



Strategic Plan
2012 - 2016
For The
Saint Lawrence – Eastern Lake Ontario
Partnership for Regional Invasive Species
Management

SLELO - PRISM



Partnership For
Regional Invasive
Species Management

Acknowledgements

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Strategic Planning

The purpose of strategic planning is to set overall goals for our program and to develop a plan to achieve them. It involves stepping back from everyday activities and asking where a program is headed and what its priorities should be.

Toward that end, over 30 partners have participated in planning sessions to define the future of the program including setting priorities for the coming years. Two Break-Out Groups were formed to focus on specific goals. In addition, representatives from each of the two groups served on a special team to develop program implementation tools.

Cover Photos

From top:

Swallow-wort, Purple Loosestrife, Japanese Knotweed, Buckthorn, Emerald Ash Borer, Water Chestnut.

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Introduction

Invasive species of plants, animals, insects and microorganisms are among the most serious threats to native species, habitats, ecosystems and public health within the five county area that defines the St. Lawrence Eastern Lake Ontario (SLELO) Region. Invasive species are opportunistic and almost always out-compete, damage or displace native species resulting in serious disruptions of ecosystem processes. Interdependency on food and habitat, hydrology, nutrient cycling, natural succession, soil erosion and water quality are among the processes impacted.

Invasive species affect almost all aspects of our culture. They interfere with many types of outdoor recreation. They reduce crop yields and interfere with harvest operations on local farms. Along public roads and highways, invasive plants restrict visibility and create roadside hazards. Invasive insects and diseases kill trees in forested areas as well as along community streets. Some invasive species have a direct negative impact on public health.

The economic impact of invasive species in the United States has been estimated at 120 billion annually, (Pimentel, et. al.2004). Local communities have been challenged with controlling invasive species or remediating their impacts at costs ranging from several thousand to millions of dollars. The economic, cultural and ecosystem impacts resulting from invasive species invasions, signify the need for New York's PRISM's (Partnerships for Regional Invasive Species Management) and thus the SLELO PRISM.

By addressing the threat of invasive species through a combined sharing of resources, PRISMs and other community partnerships can have tangible and lasting affects in the mitigation of the negative implications caused by invasive species.

Problem Statement

According to the New York Invasive Species Council web site, an invasive species is a species that is: 1) nonnative to the ecosystem under consideration, and; 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. As a threat to our biodiversity, they have been judged second only to habitat loss. Invasives come from all around the world and as the rate of international trade increases so do opportunities for introducing new invasive species.

Invasive species have caused many problems in the past, are causing problems now, and pose threats to our future. A wide variety of species are problematic for many sectors of our society including ecosystem impacts on both natural systems and managed systems such as forests, our food supply, including not only agriculture but also harvested wildlife, fish and shellfish and our man made environments, including landscaping, infrastructure, industry, gardens, and pets. Invasive species have implications, too, for recreation and for human health. In the SLELO region, invasive species are having a negative effect on sensitive ecosystems (lands and waters) and are causing economic harm and public health concerns.

In 1999 there were approximately 50,000 foreign species in the United States and this number increases each year. About 42% of the species on the Threatened or Endangered species lists are at risk primarily because of non-indigenous species (Pimentel 2004).

In the history of the United States, non-native species are introduced into the United States both intentionally and accidentally. Introduced species, such as corn, wheat, rice, and other food crops, and cattle, poultry, and other livestock, now provide more than 98% of the U.S. food system. Other exotic species have been introduced for landscape restoration, biological pest control, sport and as pets. Some non-native species, however, have caused major economic losses in agriculture, forestry, and several other segments of the U.S. economy, in addition to harming the environment.

Estimating the full extent of the damages caused by invasive species and the number of species extinctions they have caused is difficult due in-part to the lack of comprehensive understanding. Nonetheless, about 400 of the 958 species that are listed as threatened or endangered under the Endangered Species Act are considered to be at risk primarily because of competition with and predation by non-indigenous species. Many other species worldwide that are not listed are also negatively affected by invasive species and/or ecosystem changes caused by alien species.

Estimating the economic impacts associated with invasive species in the United States is also difficult; nevertheless, enough data are available to quantify some of the impacts on agriculture, forestry, and public health. (Wilcove et al. 1998).

Whole Systems

Nature is a whole system. It is a complex community, an economy, a dynamic interlinked family and many other things. Whole systems encompass the geographical and ecological complexities

found in natural landscapes which include the interactions of people (Ward et al., 2011). The size of a whole system is typically defined by its dominant ecological features and functions and therefor may cover an extensive geographic area such as the Great Lakes or the Central Appalachians. Among the many considerations of whole systems are ecological processes which are interlinked and altering one may intern alter or affect the other therefor affecting the whole system.

Invasive species can and do affect whole systems. The Great lakes are affected by aquatic invasives for example as are large scale forested areas within the Great Lakes watershed by other invasives. Strategies that are implemented at the local or regional level to prevent and/or manage invasive species often affect or are affected by strategies that take place at the whole systems level. While preparing this strategic plan, the whole systems concept has been considered where appropriate.

Partnerships for Regional Invasive Species Management (PRISM)

Invasive species are defined by Environmental Conservation Law (9-1703 (1) as non-native to the ecosystem under consideration; and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. They are a form of biological pollution that comes from all around the world and the rate of invasion is increasing due to increasing international trade. A wide variety of species negatively impact many sectors of our global community including our ecosystems, our food supplies, our economies and human health.

Responding to the growing invasive species problem, New York State passed legislation in 2003 that created the New York Invasive Species Task Force (ISTF). The ISTF final report led to a 2008 statute, known as Title 17 of ECL Article 9, which established the New York Invasive Species Council and Invasive Species Advisory Committee. The Council is co-led by the NYS Departments of Environmental Conservation (DEC) and Agriculture and Markets.



Above: Eight Proposed PRISM's for NYS)

Among the Council's numerous statutory responsibilities is the requirement to encourage and support within available funds, Partnerships for Regional Invasive Species Management [PRISMs] in their efforts to address invasive species through coordination, recruitment, and

training of volunteers, education, early detection, rapid response, eradication, research, and planning.

The purpose of this document is to outline a strategy by which the SLELO-PRISM will employ to prevent the introduction of invasive species, detect and respond to new infestations and control existing populations of prioritized invasive species within the SLELO focus area. The priorities to accomplish these objectives are outlined within this strategy.

DESCRIPTION OF SLELO PRISM REGION:

Geographic Region – SLELO

The PRISM encompasses a 7,387 square mile region and includes the counties of St. Lawrence, Jefferson, Lewis, Oneida and Oswego outside of the Adirondack Park. The SLELO region includes portions of the Lake Ontario watershed and shoreline and the Oneida Lake northern watershed. The northern and western end of the region corresponds to the county boundaries of Jefferson, St. Lawrence and Oswego Counties along the Lake Ontario coastline.



Above: Five Counties Representing the SLELO-PRISM

The eastern and southern boundaries correspond to the county boundaries of Oneida and Lewis. Both the western and northern portions of the SLELO region are contiguous international borders.

SLELO-PRISM Population by County U.S. Census Bureau 2010	
St. Lawrence	111,944.00
Jefferson	116,229.00
Lewis	27,087.00
Oneida	234,878.00
Oswego	122,109.00
Total	612,247.00

Natural Resources

The SLELO-PRISM region is a region rich with natural resources. Prominent geographical features found throughout the region have generated a vast diversity of habitat, landscapes, plant and animal life. Some of the more prominent natural features include; the Tug Hill Plateau, the Lake Ontario Shoreline and the St. Lawrence River. To the east (and bordering) the SLELO region is the Adirondack Park.

