCR Middlesex Fells Reservation.

The following amphibians occur, or may occur, on the DCR Middlesex Fells Reservation. Family, common, and scientific names follow NatureServe (2010); the sequence in which they are presented follows Cardoza and Mirick (2009).

Family	Common Name	Scientific Name	MESA[a]	Status[b]
Ambystomatidae	Blue-spotted salamander[d]	*Ambystoma laterale*	SC	Possible
Mole Salamanders	Spotted salamander	*Ambystoma maculatum*		Confirmed
	Marbled salamander[d]	*Ambystoma opacum*	T	Possible
Salamandridae Newts	Eastern newt	*Notophthalmus viridescens*		Confirmed
Plethodontidae	Dusky salamander	*Desmognathus fuscus*		Possible
Lungless Salamanders	Redback salamander	*Plethodon cinereus*		Confirmed
	Four-toed salamander[d]	*Hemidactylium scutatum*		Possible[c]
	Northern two-lined salamander	*Eurycea bislineata*		Possible
Pelobatidae Spadefoot Toads	Eastern spadefoot[d]	*Scaphiopus holbrookii*	T	Possible
Bufonidae	American toad	*Bufo (Anaxyrus) americanus*		Confirmed
True Toads	Fowler's toad	*Bufo (Anaxyrus) fowleri*		Possible
Hylidae	Spring peeper[f]	*Pseudacris crucifer*		Confirmed
True Tree Frogs	Gray treefrog[f]	*Hyla versicolor*		Possible
Ranidae	American bullfrog	*Rana catesbeiana (Lithobates catesbeianus)*		Confirmed
True Frogs	Green frog	*Rana (Lithobates) clamitans*		Confirmed
	Pickerel frog	*Rana (Lithobates) palustris*		Confirmed
	Northern leopard frog[d]	*Rana (Lithobates) pipiens*		Possible
	Wood frog	*Rana (Lithobates) sylvaticus*		Confirmed

a. Status of amphibians listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Species classified as Confirmed have been recorded on the Reservation (Friends of the Middlesex Fells 2009). Species classified as Possible are known to occur in appropriate habitat in eastern and/or northeastern Massachusetts (Cardoza and Mirick 2009) and may occur on the reservation. This category includes amphibians that: occur on the reservation but have not yet been recorded; are vagrant and dispersing on an irregular and unpredictable basis; or occur near, but not on, the reservation.

c. This species was confirmed to occur within the 7.5-minute quadrangle in which the DCR Middlesex Fells Reservation is located (Jackson et al. 2010).

d. This species has been designated a "Species in Greatest Need of Conservation" by MassWildlife (2006; Table 4).

Appendix L. Butterflies and Moths of the DCR Middlesex Fells Reservation.

The following butterflies and moth have been recorded on the DCR Middlesex Fells Reservation. Butterfly taxonomy and common names follow Opler et al. (2010); moth taxonomy follows Bugguide (2011).

Family	Common Name	Scientific Name	MESA[a]	Source[b]
		BUTTERFLIES		
Hesperiidae	Hoary edge	*Achalarus lyciades*		1
Spread-wing Skippers	Silver-spotted skipper	*Epargyreus clarus*		1
	Wild indigo duskywing	*Erynnis baptisiae*		1
	Sleepy duskywing	*Erynnis brizo*		1
	Horace's duskywing	*Erynnis horatius*		1
	Dreamy duskywing	*Erynnis icelus*		1
	Juvenal's duskywing	*Erynnis juvenalis*		1
	Common Sootywing	*Pholisora catullus*		5
	Southern cloudywing	*Thorybes bathyllus*		1
	Northern cloudywing	*Thorybes pylades*		1
Grass Skippers	Pepper and salt skipper	*Amblyscirtes hegon*		1
	Delaware skipper	*Anatrytone logan*		1
	Least skipper	*Ancyloxypha numitor*		1
	Dusted skipper	*Atrytonopsis hianna*		1
	Dun skipper	*Euphyes vestris*		1
	Leonard's skipper	*Hesperia leonardus*		1
	Cobweb skipper	*Hesperia metea*		1
	Indian skipper	*Hesperia sassacus*		1
	Hobomok skipper	*Poanes hobomok*		1
	Mulberry wing	*Poanes massasoit*		1
	Peck's skipper	*Polites coras*		1
	Long dash	*Polites mystic*		1
	Crossline skipper	*Polites origenes*		1
	Tawny-edged skipper	*Polites themistocles*		1
	Little glassywing	*Pompeius verna*		1
	European skipper	*Thymelicus lineola*		1
	Northern broken-dash	*Wallegrenia egeremet*		1
Papilionidae	Pipvine swallowtail	*Battus philenor*		5
Swallowtails	Eastern tiger swallowtail	*Papilio glaucus*		1, 2
	Black swallowtail	*Papilio polyxenes*		1
	Spicebush swallowtail	*Papilio troilus*		1, 2
Pieridae	Orange sulphur	*Colias eurytheme*		1
Sulphurs	Clouded sulphur	*Colias philodice*		1
	Cabbage white	*Pieris rapae*		1
Lycaenidae	Spring azure	*Celastrina ladon*		1
Blues	Eastern tailed-blue	*Cupido cornyntas*		1
	Silvery Blue	*Glaucopsyche lygdamus*		5
Coppers	American copper	*Lycaena phlaeas*		1
Hairstreaks	Brown elfin	*Callophrys augustinus*		1
	Juniper hairstreak	*Callophrys gryneus*		1, 5
	Frosted elfin	*Callophrys irus*	SC	1, 4
	Eastern pine elfin	*Callophrys niphon*		1
	Acadian hairstreak	*Satyrium acadia*		1
	Banded hairstreak	*Saytrium calanus falacer*		1
	Edwards' hairstreak	*Satyrium edwardsii*		1
	Oak hairstreak	*Satyrium favonius*	SC	4
	Striped hairstreak	*Satyrium lipaprops*		1
	Coral hairstreak	*Satyrium titus*		1
	Gray hairstreak	*Strymon melinus*		1
Harvesters	Harvester	*Feniseca tarquinius*		1, 2

Continued on next page.

Butterflies and Moths of the DCR Middlesex Fells Reservation. (Continued)

Family	Common Name	Scientific Name	MESA[a]	Source[b]
Nymphalidae	Viceroy	*Limenitis archippus*		1
Admirals and Relatives	Red-spotted purple	*Limenitis arhtemis*		1
Longwings	Great spangled fritillary	*Speyeria cybele*		1
Milkweed Butterflies	Monarch	*Danaus plexippus*		1
Satyrs and Wood-Nymphs	Common wood nymph	*Cercyonis pegala*		1
	Inornate ringlet	*Coenonympha tullia inornata*		1
	Northern pearly eye	*Enodia anthedon*		1
	Little wood-satyr	*Megisto cymela*		1
	Appalachian brown	*Satyrodes appalachia*		1
True Brushfoots	Milbert's Tortoiseshell	*Aglais milberti*		5
	Baltimore	*Euphydryas phaeton*		1
	Common buckeye	*Junonia coenia*		1, 5
	Mourning cloak	*Nymphalis antiopa*		1, 3
	Compton tortoiseshell	*Nymphalis vaualbum*		1, 2
	Pearl crescent	*Phyciodes tharos*		1
	Eastern comma	*Polygonia comma*		1
	Question mark	*Polygonia interrogationis*		1
	Red admiral	*Vanessa atlanta*		1, 3
	Painted lady	*Vanessa cardui*		1
	American lady	*Vanessa virginiensis*		1

MOTHS

Family, Sub-family	Species Number	Common Name	Scientific Name	MESA[a]	Source[b]
Drepanidae	6251	Arched hooktip	*Drepana arcuata*		6
Geometridae	6261	Common spring moth	*Heliomata cycladata*		6
	6270	Virgin moth	*Proitame virginalis*		6
	6273	Lesser maple spanworm moth	*Itame pustularia*		6
	6282	Mousy angle moth	*Speranza argillacearia*		6
	6339	Blurry chocolate angle	*Macaria transitaria*		6
	6340	Minor angle moth	*Macaria minorata*		6
	6342	Red-headed inchworm	*Macaria bisignata*		6
	6347	White pine angle moth	*Macaria pinistrobata*		6
	6352	Granite moth	*Macaria granitata*		6
	6570	Four-barred gray	*Aethalura intertexta*		6
	6582	Large purplish gray	*Iridopsis vellivolata*		6
	6590	Common gray	*Anavitrinella pampinaria*		6
	6598	Porcelain gray	*Protoboarmia porcelaria*		6
	6637	Pine powder moth	*Eufidonia convergaria*		6
	6638	Powder moth	*Eufidonia notataria*		6
	6654	One-spotted variant	*Hypagyrtis unipunctata*		6
	6655	Esther moth	*Hypagyrtis esther*		6
	6667	White spring moth	*Lomographa vestaliata*		6
	6739	Least-marked euchlaena	*Euchlaena irraria*		6
	6754	Hubner's pero	*Pero ancetaria*		6
	6763	Oak beauty	*Phaeoura quernaria*		6
	6804	Northern petrophora	*Petrophora subaequaria*		6
	6832	Yellow-washed metarranthis	*Metarranthis obfirmaria*		6
	6837	Alien probole moth	*Probole alienaria*		6
	6844	Hollow-spotted plagodis	*Plagodis alcoolaria*		6
	6864.1	Caripeta species	*Caripeta nr. piniata*		6
	6884	Straw besma	*Besma endropiaria*		6
	6885	Oak besma	*Besma quercivoraria*		6

Continued on next page.

Butterflies and Moths of the DCR Middlesex Fells Reservation. (Continued)

Family, Sub-family	Species Number	Common Name	Scientific Name	MESA[a]	Source[b]
	6964	White slant-line	*Tetracis cachexiata*		6
	6966	Curve-toothed geometer	*Eutrapela clemetaria*		6
	6987	Variable antepione	*Antepione thiosaria*		6
	7046	Red-fringed emerald	*Nemoria bistriaria*		6
	7139	Sweetfern geometer	*Cyclophora pendulinaria*		6
	7206	White eulithis	*Eulithis explanata*		6
	7625	Green pug	*Chloroclystis rectangulata*		6
	7637	Mottled gray carpet	*Cladara limitaria*		6
		Eupithecia species	*Eupithecia* sp.		6
		Eupithecia species	*Eupithecia* sp. nr. *Palpata*		6
	-723	Hydriomena species	*Hydriomena* sp.		6
Lasiocampidae	7701	Eastern tent caterpillar moth	*Malacosoma americanum*		6
Sphingidae	7886	Azalea sphinx	*Darapsa pholus*		6
	7871	Lettered sphinx moth	*Deidamia inscripta*		6
Notodontidae	7917	Hyperaeschra tortuosa	*Hyperaeschra georgica*		6
	7915	White-dotted prominent	*Nadata gibbosa*		6
	7920		*Peridea angulosa*		6
	7975		*Macrurocampa marthesia*		6
	7990		*Heterocampa umbrata*		6
	7994		*Heterocampa guttivitta*		6
	8007		*Schizura unicornis*		6
Erebisae, Arctiinae	8072		*Cisthene packardii*		6
	8188		*Grammia figurate*		6
	8171		*Apantesis nais*		6
	8118		*Virbia opella*		6
	8134		*Spilosoma congrua*		6
	8137		*Spilosoma virginica*		6
	8231		*Cycnia oregonensis*		6
Erebisae, Herminiinae	8322		*Idia americalis*		6
	8323		*Idia aemula*		6
	8326		*Idia rotundalis*		6
	8328		*Idia Julia*		6
	8352		*Zanclognatha marcidilinea*		6
	8355		*Chytolita morbidalis*		6
	8364		*Phalaenostola larentioides*		6
	8366		*Tetanolita mynesalis*		6
	8370		*Bleptina caradrinalis*		6
	8397		*Palthis angulalis*		6
Erebisae, Pangraptinae	8490		*Pangrapta decoralis*		6
	8491		*Ledaea perditalis*		6
Erebisae, Hypenodinae	8421		*Hypenodes fractilinea*		6
Erebisae, Phytometrinae	8479		*Spargaloma sexpunctata*		6
	9038		*Hyperstrotia villificans*		6
Erebisae, Erebinae	8641		*Drasteria grandirena*		6
	8695		*Zale undularis*		6
	8697		*Zale minerea*		6
	8699		*Zale obliqua*		6
	8704		*Zale helata*		6
	8707		*Zale metatoides*		6
Erebisae, Eulepidotinae	8587		*Panopoda rufimargo*		6
Nolidae, Nolinae	8983		*Meganola minuscula*		6
	8989		*Nola pustulata*		6
	8996		*Nola clethrae*		6

Continued on next page.

Butterflies and Moths of the DCR Middlesex Fells Reservation. (Continued)

Family, Sub-family	Species Number	Common Name	Scientific Name	MESA[a]	Source[b]
Erebisae, Eulepidotinae	8587		*Panopoda rufimargo*		6
Nolidae, Nolinae	8983		*Meganola minuscula*		6
	8989		*Nola pustulata*		6
	8996		*Nola clethrae*		6
Nolidae, Risobinae	8970		*Baileya ophthalmica*		6
Noctuidae, Plusiinae	8908		*Autopgrapha precationis*		6
Noctuidae, Pantheinae	9187		*Colocasia propinquilinea*		6
Noctuidae, Dilobinae	9193		*Raphia frater*		6
Noctuidae, Acronictinae	9229		*Acronicta hasta*		6
	9244		*Acronicta modica*		6
	9245		*Acronicta haesitata*		6
	9249		*Acronicta increta*		6
	9250		*Acronicta inclara*		6
	9254		*Acronicta afflicta*		6
	9266		*Acronicta lithospila*		6
Noctuidae, Condicinae	9696		*Condica vecors*		6
Noctuidae, Eriopinae	9631		*Callopistria mollissima*		6
	9633		*Callopistria cordata*		6
Noctuidae, Noctuinae	9678		*Elaphria versicolor*		6
	9681		*Elaphria festivoides*		6
	9650		*Athetis tarda*		6
	9545		*Euplexia bensimilis*		6
	9364		*Apamea sordens*		6
			Oligia strigilis		6
	9578		*Hyppa xylinoides*		6
	9556		*Chytonix palliatricula*		6
	10501		*Crocigrapha normani*		6
	10517		*Egira alternans*		6
	10518		*Achatia distincta*		6
	10521		*Morrisonia confusa*		6
	10291		*Morrisonia latex*		6
	10301		*Spiramater lutra*		6
	10440		*Leucania linita*		6
	10461		*Leucania ursula*		6
	10368		*Lacinipolia anguina*		6
	10397		*Lacinipolia renigera*		6
	10532.1		*Homorthodes lindseyi*		6
	10563		*Protorthodes oviduca*		6
	10567		*Ulolonche culea*		6
	10569		*Ulolonche modesta*		6
	10587		*Orthodes cynica*		6
	10288		*"Orthodes" detracta*		6
	10666		*Feltia manifesta*		6
	10663		*Agrotis ipsilon*		6
	1102_		*Noctua pronuba*		6
Noctuidae, Heliothinae	11065	Aureolaria seed borer (Orange sallow moth)	*Rhodoecia aurantiago*	T	4

a. Status under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Information contained in this table was obtained from the following sources: 1. Robbins (1989); 2. LaFontaine (2006); 3. LaFontaine (2007); 4. Harper (2010); 5. Stichter (2011); 6. Mello (2011).

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Appendix M. Rare and Endangered Species Habitat Management Plan for the DCR Middlesex Fells Reservation.

RARE AND ENDANGERED SPECIES HABITAT MANAGEMENT PLAN

Prepared by Alexandra Echandi, Natural Resource Specialist
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Department of Conservation and Recreation, Urban Parks, Fells District
May, 2011

Preface

The mission of the Department of Conservation and Recreation (DCR) is to "protect, promote and enhance our common wealth of natal, cultural and recreational resources." The protection of state-listed species on DCR properties is integral to achieving our mission. Under the Massachusetts Endangered Species Act (MESA), regulations 321 CMR 10.05, DCR has an obligation to use all practicable means and measures to avoid or minimize damage to state-listed rare species or their habitats

In order to document and ensure continuity of protection, monitoring and management in the future, DCR has developed a management plan for the rare and endangered species inhabiting the DCR Middlesex Fells Reservation. This plan was developed with the technical assistance of the Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program and DCR planners, ecologists and facility managers. The DCR contact for this plan is Thomas Walsh, Fells District Manager.

I. Introduction

DCR Middlesex Fells Reservation
The 2,575 acre DCR Middlesex Fells Reservation hosts a diverse landscape of ponds, rocky hills and ledges, meadows, woodlands and wetlands. The regional context, soils, geology, plants, natural communities and wildlife of the Fells are all documented and described in Section 2 of the Middlesex Fells Resource Management Plan (http://www.mass.gov/dcr/stewardship/rmp/rmp-midfells.htm).

Management Objectives
This Habitat Management Plan (HMP) seeks to identify management actions and approaches that will best protect and conserve the rare species inhabiting the DCR Middlesex Fells Reservation while providing for on-going recreation and property management needs. This HMP, when approved by the Massachusetts Natural Heritage and Endangered Species Program (NHESP), will also provide an exemption from MESA regulatory review for the actions listed herein.

The actions prescribed in this plan are based upon the available biological and management information compiled for the Middlesex Fells from various sources through the Resource Management Planning process. This HMP is a component of the Fells RMP.

This HMP shall be a dynamic and adaptive document, so that the DCR may improve its approaches and obtain a better understanding of species response to each management action. Specific actions in the plan will be implemented on those sections of DCR Middlesex Fells Reservation designated as NHESP Estimated and Priority Habitat of Rare Species/Wildlife.[1] However, it should be noted that implementation of the actions in this plan is resource dependant and nothing in this plan shall create an obligation for DCR. DCR also requests, and by approval of this HMP DCR shall receive, a public safety exemption to these identified management

[1] See Figure 2.1, Priority Natural Resource Map for the Middlesex Fells Reservation.

practices. Public safety would include circumstances involving fires, floods, ice storms and other situations that create imminent hazards to public health and safety.

II. Rare Species at the Reservation

State-Listed and MESA Regulated Species

Table II.a. below lists the rare species currently documented at the reservation as of this date.

Table II.a. State-Listed and Regulated Species at the DCR Middlesex Fells Reservation.

Scientific Name	Common Name	MESA Status
Ageratina aromatic (Not found in recent botanical surveys)	Lesser snakeroot	Endangered
Name not disclosed insect	---	Endangered
Nabalus serpentarius	Cankerweed (i.e., Lion's foot)	Endangered
Cicindela rufiventris hentzii	Hentz's redbelly tiger beetle	Threatened
Desmodium cuspidatum	Large-bracted tick-trefoil	Threatened
Rhodoecia aurantiago	Orange sallow moth	Threatened
Callophrys irus	Frosted Elfin	Special Concern
Limnadia lenticularis	American clam shrimp	Special Concern
Satyrium favonius	Oak Hairstreak	Special Concern
Cicindela purpurea	Purple tiger beetle	Special Concern

Note: NHESP does not release the names of rare species that are considered particularly susceptible to collection.

Habitat for these 10 rare species is concentrated in the southern half of the reservation, which is accurately represented by the 2008 version of Priority Habitat of Rare Species in the *Natural Heritage Atlas 13 edition* as shown on Figure 2.1, Priority Natural Resources. However, the best management practices embodied by these recommendations will be employed throughout the reservation as resources allow.

For each of these species; descriptions, habitats, life histories and management recommendations are detailed in NHESP rare species fact sheets listed at http://www.mass.gov/dfwele/dfw/nhesp/species_info/mesa_list/mesa_list.htm. Below, we have summarized relevant habitat and threats for each species likely to be found at the Fells.

Beetles (Hentz's redbelly and purple tiger beetles):

Hentz's redbelly tiger beetle inhabits dry, open, rocky, outcrops in the hills around Boston. Some outcrops inhabited by this beetle burn frequently, which may enhance the habitat for both adults and larva (Nelson and Simmons 2007a). This species was last documented in the Fells in 1988.

Purple tiger beetle are most frequently associated with compacted, sandy loam soils along dirt roads and trails typically in grassland, heathland or pitch pine scrub oak barrens (Nelson and Simmons 2007b).

In 2011, in conjunction with this plan, NHESP conducted surveys for the purple tiger beetle. No individuals were documented. This tiger beetle was last documented in the Fells in 1986 near the Sheepfold in the western Fells. Currently, the habitat for Purple tiger beetle no longer exists at these sites. The Skyline Trail and unmarked trails and footpaths appear to have sufficient

openings likely due to past fires to support this species, however, those openings (which are plentiful) that are not compacted by recreational use are covered with a thick growth of lowbush blueberry, moss (*Polytrichum*) and/or sedge. This is true throughout the Fells.

The frequent outcroppings in the Fells would appear to have potential habitat for several species of tiger beetle, including *C. purpurea*, in the thin dry soils filling depressions; however, these appear to be quickly vegetated if left undisturbed. Also, the soil appears to have a higher organic content and less sand than what is usually associated with *C. purpurea*. No high-quality habitat for this species was discovered in 2011 and the beetle was not observed during approximately 35 man-hours specifically searching for this species (NHESP 2011a).

Threats to both species include habitat loss due to both development and natural succesion, fire suppression, invasion by exotic plants, off-road vehicles and insecticide spraying.

With respect to potential impacts of recreational trail use on tiger beetles, the relationship is complex. Trails help to create and maintain habitat for beetle adults and larva, but adults are also susceptible to trampling from both feet and wheels (Knisey 2011).

Plants (large-bracted tick-trefoil and canker weed (i.e., lion's foot)):
Large-bracted tick-trefoil generally inhabits dry, rocky, open areas such as forest edges or rocky outcrops with curcumneutral or alkaline bedrock. Disturbance caused by humans, such as recreational trail use, can create suitable habitat for this species (NHESP 2010).

Cankerweed (i.e., lion's foot) is found in open, rocky woods, often in association with human disturbance such as mowing, trails, roads and power lines (http://www.newfs.org/docs/pdf/Nabalusserpentarius.pdf).

Both of these species are associated with open areas and human disturbance, thus, recreational trail use may enhance habitat for this species. Potential threats to both of these species include habitat loss due to development, fire suppression, over-shading from forest succession, invasion by exotic plants, lack of disturbance and trampling.

Moths and Butterflies (orange sallow moth, frosted elfin and oak hairstreak):
The orange sallow moth and oak hairstreak both inhabit dry, open, oak woodlands and open, rocky uplands. Frosted elfin is found in similar habitats, often disturbance dependant, and associated with pitch-pine scrub oak barrens (Nelson 2007a-c).

Orange sallow moth was last documented in the southern part of the reservation in 2010. The host plants for the caterpillars of this species (false foxgloves, *Aureolaria flava* and *A. pedicularia*) are easily identified throughout much of the year.

Oak hairstreak was last documented in 1998 and will go historic in 2013 unless re-documented. This species lay eggs on oak (*Quercus sp.)*, which serves as a host for the larvae.

During 2011, in conjunction with this plan, NHESP conducted surveys for frosted elfin during May and June. No individuals were documented. The most recent documentation of this species

is Lawrence Woods on 15 May 1988. It was described as good habitat with abundant Wild Indigo (*Baptisia tinctoria*, the host plant for the caterpillars of this species). This site still supports abundant host plants.

Smaller patches of *Baptisia* were present in Lawrence Woods south of Ramshead Hill and adjacent to Medford High School. Three small patches along Skyline Trail east of South Border Road were documented. Two patches of *Baptisia* were found south of Silver Mine Hill. The western patch had approximately 19 spindly clumps that are being shaded out, but the eastern patch had about 30 robust clumps (NHESP 2011a).

Threats to each of these species include fire suppression, invasion by exotic plants, introduced generalist parasitoids, excessive deer-browse of host plants, insecticide spraying, clearcut timber harvesting, off-road vehicles and light pollution.

American Clam Shrimp:
Inhabits vernal pool, which are present in late winter and early spring but may be dry at other times of the year. The American clam shrimp has been recorded in a small number of Massachusetts habitats including the Fells.

Because the pools that support this species are dry much of the year, they can easily be overlooked. Losses or degradation of these pools to development, filling, draining, changes in hydrology and contamination from pesticides threatens this species.

Name Not Disclosed Insect:
We will not release the names or habitats of rare species that are considered particularly susceptible to collection. During 2011, in conjunction with the plan, NHESP surveyed for this species. This species was not documented. Threats to this species include collection and water quality degradation (NHESP 2008b).

III. Other Species and Natural Communities in Need of Conservation

Birds
The Middlesex Fells also provides habitat for several birds designated as "Species in Greatest Need of Conservation." The following table lists these bird species in greatest need of conservation, their current MESA status and whether or not they are listed in the Breeding Bird Atlas (BBA) for the Fells area.

Common Name	Scientific Name	MESA Status	BBA
Common loon	Gavia immer	Special Concern	
Pied-billed grebe	Podilymbus podiceps	Endangered	
Green heron	Butorides virescens		Yes
Black-crowned night-heron	Nycticorax nycticorax		Yes
American black duck	Anas rubripes		
Bald eagle	Haliaeetus leucocephalus	Endangered	
Northern harrier	Circus cyaneus	Threatened	
Sharp-shinned hawk	Accipiter striatus	Special Concern	

Broad-winged hawk	Buteo platypterus		
American kestrel	Falco sparverius		
Pergerine falcon	Falco peregrinus	Endangered	
Ruffed grouse	Bonasa umbellus		
American woodcock	Scolopax minor`		Yes
Eastern Whip-poor-will	Caprimulgus vociferous		
Willow flycatcher	Empidonax traillii		
Blue-winged warbler	Vermivora cyanoptera		
Golden-winged warbler	Vermivora chrysoptera	Endangered	
Northern parula	Parula americana	Threatened	
Prairie warbler	Dendroica discolor		
Blackpoll warbler	Dendroica striata	Special Concern	
Mourning warbler	Oporornis philadelphia	Special Concern	
Louisiana waterthrush	Parkesia motacilla		
Eastern towhee	Pipilo erythrophthalmus		Yes
Field sparrow	Spizella pusilla		
Vesper sparrow	Pooecetes gramineus	Threatened	
Grashopper sparrow	Ammodramus savannarum	Threatened	
White-throated sparrow	Zonotrichia albicollis		

Four of these species may be breeding at the Fells, and two, eastern towhee and American woodcock, are ground-nesting species. Nesting behaviors of ground nesting birds may be particular disrupted by off-trail recreation and off-leash dogs (Banks and Bryant 2007).

Reptiles

The following reptile species, designated a "Species in Greatest Need of Conservation" by MassWildlife, have been confirmed at the Fells:

North American racer	*Coluber constrictor*
Eastern ribbon snake	*Thamnophis sauritus*

These species are identified as G5 (common) by MassWildlife but identified as a "Species in Greatest Need of Conservation" on the advice of outside experts.

Threats to the North American racer include habitat destruction, pesticide use and human persecution (MIDNR 2011). As this species often utilizes a large home range, it is also subject to being killed on busy roads. Although threats from recreational trail users to this species are not documented, because racers tend to bask on rocks or trails, and given the speed that mountain bikes may travel, it is reasonable to speculate that this species may be susceptible to some disturbance, trampling or occasional injury by recreational mountain bikers at the Fells.

The eastern ribbon snake inhabits wetland edges and is semi-aquatic. Wetland habitat destruction threatens this species. The ribbon snake is unlikely to be trampled or injured by recreational trail users at the Fells.

Watch-Listed Plants

The following plants are identified by the Massachusetts NHESP as Watch-list plants. The Watch List is a list of plant species that are of known or suspected conservation concern. Records of these species are tracked in the NHESP databases, but these species are not regulated under MESA. Species are included on the list because:

1) The species is thought to be rare, declining or vulnerable, but there is insufficient information on the condition, number and size of populations to make a determination (termed "Uncommon" in the reasons for listing).
2) The species was removed from the official regulatory list, but NHESP believes it still is in need of some conservation attention (termed "De-listed")
3) The species is uncommon and there are uncertainties about the taxonomic status (termed "Taxonomic Issue")
4) The species is uncommon and its status as a native or an introduced species is undecided (termed "Introduced?")
5) The species is recently discovered or re-discovered in the Commonwealth and is placed on the Watch List to ensure it is tracked while botanists determine whether it is appropriate for proposal to the MESA list.

Approximate locations and recommendations have been provided by NHESP state botanist (revised 11/21/11 with information from Hamlin, 2011d).

Scientific Name	**Common Name**	**Last Obser-vation**	**Location**	**Recommendations / Threats**	**Reason for Listing**
Betula nigra	River Birch	2011	A native stand east of Bellevue Pond.		Uncommon
Chenopodium simplex	Maple-leaf Goosefoot	2009	West side of Wright's Pond, Medford. / West roadside of Rt. 28 north of gate 25 near the Sheepfold, Stoneham 3, Sector 6.	Survey for additional sites; if found, report to NHESP.	Uncommon
Coreopsis rosea	Rose Coreopsis	2006	East side of Middle Reservoir	Survey for additional sites; if found, report to NHESP.	Uncommon
Crataegus keepii	Keep's Hawthorn	2011	Take Rock Circuit Trail East, keeping to most southerly loop. Before the path descends to the Hemlock Pool Path the 2 bushes are hid beyond East of a large rock outcrop.	These two shrubs are being shaded out by sumac; if possible, cut back the sumac and keep other woody plants and vines from overtaking the shrubs.	New
Hottonia inflata	Featherfoil	2011	1. Bellevue Pond, Middlesex Fells, Medford. 2. Wenepoykin Pool 3. Swamp on border with Whip Hill Park. 4. Straight Gully Brook.	Survey ponds and deep vernal pools for this plant. If found, report to NHESP and ensure water quality protection for the sites.	Uncommon
Lespedeza frutescens	Violet Bush-clover	2011	South slope of Pine Hill.	Survey additional sites for this plant. If found, report to NHESP.	De-listed
Polygonum tenue	Rock Knotweed	2004	Near summit of MIT observatory hill.	This plant is vulnerable to trampling and shading by succession. If possible, redirect trails away from the plants and ensure they are not shaded out by woody plants.	Uncommon

Scientific Name	Common Name	Last Obser-vation	Location	Recommendations / Threats	Reason for Listing
Ranunculus allegheniensis	Allegheny Buttercup	2008	1. Bear Hill, Middlesex Fells, Stoneham. Sugar maple – oak – hickory forest Priority Natural Community. 2. Quarry Rd. north of Bellevue Pond.	Survey for additional sites; if found, report to NHESP. This plant is susceptible to trampling; if possible, direct trails away from the plants.	Uncommon
Ranunculus fascicularis	Early Buttercup	2011	Single known population on a secluded ledge on east slope of Bear Hill.	Survey for additional sites; if found, report to NHESP. This plant is susceptible to trampling threat is overgrowth by Wild Madder – *Galium mollugo*, reducing the population to one plant in 2011.	Uncommon
Ranunculus sceleratus	Cursed Crowfoot	2010	1. Several locations within the wedge between I93, route 28 and North Border Rd. 2. Cubbyhole Swamp west of Whip Hill. 3. Sector 4.		Uncommon
Selaginella rupestris	Rock Spikemoss	2004	Near summit of MIT observatory hill.	This plant is vulnerable to trampling and shading by succession. If possible, redirect trails away from the plants and ensure they are not shaded out by woody plants.	De-listed

Priority Natural Communities

During 2011, in conjunction with this plan, NHESP surveyed, classified, mapped and confirmed Priority Natural Communities at the Middlesex Fells. The surveyors located a number of Priority Natural Communities in the Fells, many of which are upland ridgetop habitats with Pitch Pine (*Pinus rigida*) and/or Scrub Oak (*Quercus ilicifolia*) associations. The quality of these communities varied. Some were small occurrences (< 0.5 acre), others had been impacted by trails and other human disturbances, and others were relatively free of disturbance and had a vigorous plant association consistent with the community descriptions in Swain and Kearsley (2001). Invasive plant species are present throughout the Fells and frequently occurred to a greater or lesser degree in many of the reservation's Priority Natural Communities.

