2013 Mass Envirothon Current Issue

Trees, Forests, and Sustainability

Background and Strategies for Community Research

The Mass Envirothon Current Issue challenges your team to investigate an important environmental issue as it occurs in your community, to develop recommendations, and to present your findings to a panel of judges at the Envirothon competition.

In 2012-2013, Mass Envirothon teams will investigate what trees and forests can contribute to Massachusetts sustainability, and what we can do to assist, in the decades to come.

The 2013 Current Issue Problem will ask your team to identify a high priority forest value in your community, and to recommend next steps that municipalities and individuals should take toward protecting and enhancing that value. Teams are especially encouraged to look for ways that young people can take effective action in their communities on the issue.

To prepare for your presentation, your team should plan to
- Get outdoors and become hands-on knowledgeable about the trees and forests around you
- Become familiar with the ecosystem services that trees and forests provide to your community
- Get acquainted with identified local forest management issues and the people who work on these issues
- Identify ways that trees and forests can contribute to a sustainable future, and what steps we need to take to ensure that trees and forests are conserved for the long run.

These pages are intended to be a quick guide to useful resources as you begin your research into trees and forests in your community.   This document is online with live links to the URLs listed, at:
http://www.maenvirothon.org/currentissue.htm

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Introduction

We live in the forest. The Massachusetts landscape has been dominated by forests since soon after the last ice age. Even today, land left open soon reverts to forest. Can you find a view in your community that does not include a tree? Forests are predominant ecological community in our part of the continent.   If you just leave land alone almost anywhere Massachusetts, the result will be forest. Massachusetts forests vary in species composition, age, and extent. Some are tree-lined streets and landscaped parks in cities and towns. Some are urban wilds. Others are large unbroken stretches of woodland where human habitation is sparse. For practical management purposes we differentiate between urban and rural, but the forest is everywhere.

We depend on trees and forests for our well-being.   The benefits we receive include not only timber and pulp and fuel wood, but also processes like water purification, pollution sequestration, and climate regulation, and also less tangible cultural, spiritual, and recreational benefits.   We are familiar with the term "natural resources" to describe products derived from nature.

The term **ecosystem services** has emerged in recent years as a helpful way to understand and describe benefits derived from forests.   Ecosystem services include traditional natural resources but also include natural functions that have value to us – like soil formation, flood control, carbon sequestration, waste treatment. For one introduction, see http://www.forest-to-faucet.org/pdf/ecosystem-services.pdf

The United Nations' *Millennium Ecosystem Assessment* (2005) classified ecosystem services and how they contributed to human well-being:
- *Supporting services*: These are the services that are necessary for the production of all other ecosystem services. In forests, these include photosynthesis, soil formation, nutrient cycling, and water cycling.
- *Provisioning services*: These are the more familiar "products" obtained from ecosystems. Forests provide fresh water, timber and pulp, biomass fuel and cordwood, game, and pharmaceuticals.
- *Regulating services*: These include air quality regulation, shade for cooling, flood control, erosion control, and water purification.
- *Cultural services*: These are non-material benefits people obtain from ecosystems such as recreation, spiritual renewal, and aesthetic experiences such as landscape appreciation.   Parks and tree-lined streets can also contribute to community pride and enhance property values.

What are the components of human well-being that ecosystem services support? Things like adequate shelter, sufficient nutritious food, personal safety, health, rewarding work, community and social relations, freedom of choice and action.

Water-related benefits are one good place to start understanding ecosystem services. See:
- Greatest Value Of Forests Is Sustainable Water Supply
  http://www.sciencedaily.com/releases/2008/07/080714162600.htm
- Mass Department of Conservation & Recreation's Watershed Forestry site
  http://www.mass.gov/dcr/watersupply/watershed/forestry.htm
- Center for Watershed Protection's Watershed Forestry Resource Guide
  http://www.forestsforwatersheds.org/
- People are a Forest-Dependent Species
  http://www.forest-to-faucet.org/

Some ecosystem services can be provided in other ways, but this can come at a price. For example, protecting the Quabbin watershed forest's ability to filter water is much cheaper than constructing a

water purification system . Resources spent on a technological water purification fix are resources that will not be spent to foster some other component of well-being. It is also important to note that some of the ecosystem services we receive are from forests far away. For example, the Amazon forest is a global carbon sink, and much of the lumber we use to construct our homes comes from the western part of this continent. There are things we can do to protect those ecosystems, too.