Other prominent natural features include numerous wildlife management areas and preserves, inland lakes, rivers, wetlands and fens. These resources support diverse terrestrial and aquatic habitats including nesting and spawning areas.

The five county PRISM region supports a nominal forest industry (Table 1). The areas forests and trees add immensely to the quality of life for the people of the region as well as providing healthy and diverse habitat. These forested lands filter the air, safeguard private and public drinking water sources, produce locally grown forest products including lumber and maple syrup, provide essential habitat for wildlife, and moderate summer and winter temperatures near homes. Forests and trees are integral to the character of the SLELO region. They also provide a spectacular annual display of fall color across our landscape.

Table 1 – Forested Land in the SLELO Region

County	Forested land (acres)**	Land Area (square miles)*
St. Lawrence	1,274,000.00	2,680.00 square miles
Jefferson	401,000.00	1,268.00 “
Lewis	617,000.00	1,274.00 “
Oneida	455,000.00	1,212.00 “
Oswego	428,000.00	951.00 “
Total	2,789,000.00	2,796,385.00

*2010 U.S. Census

**USDA Forest Service. Resource Bulletin NE-132. 1993.

Freshwater resources are abundant in the SLELO-PRISM area and include hundreds of miles of rivers and tributaries, inland lakes and reservoirs and the Lake Ontario Shoreline which includes numerous harbors and embayments. These aquatic environments are an important part of the SLELO landscape supporting diversity of aquatic flora and fauna.

Agricultural land use within the SLELO five county region includes approximately 1,043,200.00 acres or 6% of the total land area. A county breakdown is presented in Table 2.

Table: 2 – Agricultural Land Use in the SLELO Region.

County	Acres in Agriculture
St. Lawrence	338,900.00
Jefferson	255,900.00
Oswego	97,700.00
Lewis	163,200.00
Oneida	187,500.00
Total	1,043,200.00

Source: USDA National Agricultural Statistics Service, 2010.

PARTNERSHIP STRUCTURE:

The SLELO partnership consists of any organization that has an interest in our mission. For organizational purposes our partnership has three levels: Principle Partners (those organizations with the greatest vested interests with our mission), At-Large Partners (representatives from each of the five counties within the PRISM), and Cooperating Affiliates (any organization that takes an active interest and a desire to cooperate on SLELO endeavors). In addition, the Principle Partners make up the SLELO Steering Committee and the At-Large Partners make up the SLELO Advisory Committee. Current partners are presented in Table 3 below.

Table 3 – Current SLELO Partners

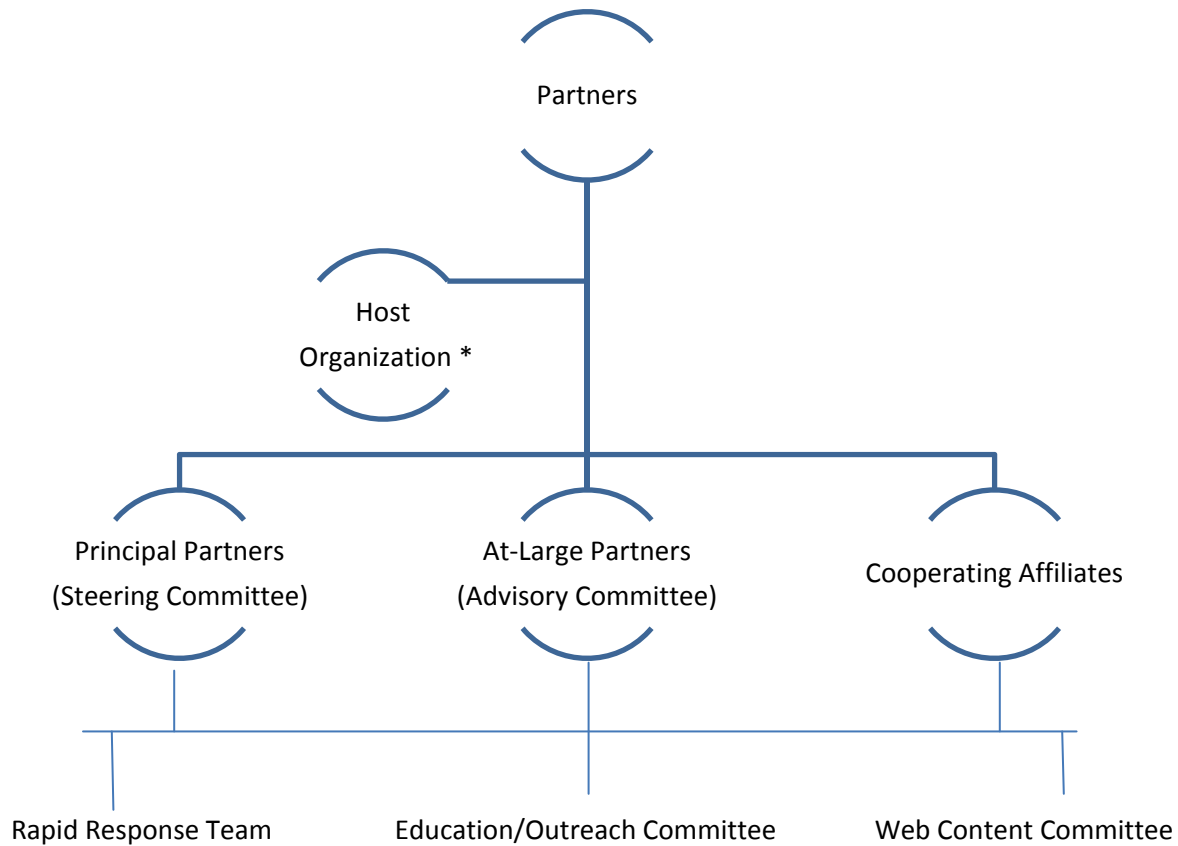
Principle Partners (Steering Committee)	At-Large Partners (Advisory Committee)	Cooperating Affiliates
NYS Dept. of Transportation	St. Lawrence County Representative	Ducks Unlimited
NYS Dept. of Environmental Cons.	Jefferson County CCE	Tug Hill Tomorrow Land Trust
The Nature Conservancy	Lewis County Representative	Tug Hill Commission
Cornell Coop. Extension ISP	Oneida County Representative	Fort Drum Military Installation
NYS Parks, Recreation & Hist. Pres.	Oswego County Representative	Lake Bonaparte Conservation Club
NYS Sea Grant		Save The River Organization
USDA or NYS Ag & Mkts. ?		Audubon Central NY Chapter
		Thousand Island Land Trust

Responsibility of Partners and Committees

As a whole, the PRISM is managed as a cooperative effort between the program coordinator, the host organization and the partners. As partners of the SLELO-PRISM, each partner is expected to support and participate with PRISM activities based on the respective organizations mission and resources and to provide expertise to the PRISM. Principle partners act as the steering committee to provide initial reviews of things such as our annual work plan or project contracts and to provide general recommendations to the partnership as a whole, but not to make final decisions. Ultimately it will be our entire partnership that provides input and makes decisions for the PRISM based on consensus. Involving the entire group as an “open partnership” is how programs grow, expand and sustain themselves.

