United States Environmental Protection Agency | Office of Policy, Planning and Evaluation (2111) | EPA 230-F-97-008u September 1997

EPA Climate Change And Massachusetts

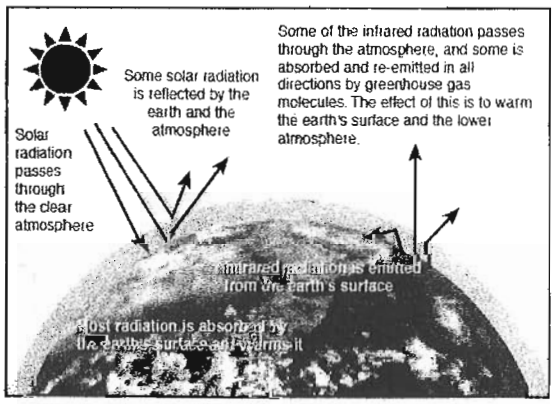
The earth's climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases — primarily carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. The heat-trapping property of these greenhouse gases is undisputed. Although there is uncertainty about exactly how and when the earth's climate will respond to enhanced concentrations of greenhouse gases, observations indicate that detectable changes are under way. There most likely will be increases in temperature and changes in precipitation, soil moisture, and sea level, which could have adverse effects on many ecological systems, as well as on human health and the economy.

The Climate System

Energy from the sun drives the earth's weather and climate. Atmospheric greenhouse gases (water vapor, carbon dioxide, and other gases) trap some of the energy from the sun, creating a natural "greenhouse effect." Without this effect, temperatures would be much lower than they are now, and life as known today would not be possible. Instead, thanks to greenhouse gases, the earth's average temperature is a more hospitable 60°F. However, problems arise when the greenhouse effect is ***enhanced*** by human-generated emissions of greenhouse gases.

Global warming would do more than add a few degrees to today's average temperatures. Cold spells still would occur in winter, but heat waves would be more common. Some places would be drier, others wetter. Perhaps more important, more precipitation may come in short, intense bursts (e.g., more than 2 inches of rain in a day), which could lead to more flooding. Sea levels would be higher than they would have been without global warming, although the actual changes may vary from place to place because coastal lands are themselves sinking or rising.

The Greenhouse Effect



Source: U.S. Department of State (1992)

Emissions Of Greenhouse Gases

Since the beginning of the industrial revolution, human activities have been adding measurably to natural background levels of greenhouse gases. The burning of fossil fuels — coal, oil, and natural gas — for energy is the primary source of emissions. Energy burned to run cars and trucks, heat homes and businesses, and power factories is responsible for about 80% of global carbon dioxide emissions, about 25% of U.S. methane emissions, and about 20% of global nitrous oxide emissions. Increased agriculture and deforestation, landfills, and industrial production and mining also contribute a significant share of emissions. In 1994, the United States emitted about one-fifth of total global greenhouse gases.

Concentrations Of Greenhouse Gases

Since the pre-industrial era, atmospheric concentrations of carbon dioxide have increased nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15%. These increases have enhanced the heat-trapping capability of the earth's atmosphere. Sulfate aerosols, common air pollutants, cool the atmosphere by reflecting incoming solar radiation. However, sulfates are short-lived and vary regionally.

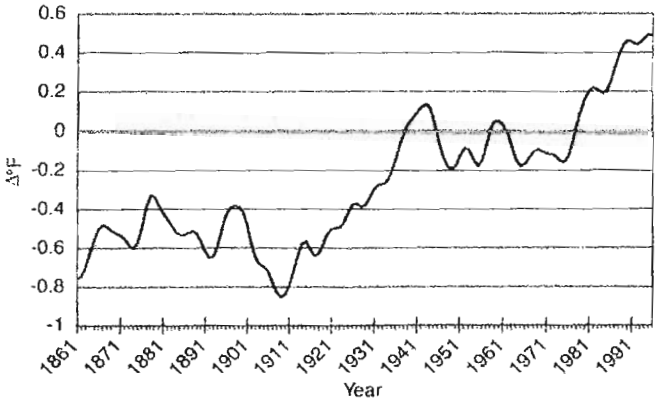
Although many greenhouse gases already are present in the atmosphere, oceans, and vegetation, their concentrations in the future will depend in part on present and future emissions. Estimating future emissions is difficult, because they will depend on demographic, economic, technological, policy, and institutional developments. Several emissions scenarios have been developed based on differing projections of these underlying factors. For example, by 2100, in the absence of emissions control policies, carbon dioxide concentrations are projected to be 30-150% higher than today's levels.