Figure 1 shows the locations of the natural communities discussed below.

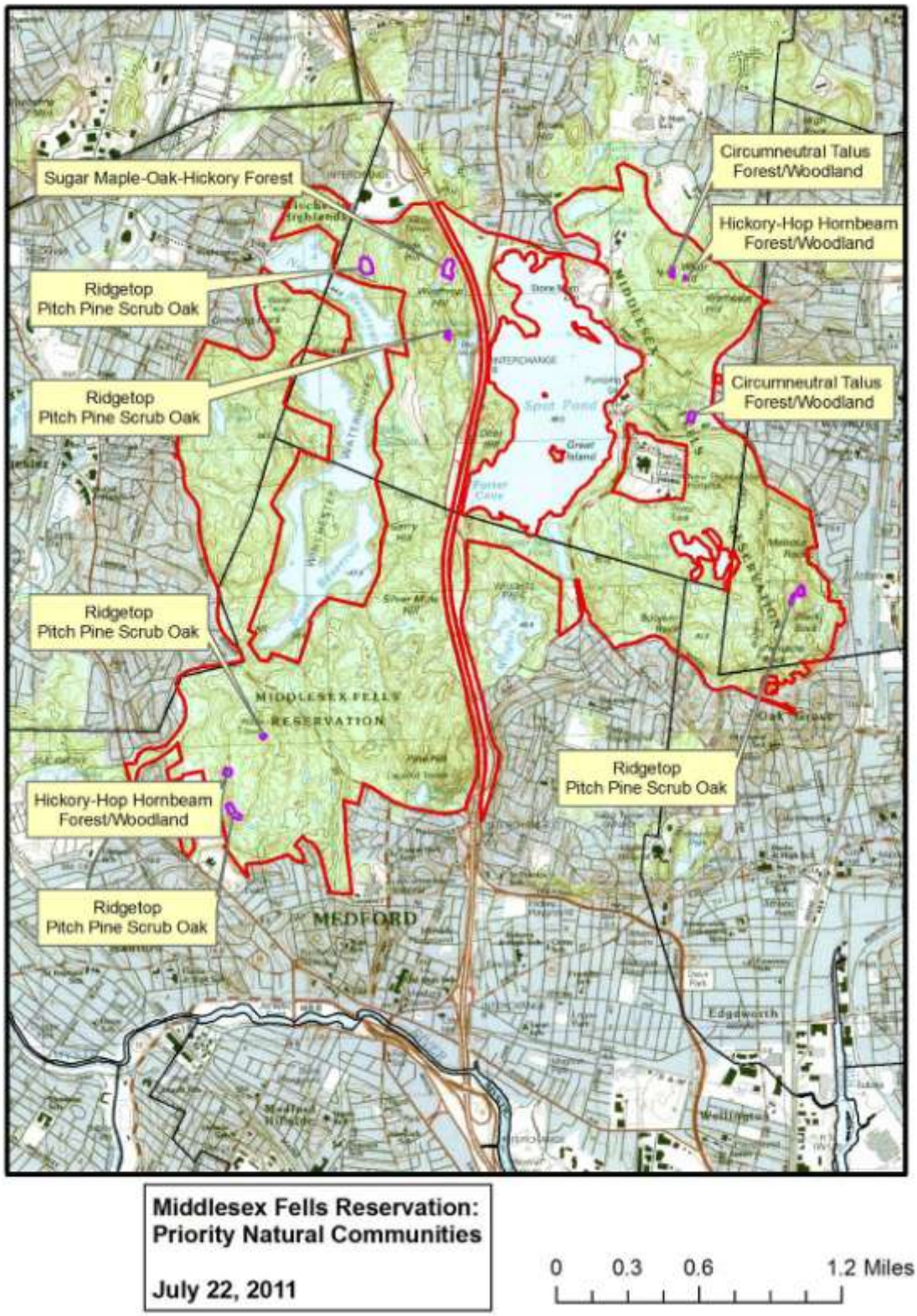


Figure 1: Locations of Documented Priority Natural Communities 7/22/11

Hickory-Hop Hornbeam Forest/Woodland (S2)
Two occurrences of this natural community were encountered that match or approximate the description of Hickory-Hop Hornbeam Forest/Woodland in the Community Classification. A third community that has both hickory and hornbeam was observed, but in other respects did not closely match the community description, and is not included.

The best example is a small patch stand (< ¼ acre), rich community of *Carya cordiformis* (Bitternut Hickory) and *Ostrya virginiana* (Hop Hornbeam) with some oaks. *Carex pensylvanica* (Pennsylvania Sedge) forms somewhat of a carpet below with *Polygonatum pubescens* (Solomon's Seal) and *Vaccinium pallidum* (Early Sweet Blueberry) scattered about. Towards the south is a nice rock outcrop with some rich-soil indicator species growing densely – *Aquilegia canadensis* (Wild Columbine) and *Corydalis sempervirens* (Pale Corydalis). This site is in the northeast part of the Fells, north of Pond St. There are no trail or other human impacts in this small stand.

A second hickory/hornbeam community is in the Lawrence Woods section of the southwestern part of the Fells. It has a mix of oak and hickory in the canopy, and abundant Hop Hornbeam in the understory. The stand has moist soils and some rich-soil indicator plants such as Early Meadow-Rue (*Thalictrum dioicum*). There are a variety of sedges here that could be inventoried when they are in the fruiting stage. This ½ to ¾ acre community is not an exact match with the classification description, but the co-dominance of hickory with oak in the canopy and the abundance of hornbeam has some similarities in structure and components to the Hickory-Hop Hornbeam Forest community.

ID	Location	Latitude	Longitude	Management Issues/Recommendations
1	Whip Hill	42.46298818	-71.08557165	No management issues.
2	Southwest of radio tower	42.43310024	-71.12321846	Trail runs near stand, but disturbance is slight.

Ridgetop Pitch Pine-Scrub Oak (S2)
Rocky summits occur throughout the Fells. Many of these summits have populations of Pitch Pine and Scrub Oak, but on most summit outlooks, these species are not the dominant elements in the community. Other species that co-occur and frequently dominate these habitats include White Pine (*Pinus strobus*), Red Oak (*Quercus rubra*), White Oak (*Q. alba*), Black Oak (*Q. velutina*), Red Cedar (*Juniperus virginiana*), Gray Birch (*Betula populifolia*), and aspens (*Populus* spp.). These habitats were identified as Acidic Rocky Summit/Rock Outcrop (S4) communities or in some cases as Mixed Oak Forest (S5) communities.

Altogether, surveyors identified five good-quality Ridgetop Pitch Pine-Scrub Oak Communities (S2). All but one of these communities have vigorous stands of Pitch Pine and Scrub Oak, which are dominant or at least co-dominant components of the association. One occurrence thought possibly to be Scrub Oak Shrubland is classified here as a variant of the Ridgetop Pitch Pine-Scrub Oak community because of the small size and species composition. Good examples occur at the following locations:

ID	Location	Latitude	Longitude	Management Issues/Recommendations
3	East of Medford High School	42.430488	-71.122788	None.
4	Radio tower, Lawrence Woods	42.43519840	-71.12045738	Some non-native species present (not invasives). Consider adding interpretive wayside signage to this site. A fire occurred near this location in 2010. Consider managing habitat through selective thinning or letting burn to maintain community.
5	Northwest of Dark Hollow Pond	42.45960725	-71.10507977	Good habitat. A number of trails here. Close trails from site. Reloate recreation use to adjacent existing trails. Manage to maintain community.
6	North of North Reservoir	42.46400281	-71.11173014	Trail-free area. Good quality community. No management recommendations, but do not open up to trails.
7	North of Black Rock, eastern Fells	42.44324201	-71.07704876	Trail goes through community but does not have serious impacts. Consider adding interpretive wayside signage.

Circumneutral Rocky Summit/Rock Outcrop Community (S2S3)

One good quality circumneutral rock outcrop community of approximately one acre was identified in the northeastern part of the Fells. It has a mix of species typical of more acidic summit woodland communities, including Pitch Pine and Scrub Oak, but it was considerably more diverse. Mosses and lichens occurred in large patches, and one large set of outcrops was covered with Pale Corydalis (*Corydalis sempervirens)*. The two most significant plant species found here, both indicative of high nutrient levels, were Wild Columbine (*Aquilegia canadensis*) and Ebony Spleenwort (*Asplenium platyneuron*). There is a trail in the community and some invasive Glossy Buckthorn (*Frangula alnus*).

ID	Location	Latitude	Longitude	Management Issues/Recommendations
8	Whip Hill	42.463426	-71.086579	Re-locate the trail through the oak woodland adjacent to this community, and control/remove the glossy buckthorn population.

Circumneutral Talus Forest/Woodland (S3)
A Circumneutral Talus Forest/Woodland was confirmed north of Ravine Road in the Viginia Wood area. The community above the talus is a hardwood-hemlock forest with an open area of Dewberry (*Rubus hispidus*), Solomon's-Seal (*Polygonatum pubescens*), and Canada Mayflower (*Maianthemum canadense*). The woods below the cliffs/talus however are rich, with Sugar Maple, White Ash, Hop Hornbeam, and Basswood (*Tilia americana*). This rich area is small (< ½ acre) and appears to be limited just to the base of the cliffs and talus. Garlic Mustard (*Alliaria petiolata*) and Lily-Of-The-Valley (*Convallaria majalis*) are noted here. This is not a high quality community of its type, but it is highly unusual for the Fells. No human disturbances are noted.

ID	Location	Latitude	Longitude	Management Issues/Recommendations
9	North of Ravine Rd.	42.45446797	-71.08492205	None

Sugar Maple-Oak-Hickory Forest (S2)
A rich forest community of just under two acres is located in the northern part of the Fells, on slopes above (west of) Route I-93. There are some seepages on the slope, and numerous rock outcroppings higher up. This community has a canopy of Sugar Maple (*Acer saccharum*) and White Ash (*Fraxinus americana*), as well as several species of oaks (*Quercus* spp.), hickories (*Carya* spp.), and Basswood (*Tilia americana*). Sugar Maple saplings comprise a significant part of the understory, and there are some representative mesic forest species such as Hepatica (*Hepatica rotundifolia*) and Wild Geranium (*Geranium maculatum*) in the stand. There are also circumneutral outcrops within the stand which have species such as Prickly Gooseberry (*Ribes cynosbati*) and Aniseroot (*Osmorhiza longistylis*). Within the Fells Reservation, this stand is exceptionally diverse and distinct. There are some impacts to the site, including invasive species, and a trail runs through the stand. Some of the richer outcrops on the upper part of the stand are choked with invasives such as Privet (*Ligustrum obtusifolium)* and Garlic Mustard (*Alliaria petiolata*). On a state-wide basis, this newly described type of community is uncommon, and it merits consideration and protection as a habitat that is not only unique in the Fells but very uncommon for eastern Massachusetts. This community type is particularly susceptible to invasion by exotic invasive plants whenever the native plant community is disturbed. Thus, DCR will manage this site to keep disturbance to a minimum and relocate trails outside of the stand.

ID	Location	Latitude	Longitude	Management Issues/Recommendations
10	Southeast side of Bear Hill	42.46407741	-71.10526795	Recommend closing trail through this area, and re-routing to adjacent existing trail. Control / removing the invasive plant populations.

IV. Potential Threats to Rare Species and their Habitats at the Fells

General threats for the various rare species are described above. Specific threats at the Middlesex Fells to state-listed rare species and species of conservation concern include:

- ***Loss of habitat due to natural succession and lack of periodic disturbance.*** Most of the state-listed rare species at the Fells and some of the host plants require period disturbance to survive. Some of the bird species of conservation concern are grassland or shrubland specialists. As a result of natural forest succession and on-going fire suppression for public and property safety, the Fells may be experiencing a loss of early successional and periodically disturbed habitats. Potential responses to this might include targeted canopy cutting and working with local fire departments to consider "let burn" strategy in some targeted situations.

- ***Invasion by Exotic Plants:*** At the Middlesex Fell, 27 plant species have been classified as invasive and another 11 as likely invasive by the Massachusetts Invasive Plant Advisory Group (MIPAG). These are non-native species that have spread into native or minimally managed plant systems where they dominate and/or disrupt native ecosystems. Invasive plants can out-compete native rare plants and watch-listed plants, can out-compete host plants critical to rare insects, and impact the health of natural communities. Invasive plants are common at the Fells along most roadsides, within many wetland habitats and in some interior locations, especially those that have been previously disturbed. The watch-listed *early buttercup* is currently under specific threat from invasives. Controlling invasive species and adopting measures to prevent the spread of invasives will be important strategies to combat this threat. However, unless carefully managed, invasive control projects can also add disturbance and even seed sources to communities.

- ***Trampling:*** Rare beetles, rare plants, watch-listed plants and host plants for rare moths and butterflies are all susceptible to trampling. The plants are all susceptible to trampling particularly by any off-trail uses. Beetles are susceptible to trampling from off and on-trail recreation particularly within ridgetop and rocky outcrop habitats, but trails also create necessary habitat for these beetles. Given the speeds at which mountain bikes can travel and the continuous tread contact, it is possible, although not established in scientific literature, that mountain bikes may pose more of a risk to trampling adult tiger beetles than pedestrian uses.

- ***Excessive Soil Disturbance:*** Rare beetles, rare plants, watch-listed plants and host plants for rare moths and butterflies are also susceptible excessive soil disturbance from OHV use or other heavy machinery. This may be particularly an issue for the large-bracted tick trefoil which occurs along a road side.

- ***Impacts to Water Quality:*** The American clam shrimp and the name not disclosed insect are susceptible to water quality degradation. Most significant threats to water quality at the Fells include contaminated runoff from neighboring urban infrastructure, pesticide and herbicide use, and potentially from erosion and sedimentation from nearby trails.

There is not ongoing erosion at these sites based on field inspections, but DCR will continue to monitor.

- ***Deer Browse:*** While the current population of white-tailed deer is not excessive, deer are present at the Fells, and uncontrolled populations in urban parklands can begin to impact plant species. The rare and watch-listed plants at the Fells are potentially at threat from deer browse. DCR, in partnerhship with other agencies, will continue to monitor deer browse at the Fells.

V. Habitat Management Recommendations

In general, the rare species documented at the Middlesex Fells have similar habitat needs and potential threats. The rare species at the Fells benefit from open woodlands; healthy vernal pool habitats; open rock outcrops with shrubland, heathland and grassland habitats; and periodic fire. The rare species are threatened at the Fells by habitat loss, trampling due to off-trail uses, invasive plants, fire suppression, insecticide spraying, and potentially, browse by white-tailed deer.

This HMP proposes the following habitat management strategies to protect these species.

Rare Species Survey and Monitoring
Dependent on volunteers and resources, contract / allow NHESP or area researchers to conduct surveys for Hentz' Redbelly Tiger Beetle (*Cicindela rufiventris hentzii)* and Oak Hairstreak (*Satyrium favonius)*. If not re-documented, these species records will go historic in 2013. If adults or larvae of Hentz' Redbelly Tiger Beetle are re-documented in the Fells, DCR will not open any new trails through such sites. If trails already exist at the site, DCR will consult with NHESP as to the particulars of whether existing trails should be closed or re-routed away from the tiger beetles.

When possible, partner with other agencies, academic institutions and individuals to permit rare species surveys and monitoring. Partners may include NHESP, USDA Forest Service, Tufts University, Harvard University, New England Wildflower Society, Vernal Pool Association, and individual birders, botanists, biologists, herpetologists and entomologists.

Permitting of survey and monitoring activities will include guidelines to protect vernal pools, prohibit the spread of materials from one site to another, minimize potential trampling and ensure that information is provided to DCR in a timely and useful manner.

Vernal Pool Protection
During new trail planning, identify potential vernal pools.

Certify vernal pools. DCR will encourage partners and volunteers to certify vernal pools, provided that these partners and volunteers follow DCR guidelines to protect pools. Guidelines include carefully washing all waders and tools to ensure invasive species are not introduced.

Close and / or re-route any trails within vernal pools. Trail closure procedures are detailed in the RMP Appendix N, Trail System Plan, however no actions would be taken within the boundaries of any vernal pools.

Use best management practices to prevent sedimentation into pools during trail use, construction and maintenance as outlined in the "DCR Trail Guidelines and Best Practices Manual."

Maintain shading around pools. DCR will not clear, or allow others to clear, vegetation around pool edges.

Maintain habitat structure in adjacent upland. DCR will not disturb rocks, tree trunks or branches within 50 feet of a pool, or allow others to do so.

Maintain habitat structure in pools. DCR will not remove or pile branches from within a vernal pool or allow others to do so.

DCR, in partnership with the Vernal Pool Association and other volunteers, will continue to evaluate trails within 50 feet of a vernal pool and consider closing or relocating trails that impact vernal pools.

Also see Guidelines for Protection of Vernal Pools and Associated Habitat on DCR Lands (Appendix D).

Priority Natural Communities Management
During new trail planning, avoid creating new trails through PNCs.

Where trails do exist and will be retained through PNCs, add trail definition (rocks and logs) to keep users on existing trails, and educate users about the importance of staying on trails.

Avoid expanding or enlarging trails beyond their existing footprint in PNC
Refrain from gathering materials for trail maintenance (rocks, logs, soil, etc.) from within the community.

Organize or allow the removal of invasive plants from PNC sites as noted above (ID 8, 9 and 10). During these projects avoid excessive soil disturbance, and introducing invasive plants with imported soil, tools or other material.

Monitor the condition of the Ridgetop Pitch Pine-Scrub Oak communities and, in consultation with NHESP, manage these sites to prevent succession to closed-canopy Pitch Pine or other trees.

Consider siting an interpretive sign in an occurrence of Ridgetop Pitch Pine-Scrub Oak community (ID 4 and/or 7), to explain to the public this biological resource and its susceptibility to over-use.

Close trails through Ridgetop Pitch Pine-Scrub Oak communities (ID 5), as noted above.

Relocate the trail through the Circumneutral Rocky Summit/Rock Outcrop Community (ID 8), as noted above.

Relocate the trail outside the rich Sugar Maple-Oak-Hickory Forest (IF 10), as noted above.

Fire
Work with local fire departments to explore options for fire suppression on outcrops. Specifically, explore possibilities for some "let it burn" protocol for specific situations that do not pose a threat to public or property safety.

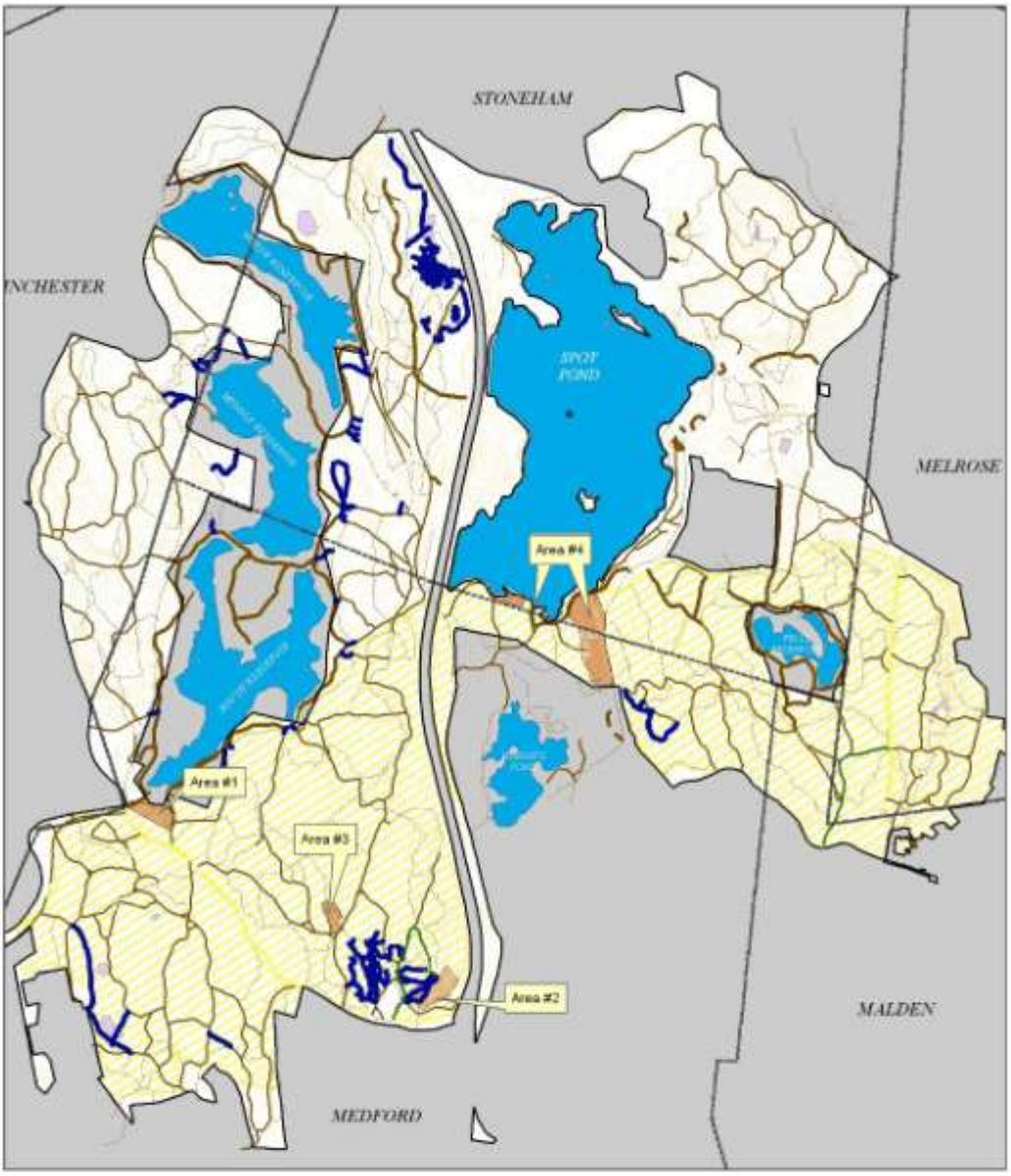
Trail Closures
Close trails and reduce the number and miles of trails within the trail system. Trails that may be impacting sensitive natural and cultural resources, and those trail segments that contribute to user confusion are a priority for closure. Trail closures will reduce the density of trails, reduce habitat loss due to trail impacts, and reduce wildlife disturbance due to recreational uses. This will undoubtedly be a long-term effort and will require a combination of DCR and partner resources to implement. Ultimately, this recommendation may result in approximately a 20% reduction in trail mileage within the Fells. Initially targetted trail closures are shown on Figure 2.

Prioritized trails for closure as follows.
High Priority:

- Trails in Priority Natural Communities as identified above
- Confusing 'spider-web' trails north of the Sheepfold and Dark Hollow Pond
- Redundant trails in poor condition or with poor alignments, particularly north of Dark Hollow Pond and in the Pine Hill area
- Unnecessary trails leading to posted watershed lands
- Un-official trails north west of Bellevue Pond and in the Little Pine Hill Area

Priority:

- Redundant trails potentially impacting vernal pools or other wetland resources
- Dead end trails
- Additional locations indicated on Figure 2: Trail and Habitat Recommendations.



Middlesex Fells Reservation

Figure 2: Trail and Habitat Recommendations.

dcr
Massachusetts

- Middlesex Fells Reservation
- Town Boundaries
- Fells_Priority_NatComms_July2011
- NHESP Priority Habitats of Rare Species
- NHESP Areas with Habitat Recommendations
- Trails Recommended for Closure
- Roads to Maintain / Regrade

N
W
E
S

Geographic data supplied by: Office of Geographic and Environmental Information (MassGIS) and DCR GIS, Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs

Trails Maintenance:
DCR in consultation with NHESP has determined that, other than the issues posed by excessive trail density, the presence of existing trails and existing trail uses within the Middlesex Fells on existing trails will not negatively impact the existing rare species.

For five of the nine rare species, routine trail maintenance on the existing trails will have no effect on the existing rare species.

Four of the species could be affected by the off-trail use or by routine trail maintenance along existing trails. Specifically these potential impacts include vegetation trampling by off-trail users, vegetation cutting during trail maintenance and water quality impacts during trail maintenance.

DCR in consultation with NHESP has identified the following sites and guidelines to fully protect rare species during trail maintenance. All areas are indicated as brown polygons on Figure 2 and labled accordingly.

- Area #1:
  In this area, DCR will not enlarge mowed areas adjacent to trails or roads beyond existing lawns. In addition, DCR will not disturb the soil adjacent to trails or roads.

- Area #2:
  In this area, DCR will not create new trails or disturb the soil or plants adjacent to trails or roads in this area. DCR may close existing poor-condition, fall-line trails, but will use materials from outside of this polygon.

- Area #3:
  In this area, we are concerned with water quality of wetlands within the polygon. DCR will ensure that trails or roads within the polygon are not eroding into wetlands during current use or maintenance. If necessary to protect water quality, DCR will consider closing or moving trails in this area.

- Area #4:
  In this area, as with Area #3, we are concerned with water quality of wetlands within the polygons. DCR will ensure that trails or roads within the polygons are not eroding into wetlands during current use or maintenance. If necessary to protect water quality, DCR will consider closing or moving trails in these areas.

In efforts to minimize potential off trail hiking and biking, and its impact on priority habitat, DCR shall regularly maintain the Reservation's trails. Trail maintenance shall include the activities as described in *DCR's Trail Guidelines and Best Practices Manual*. DCR shall also enforce its prohibition on off-trail uses, unless specifically permitted.

In order to maintain safe conditions and minimize off-road impacts, DCR will periodically re-grade the access road to Wright's Tower and Jerry Jingle Road (shown in green on Figure 2), but will restrict maintenance activities to the road bed.

Trail maintenance shall be completed by DCR staff as well as volunteers under the permission, direction and supervision of DCR staff utilizing hand tools such as loppers, bow saws, shovels, etc. DCR shall utilize brush cutters, chainsaws, mower or tractor with boom and flail, and pole saws when necessary to complete vegetation clearing.

Minimize Off-Trail Uses
DCR will engage in public education through signs, electronic communication and ranger services to encourage users to stay on official trails.

DCR will continue and enforce regulations that prohibit off-trail uses.

Trail Relocations and New Trails
DCR proposes the construction of new trail segments to relocate trails from specific Priority Natural Communities as noted above (ID 8 and 10). These locations are not within Priority Habitat, but relocations will be layed out in consultation with DCR natural resource professionals to ensure limited impacts to botanical resources and natural communities.

DCR proposes the potential construction of a new trail segment in order to effectively separate overlaps of the Mountain Bike, Skyline and Reservoir Trail loops. This new trail will help to reduce conflicts in this area, and reduce potential "rogue trail" creation or off-trail riding. In doing so, we believe that rare species will be better protected.

Proposed segments are depicted on Figure 3. It is proximate to NHESPs Area of Habitat Recommendation #1. We propose to layout and construct this trail in close consultation with the State Botanist and area botanists in order to avoid known and potential populations of large-bracted tick-trefoil.

Invasive Plant Species Control:
DCR will work to permit organized volunteers to remove invasive plants including Norway maple (Acer platanoides), Japanese barberry (Berberis thunbergii), Garlic mustard (Alliaria petiolata), Oriental bittersweet (Celastrus orbiculatus), Burningbush (Euonymus alatus), Japanese knotweed (Polygonum cuspidatum), Glossy buckthorn (Frangula alnus) and Multiflora rose (Rosa multiflora). These projects will follow guidelines outlined in *Strategic Recommendations for Managing Invasive Plants in Massachusetts* by the Massachusetts Invasive Plant Advisory Group (MIPAG).

Specifically, as noted above, DCR will work to permit the removal of invasive plants from Priority Natural Community sites (ID 8, 9 and 10) and avoid introducing invasive plants with imported soil, rock, tools or other material.

All invasive removal project that involve digging or other soil disturbance must be reviewed and approved by the DCR Archeologist with possible submission to MHC.

Any invasive removal project is Priority Habitat, as mapped at the time by NHESP, will be submitted for review to NHESP.

