



Strategy for the Management of Invasive Species On Massachusetts Audubon Society Wildlife Sanctuaries October, 2011

This document outlines Mass Audubon's goals for managing invasive species on our sanctuaries and identifies the actions we will implement to understand and avert the threats invasive species pose to our sanctuaries and to prevent new and control existing invasions.

Introduction

In the United States, as many as 45% of federally listed endangered and threatened plant and animal species are threatened by invasive species¹. Although the economic cost of non-native invasive species are difficult to quantify, it has been estimated that they cause environmental damages of approximately \$120 billion per year in the United States². Nationally, invasive plants were estimated to infest 100 million acres in 1996 and were spreading across three million additional acres every year³.

Climate change and increased globalization have the potential to increase the spread of invasive species. The increasing globalization of trade increases the potential for the inadvertent spread of species to areas beyond their native range. The effects of climate change, including changes in temperature and precipitation and possibly an increase in the frequency and severity of wind, rain, snow, and ice storms, will stress ecosystems and create more frequent disturbance that may make ecosystems less resistant to invasion. Warming climate may allow non-native species that are limited by winter hardiness to spread northward, while longer and warmer summers may stress native species adapted to colder temperature regimes.

In Massachusetts, the potential effects of globalization of trade on the introduction and spread of invasive species has been illustrated with the discovery of Asian long-horned (*Anoplophora glabripennis*) beetle in Worcester in 2008. Asian long-horned beetle likely reached Massachusetts in infected wood products used for shipping containers for products produced in

¹ Wilcove, D., D. Rothstein, J. Dubow, A. Phillips and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *BioScience* 48:607-615. See also: Wilcove, D., D. Rothstein, J. Dubow, A. Phillips and E. Losos. 2000 Leading threats to biodiversity. In: *Precious heritage: The status of biodiversity in the United States*. The Nature Conservancy. Oxford University Press.

² Pimentel, D., R. Zuniga, and D. Morisson. 2004. Update on the Environmental and Economic Costs Associated with Alien-invasive Species in the United States. *Ecological Economics* 52(3):273-288.

³ Bureau of Land management. 1996. Partners against weeds – an action plan for the Bureau of Land Management.

China. The Asian long-horned beetle infestation in Worcester and surrounding communities resulted in the removal of nearly 30,000 infected or high-risk trees by the end of 2010. An additional 62,000 trees were treated with pesticide. Detection surveys, tree removals, and treatments will continue in 2011 and future years to protect susceptible native tree species from Asian long-horned beetle.

In recent years, Massachusetts has also seen the arrival of several invasive plant species previously largely restricted to more southerly areas, including Japanese stilt-grass (*Microstegium vimineum*), mile-a-minute vine (*Persicaria perfoliata*), and kudzu (*Pueraria montana*). While it is impossible to say that these arrivals were helped by warming temperatures associated with climate change, it is likely that a warming climate will open Massachusetts to non-native invasive species that currently do not thrive here due to present climate conditions.

In Massachusetts, the environmental and economic threat posed by invasive species has been acknowledged through a number of state actions, including the development of an Aquatic Invasive Species Management Plan and the banning by the Massachusetts Department of Agricultural Resources of the non-native plant species identified as invasive by the Massachusetts Invasive Plant Advisory Group. Massachusetts has also implemented biological control programs aimed at controlling the invasive species purple loosestrife (*Lythrum salicaria*), mile-a-minute vine (*Persicaria perfoliata*), hemlock woolly adelgid (*Adelges tsugae*), and winter moth (*Operophtera brumata*).

Definition: For the purposes of this strategy we define invasive species as non-native⁴ organisms that in certain circumstances are able to proliferate and significantly alter or degrade natural communities, or threaten native species, by displacement, superior competitive interactions, modification of ecosystem processes, or predation, or cause high mortality of native species.

Some common attributes of invasive species include high reproductive rates, effective dispersal abilities, vegetative or clonal reproduction, habitat generalists, a large range in area of origin, and high genetic variability. In determining which species we will consider invasive, we will be guided by criteria developed for Massachusetts, including those prepared by the Massachusetts Invasive Plant Advisory Group, the Massachusetts Aquatic Invasive Species Working Group, and other relevant information.