At large partners act in an advisory capacity should the need arise and cooperating affiliates participate with projects and activities based on need and desire.

SLELO - PRISM Organization and Committees



**Central and Western New York Chapter of The Nature Conservancy*

SLELO PRISM MISSION;

The mission of the SLELO PRISM is to protect native habitats, biodiversity, natural areas, parks and refuges, habitats, waterbodies, farmland and open space by using a collaborative and integrated approach to invasive species management. The emphasis of these activities will be on prevention, early detection, rapid response and education.

SLELO PRISM VISION;

Within five years our PRISM will have the capacity to effectively address invasive species issues within the five county region through cooperation and partnerships to include; active invasive species management, public awareness and participation and community engagement. (SLELO Partnership Questionnaire, 2011).

OVERVIEW OF INVASIVE SPECIES PROBLEMS AND PATHWAYS

Many invasive species found within the SLELO region have and continue to have detrimental impacts on the region. Invasive species of plants, animals, insects and microorganisms are among the most serious threats to native species, habitats, ecosystems and public health. They interfere with outdoor recreation in parks, on waterways, and in other natural areas. On local farms, invasive plants reduce crop yields and interfere with harvest operations (Young 2011). Along public roads and highways, invasive trees and shrubs restrict visibility and create dangerous roadside hazards. Invasive species kill trees in forested areas as well as along community streets. Other species have a direct and negative impact on public health. The following are some of the common problems and species within the SLELO region.

Forest Pests and Pathogens

Forest cover in the SLELO Region occupies 3,229,541.00 acres of the land base (USDA Forest Service Resource FIA 2010). These forests have tremendous ecological and economic importance. Forests are relied upon for industry, recreation, clean drinking water, and biodiversity. The trees in this region are threatened by the negative impacts of the Emerald ash borer (EAB), the Asian long-horned beetle (ALB) and the sirenix wood wasp. EAB and ALB are of particular concern to this region due to the abundance of ash and sugar maple trees. In the five counties that make up the SLELO region, Ash makes up approximately 6% of the forest area and red and sugar maples makes up approximately 31% of the forested area (USDA FIA 2010).

Terrestrial Invasive Plants

The threat of invasive plant species to forest ecosystems of the SLELO Region in Northern New York has not been well documented. A 2006 study by the Eastern Chapter of The Nature Conservancy assessed the distribution and threat of 12 invasive plant species to forest and aquatic ecosystems in the nearby Catskill Mountains and identified factors that best predicted their distribution. Species considered during the study were chosen because they are known to be invasive in New York State and have the potential to occur in the Catskill Mountains. They included: Norway Maple (*Acer platanoides*), Garlic Mustard (*Alliaria petiolata*), Japanese Barberry (*Berberis thunbergii*), Asiatic Bittersweet (*Celastrus orbiculatus*), Autumn Olive (*Elaeagnus umbellata*), Japanese knotweed (*Polygonum cuspidatum*), Bush Honeysuckle (*Lonicera* spp.), Purple Loosestrife (*Lythrum salicaria*), Common Reed (*Phragmites australis*), Buckthorn (*Rhamnus* spp.), Multiflora Rose (*Rosa multiflora*), and Black Swallow-wort (*Vincetoxicum nigrum*).

Other (non-forest) terrestrial invasive plants are affecting the health and biodiversity of non-forested areas. Examples include Pale and Black Swallow-wort, Giant Hogweed and Purple Loosestrife. Swallow-wort adapts well to almost any soil type and growing conditions. Giant Hogweed tends to become established in disturbed areas such as roadsides. Purple Loosestrife prefers hydric soils typically found near streams, wetlands and roadside drainage ditches.

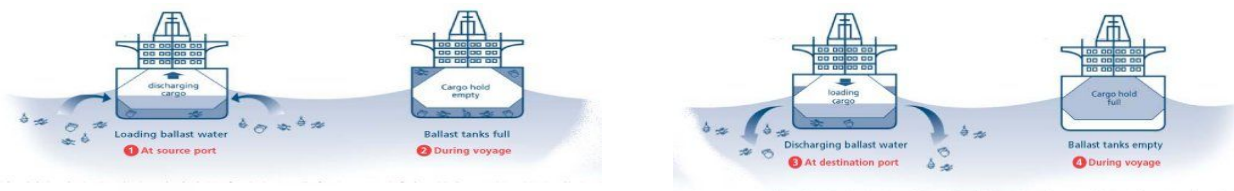
Aquatic Invasive Species

The SLELO PRISM region is home to both aquatic plant and aquatic animal species. Several aquatic plant species include: the Water Chestnut (*Trapa natans*), Eurasian Water Milfoil (*Myriophyllum spicatum*) and Frogbit (*Hydrocharis morus-ranae*). Although not documented Didymo (*Didymosphenia geminate*) is believed to be threatening the Lake Ontario shoreline. Several aquatic animal species documented include: Spiny Waterflea (*Bethotrepes cedarstroemi*), Fishhook Waterflea (*Cercopagis pengoi*), Zebra Mussel (*Dreissena polymorpha*), Quagga Mussel (*Dreissena bugensis*) and Round Goby (*Neogobius melanostomus*). The Bloody Red Shrimp (*Hemimysis anomala*), Chinese Mitten Crab (*Eriocheir sinensis*) and Ruffe (*Gymnocephalus cernuus*) are expected to be in Lake Ontario and St. Lawrence River waters soon. Two unique features in the SLELO PRISM region include Lake Ontario and the St. Lawrence River which encompass the entire western and northern portions of the region. This is an important aspect since the lake and river (both international waterways) are prime vectors for the introduction and import/export of invasive species (Kate Breheny, 2012).

PATHWAYS:

Pathway - Bilge/Ballast Water

Commercial ships and boats traveling Lake Ontario and the Great Lakes have probably been one of the primary vectors for moving aquatic invasive species. Historically, organisms may have attached themselves directly to the hulls of vessels. In recent years, ballast water has received increasing attention as a vector. Post-transport ballast water contains high densities of both plankton, fish and microscopic organisms. Ballast tanks may hold millions of liters of water allowing numerous individuals to be introduced in a single event. (Roman 2010).



The loading of ballast water. (Image courtesy of the international Maritime Organization)

Pathway - Ports of Entry

Many invasive species enter the United States each year in cargo, mail, and passenger baggage or as contaminants of commodities. In today's global marketplace, the volume of international trade brings increased potential for these invaders to enter our country. Agricultural produce, nursery stock, cut flowers, and timber can harbor insects, disease-causing microorganisms, slugs, and snails (APHIS 2010). These pests can also hitchhike on containers, crates, or pallets and enter the SLELO region via ports of entry (POE's). In the SLELO region direct POE's include; the St. Lawrence River, Oswego Harbor, Henderson Harbor, Cape Vincent and international roadways extending from Canada. Indirect POE's include all international and national airports and the New York City Harbor.

Pathway - Roads and Corridors

Roads and utility corridors that bisect the landscape move invasive species from one location to another. New road construction as well as re-construction can contribute significantly to the spread of invasive species. Maintenance of roadways can also play a critical role in spreading invasives along roadsides and right-of-ways. (Miller, 2011). Mowing and ditching equipment and processes can spread seeds by deflection as well as by transporting equipment from one location to another without thorough cleaning.

Both the construction of and maintenance of utility corridors can be a vector for transporting invasive species. Overhead and subsurface corridors require frequent maintenance which creates disturbed areas allowing invasives to become established. The movement of equipment supplies the transport mechanism.