Current Climatic Changes

Global mean surface temperatures have increased 0.6-1.2°F between 1890 and 1996. The 9 warmest years in this century all have occurred in the last 14 years.

Several pieces of additional evidence consistent with warming, such as a decrease in Northern Hemisphere snow cover, a decrease in Arctic Sea ice, and continued melting of alpine glaciers, have been corroborated. Globally, sea levels have risen 4-10 inches over the past century, and precipitation over land has increased slightly. The frequency of extreme rainfall events also has increased throughout much of the United States.

Global Temperature Changes (1861–1996)



Source: IPCC (1995), updated

A new international scientific assessment by the Intergovernmental Panel on Climate Change recently concluded that ***"the balance of evidence suggests a discernible human influence on global climate."***

Future Climatic Changes

For a given concentration of greenhouse gases, the resulting increase in the atmosphere's heat-trapping ability can be predicted with precision, but the resulting impact on climate is more uncertain. The climate system is complex and dynamic, with constant interaction between the atmosphere, land, ice, and oceans. Further, humans have never experienced such a rapid rise in greenhouse gases. In effect, a large and uncontrolled planet-wide experiment is being conducted.

General circulation models are complex computer simulations that describe the circulation of air and ocean currents and how energy is transported within the climate system. While uncertainties remain, these models are a powerful tool for studying climate. Scientists are reasonably confident about the ability of models to characterize future climate at continental scales.

Recent model calculations suggest that the global surface temperature could increase an average of 1.6-6.3°F by 2100, with significant regional variation. These temperature changes would be far greater than recent natural fluctuations, and they would occur significantly faster than any known changes in the last 10,000 years. The United States is projected to warm more than the global average, especially as fewer sulfate aerosols are produced.

The models suggest that the rate of evaporation will increase as the climate warms, which will increase average global precipitation. They also suggest increased frequency of intense rainfall as well as a marked decrease in soil moisture over some mid-continental regions during the summer. Sea level is projected to increase by 6-38 inches by 2100.

Calculations of regional climate change are much less reliable than global ones, and it is unclear whether regional climate will become more variable. The frequency and intensity of some extreme weather of critical importance to ecological systems (droughts, floods, frosts, cloudiness, the frequency of hot or cold spells, and the intensity of associated fire and pest outbreaks) could increase.

Local Climate Changes

Over the last century, the average temperature in Amherst, Massachusetts, has increased 2°F, and precipitation has increased by up to 20% in many parts of the state.

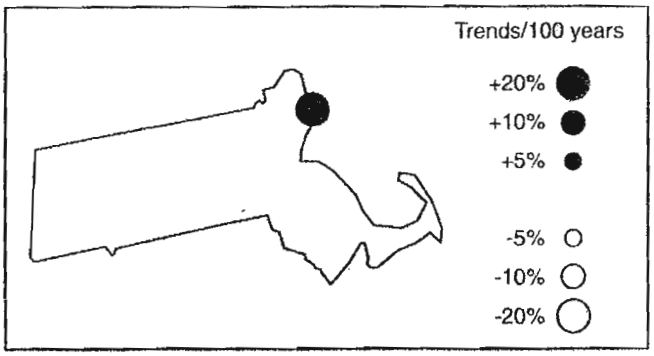
Over the next century, climate in Massachusetts may change even more. For example, based on projections made by the Intergovernmental Panel on Climate Change and results from the United Kingdom Hadley Centre's climate model (HadCM2), a model that accounts for both greenhouse gases and aerosols, by 2100 temperatures in Massachusetts could increase by about 4°F (with a range of 1-8°F) in winter and spring and about 5°F (with a range of 2-10°F) in summer and fall. Precipitation is estimated to increase by about 10% in spring and summer, 15% in fall, and 20-60% in winter. Other climate models may show different results. The amount of precipitation on extreme wet or snowy days in winter is likely to increase. The frequency of extreme hot days in summer would increase because of the general warming trend. Although it is not clear how severe storms such as hurricanes would change, an increase in the frequency and intensity of winter storms is possible.

