DFW Biodiversity Initiative Update – Spring 2013

DFW uses active management to provide a range of grassland, shrubland, and forested habitats to help support both common and declining species (Table 1). DFW Landscape Habitat Goals are based on the scientific literature, are endorsed by the State Fisheries & Wildlife Board (http://www.mass.gov/dfwele/dfw/oversight.htm), and received broad public support during a series of statewide public informational meetings in 2010.

Table 1. Active management on DFW lands (contact DFW for digital copies of any/all of these management summaries).

Project Site	DFW District	Town	Acres	Habitat Goal	Dates of Operation
Frances Crane WMA, North Section	Southeast	Falmouth	150	Grassland Habitat Restoration	1996 to Present
Frances Crane WMA, South Section	Southeast	Falmouth	350	Pitch Pine/Scrub Oak Restoration	2004 To Present
Martin Burns WMA	Northeast	Newbury	130	Shrubland Restoration	2006 to Present
Muddy Brook WMA, Patrill Hollow Section	Central	Hardwick	115	Pitch Pine/Scrub Oak Restoration	2010 to Present
Phillipston WMA, Queen Lake Road Section	Central	Phillipston	41	White Pine/Oak Forest Regeneration & Lowbush Blueberry Restoration	2012 to Present
Southwick WMA	CT Valley	Southwick	225	Grassland Habitat Restoration	2012 to Present
Stafford Hill WMA, Barn Area	Western	Cheshire	40	Young Forest Regeneration & Shrubland Restoration	2010 to Present
Peru WMA, Tracy Pond section*	Western	Peru	19	Norway Spruce Plantation Conversion'	Nov 2006 to Feb 2007
Fox Den WMA, Chipman Road section*	Western	Middlefield & Worthington	36	Abandoned Orchard Restoration & Aspen Forest Regeneration.	Feb 2006 to Mar 2007
Montague Plains WMA*	CT Valley	Montague	118	Pitch Pine/Scrub Oak Restoration	2006 to Present
Herm Covey WMA, Belchertown, MA*	CT Valley	Belchertown	30	Young Forest Regeneration	Dec 2007 to Jan 2008
Birch Hill WMA, Priest Brook section*	Central	Royalston	62	Young Forest Regeneration	May 2007 to Dec 2007
Phillipston WMA, Williamsville Road section*	Central	Phillipston	30	Young Forest Regeneration	May 2007 to Dec 2007

Moose Hill WMA, Laurel Street section*	Central	Paxton	23	Young Forest Regeneration	Feb 2007 to Mar 2007
Stafford Hill WMA, main section, Cheshire, MA*	Western	Cheshire	22	Shrubland Restoration, Abandoned Orchard Restoration, & Aspen Forest Regeneration'	Jan 2009 to Feb 2009
Dunstable Brook WMA (coming soon)	Northeast	Dunstable & Tyringham	36	Shrubland & Turtle Nesting Habitat Restoration	2010 to Present
Eugene Moran WMA (coming soon)	Western	Windsor	53	Shrubland Restoration & Aspen Forest Regeneration.	1996 to Present
Peru WMA, Mongue Road section (coming soon)	Western	Peru	12	Abandoned Orchard Restoration & Aspen Forest Regeneration	Nov 2006 to Feb 2007
Hiriam Fox WMA, Ireland Street Section (coming soon)	Western	Chester	52	Abandoned Orchard & Shrubland Restoration	Nov 2006 to Feb 2007
Noquochoke WMA (coming soon)	Southeast	Dartmouth	53	Grassland & Shrubland Restoration	2010 to Present
Muddy Brook WMA, Jackson Road Section (coming soon)	Central	Hardwick	63	Shrubland Restoration	2008 to Present
Millers River WMA, Cass Meadows section (coming soon)	Central	Athol	30	Shrubland Restoration	2008 to Present
Winimussett WMA (coming soon)	Central	New Braintree	50	Shrubland Restoration	2002 to Present
Westborough WMA (coming soon)	Central	Westborough	85	Shrubland Restoration	1998 to Present
Leyden WMA (coming soon)	CT Valley	Leyden	166	Shrubland Restoration	1998 to Present
Poland Brook WMA (coming soon)	CT Valley	Conway	50	Shrubland Restoration	2002 to Present
Total			**2041**		