Scope: We also recognize the need for and importance of dealing with invasive species on a statewide basis and in a comprehensive manner through ecological management, research, education, and advocacy. Mass Audubon will not limit its efforts to address invasive species problems to sanctuary management, and will work to address the statewide threats that invasive species pose to biological diversity through education and advocacy. In some cases

⁴ Non-native organisms were not present in a region prior to European settlement of Massachusetts. As used in this document, non-native organisms may include organisms that were present in parts of Massachusetts prior to settlement that have extended their range within the state since the time of settlement due to human activities.

and in some locations, we may decide that addressing invasive species threats beyond the borders of our sanctuaries should take precedence over management activities on our own lands.

Premises

The following premises guided the development of this strategy:

- Eradication of all invasives on our sanctuaries is beyond the current or foreseeable capacity of Mass Audubon. We must therefore set priorities to ensure that our limited resources are effectively used to achieve invasive species management goals that will have the greatest positive ecological impact and avert the most significant invasive species threats to our sanctuary system. Examples of high levels of threat include invasive species that threaten rare species or rare or exemplary ecological communities.
- We recognize that our knowledge of the effects of invasive species on Massachusetts' natural communities and native species is incomplete. Although we lack complete information, we will manage invasive species in accordance with the goals set forth in this strategy, and we will modify our strategy as new information becomes available. We will promote research on our sanctuaries and elsewhere to better understand the ecological effects of invasive species and to identify effective management strategies.
- Invasive species management on Mass Audubon's sanctuary system will be implemented in accordance with the principles of adaptive management⁵ and an integrated pest management (IPM) approach. The feasibility of long-term success, maintenance requirements, and context within the surrounding landscape will be considered in assessing the value and priority of potential invasive species management projects.
- The presence of invasive species is often a symptom of underlying environmental changes, and frequently the result of anthropogenic disturbances. Management of invasive species will be undertaken with this in mind, and concerted efforts will be made to identify and address the underlying causes of invasive species problems.
- Invasive species management will be undertaken within the larger context of habitat management, restoration or enhancement. We recognize that much of the Massachusetts landscape has been altered by human activity and that few natural communities remain unaffected by this activity. Restoration of our landscape to pre-colonial conditions is not feasible. At times, we will actively manage for habitats, such as cultural grasslands, that are largely composed of non-native species because we desire to achieve specific conservation goals (i.e. providing habitat for grassland birds). Management that encourages non-native, but non-invasive species may sometimes be necessary to achieve these goals.

⁵ Adaptive management is a process where the results of management efforts are continually analyzed and the approach and methods are modified in accordance with what is learned from this analysis.

- Invasive species management efforts may also be undertaken where necessary to support or achieve important and clearly defined mission-related education and advocacy goals. In some cases, invasive species management projects may be implemented in support of program activities, such as maintaining specific habitat types where program activities are conducted.
- Invasive species are easiest to control before they become firmly and widely established. Therefore, implementing management measures aimed at eliminating or containing small infestations of invasive species before they become a serious threat is a high priority. Situations in which an invasive species is rapidly expanding will be a higher priority for management than those where invasive species populations are more stable.
- Mass Audubon will avoid management practices that are likely to encourage the establishment and spread of invasive species, such as the inadvertent dispersal of invasive species propagules by staff or vehicles. Measures to prevent the inadvertent spread of invasive species as a result of management measures or program activities will be implemented.
- Mass Audubon will seek to share our knowledge of invasive species ecology and management with other public and private entities and to make our sanctuaries examples of land stewardship. We also seek to learn from the experiences of others with shared conservation goals.
- We recognize that in some instances⁶, the use of pesticides⁶ may be necessary to achieve our invasive species management goals. Mass Audubon will regularly revise and update our policy on the use of pesticides to ensure that any such use will be in accordance with current best management practices and will only occur as part of an integrated pest management approach. Proposed pesticide uses will be carefully and thoughtfully reviewed and approved under the process established in our pesticide policy.