Pathway – Firewood

Forest pests and pathogens pose a major threat to the health of the forest ecosystems and economy in the region. Movement of firewood and other wood products is considered the primary vector. With the threat of the Emerald Ash Borer advancing into our region along with the threat of the Asian Long-horned Beetle, educating the public and local communities will become increasingly important.

Pathway - Boating and Fishing Gear

Recreational boating and fishing is an important pathway for the movement of aquatic invasive species. Boats are known vectors of aquatic plants and animals and standards for boat cleaning are only in place on a limited number of water bodies. The aquatic invasive diatom *Didymo* can easily be spread by droplets of water on fishing gear and can persist in the moisture of felt-soled boots over long periods (M. Taylor 2011).

Pathway - Fishing and Bait:

Biologists have recognized “bait bucket introductions” as a common means of spreading aquatic invaders. One example is the Rusty Crayfish (*Orconectes rusticus*). Native to the central and midwest United States, the Rusty Crayfish has spread to other states to include New York, Massachusetts, New Jersey and Pennsylvania. This species was likely spread by anglers who transported them for use as fishing bait, largely via bait buckets. The rusty crayfish is larger than most native crayfish, so it outcompetes them, and its size makes it unattractive prey for many fish. It also destroys the aquatic plant beds that serve as cover and food for other aquatic organisms, as well as nursery habitat for sport fish. In addition, rusty crayfish prey on fish eggs, further harming local fish populations (Don’t Dump That Bait, 2011).

Pathway - Soil Transport and Land Development:

Soil is often imported and/or exported to and from development sites based on need. The movement of fill or soil from one site to another can spread invasive plant propagules both within the region and from other regions into this area. Japanese Knotweed and Phragmites are commonly brought to new areas in this way because of the ability of the plant to reproduce from tiny fragments of virtually every part of the plant. These fragments can take root in areas and establish new populations in areas previously free of these plants. Seeds are also contained in untreated soil, allowing for long-distance transportation of any invasive plant.

Land development is occurring in areas within the SLELO region in-part due to the pressure to provide housing, services and transportation routes for the Fort Drum army base. In addition, areas of the region especially along the eastern shores of Lake Ontario known for its prevailing winds are being considered for several large wind power projects. All these projects along with others have the potential to promote the spreading of invasive species through the transmission corridors, heavy equipment usage and transport and/or ground disturbance. The lack of or improper cleaning of equipment prior to transport also contributes to the spread of invasive species (Rainbolt, 2012).

Pathway – Recreation

Seeds from invasive species can stow away on hiking boots, waiters, clothing, tires, bumpers, wheel wells or the underside of vehicles and equipment used in recreational activities. These seeds can be transported great distances before falling off in a new location. Activities such as stream fishing, trail hiking, hunting, ATV riding and other activities can be a significant mechanism for transporting aquatic and terrestrial invasive species.

Pathway - Nurseries and Landscaping

Historically, the nursery industry has brought invasive ornamental plants to new areas. Known invasive species such as barberry and Burning Bush are still commonly planted in the region. Inadvertent introduction of invasive pests may also occur in the movement of plants and plant materials. The emerald ash borer was introduced to Maryland in infested saplings.

Pathway - Commercial/Retail

Some aquatic invasives can be linked to the commercial and retail industry. These include the aquarium industry, retail sales in live fish markets and ornamental water garden plant sales. Often, these exotic plant and animals are released into ponds, lakes and streams when the owner no longer wants to care for them or the fish outgrow their surroundings.

Live fish markets have also been linked to the introduction of non-native fish species, including the snakehead fish and several varieties of carp. Since some species cannot survive in small tanks for extended lengths of time, market owners have been accused of discarding them in local waterbodies when the fish are not sold quickly (LaManche, 2007).

Pathway - Natural Spread

Natural spread can be achieved via wind dispersal mechanisms of various terrestrial plants. Streams carry plant materials and animals throughout a watershed via natural hydraulics. Insects will naturally disperse by flight. (Taylor, 2011). Seeds can also be spread by animals in undigested feces.

CAUSES / KNOWN STRESSORS, PROBLEMS, THREATS

Ecosystem Disturbance Terrestrial and Aquatic):

Invasive species become easily established in disturbed areas. Disturbed areas provide less competition, increase soil temperatures and sunlight which create an opportune situation for the establishment of invasives.

In many cases, land disturbance either by development or natural causes can create disturbed areas within ecologically important areas such as preserves, wetlands, wildlife management areas and important aquatic ecosystems. Development of land including infrastructure development can play an active role in transporting invasive species seed stock. In aquatic ecosystems, native plants and organisms can be displaced by invasives due to hydrologic changes and changes in the benthic composition.

Declining Forest Health:

Forest health can be impacted by deer populations and overgrazing which reduces forest regeneration and creates an opportunity for invasives to become established.

Forest Fragmentation:

Fragmentation may also create an underlying problem that increases edge effects in forests. Many successful invasive plants are adapted for edge environments, such as vines like Asiatic Bittersweet and Porcelain Berry.

Changes In Land Use;

Since many invasive species are fast-growing and highly opportunistic, changes in land use generally favors biological invasion. Cleared areas and newly established agricultural areas can create ideal conditions that allow for the introduction of invasive species. Even abandoned agricultural areas may be susceptible to an invasion before natural succession can restore the local plant community. In addition, changes in land use practices can accelerate or exacerbate the spread of invasive species. Certain land use practices, such as overgrazing, fertilization, and the use of agricultural chemicals, can enhance the growth of invasives while suppressing native species. Other species have the ability to alter fish and wildlife habitat, contribute to decreases in biodiversity, and even create health risks to livestock and humans.

Climate Change:

Climate change may also alter the amount and seasonal distribution of precipitation and seasonal temperature patterns in ways that can favor invasive species. Stressed communities are more open and their resources are ripe for the invasion and establishment of invasive plant species. The invaders may also be better adapted than native species to the new environmental conditions resulting from climate change.

International Borders :

The SLELO PRISM region is located along the eastern shores of Lake Ontario and the St. Lawrence River. Being part of the Great Lakes allows for international movement of commercial vessels and goods as well as recreational vessels. This creates a stressor by exposing our region to those invasive species that may be introduced into our area as a result of international movement. The northern portion of the SLELO region is a gateway for international travel and may pose additional risks in the introduction (import/export) of invasive species.

Nursery Trade:

The nursery industry has historically participated in the import of non-native species. As a result, some species have been intentionally introduced into our environment. Due to the nature of the business, the nursery industry is, by default, a stakeholder in the invasive plant issue. The issue involves having unrestricted import and selling of nonnative plants, some of which may be potentially invasive, versus the control of the sale of potentially or known invasive plants. An example of this control involves, Massachusetts and New Hampshire which have banned the sale of burning bush (*Euonymus alatus*), Norway maple (*Acer platanoides*) and Japanese barberry (*Berberis thunbergii*), (*Niemiera and Von Holle 2011*).

Water Levels & Distribution:

Changes in water levels of lakes and reservoirs and periodic in-land flooding may affect the geographic ranges and distribution of invasive species. Higher water levels may cause invasive species such as Purple Loosestrife to become established further inland. Changes in water levels may also cause water-loving or water-resistant species to outcompete one another thus altering their distribution.