Climate Change Impacts

Global climate change poses risks to human health and to terrestrial and aquatic ecosystems. Important economic resources such as agriculture, forestry, fisheries, and water resources also may be affected. Warmer temperatures, more severe droughts and floods, and sea level rise could have a wide range of impacts. All these stresses can add to existing stresses on resources caused by other influences such as population growth, land-use changes, and pollution.

Similar temperature changes have occurred in the past, but the previous changes took place over centuries or millennia instead of decades. The ability of some plants and animals to migrate and adapt appears to be much slower than the predicted rate of climate change.

Precipitation Trends From 1900 To Present



Source: Karl et al. (1996)

Human Health

Higher temperatures and increased frequency of heat waves may increase the number of heat-related deaths and the incidence of heat-related illnesses. Massachusetts, with its irregular, intense heat waves, could be especially susceptible.

In Boston, one study projects that by 2050 heat-related deaths during a typical summer could increase 50%, from close to 100 heat-related deaths per summer to over 150 (although increased air conditioning use may not have been fully accounted for). Winter-related deaths are expected to change very little. The elderly, particularly those living alone, are at greatest risk.

Climate change could increase concentrations of ground-level ozone. For example, high temperatures, strong sunlight, and stable air masses tend to increase urban ozone levels. Air pollution also is made worse by increases in natural hydrocarbon emissions during hot weather. If a warmed climate causes increased use of air conditioners, air pollutant emissions from power plants also will increase.

A 4°F warming in New York City, with no other change in weather or emissions, could increase concentrations of ozone, a major component of smog, by 4%. Similar increases could occur in Massachusetts. Currently, ground-level ozone concentrations exceed national ozone health standards throughout the state. All of Massachusetts is classified as a "serious" nonattainment area for ozone. Ground-level ozone has been shown to aggravate respiratory illnesses such as asthma, reduce existing lung function, and induce respiratory inflammation. In addition, ambient ozone reduces crop yields and impairs ecosystem health.

Warming and other climate changes may expand the habitat and infectivity of disease-carrying insects, thus increasing the potential for transmission of diseases such as malaria and dengue ("break bone") fever. Mosquitos flourish in some areas around Massachusetts. Some can carry malaria, while others can carry Eastern equine encephalitis, which can be lethal or cause neurological damage. Incidents of Lyme disease, which is carried by ticks, have increased in the Northeast. If conditions become warmer and wetter, mosquito and tick populations could increase, thereby increasing the risk of transmission of these diseases.

In addition, warmer seas could contribute to the increased intensity, duration, and extent of harmful algal blooms. These blooms damage habitat and shellfish nurseries, can be toxic to humans, and can carry bacteria like those causing cholera. Brown algal tides and toxic algal blooms already are prevalent in the Atlantic. Warmer ocean waters could increase their occurrence and persistence.

Coastal Areas

Sea level rise could lead to flooding of low-lying property, loss of coastal wetlands, erosion of beaches, saltwater contamination of drinking water, and decreased longevity of low-lying roads, causeways, and bridges. In addition, sea level rise could increase the vulnerability of coastal areas to storms and associated flooding.

The coast of Massachusetts is an important resource with over 1,500 miles of shoreline. Massachusetts' coastline includes stretches of rocky shore, barrier beaches, productive estuaries, fragile salt marshes, tidal flats, and dozens of islands. Barrier beaches, salt marshes, and other wetland resource areas buffer the coast from storms, waves, and flooding.

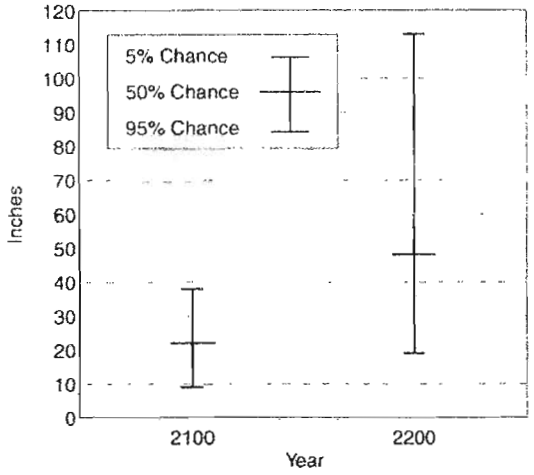
At Boston, sea level already is rising by 11 inches per century, and it is likely to rise another 22 inches by 2100. Rising sea levels are taking a toll on Massachusetts' coastal upland. Each year, an average of 65 acres of upland is submerged by a combination of rising seas and subsiding land. Much of this loss occurs along the south-facing coast between Rhode Island and the outer shore of Cape Cod, including the islands of Nantucket and Martha's Vineyard. Coastal land that has been lost because of erosion by storm waves or wetland erosion is not included in the estimate of annual average land lost from submersion.