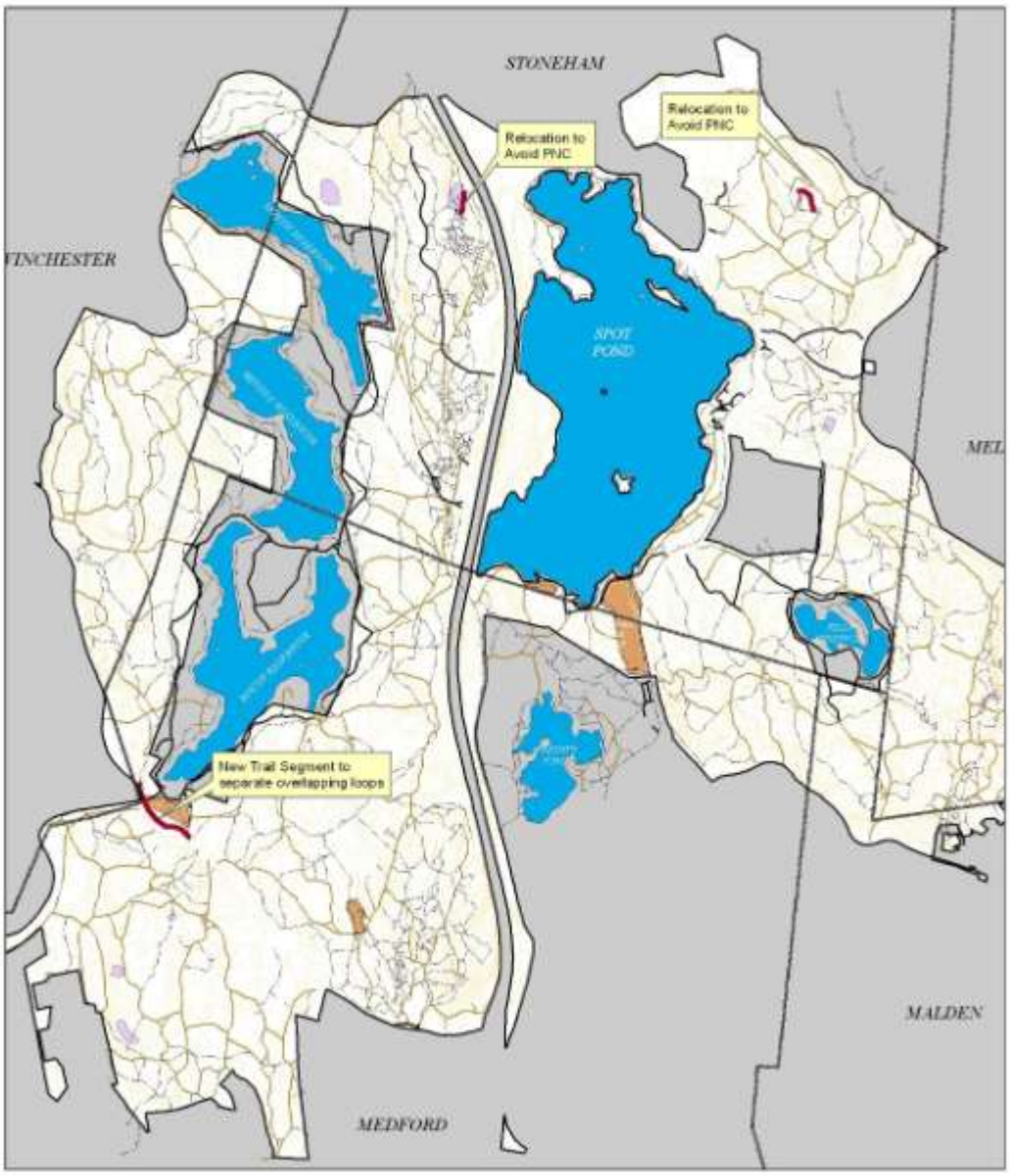
Additional Inventories:
DCR will work with the Massachusetts Division of Fisheries and Wildlife to identify strategies for deer monitoring and, if warranted, deer management at the Middlesex Fells.

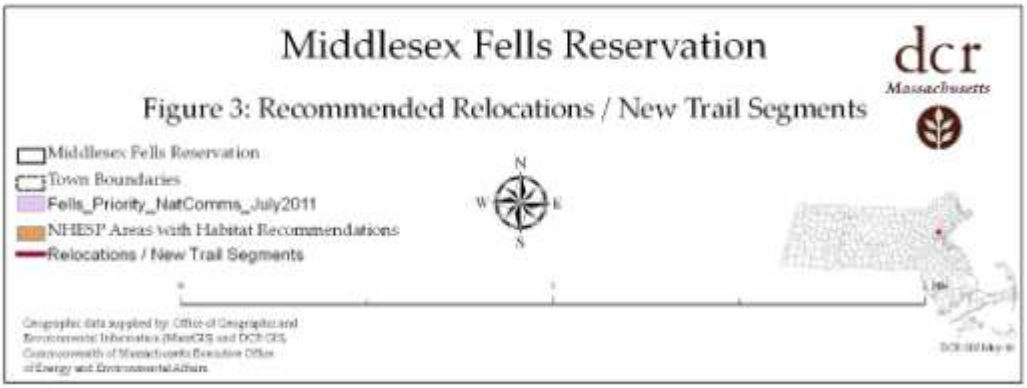
Habitat Management / Restoration:
DCR may engage in specific habitat enhancement projects to:

- Remove overstory canopy from known rare and watch-list plants locations including locations of Keep's hawthorn, large-bracted tick- trefoil and cankerweed.
- Note the locations of the larval host plant of Frosted Elfin – Yellow Wild Indigo (*Baptisia tinctoria)* and ensure that they are not mowed, trampled, overgrown by invasives, or shaded out by taller plants.
- Note the locations of host plants for orange sallow moth – false foxgloves (*Aureolaria flava* and *A. pedicularia*) and ensure that they are not mowed, trampled, overgrown by invasives, or shaded out by taller plants. These plants are hemi-parasitic on oak treesand we will not remove all of the oak trees from the vicinity of false foxgloves.

Although there are potential conflicts between recreation and rare species at the Fells, DCR does not believe that there are any current conflicts between management activities (such as mowing or forest management) at the Fells, and rare species or their habitats.

Inter-Agency Coordination
DCR will share this HMP and coordinate species and habitat protection with partner agencies including the Massachusetts Water Resources Authority and the Town of Winchester.


STONEHAM
Relocation to Avoid PNC
Relocation to Avoid PNC
WINCHESTER
SPOT POND
MEL
New Trail Segment to separate overlapping loops
MALDEN
MEDFORD


Middlesex Fells Reservation
dcr
Massachusetts
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Middlesex Fells Reservation
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Fells_Priority_NatComms_July2011
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Appendix N. Trail System Plan for the DCR Middlesex Fells Reservation.

TRAIL SYSTEM PLAN

DCR
Middlesex Fells Reservation

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(Reservoir Trail and Mountain Bike Loop. Photo by Paul Jahnige)

Section 1. Introduction

1.1. Mission of the Department of Conservation and Recreation

The Department of Conservation and Recreation (DCR) is responsible for the stewardship of approximately 450,000 acres of Massachusetts' forests, parks, reservations, greenways, historic sites and landscapes, seashores, lakes, ponds, reservoirs, and watersheds. It is one of the largest state parks systems in the country. The mission of the DCR is:

> *To protect, promote, and enhance our common wealth of natural, cultural, and recreational resources.*

In meeting today's responsibilities and planning for tomorrow, the DCR's focus is on:

- Improving outdoor recreational opportunities and natural and cultural resource conservation.
- Restoring and improving DCR facilities.
- Expanding public involvement in carrying out the DCR mission.
- Establishing first-rate management systems and practices.

The DCR was created pursuant to state legislation that in 2004 merged the former Metropolitan District Commission (MDC) and

the former Department of Environmental Management (DEM). The DCR's Division of State Parks and Recreation manages nearly 300,000 acres of the state's forests, beaches, mountains, ponds, riverbanks, trails, and parks outside the Greater Boston area. The Division of Urban Parks and Recreation manages over 17,000 acres of woodland, river, and coastal reservations within the Greater Boston area and has broad management responsibilities for the preservation, maintenance and enhancement of the natural, scenic, historic, and aesthetic qualities within this area.

The health and happiness of people across Massachusetts depend on the accessibility and quality of our parks – our natural and cultural resources, recreation facilities, and great historic landscapes. The DCR enhances this vital connection between people and their environment.

1.2. An Introduction to Trail System Planning

Trails are more than just paths in the woods, or routes that connect one place to another. Trails create recreational experiences for users that are made up of series of visual, physical, and emotional events. Trails are also the venue through which we experience and interact with the natural and cultural environment around us. In many ways, trails are the intersection of Conservation and Recreation.

Trail Systems are integrated networks, and more than just the sum of the individual trails of which they are composed. Successful trail systems work seamlessly to highlight scenic features, protect sensitive resources, create valuable connections, discourage unwanted behaviors, and provide the desired range of high-quality recreational experiences to users.

A Trail System Plan assesses the function of the existing network, and makes recommendations to guide the management of recreational trail assets within the context of the natural and culture environment under the stewardship of the DCR. These plans are intended to function both as a stand-alone trails management plan and as a component of a future Resource Management Plan (RMP).

The trails plan is intended to be a working document for setting priorities; allocating resources; and adapting to changing fiscal, social, and environmental conditions. The planning process provides a forum for communication and cooperation with park visitors, stakeholders and the surrounding communities to ensure transparency in DCR's stewardship efforts.

1.3. The Planning Process

The Middlesex Fells Trail System Plan is the first such plan undertaken by the agency. It is intended to serve as a template for future trail system plans. The Fells was selected for trail system planning as a result of three factors:

- The DCR Middlesex Fells Reservation is an extremely popular destination which experiences high levels of recreational use, particularly trail use.
- All trail uses have impacts to soils, water quality, wildlife, and vegetation. In the Fells, user-created trails, off-trail use, unsustainable trail designs, and redundant and overlapping trails compound these impacts.
- In the Fells, DCR receives many requests from various stakeholders for trail maintenance, programming, new trails, and changes in trail use designations to which we need to respond.

The development of the Middlesex Fells Trail System Plan will follow the basic process outlined in DCR's Trails Guidelines and Best Practices Manual (adopted, October 2008). This process includes the following steps:

1. Get to Know the Trails
   - Involve Stakeholders
   - Complete a Trail Inventory
   - Compile Resource Maps
   - Identify Critical Management Roads
   - Describe Use Patterns and Demand

2. Identify Scenic, Recreational and Cultural Destinations, Features and Experiences
   - Identify Your Main Parking and Access Points
   - Identify Desired Recreational Experiences
   - Identify Critical Connections to Make

3. Identify Constraints, Issues and Problem Areas
   - Highlight Trail Problem Areas
   - Identify Redundant Trails
   - Highlight Culturally and Ecologically Sensitive Sites and Areas

4. Make a Plan
   - Identify Potential Trail Closures
   - Designate Trail Uses
   - Re-route and Restore Problem Trails
   - Highlight Potential New Trails
   - Identify Stewardship Partners and Opportunities
   - Identify Necessary Trail Use Policies
   - Develop Education and Enforcement Strategies

As a part of this planning process, DCR completed its Road and Trail Inventory for the Middlesex Fells trail system. This inventory also allowed us to integrate critical natural and cultural resource information including priority habitat for rare and endangered species, vernal pools, priority natural communities, wetland resource areas, soils and steep slopes.

Following the above steps, this draft Trail System Plan was prepared and distributed within the DCR to the Operations, Recreation, and Planning and Resource Protection staff for internal review. A revised draft has been produced for public review and comment.

The draft was made available to the public via the DCR web page, and a public meeting was convened. An overview of the Trail System Plan's findings and recommendations was presented at the meeting, and public comment solicited and recorded. These comments, and written comments received during the public comment period, will be used to develop the final trails plan.

1.4. Public Participation in Developing this Trail System Plan

Notice of the DCR's intent to prepare a Trail System Plan for the Middlesex Fells was made on DCR's web site on November 19, 2009 with additional announcement to major stakeholder groups via email. A "stakeholders' briefing" was held on September 24, 2009 to introduce the planning process and solicit feedback. Invitees to this meeting included Appalachian Mountain Club, Fells Dog, Friends of the Fells, Mass Audubon, Massachusetts Water Resources Authority, New England Mountain Bike Association, Sierra Club, State Police, Winchester Water Department, and area legislators.

Public comment was solicited on the Fells trail system through a set of guiding questions also listed on DCR's web site (Sub-Appendix N.1.).

A "public workshop" was held February 8, 2010 to solicit additional public and user input. This workshop was advertised via a press announcement to news outlets covering the Malden, Medford, Melrose, Stoneham and Winchester markets, and via emails announcements to key stakeholder groups. Over 200 people participated in the planning workshop providing feedback on the needs and potential solutions to key trail system issues

through a small group workshop process. The workshop presentation, summary notes and a Public Meeting Input Compilation map was completed based on this input (see http://www.mass.gov/dcr/news/publicmeetings/greenwaysfellspast.htm).

A second stakeholders' briefing was held on May 4, 2010 to brief key stakeholders on preliminary recommendations being considered.

The draft plan was presented to the public on September 20, 2010 and advertised in the Environmental Monitor on September 9. The draft was made available for download on the internet. A 60 comment period ran until November 19, 2010.

Following this public comment period, and in part in response to some comments, the DCR announced that most of the recommendations of the Trail Plan would be held in draft until the completion of a DCR Middlesex Fells Reservation Resource Management Plan (RMP). This Trail Plan has thus become integrated into and a component of that RMP.

Public process for the Middlesex Fells RMP is described in the RMP Section 1.3.

(Stone steps and erosion control structures on the Skyline Trail. Photo by Paul Jahnige)

Section 2. Existing Conditions

2.1 Natural Resource

The natural resources existing conditions for the Middlesex Fells are detailed in the Middlesex Fells Resource Management Plan Section 2.4.

2.2 Cultural History

The cultural resources existing conditions are detailed in the Middlesex Fells Resource Management Plan Section 2.5.

2.3 Ownership and Management

DCR owns and manages the DCR Middlesex Fells Reservation under the Division of Urban Parks. However, a number of highways and roads bisect the park, and in-holdings of land exist within it.

Interstate 93, completed in 1962, bisects the Fells running parallel to Route 28. These roads create a significant barrier for both east-west trail connections and wildlife movement.

Within the Fells boundaries are five reservoirs. Spot Pond and Fells Reservoir are managed by the Massachusetts Water Resources Authority (MWRA) as backup water supply for the Boston metropolitan water system. Three reservoirs – North, Middle, and South – and the land surrounding them in the western Fells are owned and managed by the Winchester Water Department as active drinking water supply for

the town of Winchester. These ponds and the lands around them are clearly posted 'No Trespassing' to the public, but many roads and trails crisscross between DCR and town of Winchester lands.

The Stone Zoo, managed by Zoo New England, lies at the northeastern portion of the reservation. The former Boston Regional Medical Center in the eastern Fells is a private in-holding and currently proposed for mixed use re-development.

Surrounding the DCR Middlesex Fells Reservation are dense residential neighborhoods.

The trail system connects and intersect all of these areas, and this entwined pattern of ownership and management adds to the complexity of the Middlesex Fells for users and managers alike.

2.4 Trail System Development

In 1891, the first piece of the Fells, Virginia Wood, was donated as a public reservation, and by 1900, the park had grown to over over 1,800 acres and included 13 miles of woods road and eight miles of public road.

By 1919, a network of stacked loop carriage roads and bridal trails had been developed within the Fells to provide visitors with access to the ponds and woodlands of the reservation (see figure 1). Along with this network of wider roads and paths, pedestrian footpaths provided additional loops and connections particularly to the reservation's hilltops and ledges. All told, the system provided more than 50 miles of woodland recreational trail.

The 1930s brought the Civilian Conservation Corps and the Works Progress Administration to the Fells, and with them, the planting of over one million trees, and the continued maintenance and development of roads and trails within the Reservation.

The 1935 map of the DCR Middlesex Fells Reservation, includes Lawrence Woods (added in 1925), and shows the Skyline Trail. This seven-mile hiking trail connects the high points in the Reservation, circumnavigating the western part of the Fells with a spur to Cairn Hill and Black Rock in the eastern Fells. The Skyline Trail was the first of several longer-distance loop trails that essentially form a second trail system that has been overlaid on top of the original network.

Additionally, in 1934, public access to the Winchester watershed lands was closed off to protect water quality. This essentially cut out large segments of the original stack-loop trail system form public access, but these roads and trails were never discontinued.

The maps of the trail system changed little until 1989, when DCR and the Friends of the Fells organization produced a trail system map which highlighted the system of longer-distance hiking loop trails, including the Reservoir, Cross Fells, and Rock Circuit Trails, that had been established on top of the original system of carriage paths. This duel trail system contributes to the confusion on the ground.

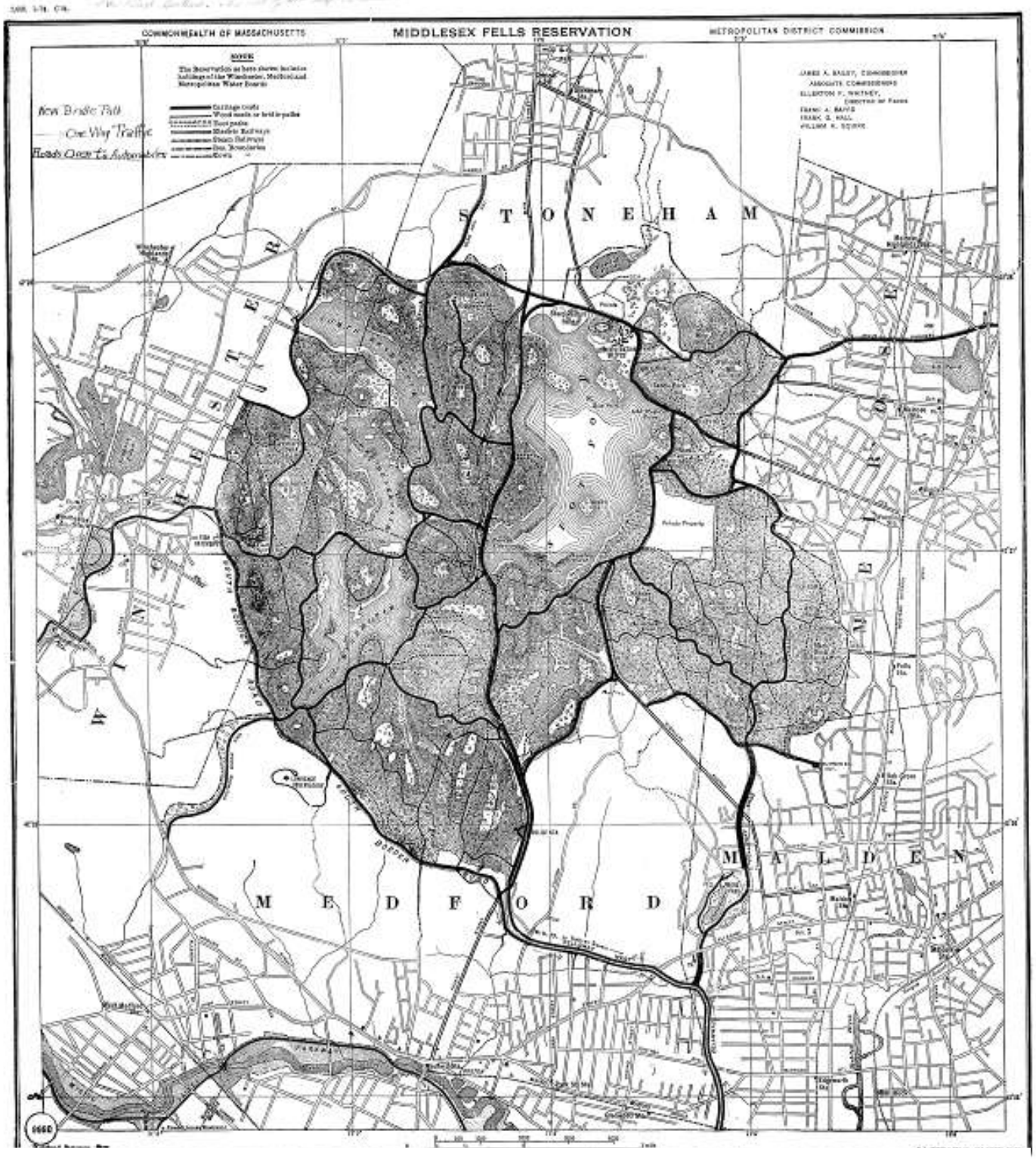


Figure 1: Middlesex Fells Reservation, 1919.

2.5 The Current Trail System

Today, the Middlesex Fells has an extensive and confusing trail network (see Maps E: Trail System and Map F: Trail Density Analysis at http://www.mass.gov/dcr/news/publicmeetings/greenwaysfellspast.htm.)

The 2009-2010 DCR Road and Trail inventory of the Fells found over 122 miles of woodland trails, user-created (rogue) trails, woods (or 'fire') roads and administrative management roads (101.7 miles within DCR owned lands).

In many cases, woodland single-track trails are overlapping and redundant with the woods roads and management access roads, a legacy of the two different trail systems in the Fells, and many roads and trails lead directly from DCR property to 'posted' watershed lands.

Unofficial, user-created (rogue) trails create additional connections and short cuts between existing trails, and in some areas, particularly north and south of Dark Hollow Pond and around Pine Hill, users have created extensive and confusing "spider web" trail networks (see figure 2 as an example).

The management of and public access to the reservoirs and watershed lands as in-holdings within the DCR Middlesex Fells Reservation adds another layer of confusion for the trail user. Most lands around the MWRA Fells Reservoir are currently open to the public. However, in accordance with MWRA-DCR MOUs (Appendix T), MWRA reserves the right to amend public access policies around the reservoirs. Swimming is prohibited in all reservoirs and existing signage details restrictions.

The Winchester Reservoir lands are clearly posted 'No Trespassing' and occasionally patrolled, although, as noted, many roads and trails connect from the DCR trail system through the watershed lands, and provide attractive loops and views. As a result most users ignore the posted signs.

Water supply management roads around both the Fells Reservoir and the Winchester Reservoirs are not parts of the DCR trail system and public access to these management roads is / may be restricted.

Although signage and marking has been improved in recent years, there is still a lack of sufficient signage, particularly intersection directional signs. Many of the longer-distance loop trails - particularly the Skyline, Reservoir and Mountain Bike Loop - cross each other multiple times and share trail sections at numerous points. For example, the Skyline Trail intersects the Mountain Bike loop 11 times and shares 3 segments of tread. This creates trail segments where multiple blazes on overlapping trails can be both confusing and intrusive.

The history of trail development, multiple ownership, lack of signage, and user-created trails have resulted in a Middlesex Fells Trail System that is extensive, complex, and confusing to the typical user. This confusion is exemplified by statistics from the recent DCR trail inventory. Within the reservation there are:

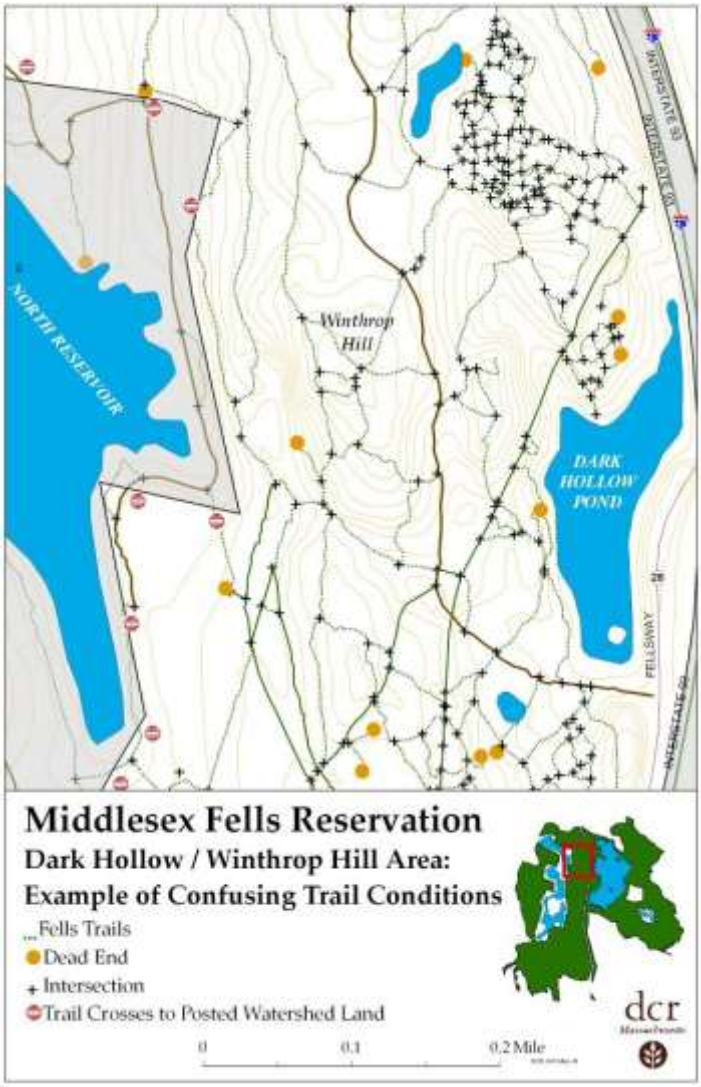
- 122 miles of trail
- 110 trail system access points
- 132 dead end trails
- 42 trails that cross on to posted watershed lands
- 1,949 intersections (16 / mile)

2.6 Trail Conditions

Based on the recent DCR inventory, the condition of trails within the Fells is relatively good, particularly when compared to other trails systems within DCR's state and urban parks properties across the state (figures 3 and 4). The inventory indicates that 65% of the trails are currently in good condition, 33% are in fair

condition and only 2% are in poor condition. This compares favorably to DCR trails statewide for which only 46% of trails are in good condition, 46% in fair condition and 9% in poor condition (see Map G: Trail Condition at http://www.mass.gov/dcr/news/publicmeetings/greenwaysfellspast.htm).

However, the inventory did find 497 trail damage points such as washouts, trail braiding,



and mud holes that should ideally be repaired or restored to maintain trail function, minimize potential impacts and provide the most positive user experiences (figures 5 and 6).

The most common type of trail damage is areas of soil loss caused by water running down the trail (washouts). These typically occur on sections of trail with a "fall line" alignment (running straight downhill), and although they can be stemmed with erosion control structures such as waterbars, in many cases, fall line trails are unsustainable and should be re-routed to a contour alignment. This will allow water to run off the trail and will reduce soil erosion.

Other types of damage points in the Fells include protruding roots and rocks, braided trails, and wet areas.

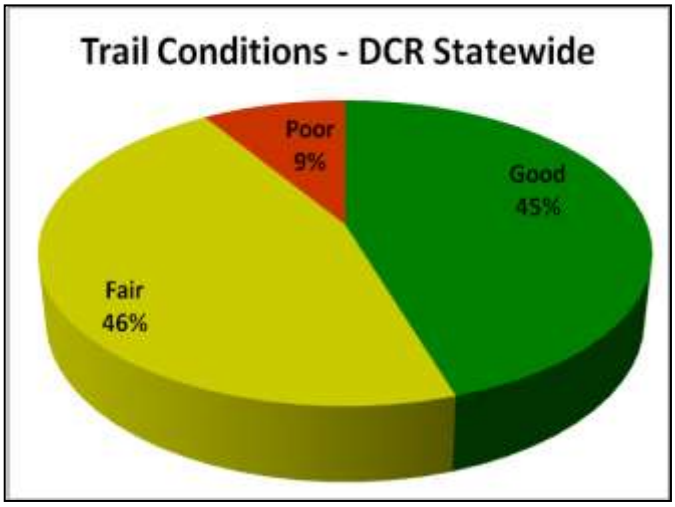
2.7 Administrative Roads

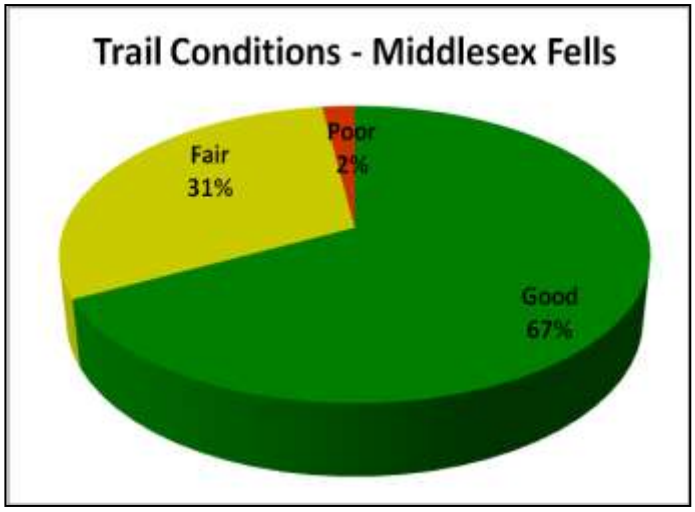
There are a number of administrative roads within the Fells maintained and used by MWRA, Town of Winchester and DCR.

In particular, MWRA maintains a road to the Bear Hill Water Tower, to their building south of Spot Pond, and to and around the Fells High Service Reservoir.

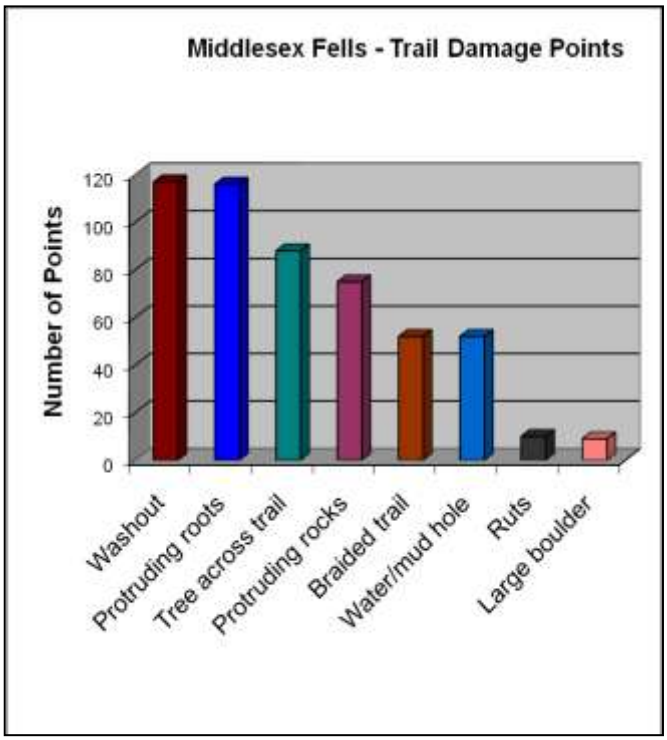
Town of Winchester Water Department maintains South Dam, West Dam, and North Dam Roads around their three reservoirs for patrolling and maintenance. These are primarily accessed in the north, from gate 18 off of Reservoir Road, and in the south, from gates 9 and 12. While there are additional access roads that connect to the Dam Roads, Winchester Water Department reports that they could be closed and restored.

DCR does not maintain specific roads or trails for vehicle access, except to Wright's Tower. Although many forest ways are known as, and may have been managed as, "fire roads," many of these are not necessary for vehicle access for park management or emergency access, and many could be allowed to re-vegetate to narrower trails, or closed and restored.