Forests are communities. They are complex ecological systems, and we have only partial understanding of all the processes at work within them. We have come to understand that even cities are ecological spaces, packed with trees, vegetation, and wildlife, connected to the ecosystems of suburban and rural areas. Diversity is a major component that strengthens these communities. Forests' ecological diversity is compounded by the many edges they share with paved and built areas, agricultural fields, bodies of water, and tended lawns. The concept of ecosystem services links human well-being to the functioning of these ecosystems. In a very real sense, we are members of the forest community.

Forests change. Forests are living things. They grow and evolve. They renew themselves over time. When they are healthy, they are resilient – able to resist damage and recover quickly. Scientists have come to understand that change – in response to human disturbance (such as clearing or selective cutting or high-impact recreation) or natural disturbances (such as hurricane or wildfire or insect infestation) – is the normal state for Massachusetts forests. Simply leaving forest land alone also results in change: succession happens, trees grow, species composition changes (and sometimes invasive species come to dominate), and wildlife habitat changes. People have been making changes in Massachusetts forests since the last ice age. Many of us are familiar with the cycles of clearing and reforestation since European settlement, but Native Americans also altered the forest for centuries before this, often with fire, to improve conditions for hunting and foraging. Climate change presents a new and severe threat to forests because the scale and speed of change may overwhelm forests' capacity to adjust.

Conservation of trees and forests is a critical component of sustainability in the 21st century.
Sustainability is about humans living in ways that protect natural systems we depend upon, and managing our use of ecosystem services wisely so that the next generation will be able to rely on them as well. What does "sustainability" mean for forest ecosystems in Massachusetts? Because they have exhibited such resilience in the past, we can easily take the forest communities around us for granted. But as human activity strains natural resource limits, and particularly as climate change transforms our world, we need new knowledge and skills and commitment to treat this home well. Acting for sustainability must include:
- Improving our understanding and appreciation of how forest ecosystems work, and the services they provide, especially in our own communities, so we can protect and use them wisely.
- Reducing our impact on forest systems – using less where we can, using more efficiently in any case, asking whether the use is something we really need rather than simply want.
- Using local resources. If we protect forests in our own community at the expense of forests elsewhere, this is not true sustainability. Using local resources strengthens local economies and reduces the energy required for transportation. And we get quicker feedback if we aren't doing things right.
- Managing competing uses of the forest resources fairly, with an assumption that in a changing climate forests will be less resilient.

For more introduction to Massachusetts forests, here are some excellent jumping off places. These sites provide links to help teams find good resource people and organizations, ask good questions, and identify issues and possible projects in their own communities:

DCR Forest Resource Related Links – web sites about forestry and land management in Massachusetts.
http://www.mass.gov/dcr/stewardship/forestry/service/links.htm

Urban and Community Forestry (in particular, see the Picks and Shovels/FAQs page)
http://www.mass.gov/dcr/stewardship/forestry/urban/index.htm

The UMass Amherst/UMass Extension Forest Conservation Program
http://masswoods.net/

A little more recommended background/overview:

An Assessment of the Forest Resources of Massachusetts (2010)
http://www.mass.gov/dcr/stewardship/forestry/docs/Assessment_of_Forest_Resources.pdf

Massachusetts Climate Change Adaptation Report (2011) Chapter 4 "Natural Resources and Habitat"
http://www.mass.gov/eea/docs/eea/energy/cca/eea-climate-adaptation-chapter4.pdf

Getting Started on Your Community Research

The following pages introduce four general areas for investigation – PLACES, PEOPLE, ISSUES, and STRATEGIES – plus a listing of helpful resource links. To do a good job in your research, your team will eventually need to be acquainted with all these areas. But you can start with any one of them.