Possible responses to sea level rise include building walls to hold back the sea, allowing the sea to advance and adapting to it, and raising the land (e.g., by replenishing beach sand, elevating houses and infrastructure). Each of these responses will be costly, either in out-of-pocket costs or in lost land and structures. For example, the cumulative cost of sand replenishment to protect the coast of Massachusetts from a 20-inch sea level rise by 2100 is estimated at $490 million to $2.6 billion.

Water Resources

Water resources are affected by changes in precipitation as well as by temperature, humidity, wind, and sunshine. Changes in streamflow tend to magnify changes in precipitation. Water resources in drier climates tend to be more sensitive to climate changes. Because evaporation is likely to increase with warmer climate, it could result in lower river flow and lower lake levels, particularly in the summer. If streamflow and lake levels drop, groundwater also could be reduced. In addition, more intense precipitation could increase flooding.

Future Sea Level Rise At Woods Hole, Cape Cod



Source: EPA (1995)

Western Massachusetts drains to the Connecticut River, and the eastern parts of the state drain directly to the Atlantic Ocean. Relatively little of the flow of the Connecticut River originates in Massachusetts, but it is the source of much of the water supply for the Boston metropolitan area. The flow of the Connecticut is strongly affected by winter snow accumulation and runoff from Vermont and New Hampshire. A warmer climate would lead to earlier spring snowmelt, resulting in higher streamflows in winter and spring and lower streamflows in summer and fall. However, warmer summer temperatures could increase water quality problems because of increased evaporation (which concentrates pollutant levels) and more favorable conditions for algae and other water organisms. Increased rainfall could mitigate these effects, but it also could contribute to localized flooding.

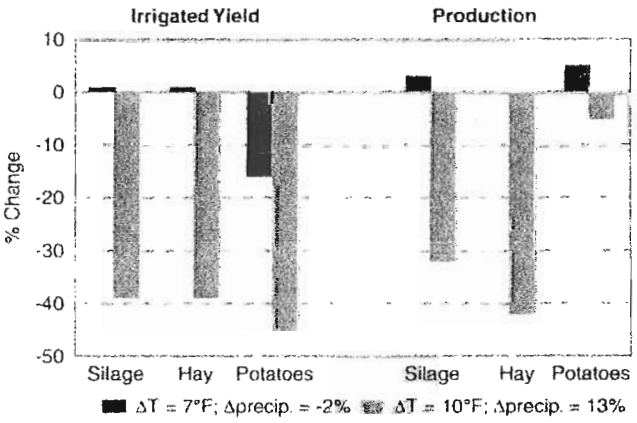
Agriculture

The mix of crop and livestock production in a state is influenced by climatic conditions and water availability. As climate warms, production patterns could shift northward. Increases in climate variability could make adaptation by farmers more difficult. Warmer climates and less soil moisture due to increased evaporation may increase the need for irrigation. However, these same conditions could decrease water supplies, which also may be needed by natural ecosystems, urban populations, industry, and other sectors.

Understandably, most studies have not fully accounted for changes in climate variability, water availability, and imperfect responses by farmers to changing climate. Including these factors could change modeling results substantially. Analyses that assume changes in average climate and effective adaptation by farmers suggest that aggregate U.S. food production would not be harmed, although there may be significant regional changes.

In Massachusetts, agriculture is a $500 million annual industry, three-fourths of which comes from crops. Very little of the crop acreage is irrigated. The major crops in the state are silage, hay, and potatoes. Climate change could change crop yields little or cause them to fall by as much as 45%, leading to changes in acres farmed and production. For example, potato yields could decrease while production rises because of an increase in potato acres farmed.