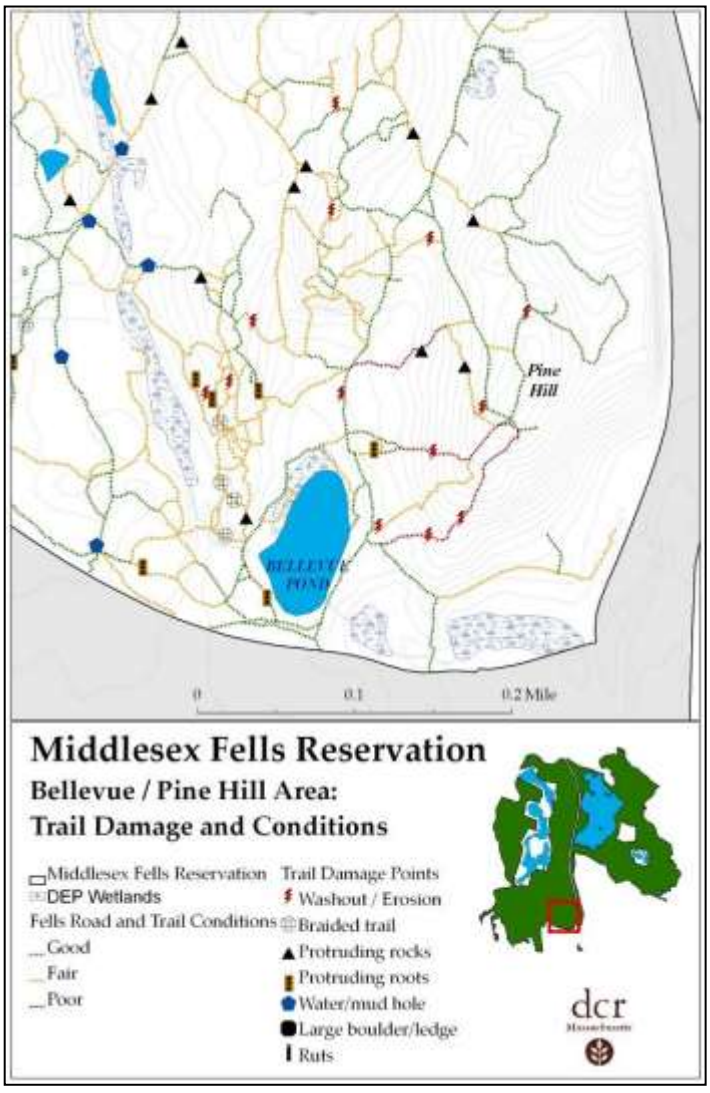




Figures 3 and 4: Trail Conditions, Statewide and in the Middlesex Fells



Figures 5: Trail Damage Point Types



Figures 6: Example of Trail Damage and Conditions

2.8 Current Uses

As an "urban oasis," the Middlesex Fells trail system is used at all times of the day and in all seasons, but it sees especially heavy use after work and on weekends during the Spring, Summer and Fall. Primary trail uses include walking / hiking, running, mountain biking and dog walking. Secondary uses include fishing access, horseback riding, snowshoeing, and cross-country skiing. All of these experiences are enjoyed by families, and parents experiencing nature with their children is a notable use. In addition, illicit activities also occur within the Fells including partying and most notably individuals seeking sexual experiences.

To help quantify use, DCR conducted trail counts during the Fall of 2009, both mid-week and weekend, at three access points – Flynn Rink, Belleview Pond, and the Sheepfold (figures 7 and 8). It is important to note that the counts did not differentiate dog-walkers from walkers without dogs, but did record the number of dogs and whether or not they were on leash.

These counts indicated high usage mid-week particularly by walkers and dog-walkers, but notably higher usage on the weekends by mountain bikers and runners. The Sheepfold was the most active access point surveyed, again especially by walkers, dog walkers, and "others," some of whom were noted as "live parkers" or people who stayed in their cars. Walking / hiking is the most prevalent trail use. The vast majority of dogs visit the Fells off-leash (85%).

A (non-random) on-line survey also conducted this fall, by a graduate student and volunteer for the Friends of the Fells, asked questions about use of the Fells (figure 9, n=122). This survey found that most respondents reported visiting the Fells in the spring, summer, and fall months primarily, but almost half also visited in the winter. While a small proportion visited almost daily (7%), one-third (33%) reported going weekly, almost a quarter (24%) monthly, and one-third only occasionally (33%). Most respondent visit on weekends (84%), but over half also visit on weekdays (51%).

When they visited, respondents most often hiked (90%), enjoyed solitude (67%), climbed observation towers (60%), observed geologic features (49%), took photographs (46%), mountain biked (43%), picnicked (41%), walked their dog (39%), or went snowshoeing (24%).

While neither of these samples is statistically representative of all trail use within the Fells, the users counts and survey do offer data about the relative types of use, magnitude of uses, and popularity of main access points.

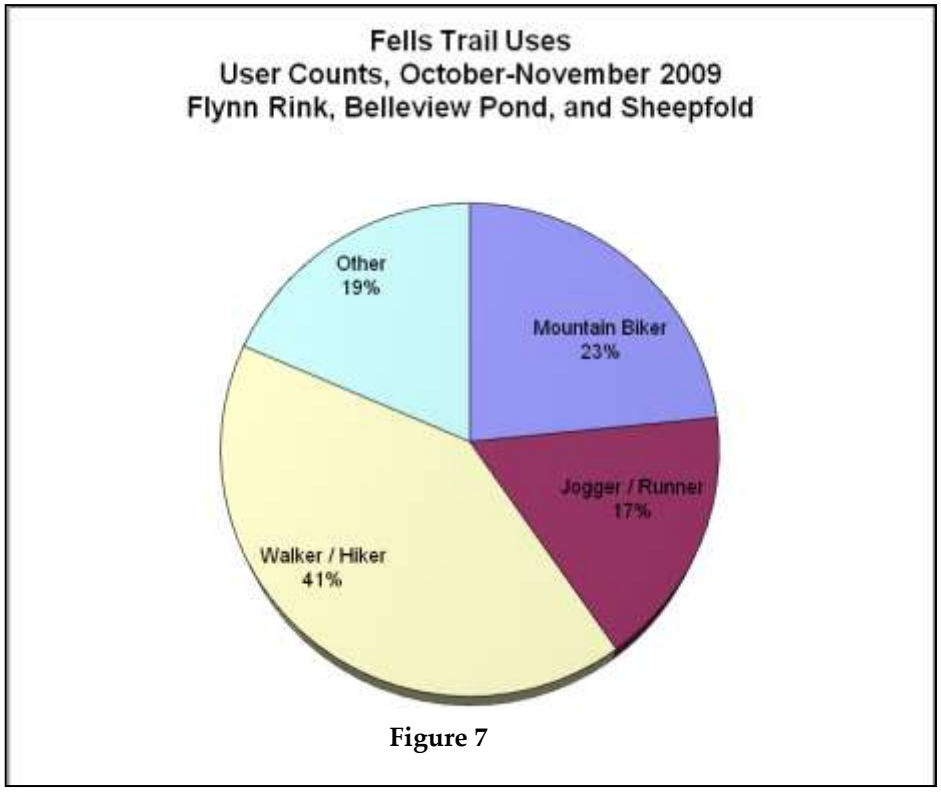


Figure 7

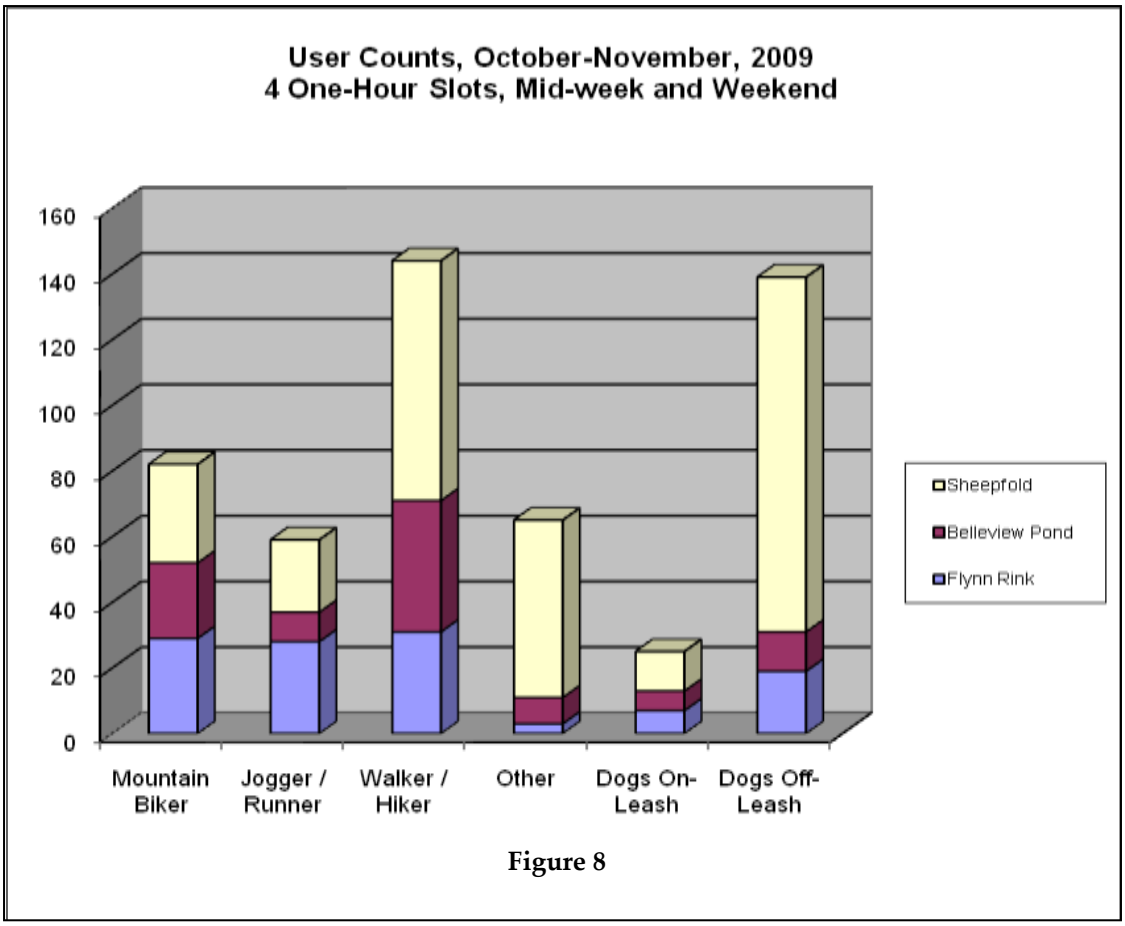


Figure 8

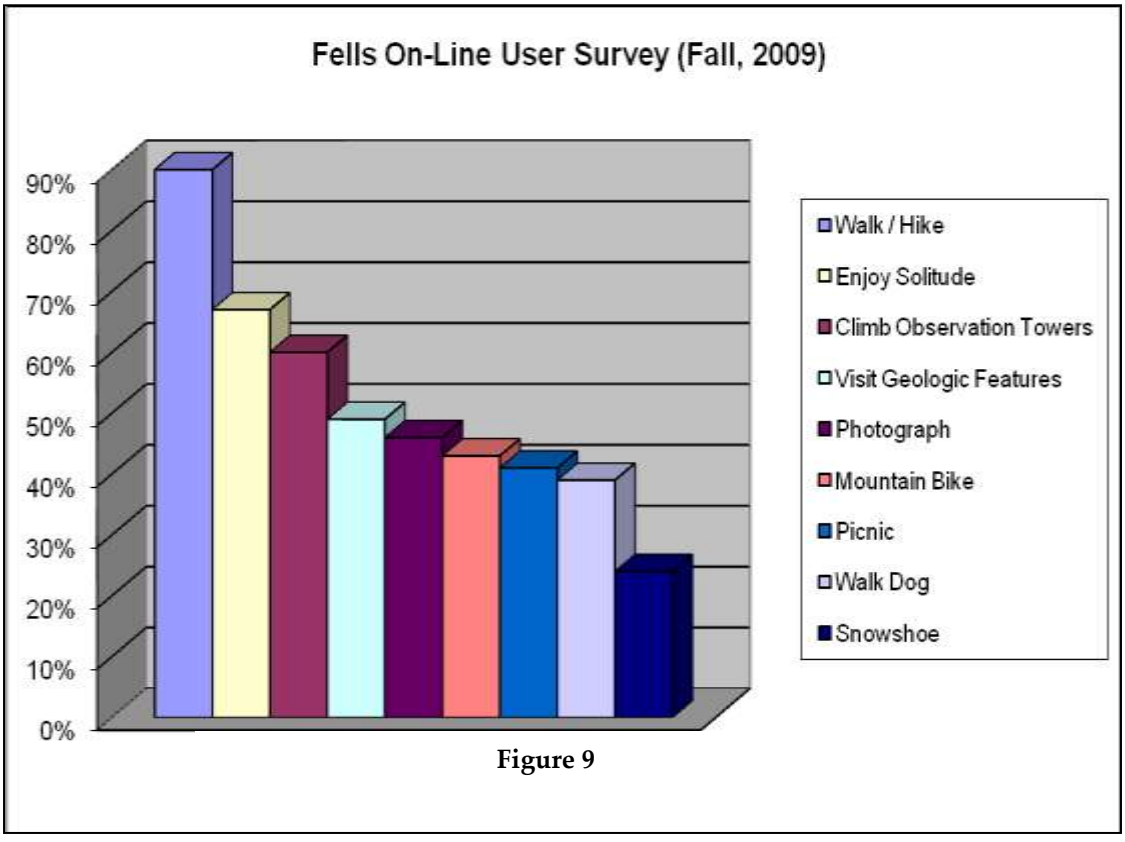


Figure 9

2.9 User Demands, Input, Behaviors and Conflict

Recreational demands, user attitudes and behaviors, and user conflict at the Middlesex Fells are described in Section 2.6 of the RMP.

User and stakeholder input collected during the Trail System planning process is illustrated in Figure 10.

To help understand trail conflict, the Federal Highway Administration and the National Recreational Trails Advisory Committee have produced "Conflicts on Multiple-Use Trails Synthesis of the Literature and State of Practice," available at www.fhwa.dot.gov/environment/conflicts/conf1.htm. The executive summary of this review notes that conflict in outdoor recreation settings (such as trails) can best be defined as goal interference attributed to another's behavior. Trail conflict has been found to be related to

- Activity style (mode of travel, level of technology, etc.)
- Focus of trip
- User expectations
- Perceptions of the environment
- Level of tolerance for others
- Different norms held by different users.

The following 12 principles for minimizing conflicts on multiple-use trails are recommended. Adherence to these principles will help improve sharing and cooperation on multiple-use trails.

1. **Recognize Conflict as Goal Interference:** Do not treat conflict as an inherent incompatibility among different trail activities, but goal interference attributed to another's behavior. For example, if a user's goal is to few wildlife, a group of screaming teens can interfere with that goal.
2. **Provide Adequate Trail Opportunities to Minimize Contacts:** Offer adequate trail mileage and provide opportunities for a variety of trail experiences. This will help reduce congestion and allow users to choose the conditions that are best suited to the experiences they desire.
3. **Establish Appropriate User Expectations:** If users expect to find the conditions and uses that they actually encounter, they are more likely to be tolerant of them. Use signage, interpretive information, and trail design to establish appropriate expectations.
4. **Involve Users as Early as Possible:** Identify the present and likely future users of each trail and involve them in the process of avoiding and resolving conflicts as early as possible, preferably before conflicts occur.
5. **Understand User Needs:** Determine the motivations, desired experiences, norms, setting preferences, and other needs of the present and likely future users of each trail.
6. **Identify the Actual Sources of Conflict:** Help users to identify the specific tangible causes of any conflicts they are experiencing. In other words, get beyond emotions and stereotypes as quickly as possible, and get to the roots of any problems that exist.
7. **Work with Affected Users:** Work with all parties involved to reach mutually agreeable solutions to these specific issues.
8. **Promote Trail Etiquette:** Minimize the possibility that any particular trail contact will result in conflict by actively and aggressively promoting responsible trail behavior. Use existing educational materials or modify them to better meet local needs.
9. **Encourage Positive Interaction Among Different Users:** Trail users are usually not as different from one another as they believe. Providing positive interactions both on and off the trail will help break down barriers and stereotypes, and build understanding, good will, and cooperation.
10. **Favor "Light-Handed Management":** This is essential in order to provide the freedom of choice and natural environments that are so important to trail-based

recreation. Intrusive design, too many signs and coercive management are not compatible with high-quality trail experiences.

11. **Plan and Act Locally:** Whenever possible, address issues regarding multiple-use trails at the local level. This allows greater sensitivity to local needs and provides better flexibility for addressing difficult issues on a case-by-case basis.
12. **Monitor Progress:** Monitor the ongoing effectiveness of the decisions made and programs implemented.

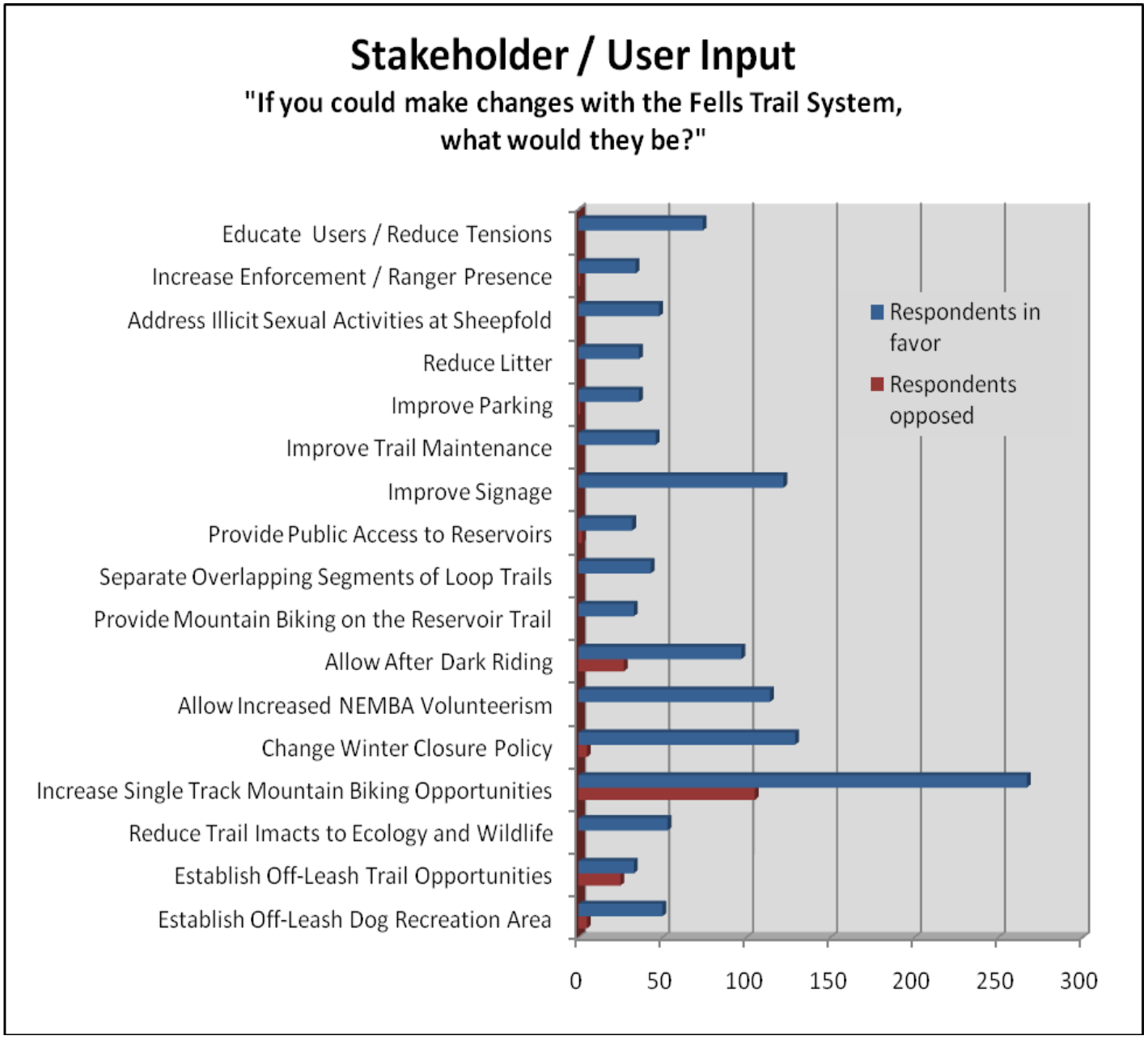

Stakeholder / User Input
"If you could make changes with the Fells Trail System, what would they be?"
Educate Users / Reduce Tensions
Increase Enforcement / Ranger Presence
Address Illicit Sexual Activities at Sheepfold
Reduce Litter
Improve Parking
Improve Trail Maintenance
Improve Signage
Provide Public Access to Reservoirs
Separate Overlapping Segments of Loop Trails
Provide Mountain Biking on the Reservoir Trail
Allow After Dark Riding
Allow Increased NEMBA Volunteerism
Change Winter Closure Policy
Increase Single Track Mountain Biking Opportunities
Reduce Trail Imacts to Ecology and Wildlife
Establish Off-Leash Trail Opportunities
Establish Off-Leash Dog Recreation Area
Respondents in favor
Respondents opposed
0
50
100
150
200
250
300

Figure 10

(Hikers ascending a section of the Skyline Trail. Photo courtesy of Jack Boudreau)

Section 3. Management Goals, Features, Experiences and Expectations

3.1 Trail System Management Goals

The trail system at the Middlesex Fells, ideally, will be designed and managed to help DCR achieve four broad goals:

- Provide the public with opportunities to experience, appreciate and interact with the beauty and wonder of nature
- Provide the public with opportunities for a range of recreational experiences and physical activities within a natural setting
- Provide for the protection and stewardship of our common wealth of natural and cultural resources
- Provide opportunities for individuals, families, groups and communities to strengthen their social bonds through interaction with nature and recreational activities

To achieve these goals, the trail system should effectively contribute to three primary objectives:

- Highlight natural, scenic, and cultural features within the Fells Reservation

- Provide a variety of desired non-motorized recreational experiences to users
- Connect important features, destinations, access points, and neighboring communities

It should achieve these while simultaneously:

- Avoiding sensitive natural resources
- Meeting the expectations of users
- Minimizing ecological impacts
- Minimizing maintenance costs and management requirements

3.2 Features

Nearly all users and stakeholders who submitted public comments to this plan agreed that the two greatest features of the Fells were:

- Its diverse woodlands, views, landscapes and habitats
- The ability to experience nature and recreate in a natural setting in close proximity to a highly urbanized metropolitan area

The trail system provides users with access to these features as the trails meander through different woodlands, climb rocky hills, and provide views of forest groves, water features and the Boston skyline.

The trail system itself is also an important feature of the Fells. Ranging from wide, relatively flat "fire roads" with stable surfaces to rugged, rocky, narrow and occasionally steep paths; the trail system offers a variety of levels of challenge, distances, loops and terrains for a variety of trail users. This system also connects the multiple parking areas and community entrance points of the park to its multiple features and destinations.

The opportunity to find solitude within a natural setting so close to where so many people live, work, learn and play is a feature of the Fells that can feel rare and special to many. The size of the Fells, its varied terrain, the number of trails, and even the lack of signage and staff, allow users to experience a sense of escape from a crowded urban environment, and even an opportunity to "get lost" in the woods. Within this solitude, some users find freedom, some find privacy and some find a sense of serenity.

Finally, the Middlesex Fells contains many particular points of interest that draw trail users, serve as destinations and combine to create a sequence of events that enhances the outdoor experience. These include:

- Bear Hill Tower
- Wright's Tower
- Stone Zoo
- Winchester Reservoirs
- Sheepfold meadow
- Long Pond
- Spot Pond
- Fells Reservoir
- Virginia Wood's history trail, waterfall and hemlock grove
- Lawrence Woods' 90 mm site and butterfly area
- Panther Cave
- Quarry sites
- Hilltop vistas
- Rocky outcrops
- Vernal pools

3.3 Access Points and Connections

Primary trail system access points in the Middlesex Fells include:

Sheepfold: This is the most popular access point to the Fells. Off Route 28 on the eastern side of the western Fells, the Sheepfold offers two large parking areas, the large open Sheepfold meadow that is a popular place for dog-owners to bring their pets, and access to several trails including the Mountain Bike Loop,

Reservoir Trail and Skyline Trail. At popular times, this parking area becomes over crowded. This is also an area where individuals come to meet for illicit sexual experiences in the park.

Belleview Pond: On South Border Road on the south side of the western Fells, Belleview Pond trailhead offers parking for about 8 cars, and easy access to Belleview Pond, Wright's Tower, Panther Cave and the Skyline Trail.

South Border Road: Numerous minimally developed pull-offs, trailheads, and small parking areas along South Border Road provide access to various parts of the western Fells trail system including Lawrence Woods, the Skyline Trail, and the Reservoir Trail. These points also provide community access from neighborhoods near Governor's Avenue in Medford and Highland Avenue in Winchester.

Marjam Supply Company / Bear Hill Parking: This parking area on the north side of the eastern Fells provides access to the Mountain Bike Loop, Bear Hill and the Dark Hollow Area.

Flynn Rink: Off Woodland Road south of Spot Pond, Flynn Rink provides parking, a fitness 'parcourse' and access to the Cross Fells Trail with connections to the Rock Circuit Trail and the Fells Reservoir. There is currently no good mountain biking trail connection from Flynn Rink to the western Fells.

Botume House: The Botume House Park Headquarters and Visitors Center has parking for about four cars, and provides access to Half Mile Road and Spot Pond, with possible connections to the Cross Fells Trail.

Greenwood Park: Offers parking off of Pond Street on the north side of the Fells, and access to playing fields, a playground and the Crystal Springs Trail.

Other Access Points: A variety of other smaller parking pullouts and trailheads provide access to certain parts of the trail system at Long Pond, Crystal Springs, Virginia Wood, and off of Fellsway East.

Connections

As mentioned in Section 2, the trail network in the Fells is extensive with many different access points and overlapping and redundant trails. As a result, there are often multiple routes connecting the many parking areas, community access points, features and destinations. However, there are also some connections that are problematic or difficult to make.

Connecting Eastern and Western Fells: Route I-93 bisects the Fells and this creates a significant barrier for trail connections between the eastern and western parts of the reservation. The only reasonable connection between the two is on Route 28 between gates 27 and 28 which is designated as part of the Cross Fells Trail.

Around Spot Pond: Although there is a desire, and some efforts to create one in the past, there is no trail connection completing a loop around Spot Pond.

Flynn Rink to Quarter Mile Pond: There is no current legal mountain biking trail connecting the Flynn Rink Parking area to Quarter Mile Pond and the fire road network.

Between the Winchester Reservoirs: Although there are heavily used existing trails and roads connecting the Fells trail system within the Winchester Watershed lands between the three reservoirs, these lands and trails are posted "No Public Access." These connections allow for a variety of loops within the western Fells, however, they are currently restricted.

3.4 Recreational Experiences and Expectations

The DCR desires to manage the Middlesex Fells in a way that provides a range of users with a range of recreational experiences. We seek to provide these experiences while simultaneously conserving the natural qualities of the Fells environment and protecting the sensitive resources that exist there.

In mirroring our goals, the experiences we wish to provide are:

- The opportunity to appreciate and interact with the beauty and wonder of nature
- The opportunity to engage in physical activities within a natural setting
- The opportunity to strengthen social bonds by sharing the above activities with family, friends, and neighbors
- The opportunity to share one's skills, knowledge and labor as a steward of the environment

More specifically, within the Fells, DCR has identified the following "managed experiences" (those we actively seek to provide and manage for). These include:

- Observing, exploring, discovering, and sharing nature from existing trails
- Experiencing diverse landscapes and views from the trails
- Walking, hiking, and snowshoeing on a variety of types and difficulties of trails and terrain
- Mountain biking on a variety of types and difficulties of trails and terrain
- Running on variety of types and difficulties of trails and terrain
- Cross-country skiing on a variety of types and difficulties of trails and terrain
- Finding solitude
- Engaging in the above experiences with a family dog, and exercising and socializing a family dog with other dogs
- Orienteering
- Engaging in these experiences as members of a family, especially parents with their childrenStewarding and improving the Fells environment

Although they may not be "managed experiences" at this time, DCR also recognizes that there may be some demand for and a benefit to allowing additional experiences including:

- Horseback riding
- Fishing (where it is allowed)
- Rock climbing and boldering

For a variety of safety, ecological, watershed protection and user conflict reasons, the DCR does not believe that the Middlesex Fells is an appropriate venue to experience the following:

- Campfires or camping
- Swimming
- Off-leash dog recreation on trails (unless specifically designated)
- Walking dogs as a part of a formal or informal business (unless specifically permitted)
- Off-highway vehicle recreation
- Off-trail recreation of any kind (unless specifically permitted)

Finally, there are some activities that occur within the Fells that are not only inappropriate, but illicit. These include:

- Partying, drinking or vandalism
- Intimate sexual experiences

The following section provides additional details, discussion and reasonable expectations regarding the above "managed experiences."

Observing, Exploring, Discovering, and Sharing Nature

As noted in the previous section, perhaps the two greatest features of the Fells are its diverse woodlands, landscapes, and habitats; and its proximity to a highly urbanized metropolitan

region. As a result, the opportunity to observe the colors and songs of migrating warblers, explore the shapes and textures of lichens on a rock outcrop, discover a vernal pool echoing with a chorus of frogs, and share each of these through the eyes of your child, are priceless experiences that the Fells has to offer.

Although it can be argued that the best way to appreciate nature is at a slow speed with your senses attuned to the world around you, discovering the wonders of the natural world is a personal experience which, depending on the individual, may be appreciated in boots, from the seat of a bike, in a backpack over your mother's shoulder, on the run or even from the seat of an ATV. As long as it is consistent with our managed and allowed uses for a particular park, and our rules and regulations, it is not appropriate for DCR to proscribe how users should best observe, explore, discover or share nature.

The experiences of observing, exploring and discovering nature are often enhanced by quietness, solitude, bright colors and the opportunity to see plants and animals that seem uncommon to our daily experience. The opportunity to share what you are seeing and hearing with one or two close friends or family can magnify the experience even more.

Conversely, this experience can be diminished by noise, groups of other people or intrusion by the features of our urbanized lifestyles such as trash or vehicles. It is also diminished by the perceived scaring away, destruction or loss of that nature; be it by a dog romping through a vernal pool, a woodland flower trampled or a rare species extirpated from the park.

However, while the Fells is a wonderful place to observe, explore and discover nature, it is also a popular and well-used urban park. As such, users should expect to encounter other users, and should expect some level of disturbance by others.

Finally, although experiencing nature might seem best engaged in "off the beaten path," in a well used park like the Fells, such off-trail explorations, be it following a fox or seeking out a calling bird, can negatively impact the very nature we are appreciating.

Experiencing diverse landscapes and views of from the trails

Although similar in many ways to observing nature, the opportunity to travel from hemlock grove, to pine-studded pond shore, to rocky hilltop in the Fells provides a special experience all its own. Within and between each woodland or habitat type, one can feel a change in the air, perceive beauty in the different qualities of light, and appreciate the textures of the earth at a landscape scale.

This diverse landscape experience is enhanced all the more by the longer-distance views that one can find in the Fells – of the sunlight sparkling off the water through the trees, or the Boston skyline from an open outcrop. It can also be enhanced by the number and mix of natural and cultural landscape features encountered, and so, to some extent, is also magnified by the distance traveled by the user.

This experience, as with many other trail experiences, can be negatively impacted by getting lost or feeling confused by the trail network and markings, and by encountering situations that make one feel uncomfortable or unsafe. These might include stumbling upon an intimate sexual act, being scared by the approach of a dog or another user, feeling unwelcomed by others or being physically or verbally threatened.

Obviously, the above two experiences (observing nature, and experiencing diverse landscapes) can be enjoyed through various

modes of travel from foot, to horseback, to bike, to ski, to snowmobile, to off-highway vehicle. The DCR believes that all users of the Fells using allowed modes of travel (thus not including motorized vehicles) should be able to engage in these experiences without that experience being negatively impacted by getting lost, or feeling unsafe.