PLACES

Maps
- **Bird's Eye View**. A fun way to start is by flying over your community using http://www.bing.com/maps.
- **Land use changes**. Oliver, the MassGIS online mapping tool at http://maps.massgis.state.ma.us/map_ol/oliver.php can be used to investigate changes in land use in your community since 1971 by using the *Land Use* data under *Physical Resources*.
- **Historic topographic maps** can be used to get a sense of how development has changed the landscape. Are there clues to which lands were forested? http://docs.unh.edu/nhtopos/nhtopos.htm
- **Team Maps.** The Massachusetts Executive Office of Energy & Environmental Affairs will provide registered Envirothon teams with large scale color printed maps of their communities showing forest-related information for use in research and presentations at the Envirothon.

Getting to know your ecological community

- What watershed do you live in? How are the forests in your town connected with forest areas in neighboring towns? Is fragmentation of forest habitat a problem?
- What associations of tree species occur in your community?
- What soils are these tree communities growing in?
- Are invasive species changing the character of the forest in your area?
- Are there "interior forests" in your community (http://www.mass.gov/dfwele/dfw/nhesp/land_protection/biomap/pdf/forest_core.pdf)? Are there "urban wilds" (http://www.cityofboston.gov/parks/urbanwilds/)? What tree and wildlife species are associated with these areas?

History. For an introduction to the role of forests in the history of the Massachusetts landscape, see the dioramas at the Fisher Museum at the Harvard Forest in Petersham: http://harvardforest.fas.harvard.edu/dioramas

- Where were the trees, and what were the forests like, 100 years ago in your town? 40 years ago?
- Were there places with no trees long ago that are now forested? Are there places where the forest no longer exists?
- How were trees used in previous eras?

Ecosystem Services. Make your own list of ecosystem services generally attributed to trees and forests. When you make use of these services, what forests are they originating from? What role do the trees and forests in your neighborhood play in supplying these benefits?

- Where does your drinking water come from? What role do forests play in this ecosystem service?
- What role do trees play in stormwater management?
- Are trees playing a part in energy conservation? In reduced use of fossil fuels?
- Are there places where trees are being cut? Places where they are being turned into wood products?
- Where are public parks in your area? What kinds of recreation occur there? What role do trees play? Are there recreational activities that put a strain on the ecosystem?
- What resources to trees and shrubs in your neighborhood provide for wildlife? What benefits do different tree species provide? What's the value of this wildlife for your community?
- What are the trees and forests in your community doing to mitigate climate change, and how can you support that?
- Do any of these services compete with each other? Are some more important to your community than others?

PEOPLE

For all of the tree and forest places you discover and visit, there are people who know the place and/or whose job it is to manage the trees and forests there.   Get them to visit those places with you and your eyes will be opened in new and unexpected ways. Here are some kinds of people you might seek out to get to know your local forest better:

Your municipal tree warden is responsible for maintaining street and park trees so that they provide minimal risk of property damage or injury. By law, every Massachusetts municipality designates someone for this role.

Forest landowners. Many individual landowners have known their property intimately over many years and have a strong sense of stewardship. Many will be happy to share what they have learned and what they value. Land trusts are non-profit, non-governmental organizations that own land and work with landowners to conserve land.

Foresters are trained to help landowners manage their woodlands. They can help you "see" how a forest will change and what the results will be over time of a variety of human interventions.

Loggers are responsible for harvesting wood from the forest using environmentally friendly practices.

Arborists are expert in selecting, planting, pruning, and caring for trees in settings where people and trees live in close proximity. They can help you understand individual trees and the benefits and risks they represent.

Park Staff manage use of ecosystem services in a way that ensures future that the resource can be enjoyed into the future.   They may have particular knowledge of recreational uses.

Long-time residents can be a storehouse of knowledge about landscapes of the past and how our attitudes about trees and forests have changed.

People who enjoy spending time outdoors and are tuned in to ecological relationships and can help you observe and appreciate life in the forest: naturalists, hunters, trackers, bird watchers, wildlife photographers.