*http://www.mass.gov/dfwele/dfw/habitat/management/bdi/forest_mgt/forest_cutting_plans.htm

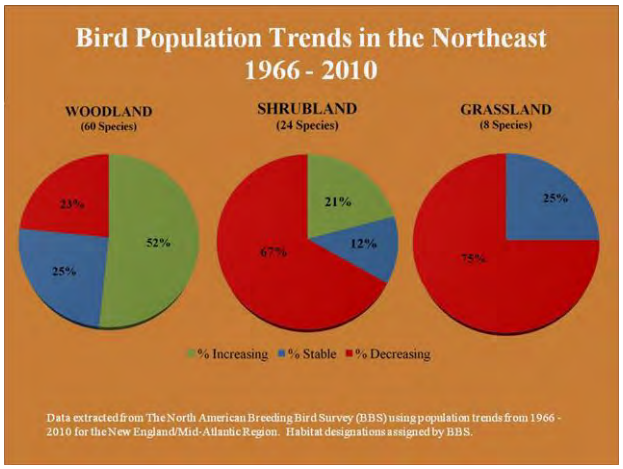
Potential management sites for grassland, shrubland and young forest habitats like those described in the table above are identified through recommendations by ecologists, biologists and land managers, based on land use composition analysis using GIS technology, and field visits to prospective sites. Sites are selected for reclamation according to criteria including habitat patch size, landscape setting, species of conservation need present on or near the site, and the current vegetation status. Through this evaluation process, agricultural lands that

were abandoned in the mid to late 20th century are most frequently identified for grassland and shrubland management, while agricultural lands abandoned in the late 19th or early 20th centuries where white pine became established on soils that historically supported deciduous forest (e.g., northern hardwood or oak/hickory) are most frequently identified for young forest management.

Background

The term 'Biodiversity' refers to the variety of life and its processes. The DFW Biodiversity Initiative was established in 1996 to help conserve the biological diversity of species, natural communities, and ecosystems across the Commonwealth. These conservation goals are realized through a variety of efforts including Invasive Exotic Plant control, restoration of degraded native plant communities, and reclamation of grassland, shrubland, and young forest habitats that support wildlife species experiencing long-term population declines. Wildlife Biologists, Restoration Ecologists, and Foresters (did someone say, 'What is Forestry?') within DFW work cooperatively on these efforts to help address the decline of wildlife species of greatest conservation need associated with open habitats identified in the Massachusetts Wildlife Action Plan. The Plan is a comprehensive strategy for identifying the state's key species requiring conservation actions and the habitats they occupy. (http://www.mass.gov/dfwele/dfw/habitat/cwcs/cwcs_home.htm).

Biodiversity conservation is based on how natural processes originally impacted wildlife habitats across Massachusetts, and on how human land use has constrained some natural processes that formerly provided critical open habitat patches across the landscape. In particular, human land use practices involving dam construction, highway infrastructure, and fire suppression have dramatically altered how flooding and fire impact the landscape. This restriction of flood and fire events was essential to protect human safety and property, but has prevented natural processes from creating and maintaining extensive patches of grassland, shrubland, and other open habitats. As a result, many native wildlife species that rely on open habitats are suffering long-term population declines.



In an effort to slow these unsustainable declines, DFW uses active management to provide a range of grassland, shrubland, and forested habitats that are no longer provided frequently enough by natural processes to help support both common and declining species. DFW Landscape Habitat Goals are based on the scientific literature, have been endorsed by the State Fisheries & Wildlife Board (http://www.mass.gov/dfwele/dfw/overs

ight.htm), and received broad public support during a series of statewide public informational meetings in 2010.

Natural Disturbance and Wildlife Habitat in Pre-Settlement Massachusetts

Open habitats such as grasslands, shrublands, and young forest have been a part of the New England landscape for millennia. Prior to European colonization, natural disturbance processes including beaver activity along thousands of streams throughout Massachusetts, and recurrent spring flooding and associated ice scouring along dozens of river courses generated extensive patches of open habitats across the state. Beaver dams form extensive shallow ponds that typically persist for years or decades until the beaver exhaust local food supplies and abandon the flowage. The abandoned dam soon falls into disrepair and ultimately breaches, allowing the extensive flowage to drain, leaving in its wake an open fertile site that is quickly colonized by herbs and shrubs that provide extremely beneficial wildlife habitat. Likewise, spring flooding following ice-out along major rivers resulted in flowing ice scouring extensive areas along the river banks that were typically colonized by herb and shrub vegetation after floodwaters subsided.