The following descriptions further discuss some of the elements particular to the modes of travel appropriate for the Fells.

Walking, hiking and snowshoeing on a variety of types and difficulties of trails and terrain

Experiencing the trails on foot is the slowest mode of travel. One can stroll leisurely, observing the world around you or engaging in deep conversation with a friend; or one can hike at a strenuous pace, raising the heart rate, sweating on the hills and feeling the rush of both accomplishment and exercise.

Travel by foot is also the simplest, lowest cost and perhaps most versatile mode of trail use. The equipment required is little more than a good pair of shoes (perhaps snowshoes) and a water bottle. Some walkers will look for wide relatively flat loops of short to moderate distances that they can travel without too much thought and return to their trailhead without being lost or confused. Some hikers will want to find more challenging trails that offer sections perhaps both steep and rocky, and bring them to destinations with features or views.

The opportunity to find a trail experience that is at the right distance and level of challenge for the individual, and the diversity of trail types and terrains in the Fells adds greatly to the pedestrian experience here. Most pedestrian users will want an experience of 1 to 8 miles, often with a destination in the middle, and generally loops are most desirable.

This experience can be diminished by encountering damaged, eroded or wet trails, the presence of trash, and (as noted above) situations that make the user feel uncomfortable or unsafe. Some of the specific situations that may diminish the pedestrian experience in the Fells include being startled by another user, having to "jump out of the way" of a fast moving biker, being confused by trails that enter posted watershed lands, being approached by an unknown dog off-leash, encountering dog waste or bags of dog waste along the trail, and becoming lost.

The Fells is a popular, multi-use, urban park. On most trails, pedestrians should expect to encounter other users, including dogs and bikers, and hikers and walkers should be prepared for faster moving users to announce themselves from behind. However, DCR also believes that walkers, hikers, and snowshoers should be able to find some high-quality trail experiences in the Fells in which they do not have to worry about encountering fast-moving bikers or off-leash dogs.

Mountain biking on a variety of types and difficulties of trails and terrain

Mountain biking is a mode of travel that can add speed, distance, technical skill and physical challenge to the trail experience. In these ways, it can be similar to trail running and cross-country skiing. In general, most users on mountain bikes desire to connect with nature and experience diverse landscapes and destinations in the same way that other users do. However, the mountain biking experience also includes some elements such as fun and technical challenge. Experiencing a trail on wheels (and on skis to some extent) is somewhat different than on foot. The flow of the trail – its twists and turns, its ups and downs, its obstacles – all contribute to the mountain biking experience. The quality of the trail is integral to the quality of the experience.

As with pedestrian users, mountain bikers desire varying distances, levels of challenge and technical difficulty, and want to find the levels that are right for them. But they may also desire to increase their level of technical challenge as they develop. Mountain bikers may travel 5 to 15 miles during an outing, and an adequate trail system should provide approximately 40 miles of trails of varying types, levels of difficulty and terrain. Single-track trails and loop trails are important to the mountain bike experience, and loops of various difficulties are important to the different riders. There are currently approximately 32 miles of trails open to Mountain Biking, but only two miles of single track.

In the Fells, the mountain biking experience is diminished by the limited number of trails open to mountain biking, particularly single-track and more challenging trails, a lack of clear signage and marking, hidden obstacles, negative encounters with other users including off-leash dogs, and a feeling of not being welcome.

On most trails, mountain bikers should expect to encounter other users, including dogs and pedestrians. They should expect to ride in a manner that will not startle others. They should be prepared to slow down, and yield to walkers and hikers, especially on downhill segments. And they should expect to stay off of some trails.

While DCR believes that mountain biking is an appropriate trail use in the Fells and desires to provide an adequate trail experience including a variety of types of trails, difficulties and terrains; the Fells, as a well used urban park, is not an appropriate place for mountain bikers on all trails or for bikers to find the most advanced trail conditions. Mountain bikers in the Fells should expect to feel welcome, be respected by all users, and be able to find sufficient, single track trail mileage in the beginner and intermediate trail categories and maybe some sections of advanced trail. But the Fells is not the appropriate place to find expert trails, man-made obstacles, off-trail opportunities, or extensive advance trail mileage.

Running on variety of types and difficulties of trails and terrain

Trail running is a pedestrian trail use, but the motivations of running are more likely to include physical exercise and traveling longer distances within the natural context. In terms of speed, distance and physical challenge, trail running is perhaps more akin to mountain biking than hiking, however, in terms of the variety, ruggedness and types of trails that are appropriate for running, it is more similar to hiking.

Within the Fells, runners include individuals, groups such as school cross-country teams and participants in organized events. The trail running experiences is enhanced by the natural context of the trails, and by the ability to traverse diverse landscapes, reach destinations such as views, and tackle varied terrain. Runners generally cover three to seven miles in an outing, and do not necessarily want to stop to figure out which way to go.

The trail running experience can be diminished by damaged, eroded, wet trails, crowded conditions, dog waste, confusing markings and the approach of off-leash dogs.

Within the Fells, runners should be able to find a variety of well-marked running loops of three to six miles on easy to moderate trails, as well as some more challenging terrain.

Cross-country skiing on a variety of types and difficulties of trails and terrain

Cross-country skiing can only be experienced in the Fells a few times a year, but the experience of being able to strap on the skis after a storm, surround yourself in a white wonderland and feel like you are the only one in the woods can

be marvelous. While skiing is a pedestrian trail use, it is perhaps most similar to mountain biking in terms of the types of trails desired, the speed and distance traveled and the equipment and technical skill required.

The experience is enhanced by varied terrain and access to a variety of loop trails of different difficulties that allow the skier to choose a route appropriate for their level of skill. Although it is possible to ski on trails that have been tracked by other users, the skiing experience is often best on untracked trails or in undisturbed ski tracks.

The experience of cross-country skiing can be diminished by becoming lost or confused, rocky trail conditions, wet trails, obstacles and sudden steep down hills.

In the Fells, cross-country skiers should expect to find a variety of well-marked trails appropriate for skiing when conditions allow. They should not expect groomed conditions or trails specifically designed or designated for skiing. Nor, unfortunately, should skiers expected to be able to ski every year.

Finding solitude

The experience of finding a moment of solitude in the Fells is special – a moment to revel in the glory of nature, to reflect on one's own existence, to meditate or pray – these are moments to be savored and cherished. Such moments are enhanced by the diversity and beauty of the Fells landscape, and diminished by intrusions of the outside world.

However, the Fells is a popular and heavily used destination. It is not a wilderness area. While users may be able to find moments of solitude in the Fells at certain places, seasons or times of the day, users should not necessarily expect to find solitude in all instances, nor expect that moments of solitude might not be disturbed by other users.

Engaging in the above experiences with a family dog, and exercising and socializing a family dog with other dogs

Family pets, especially dogs, are an important part of today's society. For many owners, dogs are members of the family. Just like humans, dogs need to both exercise and socialize with other dogs to be healthy. As a result, many users to the Middlesex Fells desire to recreate with their dogs on trails and allow their dogs to socialize and recreate together, especially at the Sheepfold.

While some dog owners prefer to keep their dog on a leash to both control and protect the dog, most dog owners at the Fells desire to recreate and exercise their dogs off-leash. Current DCR regulations require that dogs at most state and urban parks, including the Fells, be on-leash. The reasoning for this is that some dogs can be aggressive, and even friendly dogs off-leash, particularly on trails, can startle or frighten other users or dogs as they approach. Dogs off-leash will also tend to run both on and off trail, contributing to off-trail impacts, and potentially disturbing wildlife.

For many dog owners, the experience of recreating with their dog is enhanced by the opportunity to do so in a beautiful, natural setting, and by the ability to allow their dogs to run and explore at their own pace. The experience of allowing dogs to socialize with each other is enhanced by wide open spaces that allow dogs to run, and the opportunity for human owners to socialize with each other.

The experience of recreating with a dog can be diminished by negative encounters with other users or other dogs.

Since off-leash dogs on trails can impact other users and potentially off-trail environmental resources, dog owners should expect to recreate with their dogs on leash on trail at the Fells.

Engaging in these experiences as members of a family, especially parents with their children

Exploring, experiencing and recreating in a natural setting can all strengthen social bonds. This is particularly valuable for families and especially valuable when those strengthened bonds are between a child and parent. Exploring nature and recreating with a child can be an opportunity to teach, share and learn from each other. These interactions that occur in a natural setting can be more meaningful than those that might occur in front of the television, or even at the kitchen table.

Experiences with families can be enhanced by discovery, challenge, beautiful scenery and nice weather.

These experiences can be diminished by too much challenge, situations that feel unsafe and negative encounters with other users.

Stewarding and improving the Fells environment

The experience of being able to volunteer one's time and energy to improve the Fells trail system and environment is a valuable experience that many seek. Modern society often lacks opportunities to get outside and engage in physical labor, and volunteer stewardship on trails offers the opportunity to improve the environment, enhance recreational experiences and realize visible and tangible accomplishments. Such activities also strengthen participants' sense of connection to the environment and trail system, and provide opportunities for environmental education and skill development.

In addition, the Fells trail system clearly has significant need for ongoing maintenance, and volunteer stewardship will be a critical component of successful implementation of this trails plan.

The volunteer stewardship experience is enhanced by well-organized and clearly defined volunteer projects, opportunities to meet and socialize with others, and projects which have a clear, lasting and visible benefit.

The volunteer experience is diminished by a lack of organization, the exclusion of user groups and when the accomplishments of a project are un-done or appear to have little benefit.

Conclusion

The current trail network, user behaviors, conditions and policies existing in the Middlesex Fells and described in Section 2 of this plan, unfortunately do not create a trail system that fully provides for all the desired recreational experiences described above. Through the recommendations of this plan, DCR seeks to enhance, in partnership with stakeholders, our ability to better provide for these desired trail experiences.

(Stone 'turnpike' over wet area. Photo by Paul Jahnige)

Section 4. Sensitive Natural and Cultural Resources

4.1 Ecological Impacts of Trail Activities

Environmental impacts of recreation are detailed and discussed in Section 4.2 of the Middlesex Fells RMP.

Of particular concern to DCR with respect to trails and trail-based recreation in the Middlesex Fells are areas where illegal uses, off-trail uses or existing trails intersect with and impact sensitive resources, including:

- Drinking water supplies
- Wetland resource areas
- Vernal pools
- Rare and endangered species habitats
- Priority natural vegetation communities
- Sensitive cultural sites

4.2 Water and Wetland Resources

The drinking water resources and associated infrastructure, and threats to these resources are described in the Middlesex Fells RMP Section 2.4.

Management resources and practices employed to protect these resources are described in Section 3.2 of the RMP.

Recommendations specifically designed to protect water resources are discussed in Section

5 of the RMP and also in Section 6 of this Trail Plan.

Trails can negatively impact wetland resources when they directly traverse wetlands without sustainable surfaces, and when they generate sedimentation through the displacement and erosion of soils that are carried into wetland resources. The primary contributor to wetland impacts from trails is poor trail layout and design, and off-trail uses.

In accordance with DCR's *Trails Guidelines and Best Practices Manual*, trail maintenance activities that have the potential to fill, remove, dredge or alter wetland resource areas will only be considered after a thorough review and permitting process by the local conservation commissions.

Trail maintenance that has the potential to reduce existing erosion and sedimentation should be prioritized, and trails that currently traverse and impact wetland resources will be evaluated for closure.

It is important to note that mud holes or wet trail segments are not necessarily wetland resource areas, and are not likely to produce impacts to wetland resources through sedimentation. The primary impact of wet trail areas is the trail widening and vegetation trampling that occurs when users try to avoid getting their feet wet.

4.3 Vernal Pools

Vernal pools at the Middlesex Fells, their extent, and threats are described in Section 2.4 of the Middlesex Fells RMP. Recommendations designed to protect vernal pools, both certified and potential, are discussed in Section 5 of the RMP and Section 6 of this Trail Plan.

(Vernal pool with evidence of recreational impacts. Photo by Paul Jahnige)

4.4 Rare and Endangered Species Habitats

The rare species at the Middlesex Fells, and their needs, habitats, threats, and specific recommendations for protection are detailed in Appendix M of the Middlesex Fells RMP; Habitat Management Plan.

In addition, in accordance with DCR's *Trails Guidelines and Best Practices Manual*, all trail construction and maintenance activities (including basic maintenance) within Priority Habitat, whether completed by DCR staff or in cooperation with partners, must be reviewed and approved by the NHESP in accordance with the Massachusetts Endangered Species Act (MESA) unless it is covered by an exemption.

4.5 Priority Natural Communities

Although natural communities, such as bogs, grasslands or floodplain forests, are not legally protected under the MESA, they do deserve special consideration by DCR in the planning of trail maintenance and development because they harbor important components of biodiversity.

The NHESP ranks each type of natural community with a state rank (S1 – S5) that reflects the rarity and threat to that community in Massachusetts. S1 through S3 community-types are designated as Priority Natural Communities (PNCs). Exemplary natural communities are any occurrence (no matter what the rank) which is particularly good in terms of biodiversity, size, landscape context and potential for natural processes.

The PNCs, their extent, needs, and threats are all described in Section 2.4 of the Middlesex Fells RMP. Recommendations for protecting these communities are discussed in Section 5 of the RMP and in Section 6 of this Trail Plan.

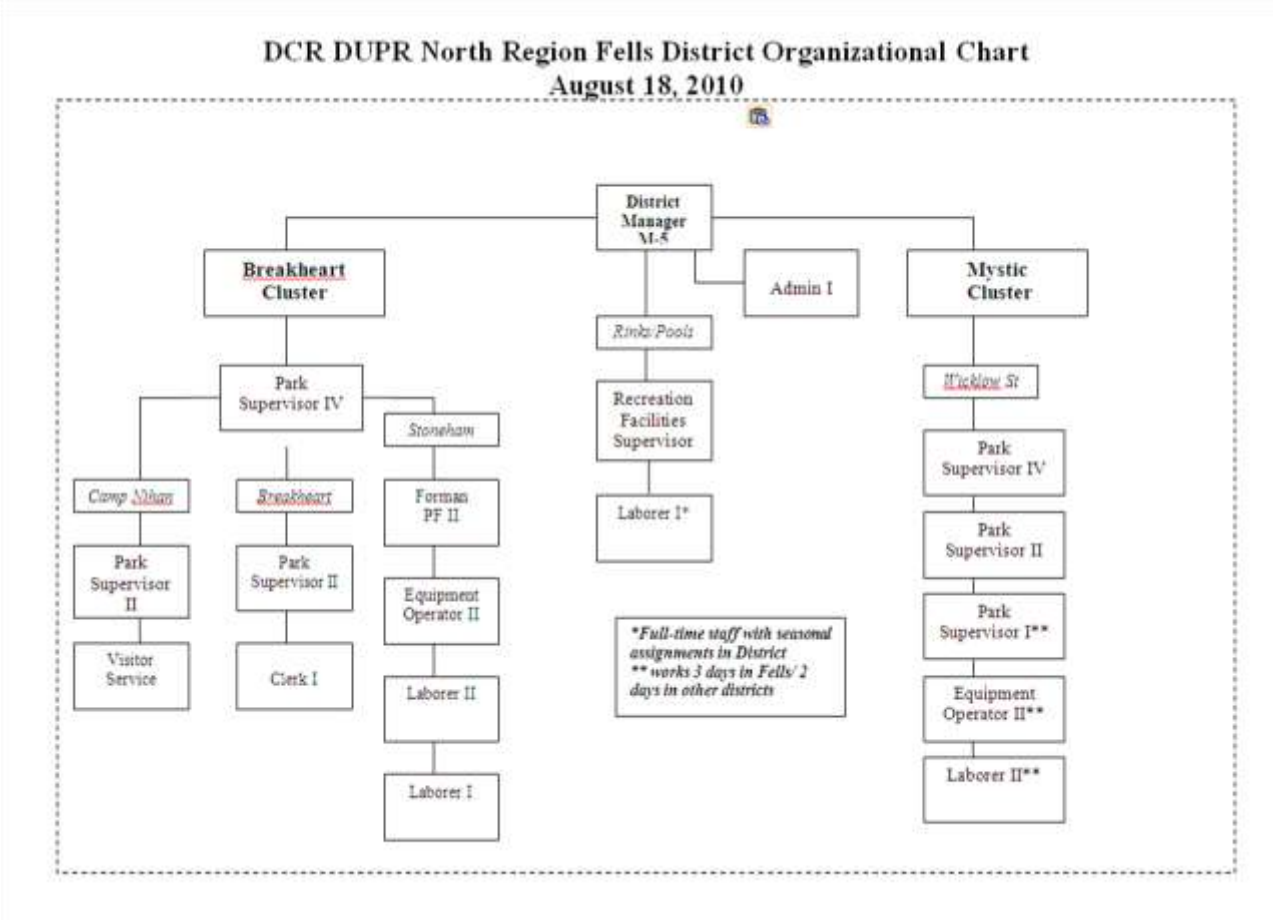
In particular, there are some examples of Hickory Hophornbeam community (S2), Ridgetop Pitch Pine-Scrub Oak community (S2) and Circumneutral Rocky Summit/Rock Outcrops community (S2/S3) at the Fells. Both of these ridge top communities are susceptible to damage by trail usage because the soils are thin and can be easily worn. Unfortunately, ridge top locations also often include exposed bedrock and offer views, so users will tend to wander off trail in search of views and pleasant spots. This off-trail use can create additional impacts and fragment the natural community.

DCR has consulted with the NHESP Natural Community Ecologist to develop a set of recommendations to help better protect these potentially sensitive resources.

4.6 Cultural Resources

The Middlesex Fells' cultural resources, their locations, conditions, integrity, and threats are all detailed in Section 2.5 and Appendix Q of the Middlesex Fells RMP. Recommendations for protecting these resources are discussed in Section 5 of the RMP.

In accordance with DCR's Trails Guidelines and Best Practices Manual, any trail project that includes excavation – including tree planting, sign installation and invasive removals – whether by DCR or volunteers, requires review by DCR's Office of Cultural Resources and potentially the Massachusetts Historic Commission (MHC; http://www.sec.state.ma.us/mhc/). If the project is not in an area with archeological and/or cultural resource sensitivity, the MHC may not require anything further. If the project is in such an area, or in an area that meets the criteria for a site that might have archeological resources, the MHC may request additional information or an archaeological survey.



Section 5. Staffing and Stewardship Partners

5.1 DCR Staffing

DCR staffing resources are described in Section 3 of the Middlesex Fells RMP.

5.2 Friends of the Middlesex Fells Reservation

The mission of the Friends of the Middlesex Fells Reservation (FOF) is to protect and preserve the natural and historic resources of the Fells through public outreach and support. In addition to advocacy and information in support of this mission, the FOF partners with DCR and others to organize a number of different educational and recreational programs including lectures, hikes, nature exploration and clean-ups.

In addition, the FOF has organized trail adoption and maintenance projects, within the Fells trail system (www.fells.org/getinv/adopt.cfm). They have received grants to maintain trails and install signs and have committed volunteer time to organizing these efforts.

5.3 New England Mountain Biking Association

The New England Mountain Biking Association (NEMBA) is a recreational trail advocacy organization with 17 local chapters dedicated to taking care of the places where members ride, preserving open space and educating the mountain bike community about the importance of responsible riding. The Greater Boston chapter (GB NEMBA) has a mission of promoting and preserving mountain bike access to the trails in the Greater Boston area by hosting riding events, helping to maintain the trails, training new riders and acting as advocates for the mountain bike community with local land managers and government authorities.

Within the Fells, NEMBA has organized trail riding events, trail maintenance days and a volunteer trail patrol (www.gbnemba.org/mtb-patrol.html), and has also advocated for expanded mountain biking access within the reservation.

5.4 Appalachian Mountain Club

The Appalachian Mountain Club (AMC) promotes the protection, enjoyment, and understanding of the mountains, forests, waters and trails of the Appalachian region. The AMC encourages people to experience, learn about and appreciate the natural world.

The Boston Chapter of the AMC hosts a variety of events within the metropolitan region including lectures, hikes, paddles, climbs and volunteer events. Within the Fells, the AMC has partnered with various groups to organize both hikes and volunteer events.

In addition, AMC's professional trail crew has worked with DCR to complete trail maintenance and repair projects.

5.5 Student Conservation Association

Each year, DCR partners with the Student Conservation Association's (SCA) MassParks AmeriCorps program to sponsor SCA youth crews to perform a variety of trail stewardship projects in parks, forests and reservations around the state.

Within the Fells, the SCA crews have performed a variety of trail maintenance and repair projects in recent years.

5.5 Other Stewardship Partners

In addition to the partners listed above, DCR collaborates and seeks to collaborate with a variety of other partners who may bring financial, organizational, human or other resources to assist DCR in forwarding its mission and goals within the Fells. These may include local user organizations such as FellsDog or state-wide organizations such as the Sierra Club.

DCR seeks to expand the number and breadth of stewardship partners collaborating with us in the Fells, particularly around the issues of trail maintenance, stewardship, and education.

Section 6. Recommendations

The DCR planning team considered the existing natural and cultural resources and their conditions and needs; existing recreation uses and impacts; user behaviors and demands; public, stakeholder and staff input; and management resources and practices all detailed within this document and the Resource Management Plan for the Middlesex Fells. Based on this evaluation, DCR has developed trail system recommendations designed to equally:

- Protect the Fells environment by reducing impacts from trail system and trail uses, and
- Enhance the recreational experiences for all appropriate trail users

Because this Trail System Plan is both a component of the Resource Management Plan and will also serve as a stand only management document, many, but not all, recommendations will appear in both documents.

Recommendations in the Resource Management Plan (described in Section 5) are organized by the Management Goals identified for the reservation.

The recommendations with this Trail System Plan are grouped into the following categories:

- Reduce the extent and confusion within the trail system
- Maintain, improve and close trails in cooperation with stewardship partners

- Improve trail system maps and signage
- Protect sensitive resources
- Enhance parking and access
- Enhance user education, information and self-enforcement
- Improve enforcement of trail rules and etiquette
- Enhance the pedestrian trail user experience
- Enhance the mountain biking trail user experience
- Provide legal, positive experience for dog-owners and their pets

6.1 Reduce the Extent and Confusion within the Trail System

As described in Section 2.5 of this plan, the trail system in the DCR Middlesex Fells Reservation is extensive and confusing. This negatively affects the recreational experience at the Fells and extending the recreational impacts to environmental resources. Trails targeted for closure are depicted in Sub-Appendix N.3.

6.1.1. Close targeted trails to reduce the number and miles of trails, reduce environmental impacts and enhance user experiences. Trails that are impacting sensitive natural and cultural resources, and those trail segments that contribute to user confusion should be closed. This will undoubtedly be a long-term effort and will require a combination of DCR and partner resources to implement. Ultimately, this recommendation may result in approximately a 20% - 25% reduction in trail mileage within the Fells.

DCR has prioritized trails for closure as follows.
High Priority:
- Trail segments that go through or are eroding into vernal pools (RMP G1.5).
- Trail segments that impact wetland resource areas (RMP G1.6).
- Targeted forest roads and trails leading directly from DCR land on to Town of Winchester water supply lands (RMP G1.4).
- Targeted redundant, confusing, fall-line and poor-condition trails in Zone 1 areas as mapped in the RMP (RMP G2.1).

Medium Priority:
- Targeted redundant, confusing, fall-line and poor-condition trails in Zone 2 areas. Specifically, these include:
  - Confusing 'spider-web' trails north of the Sheepfold and Dark Hollow Pond.
  - Redundant trails in poor condition or with poor alignments in the Pine Hill area.
  - Redundant and confusing trail segments along the Rock Circuit Trail

6.1.2 Adopt a "no net gain" guideline at the Fells. For any new, rerouted or restored trail segment, at least an equal length of redundant, confusing, fall-line or poor-condition trails shall be closed. Preferably, trails should be closed in a 3:1 ratio (closures : new trails) for any new trail project.

6.1.3 Close trails using a multi-pronged trail closure approach. Successful trail closures are difficult, especially in an park like the Fells. Sub-Appendix L.2. "Closing and Restoring Trails" details a multi-pronged approach to trail closures that can be successful. It involves:
- User education that provides information through a variety of venues about why we are closing trails and the benefits of staying off those trails
- Trail tread restoration including tread aeration and transplanting of native vegetation to eliminate trail sight lines
- Signage at trailheads to indicate that trails are closed

- Physical barriers such as rocks, fences, logs or brush to indicate that the trail is closed and to eliminate sight lines
- Enforce prohibition on off-trail recreation (RMP G2.3).
- Monitoring of success and early correction of problems.

6.1.4 Reduce overlaps and intersections of main loop trails including the Skyline Trail, Reservoir Trail and Mountain Bike Loop through trail re-routes and re-designations (RMP G4.14). These main loop trails in the western Fells intersect 23 times and share 9 segments of tread. This contributes to user confusion and conflict. These intersections and overlaps can be significantly reduced with a few trail re-routes and re-designations.

6.1.5 Improve trail intersections. Many intersections in the Fells are confusing. Many trails do not intersect at right angles, two different intersections are sometimes within a few feet of each other, and trails enter and leave at points offset from each other. These types of intersections create user confusion. Clear, simple intersections at a single point with right angles and a signpost are the most effective for keeping users on the right trail.

6.2 Maintain, Improve and Close Trails in Cooperation with Stewardship Partners

DCR has limited staff and financial resources to actively maintain, improve, or close trails. Fortunately, many stewardship partners are active in the Middlesex Fells. Most notably, these include:

- Appalachian Mountain Club (AMC), Boston Chapter
- Friends of the Fells, trail maintenance volunteers
- New England Mountain Biking Association, Greater Boston Chapter
- Student Conservation Association

6.2.1 Establish Memoranda of Understanding (MOU) and Stewardship Agreements with partners organizations at the Fells (RMP G7.1). These MOU's and Stewardship Agreements outline roles, responsibilities, permitting requirements and expectations, and institute an annual process workplan for review and approval of activities.

6.2.2 Develop annual workplans with partners to identify specific projects for trail maintenance, improvement and closure within the Fells; and ensure proper permitting and oversight.

6.2.3 Ensure that all DCR or partner activities are appropriately reviewed, permitted and approved (RMP G2.6).

6.3 Improve Trail System Maps and Signage

Trail maps and signage are vital for public safety, interpretation, communication and setting appropriate expectations.

6.3.1 Develop and distribute new DCR trail maps to improve the experience for all users (RMP G4.16). DCR will develop an accurate trail map that we can post on kiosks, distribute at key locations and have available for download from the internet. The trail map should also include information on trail user expectations and etiquette and may include intersection numbering to be used in conjunction with signage.

6.3.2 Develop and distribute a mountain biking map. Current trail maps to not adequately show those trails that are both open and closed to mountain biking, and specific information on mountain bike etiquette.

6.3.3 Improve trail signage and marking following DCR guidelines (RMP G4.15). DCR, ideally in cooperation with stewardship partners, will implement the trail sign standards described within our *Trails Guidelines and Best Practices Manual* (and described in Sub-Appendix L.4.).

6.3.4 Enhance trailhead signs and kiosks at main trailheads as resources allow. Trailhead kiosks set appropriate user expectations, include emergency contact information, describe the trail experiences available from that location and list rules and user etiquette.

6.4 Protect Sensitive Resources

All recreational uses can impact sensitive resources, but trails can also direct and concentrate users, protecting these resources.

6.4.1 Protect Water Supplies and Wetland Resources.

- Work with MWRA to protect water resources and infrastructure under their jurisdiction from degradation (RMP G1.3).
- Add structures to trail segments that impact wetland resource areas (RMP G1.6).
- Work with the Town of Winchester Police and Water Departments to enforce no trespassing from DCR land to posted water supply lands (RMP G1.1).
- Implement and enforce a trail closure for mountain bikes during the month of March (or as conditions warrant), and encourage all users to avoid wet trails (RMP G1.9).
- Develop and implement an educational program to teach trail users about ecological impacts of trail use (RMP G1.8).
- Educate dog owners about the potential impact of dog waste on water supplies (RMP G1.10).
- Enforce dog-owners properly picking up and disposing of dog waste (RMP G1.11).
- Close trails as current conditions warrant with information posted on DCR's web site and at main trail access points.
- Also see 6.1.1.

6.4.2 Protect Certified and Potential Vernal Pools.

- Permit organizations such as the Vernal Pool Society to work with volunteers to certify potential vernal pools (RMP G.1.6).
- Implement the Guidelines for Protection of Vernal Pools and Associated Habitat on DCR Lands (Appendix D)
- Enforce leash regulations outside of official designated areas and circumstances (RMP G4.7).
- Also see 6.1.1.

6.4.3 Protect rare and endangered species and their habitats.

- Implement additional habitat management recommendations detailed in Appendix M, Habitat Management Plan, once approved by NHESP (RMP G2.8).
- Consult with the NHESP prior to all unapproved activities within Priority Habitat.

6.4.4 Minimize Impacts to Priority Natural Communities (PNC).

- Enforce prohibition on off-trail recreation (unless specifically permitted) (RMP G2.3).

- Add trail definition to official trails in proximity to sensitive plants and wildlife resource locations (RMP G2.7).
- Avoid introducing invasive plants with imported soil, rock or other material.
- Refrain from gathering materials for trail maintenance (rocks, logs, soil, etc.) from within the community.
- Also see 6.1.1.

6.4.5 Reduce Disturbance to Flora and Fauna.

- Enforce prohibition on off-trail recreation (unless specifically permitted) (RMP G2.3).
- Maintain large trail-free areas as trail free (RMP G2.2).
- Add trail definition to official trails in proximity to sensitive plants and wildlife resource locations (RMP G2.7).
- Develop and implement an educational program to teach trail users about ecological impacts of trail use (RMP G1.8).
- Enforce leash regulations outside of official designated areas and circumstances (RMP G4.7).
- Continue to allow after dark uses by special permit only.
- Also see 6.1.1.

6.4.6 Protect Sensitive Cultural Resources.

- During new trail planning, consult with DCR's Office of Cultural Resources and submit project proposals to the Massachusetts Historic Commission for review.

6.5 Enhance Parking and Access

6.5.1 Consider a "pay and display" day use fee at the Sheepfold (RMP G4.4). This will help to relieve trail use and parking pressure at the Sheepfold, and allow for better enforcement of inappropriate uses.

6.5.2 Develop all-persons accessible trail opportunities in both the western Fells and from Flynn Rink (RMP G2.1). Work in partnership with NEMBA to permit and complete the Flynn Rink connection project. Work with the Town of Winchester to design, permit and develop accessible trail opportunities in the western Fells.

6.5.3 Work in partnership neighboring land owners to formalize parking areas and trailheads at in the Bear Hill area and at the former Boston Regional Medical Center site.