Changes in Agricultural Yield And Production



Source: Mendelsohn and Neumann (in press); McCarl (personal communication)

Forests

Trees and forests are adapted to specific climate conditions, and as climate warms, forests will change. These changes could include changes in species, geographic range, and health and productivity. If conditions also become drier, the current range of forests could be reduced and replaced by grasslands and pasture. Even a warmer and wetter climate could lead to changes; trees that are better adapted to warmer conditions, such as oaks and pines, would prevail. Under these conditions, forests could become more dense. These changes could occur during the lifetimes of today's children, particularly if change is accelerated by other stresses such as fire, pests, and diseases. Some of these stresses would themselves be worsened by a warmer and drier climate.

Although the extent of forested areas in Massachusetts could change little because of climate change, a warmer climate could change the character of those forests. Maple-dominated hardwood forests could give way to forests dominated by oaks and conifers, species more tolerant of higher temperatures. This change would diminish the brilliant autumn foliage as the number of maple trees declines. Across the state, as much as 30-60% of the hardwood forests could be replaced by warmer climate forests with a mix of pines and hardwoods.

Ecosystems

The coastal beaches and tidal marshes of Massachusetts are especially sensitive to the effects of sea level rise and changes in river flows. Sea level rise could inundate coastal wetlands, destroying habitat for commercial and game species as well as migratory birds and other wildlife. Barrier beach island refuges such as the Monomoy National Wildlife Refuge south of Cape Cod and the Parker River National Wildlife Refuge in northeastern Massachusetts could be threatened or lost. These refuges provide important habitat for migratory birds, including the threatened piping plover and the endangered roseate tern. Harbor and gray seals, which use beaches as refuge in the winter, also could lose habitat if sea levels rise.

Forests and woodlands support much of the wildlife in the state. Climate change could result in changes in these ecosystems. Fragmented land use patterns could impede migration of some plant species, resulting in loss of some native plants and increases in non-native plants. Changes in rainfall and runoff could change sediment levels in streams and wetlands, thus affecting fish and aquatic habitats.

For further information about the potential impacts of climate change, contact the Climate and Policy Assessment Division (2174), U.S. EPA, 401 M Street SW, Washington, DC 20460.

MA wildlife 21 oct 2002

Invoking A Vision for Our Forests

by Robert O'Connor

Forests are among the Commonwealth's greatest and most abundant natural resources, supporting wildlife, the economy and outdoor recreation while protecting and purifying our air and water. The future of something so valuable and crucial to our health, culture, wildlife and landscape cannot be left to chance.With more than three of our five million acres covered in trees, Massachusetts is one of the most forested of all the states: the eighth most forested in fact, as well as the third most populated. There are few places in the world where so many people are surrounded by so much forest. Most of our forests have roots dating to the early 1900s. They are growing vigorously as they approach middle age — so vigorously that, from 1985 to 2000, the volume of wood contained in our forests increased by nearly 50%! In the part of the state west of Worcester County, the area that our forests cover actually increased by 2% over the past 15 years.

Although land development is proceeding rapidly in many regions of the state, the Commonwealth's state environmental agencies, in partnership with our land trusts, municipalities and federal agencies, have protected and opened to the public nearly 150,000 acres of open space over the past four years (50,000 more acres than were protected in the previous eight years). Much of that acreage is in forest. A recent study estimates that our forests generate a value of $1,500 per acre per year by contributing to our tourist economy, our forest and recreation industries, and by protecting and cleaning our water and air.

Sound like a pretty rosy picture? To the casual observer, Massachusetts forests certainly seem to be doing very well. Look more closely, however, and the future sustainability of our forests immediately comes into question.

From 1985 to 2000, Worcester County lost 54,000 acres of forest; the state as a whole lost nearly 100,000 acres. While this rate of loss is cause for apprehension, a matter of even greater concern is that the *pattern* of forest-destroying development is fragmenting our blocks of forest. This greatly reduces their value for wildlife and makes sustainable management of forests ever more difficult. For example, in the region north of Quabbin Reservoir (a relatively slow growing area in terms of development), the size of the average forest block declined from 1,100 acres to 800 acres in a recent 15 year period. This reduction allows detrimental "edge effects" (including invasive species, road mortality, and nest predators/parasites) from surrounding development to reach ever more deeply into our important "forest interior" habitats. Even more shocking are the results of a recent USDA Forest Service inventory of Massachusetts which found that 75% of the forest areas sampled on a statewide grid were within a quarter mile of development.