In addition, both wildfire and fires set by Native Americans along the coast, rivers (Patterson & Sassaman 1988), and in the uplands adjacent to major river valleys (Byers 1946) created extensive open habitats. Windstorms also create patches of open habitat, but most wind events in northeastern forests typically result in small (<0.1 ha) openings (Runkle 1982, Lorimer and White 2003). Hurricanes and tornadoes (like those that devastated portions of several Massachusetts towns in June of 2011) do occur in southern New England, but relatively infrequently. While occasional major windstorms can create extensive patches of open habitat that can periodically bolster local populations of wildlife species that benefit from disturbance, their infrequent occurrence typically cannot sustain populations of disturbance-dependent wildlife species. Rather, these species historically relied on more routine disturbance events like beaver flooding.

However, during the 18th century, beaver were extirpated from Massachusetts by unregulated trapping (Foster et al., 2000), then, in the 19th century humans began constructing dams along streams and rivers, eliminating many open habitats that had formerly been provided by spring flooding and ice scouring. During this same time period Native American tribes were decimated by European diseases like small pox and by conflict with European settlers, and fire became far less common in coastal areas and major river corridors. But in what can be seen as a great ecological irony, many native wildlife species associated with these natural disturbance habitats actually increased despite the extirpation of beaver, the damming of streams and rivers, and the substantial reduction in fire because much of Massachusetts' forests were cleared for farming and fuelwood, creating a landscape dominated by open habitats where extensive old-growth forest had formerly occurred. These dynamic landscape changes created conditions where

wildlife species associated with open habitats such as bobolinks and northern harriers thrived (Cronon 1983, Foster & Aber 2004, Whitney 1994).

As Massachusetts agricultural lands were abandoned from the 1850's into the early 1900's, and as the use of fuelwood gave way to fossil fuels in the mid-1800's, fallow fields and abandoned woodlots became very productive wildlife habitat for species such as American woodcock, whip-poor-will, prairie warbler, eastern towhee, field sparrow and New England cottontail. Eventually though, beginning around the 1960's, abandoned fields and woodlots succeeded to closed-canopy forest, and wildlife species dependant on grasslands, shrublands, and young forest habitats declined dramatically (Hill and Hagan 1991, Litvaitis 1993). This decline, along with limited forest regeneration cutting, and suppression of natural disturbance processes (i.e. flooding and fire) have resulted in a relative scarcity of these habitats in Massachusetts today (USDA 2000). The on-going decline of open habitats in New England is recognized as a serious threat to biodiversity; many wildlife species dependent on these habitat types are in decline (Askins 1998, DeGraaf & Yamasaki 2001, Litvaitis 2003). Native bird population trends show alarming declines for both grassland and shrubland birds, as well as for some forest nesting birds that move from mature forest after nesting to utilize food and cover resources found in open areas (Fig. 2). Consequently, all of the New England states include grassland, shrubland and young forest habitats and many associated wildlife species in their states' Wildlife Action Plans as species of conservation need (http://www.teaming.com/state_wildlife_strategies.htm).

It should be noted that beaver returned to Massachusetts in the early 1900's and with the introduction of trapping regulations their population increased. This has provided high quality wildlife habitats in some portions of the landscape, but human land use (primarily development and road construction) has eliminated beaver activity from many sections of low gradient streams.

In urban areas, stream sections that formerly supported vibrant beaver habitats prior to European colonization often run completely underground today, and will never experience beaver influence again. In suburban areas, beaver are routinely killed when their flooding activities pose a threat to well fields, septic fields, or other development infrastructure. And even in undeveloped areas of the Commonwealth, beaver are routinely removed whenever their dam building activity threatens road culverts or bridges. While most people drive over road culverts and small bridges without even noticing that they are crossing a stream, the reality is that there are >10,000 mapped occurrences of road culverts and bridges in Massachusetts, and beaver activity is effectively excluded immediately upstream and downstream of the culvert/bridge to protect transportation infrastructure. For example, if on average each road culvert/bridge occurrence represents just 500' of 'beaver-free' zone both upstream and downstream of the culvert/bridge, some 2,000 miles of stream have been effectively removed from beaver influence.