6.5.4 Enhance parking at pullouts along South Border Road. These enhancements could include:

- Enhanced trailhead signage
- Demarcated parking spaces

6.6 Enhance User Education, Information and Self-Enforcement

6.6.1 Establish and educate users in appropriate trail etiquette (RMP G4.17). Examples of basic trail etiquette are at http://www.trailsandopenspaces.org/trail-etiquette.html, http://www.fomba.org/education.html and http://callahandogs.com/?page_id=40.

- Post, update and communicate through kiosks, signs, internet and personal contact reservation rules, regulations, appropriate behaviors and etiquette (RMP G5.1).
- Work with partners to encourage their members to comply with all reservation rules, regulations, permitting requirements, appropriate behaviors and etiquette (self-enforcement) (RMP G7.2).
- Establish, post and educate users on winter trail use etiquette, specifically that foot traffic avoid ski tracks, or pedestrian travelers stay on left/skiers on right.

6.6.2 Create a multi-user "Trail Ambassador" or "Trail Watch" program. This program should be overseen by DCR and would train volunteers to welcome trail users, create a culture of user respect, and provide information and education upon request. The purpose of a "Trail Ambassadors" program is not to enforce park rules or guidelines, but rather to provide a welcoming environment for all users, offer information and education upon request, and provide a positive presence within the trail system.

6.6.3 Develop and implement an educational program to teach trail users about ecological impacts of trail use (RMP G1.8).

6.7 Enhance Enforcement of Trail Rules and Etiquette

6.7.1 Increase DCR Ranger presence at trailheads and on trails (RMP G5.2). Increase both the number of ranger hours available for the Fells and the number of hours on the trail system, especially at peak times. Strategies to accomplish this include:

- Fill Ranger II position for the Fells District (RMP G5.3).
- Continue to support two additional long-term seasonal rangers for the Fells District (RMP G5.4).
- Provide for occasional mounted patrols (RMP G5.5).
- Bring DCR Major Impact Team to conduct "sweeps" at the Fells (RMP G5.7).

6.7.2 Enforce park rules and regulations including:

- Prohibition on off-trail recreation (unless specifically permitted) (RMP G2.3).
- Leash regulations outside of official designated areas and circumstances and a 3-dog per person limit (RMP G4.7).
- No trespassing from DCR land to posted water supply lands (RMP G1.1).
- Dog-owners properly picking up and disposing of dog waste (RMP G1.11).
- No biking on / in pedestrian only trails and areas (RMP G4.12).
- Issuing citations for flagrant or persistent violations of regulations (RMP G5.6).

6.7.3 Coordinate with the State Police to provide support, periodic patrols and enforcement at specific sites (RMP G5.8).

6.7.4 Post, update and communicate through kiosks, signs, internet and personal contact reservation rules, regulations, appropriate behaviors and etiquette (RMP G5.1).

6.7.5 Establish a Park Watch program for the Fells (RMP G5.9).

6.8 Improve the Pedestrian Trail User Experience

6.8.1 Designate Virginia Wood (with the exception of one connecting trail) and the Long Pond area as pedestrian only areas with signage and on maps (RMP G4.8).

6.8.2 Enforce no biking on / in pedestrian only trails and areas (RMP G4.12).

6.8.3 Enforce leash regulations outside of official designated areas and circumstances and a 3-dog per person limit (RMP G4.7).

6.8.4 Institute and promote the "yield triangle" (bikes yield to hikers, everyone yields to horses) on multi-use trails within the Fells.

6.8.5 Work with partners to encourage their members to comply with all reservation rules, regulations, permitting requirements, appropriate behaviors and etiquette (self-enforcement) (RMP G7.2). This should include working specifically with NEMBA and other mountain bike organizations to encourage

their members to stay off of trails designated for pedestrians only.

6.8.6 Reduce overlaps and intersections of main loop trails including the Skyline Trail, Reservoir Trail and Mountain Bike Loop through trail re-routes and re-designations (RMP G4.14). These main loop trails in the western Fells intersect 23 times and share 9 segments of tread. This contributes to user confusion and conflict. These intersections and overlaps can be significantly reduced with a few trail re-routes and re-designations.

6.9 Improve the Mountain Biking Trail User Experience

6.9.1 Designate the Reservoir Tail as a multi-use trail (RMP G4.9).

6.9.2 Designate the 1-3 official trails within the Dark Hollow area as multi-use use to provide enhanced mountain biking opportunities (RMP G4.10). This is also part of a strategy to provide a positive use to an area with unwanted activity (RMP G5.10).

6.9.3 Consider designating single-track trails and areas in the eastern Fells as multi-use, including appropriate portions of the Rock Circuit Trail, to provide more advanced mountain biking opportunities on sustainable surfaces and disperse biking from the western Fells (RMP G4.11).

6.8.5 Work with partners to encourage their members to comply with all reservation rules, regulations, permitting requirements, appropriate behaviors and etiquette (self-enforcement) (RMP G7.2). This should include working specifically with Friends of the Fells, AMC and Sierra Club to encourage their members to be respectful of all other users including mountain bikers in the Fells.

6.10 Provide Positive Experience for Dog-Owners and Their Pets

6.10.1 Manage a designated off-leash area at the Sheepfold as a pilot off-leash opportunity in partnership with and investment from dog-owner stakeholder groups (RMP G4.5).

6.10.2 Enforce leash regulations outside of official designated areas and circumstances, and enforce a 3-dog per person limit (RMP G4.7).

Middlesex Fells Trail System Plan: Public / Trail User Input

We are inviting members of the public and users of the Middlesex Fells trail system to provide input into the trail system planning process. We invite each interested individual to submit an email or letter describing their comments, experiences, goals and concerns at this stage in the process. We will also invite additional comment on the draft plan, once developed. To help guide you in your thinking, we have included the set of questions below, but please do not feel constrained by these questions.

These questions are also available on-line at
http://www.mass.gov/dcr/news/publicmeetings/greenwaysfellsusersurvey.htm

DCR's "Trail Guidelines and Best Practices" manual is available on-line at
http://www.mass.gov/dcr/stewardship/greenway/docs/DCR_guidelines.pdf

Thank you for your input!

Public / Trail User Guiding Questions

- How you (and your family) use the trails at the Middlesex Fells? (i.e. what parts of the Fells; how often; what kinds uses; what times of day, week and year; etc.)

- What would you describe as some of the highlights of the Fells trail system? (i.e. what scenic, natural or cultural resources and destinations are important to you?)

- What would you describe as some of the problems with the trail system at the Fells that affect your trail experience there?

- Can you describe the "recreational experience(s)" that you find most enjoyable at the Fells? (This might include the level of difficulty, interaction

with other users, length of the use, type of use, etc. Feel free to write about your best Fells experience.)

- If you could make three changes in the Fells trail system, what would they be?

- What other comments would you like us to consider as we develop our trail system plan for the Middlesex Fells?

Please mail or e-mail your input to:

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connections
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Closing and Restoring Trails

All trails impact the natural environment and require on-going maintenance. But some trails, usually as a result of poor layout and design, are more damaging than others, require excessive maintenance, and diminish the user's experience. Rather than try to maintain trouble trails over and over, in many cases, closing and restoring poor condition and redundant trails is the best solution for your trail system – environmentally, economically, and socially.

However, as anyone who has tried to close a trail knows, simply putting up a sign or piling brush at the trail entrance does not work. The compacted soils of the trail tread can resist naturalization for many years, and as long as open sight lines persist, users will continue to use the trail.

In most cases, successfully closing and restoring trails takes as much planning and effort as constructing new trails. The following Best Practices can help successfully close problem trails.

Provide a Better Option
The most important component of successfully closing a trail is to provide a more appealing alternative. This includes ensuring that the new route is well designed and marked, and ***flows seamlessly*** from existing trails. This may require redesigning trail intersections to take away open sight lines and create smooth transitions that keep users on the preferred route.

Educate Users
Users who do not understand why a trail is being closed may undo all your efforts. When closing trails it is important to let users know that you are closing trails, and more importantly, why. Post information on trailheads, recruit volunteers to assist and encourage users to spread the word. ***Focus***

on the benefits of closing trails including habitat and water quality protection, along with a better trail experience.

Halt Ongoing Erosion
Some trails requiring closure will be fall-line trails that channelize water and experience continuing erosion. In order to close and naturalize these trails, active, on-going erosion must be stopped. ***Check dams and slash*** should be used to stem water flow and stabilize soils while naturalization occurs.

Close Sight Lines
Trails you can see are trails you will use. In the photos (top and left), even though barriers, signs and slash have been used to close the trail, the open sight lines still invite users to explore. The most effective way to close off sight lines is to ***transplant native vegetation*** in the trail corridor, especially any place a trail is visible from another trail. In other places along the closed trail, slash can be used to disguise the trail tread.

Consider Breaking Up Tread and Re-contouring the Land
Compacted trail tread will likely resist naturalization. Have you ever come across an old road in the woods that has not been used for years? Breaking up the soil with pulaskis and pick-mattocks, and scarifying the soil will allow natural regeneration to take hold. Re-contouring the land, particularly for eroded trails, will help remove evidence of old trails.

Block the Corridor
As a last resort, you can block the beginning and end of the trail with a fence and signs. The fence will look out of place, and could draw more attention to the closure. Be prepared to answer questions by posting signage explaining the closure on, or near, the fence. When the trail has been closed for a while the fence can be removed. This strategy may be needed especially at locations where users are looking for views and water access.

Don't Introduce or Spread Exotic Plants
Use local soils and plants in your trail reclamation project if possible. If outside materials are used, make sure they are certified weed-free and native. Clean tools and work boots before bringing them from other sites to ensure that invasive seeds are not transported.

Monitor Your Closure
Return periodically to monitor the success of your closure. Ascribe to the "broken window" theory of trail maintenance. If your closure is vandalized or damaged, fix it immediately.

Tips and Tools (Mattock and McLeod)

Closing and Reclaiming Damaged Trails webpage by IMBA is at
http://www.imba.com/resources/trail_building/reclaiming_trail.html

Naturalizing Abandoned Trail from the FHWA Trail Maintenance and Construction Notebook is at:
http://www.fhwa.dot.gov/environment/fspubs/00232839/page12.htm

The Minnesota Department of Natural Resources "Trail Planning, Design and Development Guidelines" (http://www.dnr.state.mn.us/publications/trails_waterways/index.html) includes a section of decommissioning and restoring unsustainable trails.

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To subscribe, please email your contact information to paul.jahnige@state.ma.us.

Please forward to others who might be interested in Massachusetts Greenways and Trails.

Connections is the electronic newsletter from the Department of Conservation and Recreation's Greenways and Trails Program,
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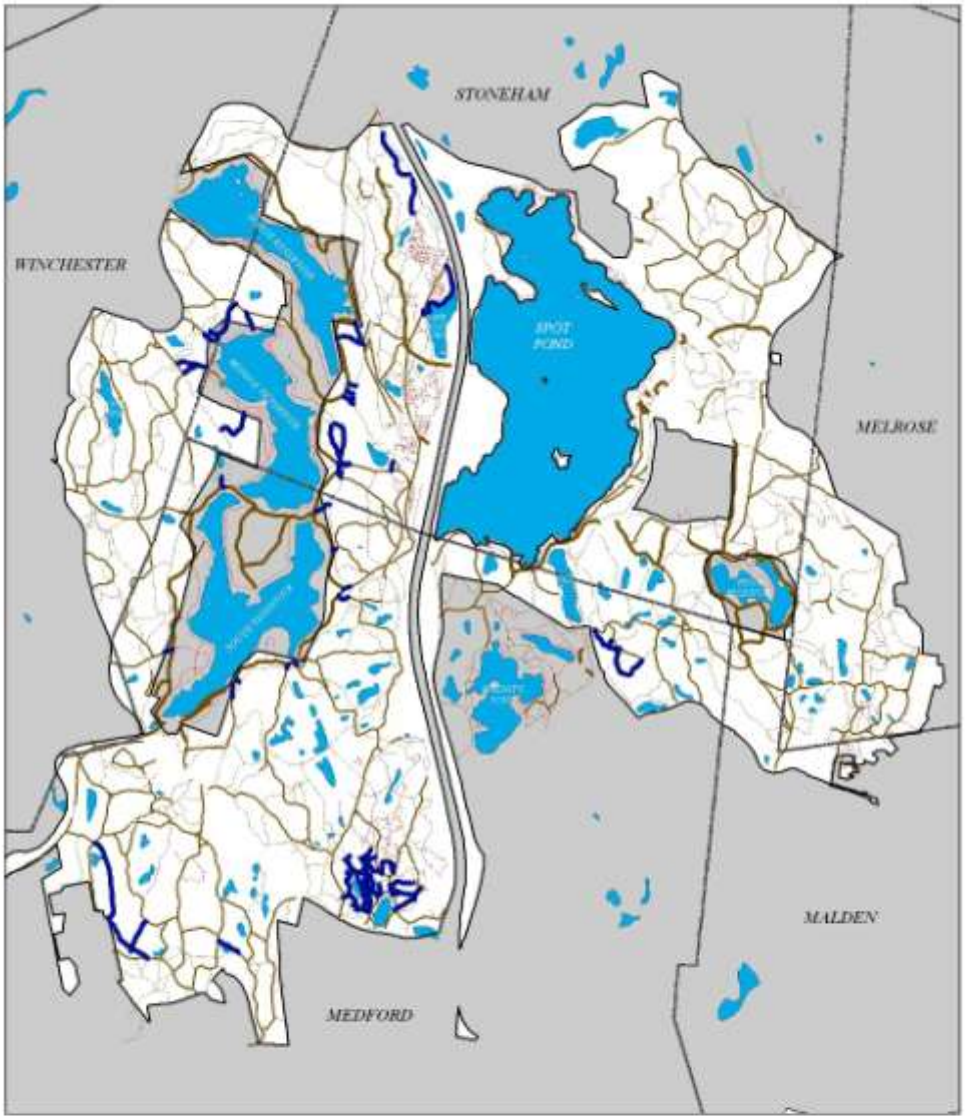
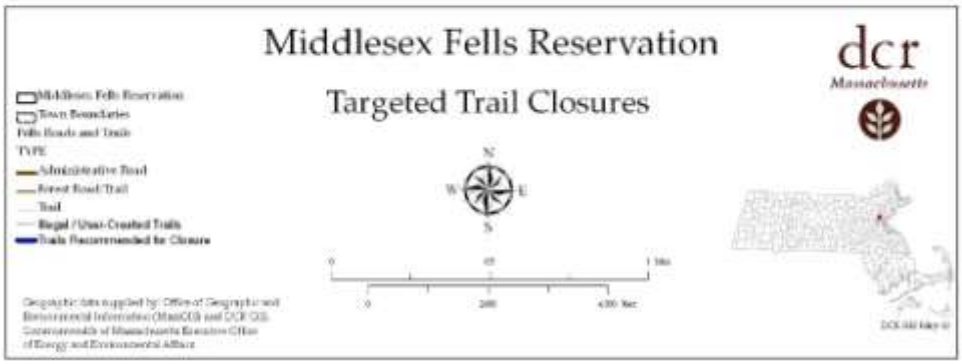
www.mass.gov/dcr/stewardship/greenway/index.htm


STONEHAM
WINCHESTER
SPOT POND
MELROSE
MALDEN
MEDFORD


Middlesex Fells Reservation
Targeted Trail Closures
dcr
Massachusetts
Middlesex Fells Reservation
Town Boundaries
Fells Roads and Trails
TYPE
Administrative Road
Forest Road/Trail
Trail
Illegal /User-Created Trails
Trails Recommended for Closure
N
W
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S

DCR Trails Guidelines and Best Practices Manual
(Section edited to provide guidance for the Middlesex Fells Trail Plan)

Trail Signage

"Signs are probably the quickest and easiest way to leave the trail user with a positive impression. If the signs are high quality, well maintained, and properly located, other trail problems are often over-looked. Consistent signs are the quickest way to increase the trail's identity and the public's support for the trail."
(National Park Service)

Current DCR Trail Marking
The Middlesex Fells currently employs a variety of different types of trail signs and marking systems including plastic blazes, painted blazes, plastic trail name signs, routed trail name and directional signs, interpretive signs, aluminum trail rules signs, and trailhead kiosks. These trail signage and marking standards will help improve trail management and user safety, and enhance the users' recreational experience. While achieving these standards may take years to realize, working toward them incrementally over time is an important goal.

Why Strive for Consistent Signage Standards?
Appropriate trail signs and markings provide information, enhance safety, and contribute to a positive user experience. Trail signage is perhaps our most important form of communication with our users, as signs are the messages that users see every time they visit. Consistent signage enhances safety, creates a positive trail identity, helps meets user expectations, and contributes to the public's support for trails.

The broad objectives of DCR's trail signage should be to:
1. Provide consistent positive exposure of the trail system to attract users
2. Educate the user about trails and trail uses
3. Reassure / ensure that the user is on the right trail and will not get lost
4. Control trail usage, reduce conflicts, and create safer, more enjoyable, and environmentally friendly recreational experiences

However, these objectives must be balanced with aesthetic considerations to avoid "sign pollution."

We accomplish these objectives through the consistent use of the following different kinds of trail marking:
- Trailhead signs and kiosks
- Intersection directional signs
- Reassurance markers and blazes
- Interpretive displays

It is important to consider the different purposes of each type of sign and use them appropriately. For example, using reassurance blazes to indicate allowed trail uses is probably inappropriate because it may require more blazing, and is very difficult to change if the allowed uses change. On the other hand, using trailhead signage to designate allowed uses is simpler to implement, requires much less maintenance, and can be easily changed.

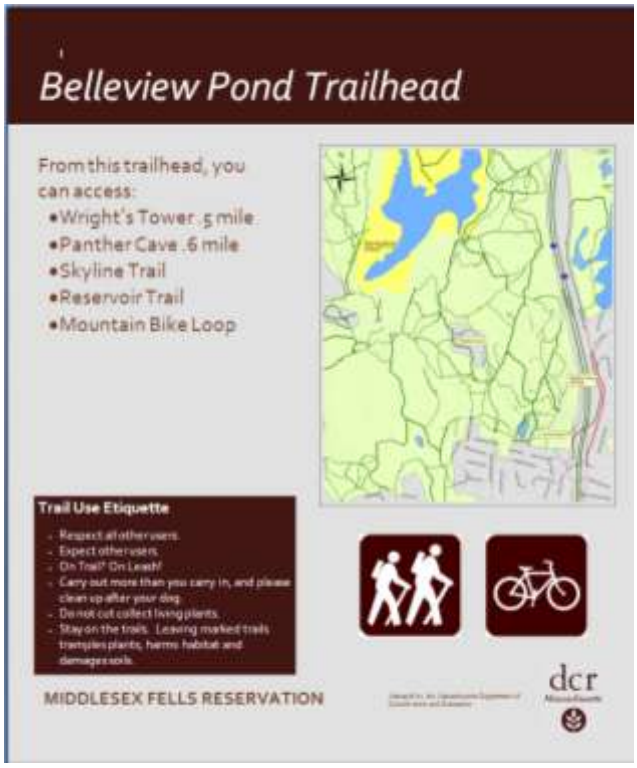
Implementation Priority
Implementing the below standards fully within the DCR system will take time. The priority for implementation should be as follows:

1. Fully implement the sign standards wherever new trails are developed or constructed.
2. Fully implement the standards when trails undergo significant restoration or repair.
3. Implement the appropriate standards as possible as trails are worked on through routine maintenance. For example, when a trail is maintained, re-blaze then, remove old plastic signage and install key intersection signs.
4. Implement the intersection signage standards park-wide.
5. Implement full signage standards park-wide.

General Trail Signage and Marking Standards

- Signage within Middlesex Fells should be consistent with respect to colors, materials, and look.
- Intersection directional signs and simple trailhead signs should be routed brown signs (wood or plastic composite material) with white lettering. Routed signs are aesthetically appealing and resistant to damage and vandalism.
- Trails should be blazed in painted 2x6 vertical blazes.
- Aluminum trail signs are ***not*** recommended.

Trailhead Signs
Trailhead kiosks or signs may come in different forms depending on the setting, complexity, and information needs.



For more developed trailheads, popular trails or high profile trails, a designed and professionally fabricated trailhead sign is appropriate. The template (right) follows the general standards for "Wayside Signage" in the in the DCR Graphics Standards Manual. This template includes:

- A sign board of approximately 20" wide by 24" in height (5:6 portrait orientation).
- Trail name or Trailhead name in Frutiger Italics in a 4" (1/6) brown band at the top.
- Text message (in sabon font) with trail description and perhaps additional information placed in the upper left text box.
- A map showing features, destinations, distances and connections in the upper right.
- Standard "Trail User Etiquette" is in a brown box in the lower left.
- Allowed and prohibited use symbols are in the lower right.
- Allowed and prohibited use symbols may also be in 4" x 4" square signs mounted on the posts below the sign.

- Park name is in capitals, left justified at the bottom with the DCR logo in the lower right corner.
- The position of the map, text boxes and symbols may be flexible depending on the specific needs of each sign.
- This type of sign should be affixed with brackets to two 4x4 pressure treated wood posts planted 24" in the ground.

On roadsides or at lower profile trailheads, simpler routed wood signs may be used. These should be:

- A sign board of approximately 21" wide by 15" in height (5:7 ratio landscape orientation)
- Trail name in Frutiger italics at about .8" – 1"
- Key trail destinations and distances at about .5"
- State Park Name in caps at the bottom
- "dcr" in the lower right corner
- Information and symbols showing allowed and prohibited trail uses and trail difficulties. This information may be in 4"x4" square signs mounted on the post below the sign.
- Sign should be affixed with lag bolts to a single 4x4 pressure treated wood post planted 24" in the ground.

Intersection Directional Signs

Within the Fells, directional signs **should** be placed at main trail intersections, decision points, and spur junctions. Intersections signs should be mounted on wood posts. Post type should be consistent within the site. Trails names and arrows **may** also be placed vertically on wood posts.

Intersection directional signs are the most important source of information for users, and can serve to enhance safety, avoid bad user experiences, and increase use of under-used sections of the trail. If someone knows that there is a tower, waterfall or other attraction down the trail, they may be tempted to hike to it and thus become intrigued with the trail idea.

Intersection signs **should** include the following information:

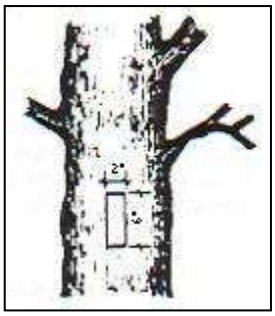
- Trail name, if the trail is named
- The closest significant destination (such as a view, summit, waterfalls, etc.)
- The closest trailhead
- A farther major destination or point of reference (such as road main entrance, major summit, overnight shelter, etc.)

- The distance to the destinations in miles and tenths
- The direction to these destinations indicated by arrows may be necessary
- "dcr" in the lower right corner
- markings for allowed or restricted uses
- intersection number in the lower left corner

In complex trail systems with numerous intersections such as the Fells, intersection numbering can be used and listed on an accompanying trail map. Numbers should not be used instead of directional signage, but can be used in conjunction and can be placed on the intersection directional sign in the lower left corner.

Reassurance Markers/Blazes

Trail blazes or reassurance markers are important trail elements that allow the user to stay on trails and provide a sense of reassurance. The recommended guidelines are consistent with best management practices for trail marking.



Official DCR trails **should** be blazed with vertical ***painted blazes***. Plastic blazes should be avoided and replaced when trails are re-blazed, upgraded of maintained. Painted blazes are more vandal resistant, do less damage than nail-on blazes, and are easier to alter.

Blazes are placed on trees, slightly above eye level so that hikers, bikers or riders can see them easily when traveling in either direction. Blazes should be placed immediately beyond any trail junction or road crossing. Blazes along continuous trail segments within the Fells need only be periodic, as tread is well established. It is not desirable to have more than one blaze visible in either direction at any one time. One well placed blaze is better than several that are poorly placed, and it is important to strike a balance between "over-blazing" and "under-blazing."

Standard blazes should be 2" x 6" vertical rectangles. The 2" x 6" rectangular shape is large enough to be seen easily without being visually obtrusive and is the most universally accepted style of trail blazing. Edges and corners should be crisp and sharp. Dripping paint, blotches and over-sized blazes should be avoided. On rough barked trees, the tree will first need to be smoothed using a paint scraper, wire brush, or draw knife. A high quality, glossy, exterior acrylic paint such as Sherman Williams Metalatex or Nelson Boundary Paints should be used for long durability.

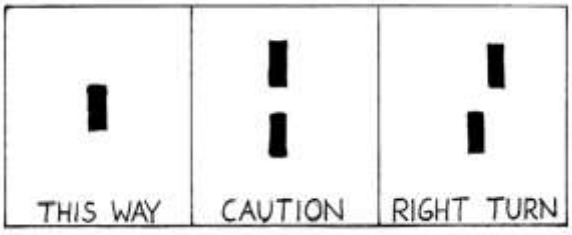
Within the Fells, the following colors are used to denote specific trails
- Skyline Trail – White
- Reservoir Trail – Orange
- Mountain Bike Loop – Green
- Cross Fells Trail – Light Blue
- Rock Circuit Trail – White
- Crystal Springs Trail - Red

In the Fells, we recommend that official trails (other than those specifically designated routes above) should be blazed in dark blue for multi-use trails and white for hiking only trails.

Vegetation should be pruned from in front of the blazes to ensure visibility in all seasons.

In non-forested areas, blazes may be placed on wooden posts 4 feet above the ground or stone cairns may be used to mark the trail. Blazes can be painted on exposed rock, but will not be visible in the winter.

Directional Change Indicators



Double blazes should be used in places that require extra user alertness (e.g. important turns, junctions with other trails, and other confusing locations). They should be used sparingly so that they do not become meaningless or visually obtrusive. They are unnecessary at gradual turns and well-defined trail locations such as switchbacks. A reassurance marker should be placed so that it can be seen from the direction indicator. Be sure to mark confusing areas to guide users coming from both (or all) directions. Avoid arrows.

Interpretive Displays

An interpretive sign must be part of a well thought out interpretive plan complete with goals, objectives, thematic statements and topics. The plan should be based on an audience and site analysis which will guide the selection of materials and interpretive approach. Contact the Interpretive Services section of the Bureau of Ranger Services if you are interested in developing an interpretive plan. Once you have completed your interpretive plan, you will need to confer with Interpretive Services and the DCR Graphics Team to develop specific displays. An outline of the wayside development process is available in the DCR Graphic Standards Manual.

Interpretive waysides are an important and effective way to provide information to visitors. There are two types of wayside: low profile and upright. Low profile exhibits are low, angled panels that provide an interpretive message related to a specific place or feature. They usually include one or more pictorial images and a brief interpretive text. Upright waysides typically provide general information, rather than site-specific interpretation; they are often located near a visitors center or trailhead to provide information about facilities, programs, and management policies.

The panels are fabricated from a high-pressure laminate material, which is both cost-effective and allows the use of color to create a more attractive presentation. They are generally guaranteed for 10 years by the fabricators, and are resistant to vandalism by spray paint or cutting. The Graphic Design team will coordinate fabrication through the state vendor program.

Sign Maintenance

Sign maintenance is critical to the operation of a quality trail system. Well maintained signs that are repaired promptly convey a sense of pride and reduce further vandalism. Signs are a highly visible representation of the quality of the trail. Their maintenance or lack of maintenance leaves the visitor with a positive or negative impression about the trail. Signs convey many kinds of information and it is critical that they be in good shape. Special attention should be given to those that are damaged from shooting and other factors, those that are faded or brittle from long exposure, and those that are simply missing. All signs that are damaged or weathered no longer convey a good impression or serve the intended purpose, and should be repaired or replaced. Periodic painting and other maintenance is a necessity and will prolong the life of a sign.

Temporary Trail Signage and Blazing

Some uses such as seasonal snowmobiling or special events may require temporary trail blazes and signs. Temporary signs installed by DCR partners should be allowed under a Special Use Permit or MOA and should follow these guidelines.

- Temporary signs shall be approved by the facility supervisor
- They should be installed on posts rather than nailed to trees
- They shall not advertise specific vendors
- They shall be removed when the seasonal or temporary use is over
- Temporary signs shall not be inconsistent with these DCR standards

Evaluation of Mountain Biking and Hiking Recreation Consistent with the Sierra Club's Policy on Off Road Use of Bicycles

Excerpts of the Sierra Club Policy (Sierra Club 1994)

"I. POLICY

a. Trails and areas on public lands should be closed to all vehicles unless

i. determined to be appropriate for their use through completion of an analysis, review, and implementation process, and

ii. officially posted with signs as being open.

b. The process must include

i. application of objective criteria to assess whether or not environmental quality can be effectively maintained, and whether the safety and enjoyment of all users can be protected;

ii. a public review and comment procedure involving all interested parties; and

iii. promulgation of effective implementing regulations where impacts are sufficiently low that vehicle use is appropriate.

c. Trails and areas designated for vehicular use must be monitored periodically to detect environmental damage or user interference inconsistent with the above criteria. Where this occurs, the trail or area must be closed to vehicles unless effective corrective regulations are enforced.

II. BACKGROUND

The Sierra Club is concerned about the effects of use of bicycles off-road. Concerns have been raised about effects such as soil erosion, impacts on plants and animals, displacement of other trail users, and impacts on other users' safety and enjoyment. These concerns argue for special regulation, with effective enforcement, of off-road bicycling.

Appendix C - Criteria

When a land management agency reviews suitability of a trail for bicycle use, bicycle use should not be allowed where it would cause the following measurable effects. This list is not all-inclusive.

a. Significant soil erosion or significant damage to streams or fish habitat.

b. Rutting, impairment of trail drainage, breakdown of trail shoulders, and other forms of damage not correctable using U.S. Forest Service trail maintenance standards and techniques.

c. Significant disturbance of plants or animals or their habitat.

d. Damage to archaeological, scientific, historical, or other significant resources, including rare natural features of interest for scientific study.

e. Danger to the safety of bicyclists or other users because of bicycle speed, steep grades, steep terrain, sharp curves, slippery or unstable trail surfaces, or limited visibility. See Appendix D for design features that can improve safety.

f. Significant displacement or annoyance of other non-motorized users.

Appendix F - Monitoring and Enforcement

If a trail is determined to be suitable for bicycles, the land management agency should develop and implement a monitoring plan:

1. Identify the impacts being monitored, including impacts to water quality, soils, wildlife, flora, and other users (accidents, injuries, enjoyment of the trail).
2. Establish quantitative and qualitative measurement scales for impacts.
3. Establish impact thresholds which, if reached, trigger correction or closure of the trail to bicycles.
4. Establish a schedule for monitoring activities.
5. Establish a written reporting system.
6. Train personnel to follow the monitoring program.
7. Reliable trained persons from user groups may be used to supplement monitoring by staff.
8. Specify baseline inventories to allow for monitoring of trends.
9. Secure the resources to carry out the monitoring plan.
10. The best enforcement of regulations will come from regular patrolling combined with effective education and an active monitoring program."