Goals

Mass Audubon establishes the following goals for invasive species management on our wildlife sanctuary system. These goals pertain only to the management of invasive species on our sanctuaries and not to other elements of the broader domain of ecological management, or with Mass Audubon efforts to deal with invasive species issues on a statewide basis through education and advocacy. They are not intended to signify that invasive species management should be the highest or only priority for ecological management on the Mass Audubon wildlife

⁶ Pesticides are defined as any substance or mixture of substances intended for preventing, destroying or mitigating any pest, including algicides, fungicides, fumigants, herbicides, insecticides, miticides, molluscicides, nematocides, rodenticides, defoliant, insect growth regulators, and plant growth regulators.

sanctuary system. Individual sanctuaries should use these goals as a guide for prioritizing their invasive species management efforts and goals.

- 1) Prevent the establishment of new populations of known or suspected invasive species, including species not yet common in Massachusetts but known to be invasive elsewhere. Where feasible, new populations of invasive species will be controlled before they can become well established and widespread. In assessing the feasibility of controlling new populations of invasive species, factors such as the likelihood of long-term success, level of ecological threat posed by the invasive species and resources and level of effort required for effective control will be considered before initiating control measures.
- 2) Protect from invasive species encroachment all known populations of endangered, threatened, and special concern species, as designated by the Natural Heritage and Endangered Species Program (NHESP), based on NHESP data as well as other sources of information, including staff knowledge, sanctuary inventories, and other relevant information. Information on rare or declining species or natural community types as identified in the Massachusetts State Wildlife Action Plan⁷, Mass Audubon's State of the Birds report, and other relevant sources will be considered in prioritizing invasive species management projects.
- 3) Protect rare and exemplary natural communities and suites of species from invasive species. The natural community classification system developed by NHESP⁸ and Core Habitat and Critical Natural Landscape as identified in BioMap 2⁹ will be used as a general guide for identifying priority communities. In general, all communities with S-rank¹⁰ designations S1, S2, and S3, and high quality examples of natural communities designated S4 and S5 will be protected from invasive species to the extent possible. The local and regional incidence of natural communities will be considered in prioritizing natural communities for protection. Efforts to protect natural communities from invasive species will not be limited to plant communities. Suites of rare or threatened non-plant species will also be protected.
- 4) Restore potentially high quality natural communities already degraded by invasive species where restoration is feasible, will have long-term benefits, and will not require significant ongoing maintenance, or where a long-term commitment to necessary maintenance is provided, giving priority to rarest communities in accordance with NHESP's S-rank and/or

⁷ Massachusetts Division of Fisheries and Wildlife. 2005. Massachusetts Comprehensive Wildlife Conservation Strategy. Massachusetts Department of Fish and Game. Revised September 2006.

⁸ Swain, P. C. and J. B. Kearsley. 2000. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, MA

⁹ Massachusetts Natural Heritage and Endangered Species Program and The Nature Conservancy. 2010. BioMap 2: Conserving the Biodiversity of Massachusetts in a Changing World. Commonwealth of Massachusetts and The Nature Conservancy.

¹⁰ S-rank is a system developed for Natural Heritage programs by The Nature Conservancy. S-rank reflects the community's rarity and threat within Massachusetts, with regard to its regional rarity and threat. S-ranks range from S1 (most rare and vulnerable) to S5 (most common and secure).

other relevant information, such as areas identified as Core Habitat and Critical Natural Landscape as identified in BioMap 2.

- 5) Protect actively managed habitats where such habitats are being maintained to support species, or suites of species that are uncommon or rare in Massachusetts, or to preserve biologically or culturally important or unique landscape features.

Based on these priorities, and in recognition of our limited resources for managing invasive species, and competing ecological management and land stewardship needs, we understand that in many locations, and under certain conditions, we will not manage invasive species. Examples include: occasional removal of invasive species from common or low-priority degraded habitats; removal of invasive species from areas where, due to surrounding conditions, reestablishment is highly likely; and management of invasive species where effective control measures are not available, or where risks and benefits are highly disputable. We will carefully evaluate all proposed invasive species management efforts to ensure that Mass Audubon's limited resources for invasive species management are being effectively allocated to achieve the greatest ecological benefit in accordance with the goals of this strategy. Low priority invasive species control measures may not be implemented if, after careful analysis, we find that they divert resources from higher priority invasive species management projects. We recognize, however, that in some cases, invasive species management projects with limited ecological value may be implemented as educational, training, or team building activities.