In short, after beaver were extirpated from Massachusetts, human population increased rapidly, and the same types of places preferred by beaver (relatively flat areas with good access to fresh, flowing water) are also preferred for

human development. So, while beaver are part of our landscape today, their ability to establish extensive patches of open habitat has been substantially constrained by human development relative to pre-colonial times. In response to the loss of open habitats due to human constraint of flooding and fire, MassWildlife and other conservation organizations actively manage grassland, shrubland, and young forest habitat to support declining populations of native wildlife species (Table 1). Currently, MassWildlife is actively working on statewide grassland and shrubland conservation planning in cooperation with MassAudubon, the MA Chapter of The Nature Conservancy, The Trustees of Reservations, The U.S. Forest Service Northeast Wildlife Research Station, DCR, and other organizations.

Natural Disturbance and Today's Forest

Windstorms, ice storms, fire, insect outbreaks, beaver flooding, ice scouring along riverfront areas, and disease are all natural processes that have had tremendous effect on forests for centuries. Some of these disturbances continue to influence our landscape (windstorms like the 2011 tornado pictured above, ice storms, and insect outbreaks), but as described above, other natural processes have been restricted or eliminated across substantial portions of the landscape by human development (fire, beaver flooding, and ice scouring).

Many ecologists suggest that wind events generally have far less impact on the relatively young (70-90 year old) and resilient forests that dominate Massachusetts today than they did on the disturbance-prone virgin forests of pre-settlement times. The 2011 tornadoes that churned across southern Massachusetts caused substantially larger openings than is typical for wind events in New England. It will probably take a century or more for today's forests to reach an age and size where wind disturbances will create openings like those found in pre-settlement forests. Forestlands that are managed to produce renewable wood products will likely remain relatively resilient to future wind disturbances.

Even if forests were allowed to mature to an old-growth state, the openings created by natural wind disturbances (typically covering less than one acre) are often not large enough to sustain all species associated with open habitats. For example some shrubland songbird species require ten or more acres of open habitat to meet their annual needs.

Not only is the structure of today's forests vastly different from pre-settlement times, the landscape as a whole is different. Today's New England landscape is dotted with housing developments, industrial parks, roads and utility rights-of-way that fragment the landscape. For example, many of the cities that now dominate our modern landscape have been built in areas (relatively flat areas with good access to fresh, flowing water) where beaver flooding and/or river flooding were historically important means of creating and maintaining open habitat.

In the absence of large predators that historically roamed extensive pre-settlement forests (e.g., wolves and mountain lions), smaller predators (e.g., coyotes and raccoons) thrive in today's fragmented landscape. A high predator population, in turn, increases the probability of predation on wildlife occupying the small habitat patches resulting from landscape fragmentation. For these reasons, extensive human-maintained grassland and shrubland habitats can offer the best opportunity for maintaining all of the native wildlife species associated with these habitats.

Extent of Species' Declines

The Breeding Bird Survey (BBS), a standardized roadside survey completed each year along thousands of routes throughout North America, gives us a good look at the extent of declines among our grassland, shrubland, and young forest birds. In addition to the yearly surveys of the BBS, recent review of published scientific articles help shed some light on why bird species associated with open habitats including the Eastern Towhee, Field Sparrow, and the Brown Thrasher are showing alarming declines. (http://www.mass.gov/dcr/news/publicmeetings/forestry/kingearlyseral.pdf). In addition, the Massachusetts Audubon Society has published a detailed account of all birds in the state, and note similar concerns for declining grassland and shrubland birds (http://www.massaudubon.org/StateoftheBirds/).