SLELO-PRISM's PRIORITY ISSUES

Within the SLELO region, partners have identified several priority issues which are poised for action. According to the 2012 SLELO Partnership Questionnaire, partners identified several issues that are considered very important and four issues identified as "extremely important". Issues identified as extremely important include:

Prevention:

Preventing the introduction of new invasive terrestrial and aquatic plant and animal species not currently found in the SLELO region is the number one SLELO priority. These species are those that are not currently found in the SLELO region, but are in close proximity and that have the potential to have the greatest negative impact. Examples include; Hydrilla, the Asian Long horned Beetle and the Mile-a-Minute vine.

Early Detection and Rapid Response ED/RR:

ED/RR for new species is a priority for the SLELO PRISM. This includes a **control component** that will help to eradicate new infestations and to contain and/or suppress species populations upon initial detection.

Education and Outreach:

Educating the general public on various issues related to invasive species is at the forefront of any long term management effort. Educational efforts will be tailored to meet the needs of each stakeholder group. Increasing the stakeholders' awareness of invasive species literacy, negative impacts, and strategies for limiting negative impacts is a goal of SLELO's educational efforts. The public needs to be aware of the numerous ways in which invasive species impact our daily lives and how they can help address the issue.

Community Preparedness:

Certain invasive species problems require that communities be prepared to deal with them. An example is the Emerald Ash Borer, a species that can have detrimental impact on communities both from an aesthetic as well as an economic standpoint. The SLELO partners have identified community preparedness as a priority issue for communities within the five county PRISM region.

GOALS, OBJECTIVES AND STRATEGIES:

A process known as Conservation By Design (TNC 2011) is a strategic planning process that engages stakeholders focusing on achieving the best possible results. Partners of the SLELO PRISM have engaged in a similar process to identify goals and objectives along with specific (action oriented) strategies with accompanying measureable results. In addition, the partners benefited from a strategic planning outline developed by the DEC Office of Invasive Species Coordination.

What follows is a framework of goals, objectives, strategies, outputs and outcomes that will help the SLELO partners to not only achieve the best possible outcomes, but to maximize conservation benefit within the SLELO PRISM region.

Prevention

Goal 1. – Prevent the introduction of invasive species into the SLELO PRISM including target conservation and priority areas. Prevention must be the first line of defense in implementing a program.

Objectives:

- A. SLELO Partnership will maintain close communication with other PRISM's to identify potential threats and to stay informed about control methods they are deploying.
- B. SLELO Partners will create and sustain public awareness of new threat species and appropriate Best Management Practices that are important to SLELO's prevention program
- C. Support prevention efforts that focus on primary pathways to prevent potential threats of Invasive Species from entering the PRISM.
- D. Support efforts that prevent the introduction of aquatic invasive species into the Great Lakes basin via the primary pathways; ballast water, live trade, trailered boats and artificial connections (canals, etc.)

Strategies: Prioritized

1. Identify and provide outreach to target audiences such as anglers, boaters, recreationists, firewood haulers, based on major pathways.
2. Initiate continued communications among PRISM's, i.e. monthly calls and meetings.
3. Support and help implement the NYS Vector Analyses Project by gathering data, etc.
4. Hold trainings and workshops for the public and private sector.
5. Develop Invasive Species Prevention Zones (ISPZ's) and criteria.
6. Encourage public agencies (DOT, DEC, OPRHP and municipalities, SWCD's etc., to incorporate invasive species awareness/training into annual meetings and annual plans.
7. Support the use of BMP's on all new development and land use projects.
8. Produce & distribute informational brochures about potential threats/species.
9. Compile a list of BMP's for new development and land use projects that will reduce the spread or introduction of invasive species and provide to target audiences.
10. Support local ordinances and compliance that deter accidental spread of invasive species via trailered boats.
11. Explore legislation or public policies to address the movement of Inv. Spp.

Outputs:

- Identify and establish at least one ISPZ each year.
- Provide three training sessions for the public and private sectors.
- Provide outreach to at least one new target audience each year.

Outcomes:

- Prevent the introduction and/or spread of invasive species within ISPZ's and/or the PRISM.
- Increased public awareness of the need to prevent the spread of invasive species.
- Invasive species awareness is incorporated into routine planning and operations of various agencies and organizations.
- Comprehensive and consistent regulations are enacted on a regional and whole system scale.

Early Detection / Rapid Response

Goal # 2. Rapidly detect new and recent invaders and eliminate all individuals within a specific area. ED/RR is the next highest priority after prevention.

Objectives:

- A. Develop and Early Detection/Rapid Response Process that provides a consistent mechanism for detecting and responding.
- B. Identify and survey high risk areas and (priority areas).
- C. Develop and maintain an early detection/prevention species list.

Strategies: - Prioritized

1. Determine potential close threats (species) and their respective pathways.
2. Utilize the ED/RR process developed by SLELO partners.
3. Determine effective monitoring plan.
4. Establish a rapid response team to react to situations and eradicate or control?
5. Utilize trained seasonal employees to survey high risk / priority areas.
6. Communicate new detections etc. with partners and other appropriate audiences
7. Reach out to other PRISM's, agencies, partners on information regarding BMP's.
6. Secure funding for implementing the ED/RR process.
8. Align (and integrate) the SLELO ED/RR Process with the state level process.
9. Develop a "go to" list of experts for positive ID of new threats.

Outputs:

1. Record number of species that are approaching the SLELO boundary.
2. Record number of times the SLELO ED/RR process was activated and how successful it was.
3. Record number of early or new detections.

Outcomes:

1. New invasive species threats to our PRISM are halted.
2. Early detections are eradicated.
3. The quantity and diversity of invasive species entering and/or becoming established in our PRISM are severely limited or stopped

Invasive Species Control

Goal # 3. Control invasives using three basic levels of control; **ERADICATION** – to eliminate all individuals and the seed bank, **CONTAINMENT** – Contain established infestations to prevent invasive species from spreading. **SUPPRESSION** – Reduce the density but not necessarily the total area or boundary of established infestations.

Objectives:

- A. Prioritize and direct seasonal invasive species control efforts
- B. Control Inv. Spp. within priority areas and prevention zones using BMP's with a high probability of success.
- C. Secure adequate funding to conduct cost effective control activities (ie. Chemicals, equipment, education).
- D. Utilize demonstration projects that provide new tools and methods of invasive species control which intern provide benefits to native species.

Strategies: - Prioritized

- 1. Develop a priority species list.
- 2. Identify priority areas or sensitive areas and prevention zones.
- 3. Create an annual work plan with input from all partners.
- 4. Develop a Project Nomination Form which aids in the development of priority projects and demonstration projects.
- 5. Implement control projects based on available funds and resources to maximize control efforts.
- 6. Utilize TNC's Decision Analyses Tool to prioritize control efforts.
- 7. Identify available resources for control, ie. Pesticide applicators, volunteers, etc.)
- 8. Develop a list of possible funding sources.
- 9. Develop a list of potential grants.
- 10. Coordinate projects using partner agencies and organizations.
- 11. Identify species specific BMP's.
- 12. Review and refine BMP's to be results oriented and cost effective.

Outputs:

- 1. One annual work plan will be developed each year.
- 2. A priority species list is created for the PRISM.
- 3. The number of priority areas will be determined and evaluated annually.
- 4. The number of implementation and control projects will be recorded and compared

- annually.
5. 3 ISPZ's will be established.
 6. The number of acres, stems and sites where control activities occurred will be recorded and compared annually for effectiveness of invasive species control.