The continuing trend of dividing large blocks of forest into smaller and smaller parcels also makes it ever more challenging to manage the economics of the resource. It is estimated that an ownership any smaller than 15-20 acres is not economically viable as a "working forest." When parcels get smaller than this, commercial interest in any logging operation is markedly reduced. Smaller parcels also make the job of land conservation more complex and difficult. Think of it: would you rather attempt to

purchase a conservation restriction and/or put together a cooperative management plan for 200 acres of forest owned by one or two people, or dozens of people? Currently, there are more than 212,000 persons that own the 2.4 million acres of private forest land in Massachusetts — an average ownership of approximately 10 acres. According to the U.S. Forest Service, the number of people owning less than 50 acres of forest land has doubled since 1973.

While our forests continue to grow vigorously, the amount and percentage of important successional habitats is stagnant or declining. Early successional (young) forest, for example, is critical habitat for many species of birds and mammals, yet has steadily declined for decades. This habitat type made up 40% of our forests in 1960, but by 1985 it had shrunk to only 5%, and in the latest 2000 inventory it fell below 4%.

This trend indicates both an under-utilization of many areas of "working forests" and a tendency of continual "partial" cuts where the forest is rarely opened enough to allow significant areas of young forest growth to occur. For example, DEM cutting plan statistics for private and state land indicate that logging has occurred on nearly a half million acres of land since 1985. However, rather than adding early successional forest, the state lost this important habitat type during the same period.

Old forest habitat — tracts that are 150 years and older — compose much less than 1% of our forests. These "old growth" forests are not only inspiring to see, but also provide necessary habitat for certain lichens, forest herbs and invertebrate wildlife. Managing forests to maintain wildlife — biodiversity — will clearly require that we increase the percentages of these two successional stages in our forests.

As if these challenges were not enough, invasive exotic species — aggressive, non-native plants, forest insects and diseases — are threatening large forest areas by taking over space for native trees, shrubs and herbs, and by attacking our native forest trees. Invasive plants such as honeysuckle, barberry, and bittersweet are especially troublesome in forests that are close to suburban development. The wooly adelgid, a tiny insect native to Japan, is now menacing the survival of our hemlock forests. Though it has received the most publicity, it is only one among many insects and diseases capable of changing our forests in ways we can barely imagine.

With these threats and challenges as a backdrop, Bob Durand, Secretary of Environmental Affairs, pulled together a dozen people representing the state's forest advocates, landowners, scientists, educators, professional foresters, and conservation organizations. This group, led by David Kittredge, the University of Massachusetts' Extension Forester, quickly assessed the condition of the Commonwealth's forests and the many challenges their management presents. The group then agreed on a bold vision for Massachusetts forests. The vision included five key directives:

1. a systematic effort to make private forest ownership an effective alternative to land development
2. aggressive forest protection
3. inventory of large forests and related significant natural resources
4. establishment of a network of large forest blocks
5. evaluation and reorganization of the agencies that manage forests

In an effort to gain wider input into this "Forest Vision," the Secretary presented the group's findings to a public meeting of the Legislature's Special Commission on Forestry in the fall of 2001. This meeting was well attended and provided a wide range of ideas on how to implement the Forest Vision. The meeting also generated additional issues such as:

1. the impact of poor harvesting practices (such as "high grading" — the removal of only the most commercially valuable trees from a woodlot during a logging operation);
2. the need to revamp Chapter 61, the state's forest tax law, to make it more attractive to forest landowners (currently the acreage in this program is stagnant at between 10 and 15% of eligible forest land);
3. the need to increase forest management on state lands so that they can serve as a model for private
   landowners;
4. the need to expand local forest product markets, especially for species and trees with low or no commercial value. (Currently, many Massachusetts
   forest products are shipped to Canada and beyond, leaving the residents of one of the nation's most heavily
   forested states to import 98% of the wood and paper products they use!)

Secretary Durand began implementing a series of innovative programs to address the key vision elements shortly after the Forest Vision was presented. A new program, the Private Forest Land Initiative, was launched in the Tully River Valley north of Quabbin Reservoir, one of the largest unfragmented forests remaining in southern New England. Through this state-funded program, Mount Grace Land Conservation Trust and the New England Forestry Foundation negotiated to purchase Working Forest Conservation Restrictions (CR's) with hundreds of landowners in a four-town area. The CR's encouraged forest management that enhanced the wildlife habitat values of the forest while keeping the ownership in private hands. Nearly 9,000 acres in over 200 parcels have been protected through this program in less than two years. This model of "de-fragmenting" the forest landscape, in partnership with nonprofit organizations, is now being expanded to other heavily forested sections of the state.