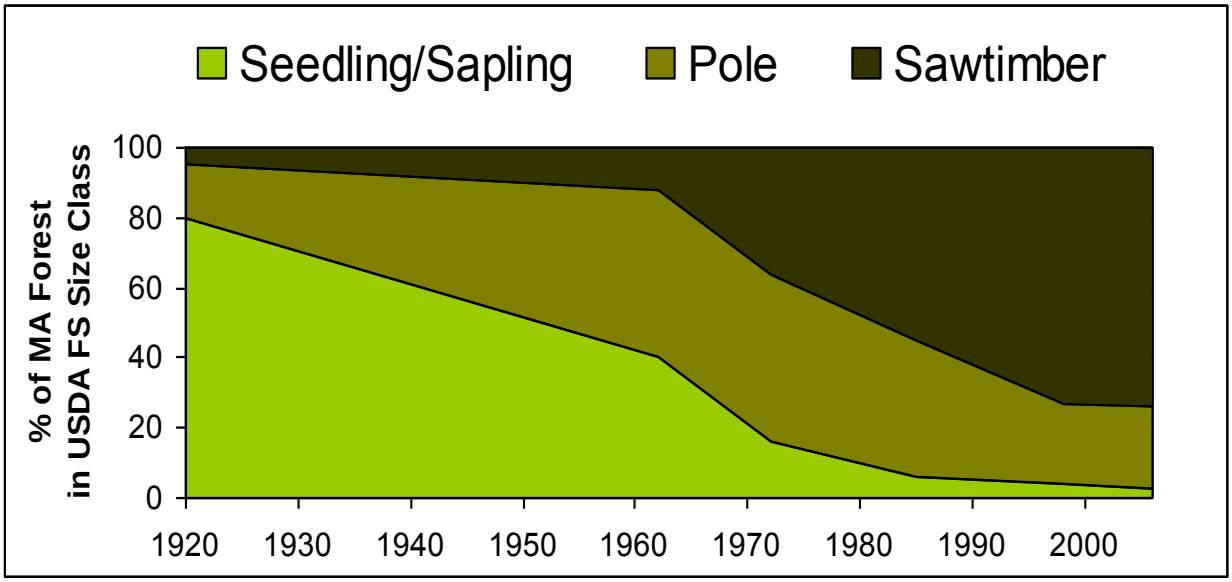
Five of six birds commonly associated with Massachusetts' grasslands are exhibiting dramatic declines along eastern BBS routes. Three of these species, the upland sandpiper, vesper sparrow, and grasshopper sparrow, are classified as either Threatened or Endangered by MassWildlife. From review of the scientific literature, it is clear that without the maintenance and creation of open habitat, state and federally listed species that require this type of habitat will continue to show decline.

Birds are not the only groups of wildlife exhibiting declines because of a lack of open habitats. The regal fritillary butterfly, once common, no longer occurs in the

state. The New England cottontail, Massachusetts' only native cottontail (as compared to its cousin the eastern cottontail, which was introduced to the state in the early 1900's), was once common throughout all of the states in New England. Now it occurs only sporadically in New England. Black racer snakes and box turtles rely on open habitats for various stages of their life cycle, and many old field and grassland plants including New England blazing star (a state Special Concern species), Sandplain Gerardia (a state Endangered species), and Eastern Silvery Aster (a state Endangered Species) are becoming increasingly rare.

Availability of Habitat

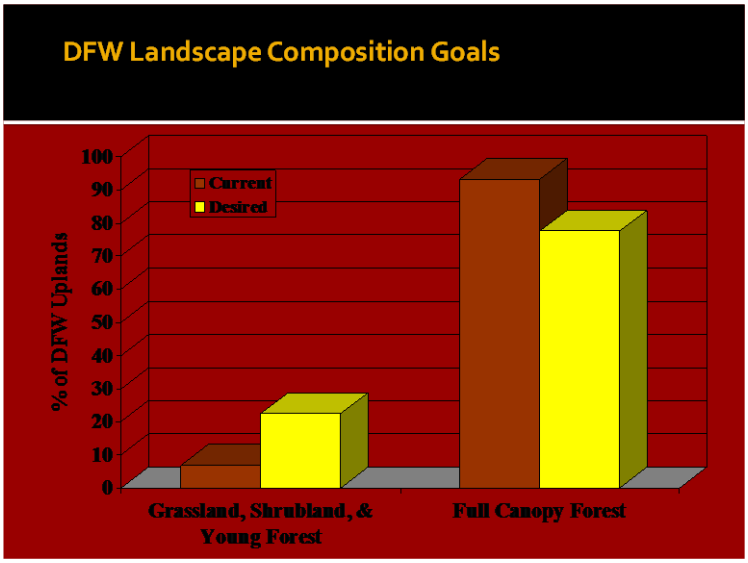
Outside of developed areas, the Massachusetts landscape is dominated by maturing forests (see figure below). The habitat composition of MassWildlife's 200,000+ acre system of Wildlife Management Areas (WMAs) and Wildlife Conservation Easements (WCEs) reflects the maturity of Massachusetts' forests. As of 2006, eighty six percent (86%) of the land within WMAs was forested, with 41% of the upland forest dominated by sawtimber trees larger than 14″ in diameter, 56% by pole-sized trees 5″ to 13″ diameter, 2.6% by sapling trees 1″ to 4″ diameter, and only 0.3% dominated by seedling trees less than 1″ in diameter. Forest canopies typically grow closed soon after tree diameters in the forest exceed 5 inches. Open water, marshes, and shrub swamps made up another 9.8% of WMA habitat and only about 5.3% of WMA land provided grassland and shrubland habitat.