Discussion of DCR's Evaluation

Through this RMP, the DCR evaluated both pedestrian and mountain biking at the DCR Middlesex Fells Reservation and, consistent with the above Sierra Club policy, found that mountain biking is an appropriate recreational trail use at the Fells, though not necessary on all trails or in all areas. DCR notes that the above policy is not DCR policy, but rather that of a third party environmental advocacy organization devoted to protecting wild places, and not all aspects of the above policy are consistent with DCR's mission and policies, or the management principle and goals of this RMP.

DCR is somewhat surprised that, given the research on environmental impacts, the Sierra Club does not have a similarly protective policy regarding evaluating, managing and monitoring pedestrian and camping uses, especially given the research on impacts in wild places.

DCR is also surprised that the above policy is based on a background statement that says "concerns have been raised." Given the state of research on environmental impacts, it is incumbent upon on organizations like the Sierra Club to base policies on best available scientific information. If the available research is lacking, then it is incumbent upon that organization to collect, compile, complete or fund additional research.

That being said, DCR's evaluation of mountain biking at the Fells is consistent with this policy as detailed below.

I.a)i. Through this RMP, DCR has completed an analysis, review and recommends implementation of mountain biking on specific trail and in specific areas at the Fells.

I.a)ii. DCR guidelines call for officially posting open and closed trails and areas on maps, at trailheads, and at specific trail intersections.

I.b)i. DCR evaluated specific objective criteria in Section 2.4, 2.5, 4.2 and 4.4 of the RMP to determine that environmental quality can be effectively maintained, and that the safety and enjoyment of all users can be protected (see additional discussion below).

I.b)ii. This RMP, including public meetings, workshops and extensive public comment periods, has provided significant opportunities for public review and comment by all parties.

I.b)iii. The RMP recommends the promulgation of rules, regulations and etiquette to ensure appropriate mountain biking and pedestrian uses, and identifies a multi-faceted management, enforcement and compliance strategy in Sections 4.6 and Section 5 of this RMP.

I.c) The RMP identifies and recommends the implementation of a monitoring protocol to ensure that the impacts and compliance of all users are monitored and corrective action can be taken if necessary.

Appendix C – Criteria:

In the RMP's review of mountain biking and pedestrian impacts to specific resources at the Fells we evaluated the impacts to the specific soils, vegetation, natural communities, rare species, wildlife, water quality, archaeological and historic resources, trail resources, public safety, other users' recreational experiences, and recreational conflict.

a) The RMP determines that recreational uses at the Fells, including mountain biking and hiking, contribute to measureable erosion on some trail segments and impacts to some wetland resources areas. The RMP recommends repairing areas of trail damage, closing specific trails impacting wetland resource areas, and re-routing some fall-line and poor condition trails. While both mountain biking and pedestrian uses may contribute to these impacts, they cannot be attributed to one use over another. The RMP documents that overall, the condition of trails, soils and streams at the Fells is in good condition. The RMP does not find that any recreational uses at the Fells are leading to "significant erosion" or "significant damage to streams or fish habitat."

b) Through the RMP, DCR's road and trail inventory documented all occurrences of trail damage (see Section 2.6), including rutting, exposed roots, washouts and mud holes. This inventory documents that the condition of the trails at the Fells are in comparatively good condition. The RMP recommends repairing, closing or re-routing sections of trail that are especially damaged or difficult to maintain. The specific locations of trail damage are attributable to all approved recreational uses at the Fells. The RMP finds that all trail damage areas are "correctable using U.S. Forest Service trail maintenance standards and techniques" and practices detailed in DCR's Trail Guidelines and Best Practices Manual.

c) The RMP documents that plant and animal habitats at the Fells are diverse, extensive, numerous and generally in good condition. The RMP determines that all recreational uses have the potential to disturb wildlife, and that off-trail uses trample plants and disturb wildlife significantly more that on-trail uses. Sections 4.2 and 4.4 describe the extent, impacts and characteristics of off-trail use at the Fells. Off-trail uses are primarily pedestrian. The RMP recommends that off-trail uses continue to be prohibited and recommends enhanced education and enforcement around this issue. The RMP finds that current uses at the Fells are not resulting in significant disturbance of plants or animals or their habitat.

d) The RMP documents the extent and condition of cultural resources at the Fells (Section 2.5). The RMP finds no evidence of impacts to these resources from existing recreational uses. The RMP also evaluates the potential impacts to rare species and priority natural communities at the Fells. It determines that some species and communities are susceptible to trampling from any off-trail uses. The RMP recommends that off-trail uses continue to be prohibited and recommends enhanced education and enforcement around this issue. The RMP recommends closing or re-routing some trails in proximity to certain rare resources, and recommends adding trail definition to existing trails in other areas. The RMP does recommend that the Skyline Trail remain pedestrian only to best protect certain species. The RMP does not find that mountain biking is damaging any rare resources at the Fells.

e) The RMP evaluated the issues of safety, conflict and impacts to other users' recreational experiences at the Fells (Section 4.4). The RMP does not find that mountain biking at the Fells poses a significant public safety risk. The RMP does recommend that the Skyline Trail should remain pedestrian only because of its steep terrain, poor sight lines and fall line alignment. The RMP does find that some level of conflict exists between mountain bikers and other users. The RMP also finds that mountain biking can negatively impacts some pedestrians' recreational experiences, and that many pedestrians do not want to encounter a mountain bike, and do not want to be startled by the approach of a mountain bike. As a result, the RMP recommends that at the Fells a certain level of separation between users is appropriate. The RMP recommends establishing two pedestrian-only areas where one will hopefully not have to encounter a mountain bike, and recommends maintaining several pedestrian-only trails. Consistent with the Sierra Club Policy Section E, the RMP also recommends separating overlapping segments of heavily used mountain biking and pedestrian-only trails, and allowing mountain biking on some additional segments of existing trail to provide a "satisfying and safe bicycling experience that will minimize the desire of bicycle riders to enter closed areas" (Sierra Club 1994).

f) The RMP does find that mountain biking at the Fells, especially mountain biking on hiking only trails, does lead to the annoyance of some other users. The RMP recommends enhancing enforcement of no mountain biking on hiking-only trails. The RMP does not find that mountain biking has lead to "significant displacement of other users." However, it is important to note here that DCR must provide recreational opportunities to a variety of users, and while annoyance, displacement of and conflict between users is a concern, there is not moral hierarchy of recreational use. Here the above policy may be inconsistent with DCR's mission to "protect, promote and enhance our commonwealth of natural, cultural and recreational resources."

Appendix F – Monitoring and Enforcement

The RMP recommends the establishment of a multi-faceted management and compliance strategy to enhance compliance and reduce impacts by all users. The RMP identifies that, for most recommendations surrounding enforcement and compliance, the resources to implement these are currently available. The RMP also establishes monitoring protocol consistent with Sierra Club's Policy Appendix F. DCR does not make the specifics of this protocol available to the public for obvious reasons, however, we have:

1) Identified criteria to monitor including trail damage, resource damage, public safety and compliance with rules and regulations.

2) Established both qualitative and quantitative measures.

3-5) Our protocol establishes thresholds, monitoring locations, schedule and electronic record keeping and reporting. For example, the RMP identifies an appropriate level of rules compliance of 75%.

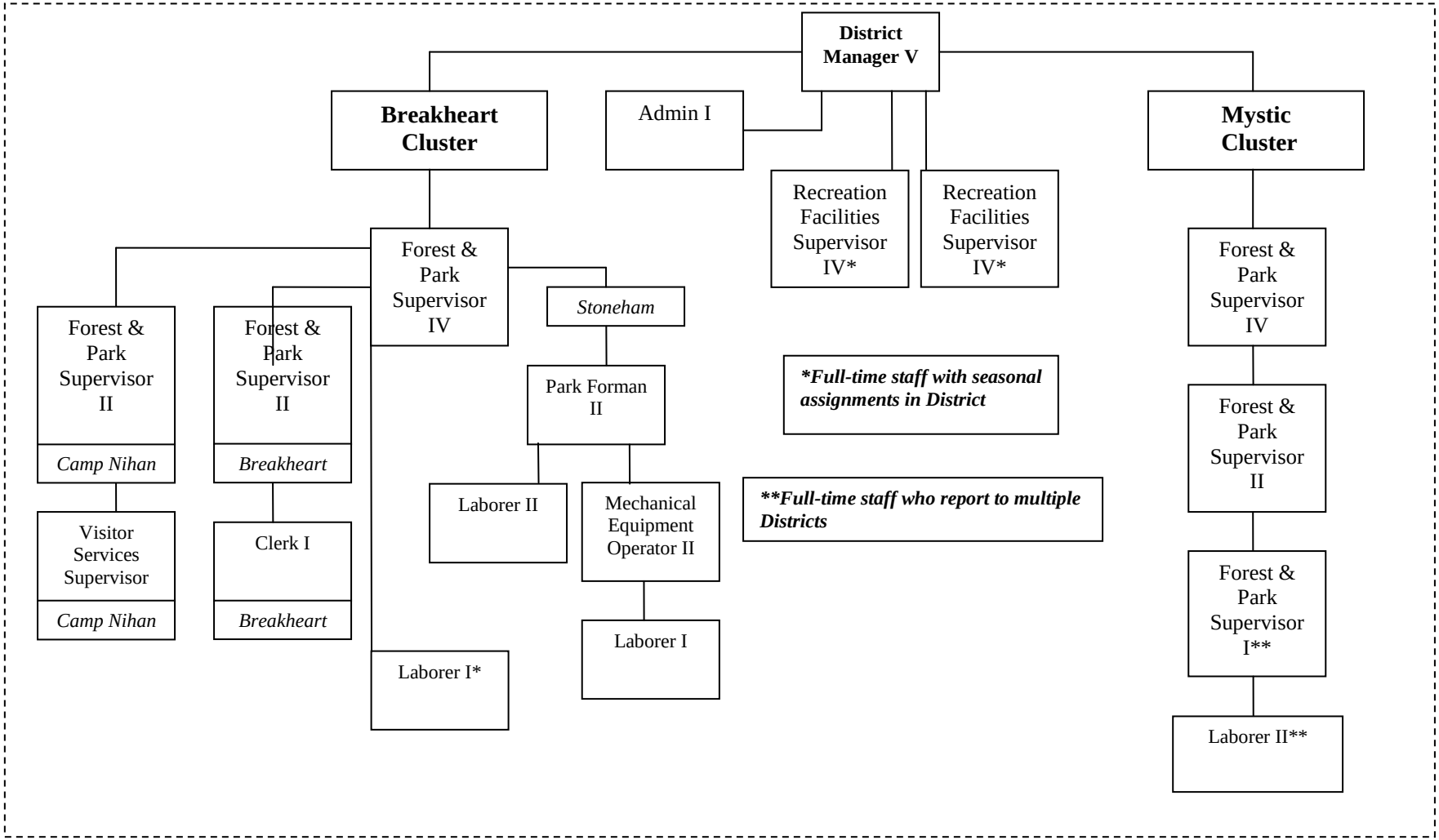
6-7) Following the approval of the RMP, we will institute staff training on the monitoring protocol for ranger services, operations and planning staff.

8) The RMP, Section 2, trail inventory, incident reporting and the initial compliance monitoring data, establish baselines to monitor and evaluate trends. For example, the trail inventory establishes a baseline of acceptable number and area of trail damage per trail mile on single track trails.

9) The RMP identifies that the resources our currently available in implement this protocol.

10) The RMP recommends a multi-faceted management and compliance strategy to enhance compliance and reduce impacts by all users including ranger presence, patrols and education.

Appendix O. Organizational Chart for the Fells District, May 2011.



Appendix P. 2011 Work Plan for the Fells District, Breakheart Cluster.

Site	Type[a]	Community	Mow/Trim[b,c]	Weed, Grassy[d]	Weed, Paved[e]	Trash Barrel[f]	Litter Removal[g]	Graffitti Removal[h]	Ball Field[i]	Playground[j]	Bathroom[k]	Sweep[l]	Catch Basins[m]
Boundary Rd	Pkwy	Medford	E21	E21	E21		E14					E60	A
Breakheart Reservation	Rec	Saugus, Wakefield	E7	E7	E14	E1	E1	E30			E1[n]	E60	
East Border Rd	Pkwy	Medford	E18	E18	E18		E14					E60	A
Elm St	Pkwy	Medford	E18	E18	E18		E14					E60	A
Fellsway East	Pkwy	Medford, Melrose	E18	E18	E18		E14					E60	A
Fellsway West	Pkwy	Malden, Medford, Stoneham	E18	E18	E18							E30	
Greenwood Park	Rec	Stoneham	E14	E14	E14	E3	E3	E30		E7			
Hall Memorial Pool	Rec	Stoneham	E14	E14	E14	E1[n]	E14[n]			E7	E1[n]		
Highland Ave	Pkwy	Malden, Medford	E18	E18	E18		E14					E60	A
Hillcrest Pkwy	Pkwy	Winchester	E18	E18	E18		E14					E60	A
Holland Memorial Pool	Rec	Malden	E14	E14	E14	E1[n]	E14[n]				E1[n]		
Lynn Fells Pkwy	Pkwy	Melrose, Saugus	E18	E18	E18		E7					E30	A
Lloyd Memorial Pool	Rec	Melrose	E14	E14	E14	E1[n]	E14[n]				E1[n]		
Medford St	Pkwy	Medford	E18	E18	E18							E60	A
Middlesex Ave	Pkwy	Medford	E18	E18	E18							E30	A
Middlesex Fells Reservation	Rec		E14	E14	E14	E3	E14					E60	A
New South St	Pkwy	Stoneham	E18	E18	E18		E14					E60	A
North Border Rd	Pkwy	Medford	E18	E18	E18		E14					E60	A
Park St	Pkwy	Stoneham	E18	E18	E18		E14					E60	A
Ravine Rd	Pkwy	Stoneham	E18	E18	E18		E14					E30	A
Reservoir St	Pkwy	Stoneham	E18	E18	E18		E14					E60	A
South Border Rd	Pkwy	Winchester	E18	E18	E18		E14					E60	A
South St	Pkwy	Stoneham	E18	E18	E18		E14					E30	A
West Border Rd	Pkwy	Malden	E18	E18	E18		E14					E60	A
West Wyoming Ave	Pkwy	Melrose	E18	E18	E18		E14					E60	A
Woodland Rd	Pkwy	Medford, Stoneham	E18	E18	E18		E14					E30	A
Wyoming Ave	Pkwy	Melrose	E18	E18	E18		E14					E30	A

a. Types of sites are either recreation facilities (Rec) or parkways (Pkwy).
b. Work associated with mowing and edge trimming a site.
c. The frequency with which maintenance activities are performed are reported as E# = every # of calendar days, A = annually, or AN = as needed.
d. Weeding around trees, fences, and park furniture, but not pavement or pathways.
e. Weeding pathways, curbs, sidewalks, and other infrastructure.
f. Emptying trash barrel and replacing bag.
g. General litter removal, by hand.
h. Raking or sifting of sand to locate debris, which is them removed from site.
i. Field striping and general maintenance.
j. Weekly informal inspection of playgrounds; formal inspections are conducted annually.
k. Restrooms are cleaned throughout the day, every day that they are open.
l. Mechanized sweeping of streets and parking areas.
m. Cleaning of catch basins.
n. During the summer swimming season only.

Appendix Q. Historic Resources of the DCR Middlesex Fells Reservation.[a]

Resource	Type[b]	NR[c]	MHC #	Condition[d]	Integrity[e]	Date
Bear Hill / Dark Hollow						
Bear Hill Tower	Structure			C	M	1910
Bear Hill Reservoir Gatehouse	Structure	Y	STN.904	B	M	1902
Dark Hollow Railway Trestle	Structure			C	H	c. 1910
Sheepfold Area						
Railway Bridge #1	Structure			C	H	c. 1910
Railroad bed	Structure			C	M	1907-1910
Box culvert 1	Structure			C	H	c. 1910
Restroom facility	Building			C	H	
Water fountain	Object			D	M	c. 1917
Soap box derby track	Structure			B	H	1950s/60s
Sheepfold	Landscape			B	M	
Railway Bridge #2	Structure			C	M	c. 1910
Bellevue Pond / Pine Hill / Silver Mine Hill						
Silver Mine	Archaeological Site			C	H	1881-83
Medford Quarry	Archaeological Site			D	M	Early 1800s-1870s
Wright's Tower	Structure			A	H	1937-38
Bellevue Pond	Landscape			C	H	1937-39
Bellevue Pond overlook	Structure			C	H	1937-39
Bellevue Pond dam	Structure			C	H	1937-39
Bellevue Pond bridge	Structure			C	H	Early 1800s-1870s
Bellevue Pond culvert #1	Structure			C	H	1937-39
Bellevue Pond culvert #2	Structure			C	H	1937-39
Bellevue Pond culvert #3	Structure			C	H	1937-39
Bellevue Pond culvert #4	Structure			C	H	1937-39
Springhouse	Structure			D	H	1937-39
Circular foundation	Archaeological Site			C	L	1940s/50s
Battery	Archaeological Site			C	L	1940s/50s
Manhole 1	Archaeological Site			D	L	1940s/50s
Manhole 2	Archaeological Site			D	L	1940s/50s
3 foundations	Archaeological Site			C	L	1940s/50s
4 foundations	Archaeological Site			C	L	1940s/50s
Cellar hole	Archaeological Site			C	L	1940s/50s
Loop road	Structure			C	L	1940s/50s
Lawrence Woods						
90 mm site	Landscape			C	L	1940s/50s
Foundation 1	Archaeological Site			C	L	1940s/50s
Foundation 2	Archaeological Site			C	L	1940s/50s
Foundation 3	Structure			C	L	1940s/50s
Foundation 4	Structure			C	L	1940s/50s
Stone Wall	Structure			C	M	
Rams Head Tower site	Archaeological Site			D	M	c. 1899
Long Pond (and south) Area						
South Border Road Wall	Structure	Y	WNT.924	F	M	c. 1920
Light post	Object			C	M	
Tennis court site	Archaeological Site			D	M	
Girl Scout cabin site	Archaeological Site			D	L	
Granite block culvert	Structure			C	M	

Continued on next page.

Appendix Q. Historic Resources of the DCR Middlesex Fells Reservation.[a]

Resource	Type[b]	NR[c]	MHC #	Condition[d]	Integrity[e]	Date
Spot Pond						
Tudor Barn	Building	Y	STN.8	A	M	c. 1855
Botume House	Building	Y	STN.4	B	H	c. 1858
Botume House garage	Building			B	H	Early 1900s
Botume House wall	Structure			C	H	c. 1858
Spot Pond	Landscape	Y		B	H	
Spot Pond East Gatehouse	Building	Y	STN.900	B	H	1898-1900
Spot Pond South Gatehouse	Structure	Y	STN.902	A	H	1898-1900
Spot Pond (Gillis) Pumping Station	Building	Y	STN.5	A	H	1898-1900
Eastern Fells						
MIT Observatory	Structure			C	H	1899
M marker	Object			B	H	
Middlesex Fells Reservoir	Structure	Y	STN.903	B	H	1900
Middlesex Fells Reservoir Gatehouse	Building	Y	STN.903	A	H	1900
Cairn	Object			C	L	
Virgina Wood						
Virginia Wood plaque	Object			C	H	1894
Copeland House	Building		STN.6	B	H	c. 1870
Copeland House shed	Building			F	H	
Mill raceway	Archaeological Site	Y		D	H	18th century
Dam	Structure	Y		C	H	
Girl Scout Camp chimney	Archaeological Site	Y		C	M	c. 1938
Bucknam Mill Pond Dam	Structure	Y		C	H	1790, 1930s
Buckman Mill Pond	Archaeological Site	Y		B	M	1790
Bucknam raceway	Structure	Y		F	M	1790
Middle Mill Dam	Structure	Y		B	H	1792, 1930s
Middle Mill Pond	Structure	Y		C	H	1792
Barrett Dam	Structure	Y		C	M	By 1814
Culvert	Structure			B	H	20th century
Raceway	Structure	Y		C	H	By 1850?
Cellar hole	Archaeological Site	Y		F	H	
Virginia Wood	Landscape	Y		B	H	
Greenwood Park / Crystal Spring						
State Police K-9 unit cottage	Building			B	M	
Gould Farmhouse	Building			C	L	Early 1800s
Stone Zoo	Landscape			C	M	
Crystal Spring	Structure			C	H	
Greenwood Park cellar hole	Archaeological Site			D	M	
Greenwood Park wall	Structure			C	M	
Parkways and associated features						
South Border Road	Parkway	Y	MDF.924 WNT.922			1900-1901
Hillcrest Parkway	Parkway	Y	WNT.923			1896-1918
South Street	Parkway	Y	STN.907			1903-1906
Pond Street	Parkway	Y	STN.908			early 20th century
Fellsway East	Parkway	Y	MAL.929 MEL.909 STN.909			1930-1931
East Border Road	Parkway	Y	MAL.930 MDF.926			1896-1937
Woodland Road	Parkway	Y	MDF.927 STN.910			early 20th century

Continued on next page.

Appendix Q. Historic Resources of the DCR Middlesex Fells Reservation.[a]

Resource	Type[b]	NR[c]	MHC #	Condition[d]	Integrity[e]	Date
Pond Street Median	Parkway feature		STN.912			early 20th century
Fellsway East/Pond Street Miter	Parkway feature		STN.915			early 20th century
Fellsway East/Ravine Road Miter	Parkway feature		STN.913			early 20th century
Woodland Road Median, Rotary, and Miter System	Parkway feature		MDF.930 STN.914			early 20th century

a. Resources identified through field cultural resources inventory, April 2011.

b. Resource types include the following Archaeological Sites, Buildings, Landscapes, Objects and Structures.

c. NR = the National Register of Historic Places. Entries in this column indicate whether the resource is included in the National Register; Y = Yes, N = No, and E = Eligible (i.e., received a positive Determination of Eligibility).

d. Condition Assessment using Park Heritage Landscape Inventory definitions: A = Excellent: Resource is in pristine condition, regular maintenance and upkeep being performed. No evidence of major disturbance and deterioration by natural and/or human forces. No immediate corrective action is required to maintain the current condition. B = Satisfactory: Resource is physically stable and needs only minor repairs and regular maintenance. Clear evidence of minor disturbances and deterioration by natural and/or human forces. If left to continue without appropriate maintenance, the resource will deteriorate to Unsatisfactory condition. C = Unsatisfactory: Resource is heavily deteriorated with clear evidence of major disturbance and rapid deterioration by natural and/or human forces. Physically unstable constructed or vegetative features are noted. Immediate corrective action is required to prevent loss of significant historic features. If left to continue without appropriate corrective action, the resource will deteriorate to Non-Functioning condition. D = Nonfunctioning: Resource has undergone significant deterioration that prevents it from functioning as originally intended, and may contain an immediate health or safety risk. Immediate corrective action is required to prevent total loss of the resource. If left to continue without appropriate corrective action, the resource will deteriorate to Critical Failure condition. F = Critical Failure: Resource is deteriorated beyond repair, collapsed or in ruins. May contain an immediate health or safety risk. (Note: historic features previously identified as a "ruin" and are managed as such, may have condition A-F depending on physical stability.) A dash (-) indicates a lack of information on condition.

e. Integrity of the resources in terms of location, design, setting, materials, workmanship, feeling and association are identified as H = High, M = Medium and L = Low in accordance with Federal guidelines (NPS n.d. a).

Appendix R. Non-Historic Buildings and Associated Structures of the DCR Middlesex Fells Reservation.

Name	Ownership	Building Condition	Type
Spot Pond boat house	DCR	A	Building
Spot Pond boat ramp	DCR	C	Boat Ramp
Bear Hill – water tank	MWRA	A	Water Storage
Flynn ice skating rink	DCR	A	Building
Flynn rink – parcourse	DCR	A	Play Structures
Fells covered water storatge tank	MWRA	A	Water Storage
Greenwood Park – playground	DCR	A	Play Structures
Greenwood Park – pavillion	DCR	A	Structure
Greenwood Park – playing field	DCR	A	Athletic Field
Hall Memorial Pool	DCR	B	Pool / Building
Hall Memorial Pool – wading pool	DCR	B	Pool
Hall Memorial Pool – bath house	DCR	B	Building
Jerry Jingle – gazebo	DCR	A	Structure
Cell tower and building	Non-DCR	A	Building
Labor Yard – operations building	DCR	B	Building
Labor Yard – engineering office	DCR	B	Building
Labor Yard – engineering storage shed	DCR	B	Building
Labor Yard – supply building	DCR	C	Building
Labor Yard – vehicle maintenance building	DCR	C	Building
Labor Yard – equipment storage building	DCR	C	Building
Labor Yard – salt shed	DCR	B	Building
Labor Yard – fueling station	DCR		Structure
Labor Yard – CNG fueling station	DCR		Structure
Labor Yard – transfer station	DCR		Structure

Appendix S. Significant Reservation Events.

Year(s)	Event
12,000-9,000BP	Paleoindian Period.
9,000-2,700BP	Archaic Period.
2,700-450BP	Woodland Period.
450-250BP	Contact Period.
1850	Boutume House built.
1892	First piece of the Fells was protected with the donation of Virginia Wood to the newly formed Trustees of Reservations.
1893	The Metropolitan Park Commission (MPC) is established to "acquire, maintain, and make available to inhabitants of said district open spaces for exercise and recreation."
1893–1900	MPC acquires 1,881 acre of the DCR Middlesex Fells Reservation.
1899	Fells Reservoir constructed.
1907	Middlesex Fells Zoo officially established.
1910	Electric trolley service began from Somerville to Stoneham through the Fells and stopping at the Sheepfold.
1919	The Metropolitan District Commission is created by the combining of the MPC with the Metropolitan Water and Sewer Commission.
1925	Lawrence Woods was added to the reservation.
1933-1937	Civilian Conservation Corps (CCC) and Works Progress Administration (WPA) are active on the reservation, constructing recreational facilities, improving infrastructure, and conducting forestry activities.
1937	Wright's Tower constructed on Pine Hill by the WPA.
1951	90 mm anti-aircraft site established in Lawrence Woods.
1979	Cover water storage tank constructed near Fells Reservoir.
1984	MDC Water System and Botume House added to the National Register of Historic Places.
1991	Custody, care and control of the Stone Zoo transferred to the Commonwealth Zoological Corporation.
1992	Spot Pond Archaeological District added to the National Register of Historic Places.
2004	Department of Conservation and Recreation is created through the merger of the Metropolitan District Commission and the Department of Environmental Management.

Appendix T. MWRA – DCR Memoranda of Understanding.

Agreement between the Metropolotan District Commission and the Massachsetts Water Resources Authority. March 1999. Regarding Spot Pond Reservoir and its Surrounding Land Held by or on behalf of the Commonwealth.

Agreement Between the
Metropolitan District Commission and the
Massachusetts Water Resources Authority

March, 1999

This instrument contains terms and conditions that MDC and MWRA agree shall be suitably incorporated into the Memorandum of Understanding dated April 6, 1986, as revised:

REGARDING SPOT POND RESERVOIR AND ITS SURROUNDING LAND HELD BY OR ON BEHALF OF THE COMMONWEALTH

1. Effective as of July 1, 1999, the MDC undertakes responsibility for operation, maintenance, and management of Spot Pond Reservoir and, with the exception of the facilities described in the sentence next below, those MDC-owned or Commonwealth-owned properties adjacent to Spot Pond Reservation (the "Middlesex Fells Reservation - Spot Pond Area"), as shown on a plan attached hereto entitled "Spot Pond Reservoir Plan" dated March, 1999 (the "Plan") for public recreational purposes; provided, however, that all pipelines, connections, facilities and appurtenances constituting part of the Waterworks System within the Middlesex Fells Reservation - Spot Pond Area remain within the jurisdiction of the MWRA and the MWRA reserves all rights to use, improve, operate, maintain and manage such pipelines, connections, facilities and appurtenances, and further provided that the MWRA retains the rights to and responsibility for the use, operation, maintenance and management of Spot Pond Reservoir as an emergency back-up water supply, as more fully described in Paragraph 2, below. Excepted from the management responsibilities undertaken by the MDC under this paragraph are the following facilities which shall continue to be used, operated, managed and maintained by the MWRA for water supply purposes: the James Gillis Pump Station; the Spot Pond South Gate House; the Spot Pond East Gate House; and those lands immediately appurtenant to these facilities enclosed within fencing installed by MWRA (the "Spot Pond Waterworks Land"), as shown on the Plan. The properties for which the MDC assumes management responsibility under this paragraph shall be assigned and managed by the MDC Division of Reservations and Historic Sites.

2. Spot Pond Reservoir is and shall remain an emergency back-up water supply source for the MWRA waterworks system. Therefore:

(a) The parties acknowledge and endorse professionally-accepted water management principles applicable to this situation as included in policies of the New England Water Works Association in a resolution dated December 21, 1995 on Recreational Use of Public Water Supplies, to wit:

- Recreational activities on a water supply reservoir or within the watershed . . . should be reviewed for consistency with watershed protection plans and politics to ensure that such activities do not conflict with measures required to protect a water supply or water supply watershed;
- A proponent of recreational use of a public water supply should be required to provide technical evidence that such activity will not adversely affect the water quality;
- Ratepayers should not bear the burden of financing recreational use; other sources of financing must be determined.

(b) MWRA shall conduct a regular program for sampling water quality in the Spot Pond Reservoir and shall share the sampling results with MDC. The parties shall cooperate in any steps necessary and appropriate to assure the adequacy of Spot Pond Reservoir water for its intended emergency back-up water supply purposes.

(c) MWRA shall have the right to make reasonable entry upon and use of the Middlesex Fells Reservation - Spot Pond Area for purposes of exercising its water supply responsibilities and shall endeavor to provide adequate notice to MDC of such activities in order to accommodate the MDC's responsibilities and activities. Without limiting the generality of the previous sentence, MWRA shall be responsible for pipeline operations, maintenance, and renewal and the proper maintenance and clearance of pipeline rights of way. MWRA shall notify MDC in advance of any planned construction or activities that will result in alteration of views, drainage or use of the Middlesex Fells Reservation - Spot Pond Area so as to permit MDC review and comment and provide full opportunity for the parties to agree on the carrying out of such activities.

(d) MWRA, in consultation with MDC, shall develop a Reservoir Operation Plan for Spot Pond to establish seasonal water elevations and operational criteria to maintain water elevations and water quality conditions as an emergency back-up water supply in accordance with best professional water supply practices. The plan shall establish seasonal low water elevations and the upper bound elevations for flood control purposes for Spot Pond and shall establish operating parameters including water quality criteria, seasonal volume and elevation operating ranges, trigger levels for removal of excess water, recommended practices for maintenance and inspection of all hydraulic structures essential to the operational control and regulation of reservoir volumes and water quality, operational guidelines governing withdrawals from the Town of Winchester for its water system, and operations and communication protocols for activating Spot Pond as an emergency back-up water supply source for the MWRA waterworks system. The parties agree to include or negotiate in the Reservoir Operation Plan suitable recommendations resulting from the "Emergency Distribution Reservoir Water Management Study" now being performed on behalf of MWRA by Camp Dresser and McKee, Inc. The primary responsibility for operating reservoir controls to add water to or remove water from the Reservoir shall lie with MWRA and shall be exercised with reasonable notice to and collaboration with MDC.