To address the need to conserve a network of large forest blocks, the Secretary created the state's first bioreserve, recently codified by state law. The Southeastern Bioreserve is a partnership of Environmental Affairs agencies, the City of Fall River and the Trustees of the Reservations. This first bioreserve protected 4,000 acres of private land and 4,000 acres of city water lands, both adjacent to the 6,000 acre Freetown State Forest. A management plan for the entire 14,000 acres is near completion. The plan calls for active forest management to meet habitat goals, with more fragile sites set aside from active management. The bioreserve concept will be expanded to several other appropriate areas of the state (see article on page __).

The Secretary has made land conservation his top priority to address the need for aggressive protection of forest land from the threat of development. Over the past four years, nearly 150,000 acres has been protected, in partnership with conservation organizations, municipalities and the federal government. More than half of this acreage was protected using Conservation Restrictions (CRs). This approach respects the commitment of private individuals to properly manage forestlands. Ultimately, the bulk of the 2.4 million acres of private forest lands will be conserved and managed because of the good work of thousands of private landowners.

To address the need to inventory large forest areas and related significant natural resources, an Open Space Plan for Massachusetts was created in partnership with dozens of nonprofit conservation organizations and municipal and federal government natural resource staff. This plan includes forest areas mapped in over 25 statewide and regional conservation plans, including MassWildlife's BioMap, the Nature Conservancy's Forest Matrix study, and the Commonwealth Connections, Department of Environmental

Management (DEM) and the Appalachian Mountain Club's plan for greenways and trails in the state.

The Open Space Plan shows a network of large forest blocks connected by greenways. Secretary Durand set a goal of conserving an additional one million acres of land over the next 20 years, in partnership with land trusts, private forest landowners, municipalities, and federal agencies. The plan calls for one half of the land to be protected by conservation restrictions, once again emphasizing the importance of private land ownership.

To address the issue of increasing coordination of management of forest land held by the three state environmental land holding agencies, the Secretary has called on them to jointly undergo independent "green certification" under the auspices of the Forest Stewardship Council. This evaluation is already underway, led by a "Green Certification Team" of nationally renowned experts in silviculture, wildlife and landscape ecology, and forest economics. The team has been asked to specifically look at ways the three agencies can improve coordination, especially where they manage forests within the same landscape areas.

If successful, Massachusetts will be the first state to gain green certification of all state environmental lands held by the various forest, wildlife and watershed agencies. The report issued by the team will include a set of recommendations that must be implemented by the agencies in order to maintain this prestigious certificate.

While active forest management has occurred for decades on many areas of state land under DEM, MassWildlife and MDC (Metropolitan District Commission) control, it is generally agreed that sustainable forest management that would benefit the state's biodiversity and its local, rural, wood-based industries could occur on many more acres each year. Accomplishing such management has been hampered in the past by a lack of detailed forest management plans which outline how to implement sustainable management. Completion of forest management plans for all state forested lands has therefore been made a priority. The process has been accelerated through the funding of a forest inventory for MassWildlife's 110,000 acres, and a project to map the forests on DEM's 285,000 acres of land.

The forest plans that result will guide sustainable forestry and — where sensitive resources such as old growth forests and examples of a range of representative unmanaged forest types will add to the diversity of habitats across the landscape — will also set aside appropriate forested areas from management. Where planning has been completed, the DEM and MDC will supplement their existing staff of foresters and contract with licensed professional foresters across the state to implement forest management activities.

It is critically important that state agencies take the lead and set the example for sustainable forest management so that landowners won't have to go far to see its benefits. To supplement this effort, Environmental Affairs is funding the University of Massachusetts with $100,000 per year for 5 years in order to establish state-of-the-art demonstration forests on 2,000 acres of forests surrounding the Amherst campus. UMass, for its part, has filed legislation that will permanently dedicate these 2,000 acres to forest conservation.

Demonstration forests are well worth promoting across the Commonwealth. Noting that many communities within the state have their own "town forests," Environmental Affairs has initiated a program that will offer them forest stewardship plans and practices to protect and enhance water and wildlife resources in exchange for permanent conservation restrictions on these local forests. With nearly 500 parcels of municipal land totaling almost 20,000 acres classified as town forest, this program could create dozens of demonstration forests from the Cape to the Berkshires.