FINDING RESOURCE PEOPLE

UMass Amherst's Forest Conservation Program website (http://masswoods.net/) is an excellent resource for finding people in your community.
- MassWoods has a zip code directory of contact information for the local state service forester, private foresters, land trusts (land protection specialist), conservation lawyers and appraisers, and conservation organizations working in your town. See http://masswoods.net/professionals
- MassWoods Keystone Cooperators are landowners and community leaders with training in forest ecology, land protection, forest management, and wildlife habitat who can share their knowledge and experience with you and help you find resources and professionals. See http://masskeystone.net/find-a-keystone-cooperator-in-your-area

The Massachusetts Forest and Park Friends Network (http://www.networkingfriends.net/) is a grassroots organization of volunteer "Friends" groups working together to better protect and enhance Massachusetts' state forests, parks, and trails. According to the database linked from their main web page, 48 of 331 Mass Department of Conservation & Recreation properties have Friends groups. To contact a group near you, see: http://www.networkingfriends.net/dcrproperties.htm

A host of professional and community organizations and government agencies are involved with Massachusetts trees and forests. Their websites, programs, and members may be resources for your investigations. Here is a sampling of links:
Massachusetts Land Trust Coalition http://www.massland.org/
Massachusetts Arborists Association http://www.massarbor.org/
Massachusetts Nursery and Landscape Association (MNLA) http://www.mnla.com/
Boston Natural Areas Network (BNAN) http://www.bostonnatural.org/index.htm
Massachusetts Forest Alliance (wood producers, foresters, landowners) http://massforestalliance.org/
The Trustees of Reservations http://www.thetrustees.org/about-us/our-mission/

MassWildlife Biodiversity Initiative involves forestry in wildlife management areas:
http://www.mass.gov/dfwele/dfw/habitat/management/bdi/bdi_home.htm

State Parks and Forests (Mass DCR)
General information about conservation & recreation on state lands http://www.mass.gov/dcr/
Massachusetts Forest and Park Friends Network http://www.networkingfriends.net/
Forestry in state parks & forests http://www.mass.gov/dcr/stewardship/forestry/manage/
Mass Audubon advocacy http://www.massaudubon.org/advocacy/dcr_forest_management.php
Landscape Designations for DCR State and Urban Parks
http://www.mass.gov/dcr/ld/landscapedesignations.htm

Urban and Community Forestry http://www.mass.gov/dcr/stewardship/forestry/urban/

Forest Stewardship programs http://www.mass.gov/dcr/stewardship/forestry/service/steward.htm

Watershed Forestry http://www.mass.gov/dcr/watersupply/watershed/forestry.htm

Insect Pests and Diseases
Mass Department of Agricultural Resources (MDAR) Introduced Pests Outreach
http://massnrc.org/pests/index.htm and DCR Forest Health program
http://www.mass.gov/dcr/stewardship/forestry/health/index.htm

Federal agencies
US Fish & Wildlife Service
http://www.fws.gov/northeast/planning/index.html
USDA Forest Service
http://www.forestactionplans.org/states/massachusetts
http://www.na.fs.fed.us/sustainability/

Local government (see your municipal web site)
Tree warden
Department of Public Works (often the home base for the Tree Warden)
Conservation Commission
Open Space Committee
Planning Board
Tree and forest committees http://www.mass.gov/dcr/stewardship/forestry/urban/TreeBoard-0301.pdf

ISSUES

Many environmental activists get involved for the first time because of a burning local issue that affects them directly. They learn the relevant science and decision-making processes as they go, and usually end up with a much larger, more informed ecosystem perspective.

You may find an issue to get you started by talking with people or reading the local newspaper. It is hard to find a land use/development issue that does not involve forests in some way!

What are the controversies and differences of opinion? How do the potential solutions relate to ecosystem services and sustainability?