3. MDC is expected to develop, implement and manage a public access plan and program for the Middlesex Fells Reservation - Spot Pond Area. MWRA will have the opportunity to review and comment thereon. The plan and program will incorporate protective measures to reasonably preserve and protect water quality in Spot Pond Reservoir for emergency back-up use water supply purposes. These measures are expected to include (but are not necessarily limited to):

(a) provisions for wildlife (bird, rodent, etc.) controls to avoid increases in wildlife populations;

(b) provisions for controls of pets and domestic animals to minimize pathogenic threats to water quality. A leash requirement and "pick-up-after-your-dog" program will be instituted and enforced. Horseback riding shall be prohibited;

(c) trash and debris control to prevent direct or indirect (e.g., through attraction of wildlife) contamination of the Spot Pond Reservoir;

(d) water-based activities (including fishing, boating and other secondary contact recreation activities) shall be permitted only after reasonable demonstration of their consistency with the stated water quality objectives of the Reservoir. Swimming and bathing will not be permitted. Recreational use of engine-powered boats on the Reservoir is not expected and any other use of engine-powered boats (for example, for maintenance) must be approved by MWRA. MDC shall consider establishment of a concession program for operation of non-engine powered boats on the Reservoir as part of a program to control, limit or preclude the use of private boats on the Reservoir that may cause water contamination or the introduction of invasive species.

(e) development of a signage program delineating permitted and prohibited activities in the Middlesex

Fells Reservation - Spot Pond Area as relating to water quality protection.

(f) no impervious surfaces shall be placed on pipeline rights of way, or on any other section of the Middlesex Fells Reservation - Spot Ponds Lands which would lead to a material contribution of uncontrolled run-off into the Spot Pond Reservoir.

4. MDC's responsibilities regarding the use and maintenance of the Middlesex Fells Reservation - Spot Pond Area and the protection of water quality in the Spot Pond Reservoir from any consequences of such use and maintenance as a back-up emergency water supply shall also include:

(a) installation of fencing as require for public protection or controls on public access, except as MWRA is required to fence the Spot Pond Waterworks Land as described in paragraph 1.

(b) proper maintenance of the area consistent with good watershed management practices with particular attention to the appropriate maintenance of vegetation and limitations on the use, of pesticides, insecticides and fuels in watershed areas; also routine and continuous maintenance of the dam, spillway and drainage structures and facilities associated with Spot Pond Reservoir and its use, provided, however, that with regard to the integrity of the dam structure or spillway as required to maintain the Reservoir for its emergency back-up water supply functions, the parties will consult concerning conditions and maintenance requirements, including the engineering design or protection of the water, and MWRA shall bear the cost of any agreed-upon maintenance or improvements.

(c) provision of policing and patrolling of the area, including the use of MDC Rangers for enforcement of, as well as user education about, policies and restrictions to achieve water quality protection.

(d) MDC shall notify MWRA in advance of any planned construction or alteration to the Middlesex Fells Reservation - Spot Pond Area so as to permit MWRA review and comment and full opportunity for the parties to agree that such activities will not adversely affect the uses of the Spot Pond Waterworks Lands or the water quality objectives for the Spot Pond Reservoir. So-called 8(m) permits shall be obtained from MWRA where applicable.

5. MDC acknowledges that future necessary improvement for the MWRA waterworks system may require the location of a covered storage distribution facility, a water tunnel access shaft and appurtenances and an associated construction staging site in the vicinity of the Spot Pond Waterworks Land in conjunction with construction of the so-called Northern Tunnel Loop or another project to achieve similar objectives. In that eventuality, MDC agrees to cooperate with MWRA is all respects necessary to identify and use a suitable site or sites for such purposes including the use, if necessary, of appropriate portions of the Middlesex Fells Reservation - Spot Pond Lands and to make such modifications of property arrangements in the area and of the public access plan and program as the circumstances may warrant to serve public interest in the operation and development of the MWRA waterworks system.

6. This agreement assigns to MDC responsibility for the care and control of the Tudor Barn as a part of the Middlesex Fells Reservation - Spot Pond Area and all responsibilities of MWRA under a certain Memorandum of Agreement among MWRA, MDC and the Massachusetts Historical Commission shall be undertaken and discharged by MDC. MWRA shall provide funds to MDC in an amount not to exceed $88,000 to provide for payment of costs of a program of structural repair and stabilization of the Tudor Barn.

7. The parties agree to consult and cooperate in the pursuit of their separate and mutual objectives for the future use of the Spot Pond area. In the event that, despite such efforts and after adequate notice, either party must

act to perform duties properly falling to the other under the terms of this agreement, the party taking action to cure the inaction of the other shall be and hereby is indemnified by the other in such undertaking and shall be entitled to recover from the other its reasonable costs and expenses in performing such actions.

The parties agree that costs of the public access plan and program, including costs of that program which are reasonably related to protection of water quality in the Spot Pond Reservoir for emergency back-up water supply use, shall be borne by the MDC and its Operation Division and not by MWRA ratepayers. Costs of water supply protection activities that are independent of the public access plan and program including water quality sampling, shall be borne by the MWRA.

This agreement is intended to bind the successors of the parties.

This agreement has been approved by the Board of Directors of MWRA on March , 1999 and the Commissioners of MDC on March , 1999 and has been executed under appropriate authority by the undersigned.

Commissioner
Metropolitan District Commissioner

February 25, 1999
Date

Executive Director
Massachusetts Water Resources Authority

Date

Memorandum of Agreement between the Massachusetts Water Resoruces Authority and the Commonwealth of Massachusetts Metropolitan District Commission Concerning Mitigation for the Fells Reservoir Covered Storage Project. February 23, 1995.
First and final pages included. Full text available on request.

MEMORANDUM OF AGREEMENT BETWEEN THE MASSACHUSETTS WATER RESOURCES AUTHORITY AND THE COMMONWEALTH OF MASSACHUSETTS METROPOLITAN DISTRICT COMMISSION CONCERNING MITIGATION FOR THE FELLS RESERVOIR COVERED STORAGE PROJECT.

Parties:

The parties to this agreement are the Massachusetts Water Resources Authority, (the "MWRA") a body politic and corporate and an independent public authority of the Commonwealth, having a principal place of business at the Charlestown Navy Yard, 100 First Avenue, Charlestown, Massachusetts 02129 and the Metropolitan District Commission, (the "MDC"), an agency of the Commonwealth and a department within the Executive Office of Environmental Affairs having a principal place of business at 20 Somerset Street, Boston, Massachusetts 02128.

Recitals:

WHEREAS, for the purposes of safeguarding water quality and coming into compliance with the federal Surface Water Treatment Rule of the Safe Drinking Water Act and Massachusetts' regulations which prohibit open distribution storage reservoirs, the MWRA plans to construct and operate a 20 million gallon covered storage facility in Basin No. 3 of the Fells Reservoir; and

WHEREAS, the MDC, after reviewing various alternative locations for a covered storage facility both inside and outside the Fells Reservation, concurs with the MWRA's selection of Basin No. 3 as the preferred alternative for constructing covered storage; and

WHEREAS, pursuant to the terms of a Consent Order issued by the Massachusetts Department of Environmental Protection jointly to the MWRA and the MDC, the MWRA is required to complete construction of covered storage at the Fells Reservoir by December 31, 1998; and

WHEREAS, Basin No. 3 of the Fells Reservoir is part of the waterworks system under the care and control of the MWRA and is located within the Middlesex Fells Reservation (the "Fells Reservation"), a public parkland in the towns of Stoneham, Medford, Melrose and Winchester, Massachusetts and the City of Malden, Massachusetts, owned by the Commonwealth and under the care and control of the MDC; and

IN WITNESS WHEREOF the Parties hereto have caused this agreement to be executed as of the 2nd day of February, 1995 by their duly authorized representatives.

MASSACHUSETTS WATER RESOURCES AUTHORITY

By: _____
Douglas B. MacDonald
Executive Director

METROPOLITAN DISTRICT COMMISSION

By: _____
Ilyas Bhatti
Commissioner

MASSACHUSETTS WATER RESOURCES AUTHORITY
Chelsea Facility
2 Griffin Way
Chelsea, Massachusetts 02150

Telephone: (617) 242-6000
Facsimile: (617) 305-5990

Frederick A. Laskey
Executive Director

November 18, 2010

Mr. Paul Jahnige
Middlesex Fells Trail Plan
136 Damon Road
Northampton, MA 01060

Re: Middlesex Fells Reservation Trail System Plan

Dear Mr. Jahnige:

The Massachusetts Water Resources Authority (MWRA) would like to offer its comments on the Department of Conservation and Recreation's (DCR) Middlesex Fells Reservation Trail System Plan. The MWRA understands that this is DCR's first attempt at developing a Trail System Plan and that the Plan will not be finalized until the Resource Management Plan is completed.

The MWRA's comments focus on four areas:

- MWRA Facilities and Infrastructure;
- The Existing Memorandum of Agreement between the MWRA and DCR;
- Section 8 (m) Permitting;
- General Comments/Suggestions on the Plan.

MWRA Facilities/Infrastructure

The Draft Plan does reflect many of the MWRA's earlier comments emphasizing the need to protect critical water supply facilities and infrastructure that exist with the Reservation, including a covered reservoir, a pump station, valves, pipelines, tanks, gatehouses, open reservoirs and access roads. These facilities exist in an area used by thousands of people, and the MWRA must protect all water supply infrastructure in the Fells.

The 20-million gallon Fells Covered Reservoir, located in the High Fells, is a key component in the MWRA's Water Supply Program, as is the co-located open backup reservoir. This ensures sufficient water distribution storage and supply for the MWRA's Northern High Service Area.

In addition to the underground facility, the MWRA maintains pipelines that run though the reservation. The MWRA retains easements along these pipeline routes that must be protected.

Memorandum of Understanding between MWRA and DCR

MWRA will continue to retain control and manage those features critical to its operations within the Reservation. The existing Memoranda of Agreement (MOA) for Spot Pond and the Fells Reservoir between the MWRA and the DCR reference the MWRA's right, in consultation with the DCR, to revise the public access policy to further limit public access to the Fells Reservoir and Spot Pond in response to operational changes. The Fells MOA further notes that MWRA may implement additional restrictions or terminate public access if it believes that public access has a negative impact on the water supply.

It is the MWRA's position that protection of the public water supply will always take precedence over any extension of public access. To that end, the MWRA's specific concerns are as follows;

- All trail areas should be clearly marked with appropriate signage indicating what areas and activities are off limits.
- Trails should not be routed near or across dams or other critical MWRA facilities.
- Rules and regulations should be enforced.
- Policy changes should reflect public input, but never at the expense of water supply concerns.

Section 8-(m) Permitting

The MWRA will be responsible for operating and maintaining the Middlesex Fells Covered Storage Facility and all associated surface piping and easements. Pursuant to the MWRA Enabling Legislation, Section 8 (m) of Chapter 372 of the Acts of 1984 enables the MWRA to issue permits to build, construct, excavate, or cross within or near an easement or other property interest held by the MWRA, with the goal of protecting Authority-owned infrastructure. An 8 (m) permit will be required if DCR proposes any construction or structures that may impact MWRA infrastructure within the Fells Reservation.

General Comments/Suggestions on the Draft Plan

- Introductory Letter from Commissioner Sullivan, Second Paragraph
  Suggest adding to first sentence: . . .meadows, woodlands, and wetlands and *"significant water supply resources and infrastructure"*

- Section 3 Management Goals, Features, Experiences and Expectations, Page 19, Part 3.1

  Suggest adding another bullet: *Provide for public access while protecting public water supply for the MWRA and the Town of Winchester.*

- Section 4, Page 29 Part 4.2 Watershed lands

  Suggest more proactive signage/education on the no swimming rule.

- Section 6, Page 38, Part 6.3 Improve Trail System Maps and Signage

  Suggest that special signage be developed to highlight water supply areas/facilities, perhaps with an MWRA logo.

In closing, the MWRA looks forward to working in partnership with DCR in maintaining public access in the Fells and believes that both can exist side by side. We look forward to participating in the upcoming meetings and discussions on the Resource Management Plan. Please contact me at (617) 305-5917 if you have any questions or need additional information.

Sincerely,

David Gilmartin
Director, Office of Emergency Preparedness

cc: Mr. Joseph Orfant, DCR
Frederick A. Laskey, MWRA
Michael Morris, MWRA
Marianne Connolly, MWRA

Appendix U. Designations

Several of the DCR Middlesex Fells Reservation's features have received special recognition. Such recognition may take the form of a legal designation, designations designed to implement policy, or designations intended to increase public awareness. The following designations are associated with the DCR Middlesex Fells Reservation and its resources.

U.1. LEGAL DESIGNATIONS

Great Pond. Spot Pond is designated a Great Pond and are subject to the Massachusetts Public Waterfront Act (Chapter 91) and associated regulations (310 CMR 9.00).

As a Great Pond, the land below the natural low water mark is held by the Commonwealth in trust for the public. Activities involving fill, structures (including docks), or the lowering of water levels in Great Ponds are under the control of the Massachusetts Department of Environmental Protection (DEP) and require either a license or permit.

National Register of Historic Places. The DCR Middlesex Fells Reservation's parkways, reservoir system, Spot Pond Archeological District and some buildings and structures (e.g., Botume House), are listed in the National Register of Historic Places. The National Register "is the official list of the Nation's historic places worthy of preservation," and includes properties with community, state, or national significance (NPS n.d.*a*). Information on listed sites is provided in Appendix Q.

Priority Habitat. Nearly 40% of the Middlesex Fells Planning Unit has been designated Priority Habitat under MESA (321 CMR 10.00; Appendix F).

Activities that may alter this habitat (e.g., trail maintenance, vista pruning, digging archaeological test pits) are subject to regulatory review by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). With minor exception (see 321 CMR 10.14), habitat conservation plans must be prepared, submitted to, and approved by the NHESP before activities can take place within Priority Habitat.

U.2. PUBLIC AWARENESS DESIGNATIONS

BioMap2. BioMap2 identifies two complementary spatial layers, Core Habitat and Critical Natural Landscape, primarily as a tool to help strategically target critical landscapes for land protection from development.

Core Habitat identifies key areas of habitat for rare species and other species of conservation concern; Priority Natural Communities; high-quality wetland, vernal pool, aquatic, and coastal habitats; and intact forest blocks.

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

Important Bird Area. The Massachusetts Audubon Society has designated the Middlesex Fells, as an Important Bird Area (IBA; Mass Audubon n.d.). The Fells has been designated an IBA because it is an important migratory stopover and seasonal concentration site for migratory land birds (e.g., warblers). Large protected parks in otherwise highly developed landscapes can be essential for night-time migrants looking for a place to rest and feed when overtaken by daylight (Petersen 2011)

Priority Natural Communities. The NHESP (2002) "actively inventories and tracks the distribution and status of uncommon and exemplary natural communities." Seventy-two communities are considered conservation priorities in Massachusetts (NHESP 2002); five of which are known to be present in the DCR Middlesex Fells Reservation (Table 2.3.2).

Species in Greatest Need of Conservation. MassWildlife (2005) has identified 257 animal species as being in greatest need of conservation. This includes federal and state-listed species, globally rare species, and animals listed as being of

regional concern by the Northeastern Association of Fish and Wildlife Agencies. They are considered conservation priorities in Massachusetts. Many have been recorded on the DCR Middlesex Fells Reservation; they are identified in appendices M.

Watch List. This list (NHESP 2007*b*) "is an unofficial, non-regulatory list of plants of known or suspected conservation concern that the NHESP is interested in tracking." It is intended to create awareness and promote the conservation of species on this list. Watch List plants recorded at the Middlesex Fells are identified in Appendix M.

Appendix V. Middlesex Fells Parkway Vision Plan.

A poster describing the recommendations of the Middlesex Fells Parkway Vision is available at: http://www.mass.gov/dcr/pe/documents/fellsposter.pdf

Appendix W. Evaluation of Recreation with Dogs Strategies

The DCR believes that the goals of any efforts around recreation with dogs at the Fells should be to:

- Provide and enhance opportunities for dog-owners to recreate and exercise with their dogs
- Reduce situations in which dogs impact other users' experiences (including dogs approaching other users without invitation and encountering dog waste and bags of waste)
- Reduce disturbance of wildlife and impacts to water resources by dogs
- Enhance compliance with acceptable behaviors and regulations

A public desire for provision of off-leash opportunities has also been expressed as a goal for the Middlesex Fells.

In evaluating options for recreation with dogs at the Fells, the DCR considered the following:

1. **Enhancing enforcement of current leash regulations throughout the park.** This would involve increases to enforcement of DCR's leash regulations, outside of any officially designated off-leash area. It would involve multiple enforcement strategies (discussed in Section 4.6 of the RMP) including rangers, state and local police, public education, the Park Watch program, ranger sweeps, citations and user self-enforcement.

2. **Providing a designated off-leash area at the Sheepfold.** A pilot designated off-leash area has already been announced for the Sheepfold. This involves an un-fenced area of a portion of the field; designated through mowing, maps and signage; in which dogs, under voice control by their owners, could exercise and socialize off-leash. Dog-owners would be required to control their dogs when necessary, pick up after their dogs and keep their dogs on-leash outside of the designated area.

3. **Providing a single designated off-leash trail, or set of trails**. This would involve designating and clearly marking a trail or set of trails, likely a loop from the Sheepfold, as allowing off-leash dogs. This would need to be clearly indicated on maps, and signed on the trail. Dogs would be required to be under voice control of their owners, not approach other users unless invited to do so and not roam off-trail. Owners would be required to pick up after their dogs, and have their dogs on-leash outside of designated areas.

4. **Designating "courtesy hours."** This option would involve allowing dogs off-leash within the reservation at certain times desired by dog owners, but not as heavily used by other users, likely dawn to 9 a.m. This provision would need to be clearly communicated to the public on signs, maps and trailheads. During this time, dogs would be allowed off-leash on all trails in the reservation. Dogs would be required to be under voice control of their owners, not approach other users unless invited and not roam off-trail. Owners would be required to pick up after their dogs, and have their dogs on-leash at all other times.

5. **Creating a certified dog program.** This option would require third-party management and would include a fee. Under this option, dogs would have to be certified by a third-party vendor that they can be under full voice control of their owners, that they would not approach another dog or user unless invited and that they would not roam off-trail or disturb wildlife in a natural setting. Certified dogs would then receive a highly visible medallion or other marker to wear and would be allowed off-leash on all trails at all times, provided that they that did not violate these standard behaviors. This program would need to be clearly communicated to the public through signs, maps, websites, trailheads and information materials. DCR would put out a formal "request for responses" for the management of such a program.

   Options 2 through 5 above would all require either changes to DCR Regulations or special provisions to regulations enacted by the DCR Commissioner.

6. **Keeping the status quo.** Under this option, DCR would pursue no changes to regulations, rules, programs or enforcement levels around the issue of recreation with dogs.

   The matrix below evaluates some of the pros and cons of each option.

		Options					
		Enforce Current Leash Regulations	**Designated and Controlled Off-Leash Area**	**Designated "Courtesy Hours"**	**Designated Off-Leash Trail(s)**	**Certified Dog Program**	**Status Quo**
Goals	**Provide opportunity for owners to recreate and exercise with their dogs**	Allows for dogs on **all** trails, but provides **no provisions** for off-leash recreation and **less** opportunity for dog exercise	Provides a single **additional opportunity** for dogs to exercise and socialize off-leash	**Provides both** on- and off-leash recreation and exercise options	**Provides both** on- and limited off-leash recreation and exercise options	**Provides both** on- and off-leash recreation and exercise options for a subset of well-trained dogs	**Provides opportunities** throughout park
	Provide opportunity for dog to recreate and social off-leash	**Provides no opportunity**	**Provides opportunity** at a single location	**Provides opportunity throughout** park at certain times	**Provides opportunity** at a single location / set of trails	**Provides opportunity** for well-trained dogs following specific behaviors	**Provides unofficial opportunity** throughout park
	Reduce situations in which dogs impact other users' experiences (including approaching other users and dog waste)	Would **reduce** unwanted approaches and potential impacts.	**May limit potential** for unwanted approaches and impacts **to designated area** and possibly surrounding area	**Does not address** this issue during courtesy hours, but **may reduce** unwanted approaches and impacts at other times	**May limit potential** for unwanted approaches and impacts **to designated area** and possibly surrounding area	Would **reduce** unwanted approaches and impacts.	**Does not address**
	Reduce disturbance of wildlife and impacts to water resources by dogs	Would **likely reduce** wildlife disturbance, off-trail impacts and water resource impacts.	**Limits additional disturbance** and off-trail impacts to designated area and possibly surrounding area	**Does not significantly reduce** disturbance or potential for impacts	**Limits additional disturbance** and off-trail impacts to designated area and possibly surrounding area	Would **likely reduce** wildlife disturbance, off-trail impacts and water resource impacts.	**Does not address**
	Enhance compliance with acceptable behaviors and regulations	**Would achieve** this through enforcement.	**May allow** for easier enforcement and self-compliance elsewhere	**May allow** for better self-compliance, during non-courtesy hours, but **may be confusing**, difficult to understand or enforce	**May allow** for easier enforcement and self-compliance elsewhere, but **may create some confusion**	**May create** confusion among the public and may be a confusing to enforce	**Does not address**
	Management implications	**Requires more** enforcement resources, but rule is **simple**, understandable and enforceable	**Requires more** enforcement, management and monitoring, but rules are still understandable and enforceable	**Requires more** enforcement, management and monitoring. **May add some confusion**	**Requires more** enforcement, management and monitoring. **May add some confusion**	**Requires more** enforcement, management and monitoring. **May add confusion**	**Requires no additional resources**

Appendix X. Land Stewardship Zoning Guidelines, Department of Conservation and Recreation, February, 2006.

Background

In July, 2003 state legislation established the Department of Conservation and Recreation (DCR), consisting of a Division of Urban Parks and Recreation, a Division of State Parks and Recreation, and a Division of Water Supply Protection. This legislation essentially merged the former Department of Environmental Management (DEM) and the Metropolitan District Commission (MDC). In addition, it required the preparation of management plans for state parks, forests and reservations under the management of the DCR (Chapter 21, Section 2F). This legislation states that management plans shall include guidelines for operation and land stewardship, provide for the protection and stewardship of natural and cultural resources, and shall ensure consistency between recreation, resource protection, and sustainable forest management.

As part of addressing this legislative requirement, land stewardship zoning guidelines are incorporated into the development and implementation of DCR Resource Management Plans. These Land Stewardship Zoning Guidelines (Guidelines) represent a revision of the previous Land Stewardship Zoning system developed by Executive Office of Environmental Affairs (EOEA) agencies in the early 1990s, and which had been applied to the preparation of management plans for state parks, forests and reservations under the management of the former DEM.

Currently, DCR is undertaking a further revision of of these Guidelines to clarify the criteria for establishing zones and ensure that the Guidelines are consistent with the Landscape Designation guidelines. The Middlesex Fells Planning Unit RMP was developed to be consistent with anticipated revised language.

These revised Guidelines provide a general land stewardship zoning framework for the development of Resource Management Plans for all state reservations, parks, and forests. They do not apply to Division of Water Supply Protection properties which have a separate legislative mandate and established planning procedures.

Overview of Guidelines

The Guidelines define three types of zones to address the legislative requirement to provide for the protection and stewardship of natural and cultural resources and to ensure consistency between recreation, resource protection, and sustainable forest management. The Guidelines are intended to provide a general land stewardship zoning framework that is flexible and that can guide the long-term management of a given DCR property or facility. The three zones may be supplemented with significant feature overlays that identify specific designated/recognized resource features (such as Forest Reserves, Areas of Critical Environmental Concern, or areas subject to historic preservation restrictions). DCR parks, forests, and reservations are also subject to specific policy guidelines and/or performance standards (such as Executive Order No. 181 for Barrier Beaches) and applicable environmental laws and regulations of the Commonwealth.

Application of the three-zone system to a particular DCR park, forest or reservation is facilitated by the development and application of Geographic Information Systems (GIS) technology. GIS resource overlays provide a general screen whereby lands of special resource significance and sensitivity can be mapped and identified. General landscape features such as forested areas, wetlands, streams and ponds can also be mapped as part of this overlay approach. Further, additional data regarding recreational uses and developed facilities and sites can be added. This type of mapping and data collection, based on the best information currently available, provides the basis for subsequent analysis and ultimately the development and application of appropriate land stewardship zoning guidelines to a specific state park, forest or reservation.

Land Stewardship Zoning Guidelines provide a foundation for recommendations that will address resource stewardship and facility management objectives, and are intended to cover both existing

DCR property or facility conditions and desired future conditions for that property or facility. Proposals for changing applied Land Stewardship Zones in a previously approved Resource Management Plan should be submitted to the DCR Stewardship Council for review and adoption

Land Stewardship Zones

Zone 1

General Description

This zone includes unique, exemplary, and highly sensitive resources and landscapes that require special management approaches and practices to protect and preserve the special features and values identified in the specific Resource Management Plan. Examples of these resources include rare species habitat identified by the Natural Heritage & Endangered Species Program as being highly sensitive to human activities, fragile archaeological or cultural sites, and unique or exemplary natural communities. Management objectives emphasize protecting these areas from potentially adverse disturbances and impacts.

As stated above, DCR is currently revising this description to clarify the criteria for establishing zones and ensure that the Guidelines are consistent with the Landscape Designation guidelines. The Middlesex Fells Planning Unit RMP was developed to be consistent with anticipated revised language.

General Management Guidelines

- Only dispersed, low-impact, non-motorized, sustainable recreation will be allowed provided that the activities do not threaten or impact unique and highly sensitive resources.
- Existing trails and roads will be evaluated to ensure compatibility with identified resource features and landscape, and will be discontinued if there are suitable sustainable alternatives. New trails may be constructed only after a strict evaluation of need and avoidance of any potential adverse impacts on identified resources. New roads may only be constructed to meet public health and safety needs or requirements; however, the project design and siting process must avoid any potential adverse impacts on identified resources and demonstrate that there are no other suitable alternatives.
- Vegetation or forest management will be utilized only to preserve and enhance identified resource features and landscapes.

Special Management Guidelines for Fells Zone 1

- All trails within Zone 1 areas will be evaluated. Targeted redundant, confusing, fall-line and poor-condition trails in Zone 1 areas will be closed or re-routed (see Appendices M and N for specific targeted trails).
- No new trails will be permitted within the trail-free areas over 10 acres.
- Trail definition (borders) will be added to trails in proximity to sensitive plants.
- Existing non-motorized trail uses, including pedestrian and mountain biking uses, will be allowed on trails within Zone 1 as designated by DCR.
- No off-trail uses will be permitted in Zone 1, except scientific research.
- Geo-caches off-trail will not be permitted in Zone 1.
- Invasive removal or control projects will only ba allowed following review and approval by DCR, and NHESP and MHC if necessary, to ensure minimal disturbance and project of below-ground resources.
- Vegetation management will be used only to preserve and enhance identified resource features and landscapes including enhancing habitats for rare and endangered species, protecting archaeological resources and controlling invasive species.

Zone 2

General Description

This zone includes areas containing typical yet important natural and cultural resources on which common forestry practices and dispersed recreational activities can be practiced at sustainable levels that do not degrade these resources, and that hold potential for improving their ecological health, productivity and/or protection through active management. Examples include terrestrial and aquatic ecosystems characterized by a diversity of wildlife and plant habitats, rare species habitat that is

compatible with sustainable forestry and dispersed recreation, agricultural resources, and resilient cultural sites and landscapes. Zone 2 areas may be actively managed provided that the management activities are consistent with the approved Resource Management Plan for the property.

General Management Guidelines

- Management approaches and actions may include a wide range of potential recreational opportunities and settings that are consistent and compatible with natural resource conservation and management goals.
- Utilize Best Management Practices for forestry and other resource management activities to encourage native biodiversity, protect rare species habitats, unique landforms, and cultural resources.
- Protect and maintain water quality by providing for healthy functioning terrestrial and aquatic ecosystems.
- Provide a safe, efficient transportation network with minimal impact on natural and cultural resources while serving public safety needs and allowing visitors to experience a variety of outdoor activities.
- New trails may be allowed dependent upon existing area trail densities, purpose and need, physical suitability of the site, and specific guidelines for protection of rare species habitat and archaeological resources.
- Sustainable forest management activities may be undertaken following guidelines established through ecoregion-based assessments, district level forestry plans, current best forestry management practices, and providing for consistency with resource protection goals.
- Roads may be constructed if access for resource management or public access is needed and construction can be accomplished in an environmentally protective manner. Existing roads will be maintained in accordance with the DCR road classification system and maintenance policy.
- Additional site-specific inventory and analysis may be needed prior to any of the management activities described above to ensure that no adverse impacts occur to previously un-documented unique and sensitive resources and landscape features.

Zone 3

General Description

This zone includes constructed or developed administrative, maintenance and recreation sites, structures and resilient landscapes which accommodate concentrated use by recreational visitors and require intensive maintenance by DCR staff. Examples include areas developed and deemed appropriate for park headquarters and maintenance areas, parking lots, swimming pools and skating rinks, paved bikeways, swimming beaches, campgrounds, playgrounds and athletic fields, parkways, golf courses, picnic areas and pavilions, concessions, and areas assessed to be suitable for those uses.

General Management Guidelines

- The management approach and actions will emphasize public safety conditions and provide for an overall network of accessible facilities that meets the needs of DCR visitors and staff.
- Maintenance of these facilities and associated natural and cultural resources, and new construction or development, will meet state public health code, and state building code and environmental regulations.
- Shorelines and surface waters may be used for recreation within constraints of maintaining public safety and water quality.
- Historic restoration, rehabilitation or reconstruction for interpretation or adaptive reuse of historic structures will be undertaken only in conjunction with a historic restoration plan.
- To the greatest extent possible, construction will include the use of “green design” for structures, such as use of low-flow water fixtures and other water conservation systems or techniques, solar and other renewable energy sources, and the implementation of Best Management Practices to protect the soil and water resources at all facilities.

Significant Feature Overlays

General Description

The three land stewardship zones may be supplemented with significant feature overlays that identify specific designated/recognized resource features. These significant features are generally identified through an inventory process or research, and are formally designated. The purpose of these overlays is to provide more precise management guidance for identified resources and to recognize, maintain, protect, or preserve unique and significant values, regardless of the zone in which they occur. Examples of significant feature overlays include Forest Reserves, areas subject to public drinking water regulations, or areas subject to historic preservation restrictions.

Management Guidelines

Specific management guidelines for significant features overlays are provided by resource specialists or by the federal, state, regional, or local agency that has recognized and listed the resource or site.

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