Addressing the need to make private forest ownership an effective alternative to land development, Secretary Durand is launching one of the most intensive outreach efforts to private forest land owners in the nation. Over the next two years, 7,000 persons owning approximately 500,000 acres of forest will be contacted and offered a free forest stewardship plan. These plans will be conducted by private licensed professional foresters. The initial contact letter will also contain a wealth of information on the benefits of good forest management and land conservation. This project is being conducted in partnership with several nonprofit conservation organizations — including the Trustees of the Reservations and the New England Forestry Foundation — that have committed to hold landowner workshops and offer landowners free estate planning (one of the most critical needs to achieve good land conservation).

This project will also be supplemented by federal funding from the new Farm Bill, which will greatly increase funding for the Forest Stewardship Program to offer landowners cost-sharing for forest practices called for in plans to protect water resources and enhance wildlife habitat. It is anticipated that federal funding will be on the order of $350,000 annually for the next 5 years.

Addressing the lack of local forest product markets, Environmental Affairs has launched a new grant program for local sawmills to fund pilot projects that find innovative new uses for low quality wood products. Environmental Affair's Watershed Initiative is also funding UMass to help Massachusetts' first forest landowner cooperative expand local markets for low quality products. The agency is also helping to fund feasibility studies for two future "biomass" projects — one at the Massachusetts Water Resources Authority's new drinking water treatment plant, and one for the Hampshire College Campus. The biomass projects have the potential to use thousands of tons of wood chips for heating, cooling and electricity at these facilities.

Biomass is an emerging technology that uses renewable forest products for commercial and industrial heating and electricity generation. It has the benefit of lower emissions than coal-fired plants, and unlike all fossil fuels, it actually produces a zero net emission of green house gases because it is generated from sustainable forest management. Additionally, biomass supports local green economies and avoids the environmental risks involved in shipping fossil fuels across the globe. Environmental Affairs hopes to find additional sources for biomass energy so that much more of the sustainable harvest of 1.4 million tons per year of low quality wood products can be utilized. Imagine the benefits to air quality, global warming, and the local green economies if even one of our "filthy five" coal-fired electric generating plants were replaced with local biomass!

Over the coming year, Secretary Durand has committed to make measurable progress on other important forestry issues raised through the Forest Vision public process. DEM staff are close to significant revisions to the Forest Cutting Act policy that will work to better educate landowners of the benefits of long-term forest management and the detriments of short term management practices (such as high grading). In the coming legislative session, Environmental Affairs will work with forest advocates to gain

consensus on key changes to Chapter 61 so that incentives for joining and staying in the program are increased. Through implementation of "Green Certification," agencies will move quickly toward more active sustainable management of state lands. MassWildlife will be actively working to increase the acreage in early successional forest cover to enhance and maintain biodiversity. By showcasing these types of management and management incentives, we can demonstrate the benefits to both biodiversity and local economies.

When people across the country think of forests, they probably think of Maine, Minnesota or Oregon. They should think of us, however: with 62% of Massachusetts in forest cover, we actually surpass two of those states in percentage of forested land! What are the benefits of sustainably managing our three million acres of forests?

Massachusetts can save its forests by putting them to work. Good forest management creates value for land activities other than sprawl development. Good forest management adds to the local green economy. By processing and manufacturing forest products locally, we enhance these economies and make Massachusetts more self-sufficient.

With well over half of our state covered with forests, we can do better than filling only 2% of our wood and paper needs locally. A realistic goal through increased management of state and private forest lands and reduction in demand for paper and wood products would be 40 - 50%. This ambitious goal is supported by analysis done by David Kittredge at UMass, David Foster at Harvard Forest, and by MassWildlife's own Chief Forester, John Scanlon. Just as the "buy local" mantra has been successful for the state's agricultural industry, the same approach can be applied to conserving and utilizing our forests. Through implementing aggressive stewardship forestry on private lands and moving closer to sustainably managing state lands, we can move towards better supporting local forest economies while enhancing the biodiversity, recreation and water supply values of our forests into the future.

Robert O'Connor is the Director of Land and Forest Policy at the Executive Office of Environmental Affairs. Prior to this appointment he was the Director of Natural Resources and the Superintendent of the Quabbin Section at the Division of Watershed Management within the MDC.