Outcomes:

1. Early detections of existing and new arrivals of invasive species will be eradicated, contained or suppressed.
2. The spread of invasive species within the PRISM will be limited.
3. A better understanding of invasive species pathways within the PRISM, priority areas and ISPZ's will be developed and utilized.
4. New control measures are developed and utilized.

Education / Outreach

Goal No. 4 - Increase public awareness and understanding of invasive species issues.

Objectives:

- A. Educate various groups to identify priority invasive species, understand their impacts and management options.
- B. Establish a SLELO invasive species marketing campaign including the development of timely educational materials.
- C. Designate official county repositories in order to make SLELO materials available for local use and benefit.

Strategies:

- 1. Form an education/outreach committee.
- 2. Develop specific invasive species educational materials and fact sheets based on theme and specific subject matter.
- 3. Develop a SLELO printed newsletter and electronic newsletter.
- 4. Develop and use a SLELO display/exhibit and make available for partner use.
- 5. Hold training and public informational workshops (1 per SLELO county).
- 6. Develop a SLELO/Invasive Species marketing package (logo, tag-line, promo materials, etc.)
- 7. Host and participate in educational programs.
- 8. Attend events to promote SLELO-PRISM and our mission.
- 9. Create a SLELO invasive species media campaign.
- 10. Annually purchase promotional materials for distribution at events, etc.
- 11. Develop a new standard catch-phrase and a variety of SLELO-PRISM marketing tools for all public interactions.
- 12. Maintain and promote SLELO website.
- 13. Develop a user friendly SLELO map that includes partner locations and local contact information and resources available.
- 14. Develop targeted mailing lists for both newsletters.
- 15. Utilize press releases, public service announcements and paid ads when appropriate.
- 16. Develop a SLELO letterhead.
- 17. Create a top 10 Inv. Spp. Business card.
- 18. Develop an educational travelling trunk for presentations and displays to include insects, plants and animals.

Outputs:

1. Record # of SLELO sponsored or SLELO participations in events.
2. Record # of people targeted and attending SLELO events.
3. Record # of press releases prepared and submitted.
4. Record # of electronic and printed newsletters created.
5. Record # of educational materials created.
6. Participate in 10 events.
7. Conduct 5 invasive species educational programs across the region each year.

Outcomes:

1. Various groups and public will have a better understanding of invasive species, their impacts, pathways and management.
2. SLELO will have consistent message, logos and catch phrases.
3. Local residents will have better access to SLELO information.

Cooperation

Goal # 5- Facilitate opportunities for sharing resources, including funding, personnel, equipment, information, and expertise.

Objectives:

- A. Develop a shared understanding of partner organizations, their charter and their responsibilities relevant to invasive species management.
- B. Establish collaboration among partners on projects and various SLELO activities.
- C. Work cooperatively to assist with implementing components of the strategic plan developed by SLELO partners.
- D. Continue to develop our partnership by engaging new and diverse partners.

Strategies:

1. Coordinate seasonal employee efforts between agencies to compliment efforts not duplicate efforts.
2. Invite partners to volunteer and participate in coordinated invasive species activities.
3. Approach academia, nursery and business organizations and institutions to participate as partners.
4. Coordinate with partners in hosting educational activities, exhibits and materials.
5. Establish and update regularly a SLELO calendar of events via *website content comm*.
6. Create partner information sharing opportunities at monthly partner meetings as well as other venues.
7. Arrange for periodic calls or allow time at meetings to discuss field activities.
8. Provide for dialog at monthly meetings to report out on cooperative efforts.

Outputs:

1. One map will be created showing partner locations.
2. One calendar of events will be created under website (see strategy above)
3. Host or co-sponsor at least two educational events each year.
4. Provide a minimum of 3 opportunities for partners to volunteer for SLELO activities.
5. Provide 12 sharing opportunities at regular monthly SLELO meetings.

Outcomes:

1. Better cooperation among partners to achieve SLELO's mission.
2. Increased collaboration among partners.
3. Less duplication of efforts.
4. A sense of "belonging" among SLELO partners.

Information Management

Goal # 6. Collect, utilize, and share information regarding surveys, infestations, control methods, monitoring, and research.

Objectives:

- A. Create opportunities to share partner resources and information.
- B. Fully utilize iMapinvasives software.
- C. Encourage invasive species reporting.
- D. Promote and utilize the SLELO website.
- E. Establish and make available an archive of relevant partner reports and studies.

Strategies: - Prioritized

- 1. Develop a SLELO resource directory to include partners, capacities and resources available.
- 2. Provide training to staff and partners in iMapinvasives software.
- 3. Establish a SLELO website content team with editing access to site.
- 4. Conduct round-table updates from partners at SLELO meetings.
- 5. Conduct partner and guest presentations at SLELO meetings.
- 6. Work with CCE offices to collect invasive species reports from the public.
- 7. Create a SLELO email repository of important messages on the SLELO website.
- 8. Create a “studies & reports” page on the website via web content committee.

Outputs:

- 1. 12 round table discussions. One at each monthly SLELO meeting.
- 2. 12 partner guest presentations. One at each monthly SLELO meeting.
- 3. Create a SLELO resource Directory by 12/31/12 .
- 4. Conduct at least two invasive species training workshops each year for all interested individuals and organizations.
- 5. Target 50% of training workshop attendees to input data into iMapinvasives.
- 6. Identify and designate one Point-Of-Contact at each county CCE to receive IS reports from the public.
- 7. Increase SLELO list-serve subscribers by 10% each year.
- 8. One SLELO website content team(WCT) will be established by 12/31/2012.
- 9. WCT will solicit and post 10 reports to the SLELO website.
- 10. WCT will create a “studies & reports” page to the website by 12/31/2012.

Outcomes:

1. Increased knowledge of IS among partners within the SLELO region.
2. A more comprehensive understanding of IS issues and management among SLELO partners.
3. Less duplication of efforts.
4. Increase in website usage by partners and the public.
5. Enhanced understanding of IS distribution.

Site Restoration

Goal # 7. Develop and implement effective restoration methods by reducing the impact of invasive species on ecosystem processes and in areas that have been degraded by invasive species and where suppression or control has taken place.

Objectives:

- A. Identify and establish priority restoration areas based on priority project areas.
- B. Establish protocols for site restoration including selection of BMP's, implementation and monitoring and restoration goals for each site.
- C. Facilitate restoration projects in the SLELO region.
- D. Implement appropriate restoration BMP's for various habitat types.

Strategies: – Prioritized.

1. Identify priority restoration sites and areas.
2. Research current BMP's based on species.
3. Secure additional funding for restoration projects.
4. Assemble a team of seasonal employees and volunteers to implement restoration projects within the SLELO region.
5. Develop a site restoration plan for sites being restored.
6. Create and implement a monitoring plan for restored sites.

Outputs:

1. Implement one restoration site beginning in 2013.
2. Achieve 30% or better survival of native plants/seed.
3. Achieve a minimum of 80% native cover on all sites restored.

Outcomes:

1. Disturbed sites are restored with native populations.
2. Best Management Practices are assessed for their worthiness.
3. Results of restoration efforts are ascertained and disseminated.

ADDITIONAL PROGRAM ELEMENTS:

Involving and Engaging Public and Local Government:

Strong and prosperous communities provide opportunities for people to learn, explore and interact. The SLELO partners will identify opportunities and provide for community involvement on invasive species topics and issues. Strategies include;

- General correspondence with local government officials.
- Providing invasive species presentations based on requests.
- Posting announcements on the SLELO website
- Preparing press releases for local newspapers and media.
- Recruiting community volunteers for SLELO projects.
- Actively engaging in citizen science initiatives.
- Increasing SLELO visibility by participating in community events.