A maturing forested landscape coupled with the residential and commercial development of much of the remaining abandoned agricultural land are taking a toll on wildlife species that require open habitat such as grassland, shrubland, young forest, and non-forested wetlands. Planned management to maintain and reclaim

grasslands and shrublands, and to create young forest habitat are essential to the populations of many declining wildlife species, and to some state and federally listed species (i.e. birds, invertebrates, reptiles). Provided that this type of management is limited to only small portions of the landscape, and that the majority of undeveloped lands support full canopy forest, management for open habitats it will not adversely affect populations of wildlife species that utilize mature forests during some portions of the life cycle (e.g., black bears, wild turkey).

Landscape Habitat Goals



DFW landscape goals for wildlife habitat have received broad public support and call for 20-25% of uplands in open habitats (including grassland, shrubland, and young forest) and 75-80% in a full-canopy forest condition, including 10-15% in forest reserves across approximately 180,000 acres of state WMA's These goals are science-based and respond to the state-wide and regional decline in grassland, shrubland, and young forest habitat and associated wildlife caused by direct losses from development and alteration of natural disturbance processes (e.g. flooding, fires, etc.).

Abandoned Field Reclamation

DFW is attempting to reclaim open habitats for declining wildlife throughout the Commonwealth by setting back succession on many abandoned field areas using mulching machines such as the Brontosaurus, which is a tracked excavator with a spinning drum mulching head, and tracked bobcat type machines with a fecon type mulching head. The Brontosaurus can efficiently mulch a standing tree up to six inches in diameter while the bobcat with the fecon head can mulch trees up to four inches in diameter.

Private sector companies are contracted to perform this work through a public, competitive bidding process, but not all trees and shrubs are cut from a project area. Many trees and shrubs that provide valuable food and cover for wildlife are specifically retained. Some of these include dogwoods, viburnums, serviceberry, cherries, hickories, butternut, and various oaks, among others. However, invasive exotic plants are specifically targeted for control.

A brontosaurus type machine mulches 8 inch red maple in an abandoned blueberry field

An ASV with a fecon head mulches birch in an abandoned agricultural field

Shrubs like serviceberry are retained for the wildlife food

Released apple trees in upland old field habitat provides valuable soft mast food for wildlife

Reclaimed blueberry fields

Invasive Exotic Plant Control

Invasive exotic plants are those that have been purposefully or unintentionally introduced into an area where they are not native. Aldo Leopold, father of wildlife management in this country once said, "Good or bad is not a matter of species, it is a matter of numbers." This certainly holds true for invasive exotic plants. There are approximately 900 introduced plant species in Massachusetts. Most are benign and are enjoyed by many as landscape and garden plants. However, others spread rapidly, become difficult to control or eradicate, and degrade our natural communities by outcompeting

Licensed applicators selectively treat individual invasive exotic plants to allow native plant communities to thrive.

native species for resources. European and glossy buckthorn, multiflora rose, Asiatic bittersweet, autumn olive, and purple loosestrife are just a few examples of invasive exotic species that are causing ecological damage throughout the state. In fact, invasive exotics have been implicated in contributing to the decline of 42% of those species listed as threatened or endangered by the US Fish and Wildlife Service.

The Upland Program strives to control invasive exotic plants on all project sites. Various control options are weighed for each project site. In most cases, herbicides are used since they provide the most effective means of controling invasive exotic plants. Other, non-chemical techniques will work in some instances (e.g., hand-pulling of seedlings). However, when root systems become well developed, techniques like pulling become less effective and can even contribute to a worse invasion. Mature root systems are difficult to pull out entirely. If root segments are left in the soil, they will often times resprout. Additionally, the soil disturbance created after pulling out a plant, creates a perfect bed for seeds of invasive exotic plants to germinate. Check the "links" and "references" sections for more information on invasive exotic plants and how to control them.