Here are some hot topics in Massachusetts communities this year:

- How can forests provide low-cost protection of resources like drinking water? Low-cost stormwater management?   Wetland protection?
- How should we manage the impact of recreation on forests, including overuse and competing uses?
- Given limited town budgets for tree care and removal, what level of risk in street trees should be tolerated? Should we be planting trees? If so, where?
- How can landowners be encouraged to keep their land as forest, rather than developing it?
- Harvesting the forest – how much is sustainable? How can this be done with least interference with other uses? How can it be done in most environmentally sound way? Can logging actually "improve" a forest stand? For timber production? For wildlife habitat?
- Is high grading (removing only the most valuable timber) an acceptable practice?
- Wood biomass is a non-fossil fuel. But how safe, clean, and renewable is it? Again, how much can be harvested sustainably for this purpose?
- Is there a potential market for "buy local" wood similar to what we have for "buy local" food?
- How can the ecological integrity of landscapes on a regional/watershed-wide basis be protected and enhanced? How can this be done when land ownership and management is so fragmented?
- New and damaging species like the Asian Longhorn Beetle and the Emerald Ash Borer are invading Massachusetts urban and rural forests. Can we stop them? Where should we focus our efforts?
- Climate Change tends to strain forest ecosystem relationships and to exacerbate all these issues. In particular,
    - Different species in an ecological community react differently to warming climate. Community relationships are strained.   Native species may be at a disadvantage. Non-native species may find a hospitable new home.
    - Water cycle intensification means an increase overall rainfall and more intense rainfall events, increases erosion
    - Extreme weather events may be more frequent and damaging
- How significant is the role of Massachusetts forests in carbon sequestration to combat climate change?

STRATEGIES & TOOLS

The Citizen Forester electronic newsletter from DCR
http://www.mass.gov/dcr/stewardship/forestry/urban/citForester.htm
Sample articles from the past year related to ecosystem services:
December 2012 *Home Tree Inspections*
September 2012 *Drought, Stress and What it all Means for Your Trees*
August 2012 *Street Tree Inventories*
July 2012 *Establishing a Wood Bank: Neighbors Helping Neighbors*
June 2012 *Carbon Sequestration and Urban Trees*
April 2012 *What to Expect From Winter Moth in Massachusetts*
March 2012 *Where Does your wood come from? Working lands and wood products from Massachusetts*
January 2012 *Tree canopy and your community*

Forest management (stewardship) plans come in all sizes.
an individual plan: www.mass.gov/dcr/stewardship/forestry/docs/sampleplan.doc
a municipal plan: http://www.mass.gov/dcr/stewardship/forestry/urban/docs/lawremgtplan.pdf
for public lands: http://www.mass.gov/dcr/stewardship/forestry/docs/FSP%20Choice%20Brochure.pdf

Tree City USA (a program of the Arbor Day Foundation supported by the USDA Forest service) provides direction, technical assistance, public attention, and national recognition for urban and community forestry programs in individual towns and cities. See
http://www.arborday.org/programs/treeCityUSA/about.cfm

Urban Tree Risk Management: A Community Guide to Program Design and Implementation
http://www.na.fs.fed.us/spfo/pubs/uf/utrmm/index.htm
Includes a chapter (with lots of pictures) on "How to Detect and Assess Hazardous Defects in Trees"

National Wildlife Federation backyard habitat certification program
http://www.nwf.org/How-to-Help/Garden-for-Wildlife.aspx
Cornell Lab of Ornithology Citizen Science Yardmap project: http://content.yardmap.org/

Massachusetts Forestry Best Practices Manual
http://masswoods.net/images/stories/pdf/BMP_Manual.pdf
http://www.forest-to-faucet.org/pdf/best-management-practices.pdf

Connecting People and Partners: A Town's Guide to Land
Conservationhttp://www.franklinlandtrust.org/FLT_old/pdf/Connecting_People_Partners.pdf

Conservation restrictions
http://www.massaudubon.org/PDF/land/CRManualFinal.pdf

American Forests' National Big Tree Program
http://www.americanforests.org/our-programs/bigtree/

Opportunities to volunteer in State Parks
http://www.mass.gov/dcr/getInvolved.htm