Supporting Research via Citizen Science:

Citizen science is a process of developing projects in which the public actively engages in scientific investigation and conservation practice. Participants to gain a better understanding of a particular scientific discipline and related issue such as invasive species. This process also promotes community involvement in shaping a particular outcome.

As opportunities are identified within the SLELO region, the SLELO partners will engage in citizen science activities. Potential opportunities may include:

- Hydrilla monitoring via lake associations.
- Community Ash Tree Inventories
- Emerald Ash Borer Monitoring/surveillance/education
- Asian Long-horned Beetle Monitoring/surveillance/education
- Site Restoration Monitoring

Recruiting & Training Volunteers:

Volunteers are a necessary and extremely helpful component of community initiatives. People from all walks of life donate their time and effort to various causes, day and night, every day of the year. The more connected to a community people feel, the more likely they are to take

responsibility for the community and feel pride and a sense of commitment. Mobilizing community resources and expanding capacity through volunteers also enhance an organization's purpose, which can attract additional volunteers, program participants and become an important component in achieving and organizations mission.

Volunteers for the activities within the SLELO PRISM shall be recruited in several ways;

- ✓ First, The Nature Conservancy (as host organization) will utilize an existing recruitment process and database to generate volunteerism and to take part in SLELO activities.
- ✓ Second, press releases will be utilized to capture new recruits based on project needs.
- ✓ Finally, word of mouth on behalf of the SLELO partnership will enhance volunteer recruitment.

Training volunteers will be accomplished by providing on-site and/or classroom training using expertise from the partnership and in cooperation with Cornell Cooperative Extension as one of SLELO's partner organizations.

IDENTIFYING AND PURSUING FUNDING OPPORTUNITIES:

In order to maximize and continue SLELO initiatives, sustained funding must occur. The SLELO PRISM currently has limited funding from New York State, which must be used strategically to address priority issues and to maximize the conservation benefit. The SLELO partners will, whenever possible, share in project expenses by separating components and assuming corresponding costs. In addition, SLELO partners will seek and pursue funding for new projects and seek to sustain PRISM support within the NYS Environmental Protection Fund.

PRIORITY SPECIES

As a result of the strategic planning process, partners of the SLELO-PRISM identified the need to create "lists" as related to invasive species management efforts. Significant progress towards the development of these lists was made. Please note that these lists are considered to be "tentative" pending further refinement in 2012.

These lists include;

- ✓ Prevention “Watch-List” Species (Table 4)
- ✓ Target Management Species List (Table 5), (Table 7)
- ✓ General Species Of Concern List – All Species (Table 6).

Table 4 – Prevention “Watch-List” Species

✓ Mile-A-Minute Vine	(<u>Polygonum perfoliatum</u>)
✓ Didymo	(<u>Didymosphenia geminate</u>)
✓ Hydrilla	(<u>Hydrilla verticillata</u>)
✓ Asian Long horned Beetle	(<u>Anoplophora glabripennis</u>)
✓ Hemlock Woolly Adelgid	(<u>Adelges tsugae</u>)
✓ Silver, Big Head and Grass Carp	(<u>Ctenopharyngodon spp.</u>)
✓ New Zealand Mud Snail	(<u>Potamopyrgus antipodarum</u>)
✓ Hemimysis	(<u>Hemimysis anomala</u>)
✓ Asian Clam	(<u>Corbicula fluminea</u>)
✓ Kudzu	(<u>Pueraria lobata</u>)
✓ Feral swine	(<u>Sus scrofa Linnaeus</u>)

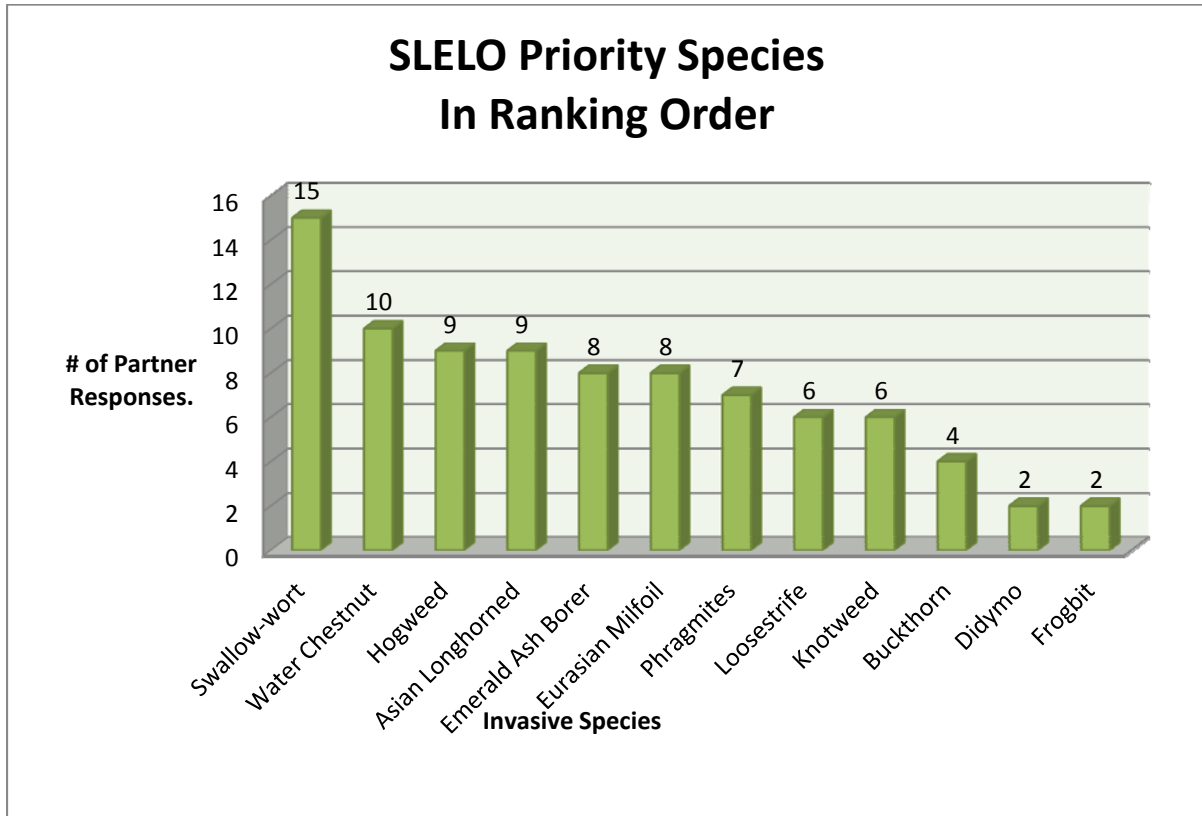
Table 5 - Target Management Species within the SLELO-PRISM Focus Area

✓ Black & Pale Swallow-wort	(<u>Cynanchum spp.</u>)
✓ Water Chestnut	(<u>Trapa natans</u>)
✓ Giant Hogweed	(<u>Heracleum mantegazzianum</u>)
✓ Emerald Ash Borer	(<u>Agrilus planipennis</u>)
✓ Eurasian Water Milfoil	(<u>Myriophyllum spicatum</u>)
✓ Phragmites	(<u>Phragmites australis</u>)
✓ Purple Loosestrife	(<u>Lythrum salicaria</u>)
✓ Japanese Knotweed	(<u>Polygonum cuspidatum</u>)
✓ Glossy Buckthorn	(<u>Rhamnus spp.</u>)
✓ European frogbit	(<u>Hydrocharis morsus-ranae</u>)