Implementation of this Strategy

Mass Audubon will do the following to implement this strategy:

Implementation Process:

- 1) Survey and Inventory Invasive Species on Sanctuaries: Mass Audubon will continue to survey its properties for the presence of invasive species. Surveys will be conducted at a minimum of every five years as part of the regular updating of rapid ecological assessments and ecological management plans that Mass Audubon prepares for all of its properties. Mass Audubon staff will be provided with training and identification materials that will assist them in identifying invasive species to allow them to better detect new invasions. A special emphasis will be placed on training to detect invasive species that are not yet common and widespread that are believed to constitute a significant potential threat to natural communities (e.g. Asian long-horned beetle, mile-a-minute vine).
- 2) Prioritize Invasive Species Management Projects: Invasive species management needs will be identified and prioritized in the rapid ecological assessments and ecological management plans Mass Audubon prepares for each property. Ecological management plans and rapid ecological assessments will include specific recommendations for invasive species projects that should be accomplished within the next five years.

- 3) Incorporate High Priority Invasive Species Management Projects into Annual Plans: Mass Audubon management units and staff will incorporate high priority invasive species management projects into annual work plans to ensure that they receive a high priority for implementation.

Implementation Measures and Practices:

- Seek Funding to Address Invasive Species Threats: Mass Audubon will seek grants and other funding assistance to implement invasive species management projects on its properties. Regional scientists and regional directors will assist in identifying invasive species project funding priorities in situations where multiple projects are eligible for limited grant funds.
- Train Staff and Volunteers to Detect Invasive Species Threats Early: To facilitate early detection of new populations of invasive species, Mass Audubon will provide training programs and materials to staff and volunteers to recognize invasive species already known to be present in Massachusetts and species believed to be potentially invasive should they become established here.
- Provide Guidance to Staff on Appropriate Measures to Manage and Prevent the Introduction and Spread of Invasive Species: Mass Audubon has provided guidelines to staff on measures to control and prevent the introduction and spread of invasive species and will continue to update this information and provide it to staff in an easily accessible format. Information on prevention and management developed by Mass Audubon will be shared with conservation partners and the public.
- Employ Volunteers to Assist in Invasive Species Management: Mass Audubon will continue efforts already underway at sanctuaries to engage volunteers in invasive species management. We will develop and implement programs that inform volunteers of invasive species and ecological management issues, provide a hands-on ecological management opportunity and training for participants, and generally support Mass Audubon's conservation and habitat protection goals.
- Prepare Guidance to Address Specific Invasive Species Threats: Mass Audubon will prepare guidance documents to assist staff in dealing with specific invasive species threats on an as-needed basis. For example, Mass Audubon has prepared guidance on addressing hemlock woolly adelgid and associated hemlock decline on Mass Audubon properties.
- Incorporate Invasive Species Issues into Education and Advocacy Programs: Where feasible, our sanctuaries should be used as classrooms to educate members, the local community and the general public on the ecological effects of invasive species and management needs and measures. Education and advocacy efforts should be implemented in a manner that

supports sanctuary and statewide invasive species management priorities consistent with this strategy.

- Partner to Enhance Invasive Species Management Efforts: Mass Audubon will share information on invasives species management with other conservation landowners, academic institutions, and government agencies and where deemed appropriate will partner with other landowners and in regional initiatives to address invasive species threats.
- Share Resources to Address High Priority Invasive Species Management Needs: Mass Audubon will encourage and facilitate the sharing of resources, including labor, equipment, and expertise, among sanctuaries and regions to expedite the implementation of high priority invasive species management projects. Existing invasive species management resources (equipment, personnel with specialized knowledge and skills) will be identified and made known to all sanctuaries.
- Identify Invasive Species Research Needs and Priorities: Mass Audubon will identify and regularly review and update invasive species research needs and priorities and make these needs known to staff and outside researchers.
- Monitor the Effectiveness of Invasive Species Management Practices: Mass Audubon will evaluate the effectiveness of management actions in controlling invasive species and in achieving the management goal of maintaining or restoring a native ecological community. It is not feasible to do detailed monitoring of all projects, but all projects should have at least some evaluation component. An assessment of the success is an integral part of adaptive management.

Strategy Evaluation

Mass Audubon will evaluate and update this strategy from time to time as deemed necessary to respond to changing threats and conditions. Mass Audubon will track invasive species management projects implemented in its annual plan and report results at the end of each fiscal year.