Herbicide applications are typically done by contractors licensed and certified by the Massachusetts Pesticide Bureau within the Department of Food and Agriculture (MDFA). Only those herbicides approved by the MDFA and the Massachusetts Department of Environmental Protection for use in sensitive areas are used. Sensitive areas include areas within 400 feet of a public ground water supply well, within 100 feet of a public surface water supply, within 50 feet of private water supplies, within 10 feet of surface waters and wetlands, and within agricultural and habituated areas. All other federal, state, and local regulations are also followed including the Wetlands Protection Act.

'What is Forestry?'

The practice of Forestry is centuries old (http://archive.org/details/briefhistoryoffo00fern), and is often referred to as both an art and a science. Today, Forestry not only includes the practices by which trees are sustainably grown, tended, and harvested (often referred to as silviculture), but also involves the conservation of entire plant communities (herbaceous plants, shrubs, and trees: http://www2.dnr.cornell.edu/ext/forestconnect/FO/sfda/what%20is.htm), and the long-term protection of forest lands from development. Forestry involves both the manipulation of existing woodlands (e.g., thinning operations that remove individual trees with low economic and habitat value to focus future growth on a desirable subset of existing trees), and regeneration of woodlands (e.g., cutting of groups or entire areas of trees to harvest renewable wood products like timber and firewood in order to establish a new forest for the future). Forestry can help to maintain a variety of ecosystem services including clean air and water, wildlife habitat, recreational opportunities, aesthetic values, and forest products which can be utilized by our local communities (which in turn can provide local jobs). Today, an individual tree may be favored for its economic value (e.g., veneer sawlogs), it's habitat value (e.g., full-crowned oaks that provide abundant acorn mast for wildlife, or mature hemlocks that provide important winter cover for wildlife), its aesthetic value (e.g., an old sugar maple that provides bright orange foliage in autumn), or any combination thereof.

On average one person uses approximately 190 board feet of wood per year, which is equivalent to one tree the size of the white pine pictured above. Anne Marie Kittredge @ MassWildlife Photograph.

An important component of Forestry is somewhat analogous to taking pictures. With the advent of digital cameras and cell phone cameras, many of us have become amateur photographers, and while we make take many different kinds of pictures (landscapes, action photos, portraits of loved ones, etc.), whenever we take any kind of picture we are ultimately doing the exact same thing: capturing light. Forestry is all about capturing available sunlight (as well as other resources like water and soil fertility) and directing it to trees, shrubs, and herbaceous plants that we want to favor.

Forest products are an important part of our everyday life and include items such as the infrastructure of our homes, fuel for heating, and paper products like toilet paper. We all use them every day. Based on the 2012 census data Massachusetts has more than 6.5 million residents. On average one person uses more than 100 board feet of wood per year, which is equivalent to one tree about

Deer browse on downed tree tops at an active timber harvest on our Stafford Hill WMA. Bill Byrne@MassWildlife Photo.

the size of the white pine pictured to the left. Harvesting forest products locally gives the consumer the opportunity to observe and learn about the the practices used to harvest these products and the opportunity to observe the response of our forest lands to these management activities over time.

Forestry is just one of many tools that DFW includes in its active management tool box to meet our Landscape Habitat Goals and to help address the decline of wildlife species of greatest conservation concern that depend on these open habitats (Hyperlink to Biodiversity Initiative). While DFW practices forestry as part of long-term management on lands that will remain in forest use, we also utilize forestry as a tool to restore or create open habitats that will not remain in forest use. Specifically, management of grassland and shrubland sites often involve a forestry component to clear trees that are taking over these important habitats, and/or to clear trees to expand existing grasslands and shrublands On land to be retained in forest use, forestry could involve the removal of old field white pine of low merchantable value from the overstory to encourage regeneration of a diverse mix of hardwood (particularly mast producing species like oak) and softwood trees, and provide more sunlight to existing native shrubs (i.e. highbush blueberry) in the understory. This work can also improve the quality of residual overstory trees by providing adequate spacing and exposure to sunlight.