Table 6 - General Species of Concern List – All Species

✓ Black & Pale Swallow-wort	(<u>Cynanchum</u> spp.)
✓ Giant Hogweed	(<u>Heracleum mantegazzianum</u>)
✓ Japanese Knotweed	(<u>Polygonum cuspidatum</u>)
✓ Japanese Stiltgrass	(<u>Microstegium vimineum</u>)
✓ Honeysuckle	(<u>Lonicera Caprifolium</u>)
✓ Spotted Knapweed	(<u>Centaurea maculosa</u>)
✓ Mile-A-Minute Vine	(<u>Polygonum perfoliatum</u>)
✓ Glossy Buckthorn	(<u>Rhamnus</u> spp.)
✓ Purple Loosestrife	(<u>Lythrum salicaria</u>)
✓ Phragmites	(<u>Phragmites australis</u>)
✓ Water Chestnut	(<u>Trapa natans</u>)
✓ Eurasian Water Milfoil	(<u>Myriophyllum spicatum</u>)
✓ European Frogbit	(<u>Hydrocharis morsus-ranae</u>)
✓ Didymo	(<u>Didymosphenia geminate</u>)
✓ Hydrilla	(<u>Hydrilla verticillata</u>)
✓ Emerald Ash Borer	(<u>Agrilus planipennis</u>)
✓ Asian Longhorned Beetle	(<u>Anoplophora glabripennis</u>)
✓ Sirex	(<u>Sirex</u> spp.)
✓ Hemlock Woolly Adelgid	(<u>Adelges tsugae</u>)
✓ Leek Moth	(<u>Acrolepiopsis assectella</u>)
✓ Round Goby	(<u>Neogobius melanostomus</u>)
✓ Silver, Big head & grass carp	(<u>Ctenopharyngodon</u> spp.)
✓ Zebra/Quagga Muscles	(<u>Dreissena</u> spp.)
✓ Spiny Water Flea	(<u>Bythotrephes longimanus</u>)
✓ New Zealand Mud Snail	(<u>Potamopyrgus antipodarum</u>)
✓ White Nose Syndrome	(Infectious agent)
✓ VHS-Disease	(Viral hemorrhagic septicemia virus)
✓ Spring viremia	(Infectious agent/viral)
✓ Hemimysis	(<u>Hemimysis anomala</u>)
✓ European Frogbit	(<u>Hydrocharis morsus-ranae</u>)

Table 7 – Target Management Species Presented in Ranking Order.



PRIORITY SITES:

Because time and economic resources are limited, it is important that SLELO-PRISM partners focus the management of invasive species on sites that are considered ecologically important and/or sites that are considered to have conservation value. In addition sites that are considered to be seed-banks, vectors or that pose a proximity threat to high value sites are all factors involved in determining site-based management on both public and private lands.

The following is a working list of recommended invasive species management sites. Several sites involve multiple ownerships or covenants via easement. The list does not include every site where invasive species management may occur, but does provide a general list of focus areas.

Site Name	Brief Site Description
Tug Hill Plateau	150,000 acre mixed forested lands.
Grenadier Island	1,290 acres island with TNC easement & TILT
Limerick Cedars	coastal barrier dune/wetland complex/limestone barrens complex.
Chaumont Barrens	Alvar barrens grassland
El'Dorado Preserve	Freshwater dune barrier system
Rome Sand Plains	TNC Preserve
State Parks (within SLELO region)	numerous
St. Lawrence State Park	St. Lawrence County
Salmon River Reservoir	2,660 freshwater reservoir
Whetstone Reservoir (State Park/Tug Hill)	Freshwater reservoir
St. Lawrence River	River system
Oswego River	NYS - 2 nd largest river draining into L. Ontario
Black River	49 mile river system between Tug Hill and the Adirondacks.
French Creek	Near Clayton ? Empties into French Creek Bay ?
Three Mile Creek	?
Three Mile Creek	Alvar
Chaumont Bay	Lake Ontario shoreline embayment
Mud Bay	A bay of Lake Ontario at the west end of Cape Vincent
Rainbow Shores	
Selkirk Fen	Fen located near Selkirk state park
Salmon River Estuary	Near Port Ontario
Lake Ontario Shoreline	Coastal shoreline
Sandy Pond	Shoreline dunes and open water embayment
Black Pond	526 acre barrier beach dune/emergent marsh and wetlands.
Oneida Lake	79.8 square mile inland freshwater lake
Lake Delta	Oneida Co.
Mohawk River Headwaters	Headwaters in Lewis and Oneida County's
Henderson Harbor	Lake Ontario embayment
Battle Island	Oswego River
Silver Lake Fen	Oswego County
Black Lake	St. Lawrence County
Grassland Bird Focus Area	See Irene, DEC Biologist Region 6
Golden Winged Warbler Focus Area	See Irene, DEC Biologist Region 6
Deer Creek Marsh Unit	1,195 acre WMU-shoreline/dunes/wetlands
Perch River WMA	See Irene, DEC Biologist Region 6
Fish Creek WMA	St. Lawrence County

Upper & Lower Lakes WMA	St. Lawrence
Lakeview WMA	3,461 acre coastal wetland complex
Happy Valley WMA	8,895 acres northern hardwood forest/wetlands
Three Mile Bay WMA	3,697 acres of wooded swamp and marsh
Little John WMA	7,912 acre Hemlock/Spruce stands.NW side Tug Hill
Mud Lake	Northern Jefferson County
State Routes 3, 28, 56, 58 and 365	Vectors leading into the Adirondack Park

INVASIVE SPECIES CONTROL METHODS AND CONSIDERATIONS:

Many dynamics are involved in controlling invasive species. Dynamics such as species biology, resources available and costs all play a role in managing invasive species. This section discusses various considerations for the control and management of invasive species.

Table 8 - SUMMARY OF INVASIVE SPECIES BEST MANAGEMENT PRACTICES

Invasive Category						
Control Type:	<u>Aquatic</u>	<u>Terrestrial</u>	<u>Insects</u>	<u>Animals</u>		
	<u>Plants</u>	<u>Plants</u>				
<u>Biological</u>	X	X	X			
<u>Chemical</u>	X	X	X			
<u>Physical</u>						
<u>*Hand Pull</u>	X	X				
<u>*Pod Pull</u>	X	X				
<u>*Hand Dig</u>		X				
<u>*Burn</u>		X				
<u>*Barriers</u>	X	X				
<u>Mechanical</u>						
<u>*Excavating</u>		X				
<u>*Mowing</u>		X				
<u>*Harvesting</u>	X	X				
<u>*Dredging</u>	X					
<u>*Trapping</u>			X	X		
<u>Biological:</u> Refers to the use of aquatic or terrestrial insects such as Gallarucell beetle for Purple Loosestrife.						
<u>Chemical:</u> Typically refers to the use of pesticides (insecticides, herbicides aquatic & terrestrial)						
<u>Physical:</u> Any type of control that results from physical manipulation of the population.						
<u>Mechanical:</u> Any type of control that results from using a mechanical device.						

Terrestrial Plants:

Black and pale swallow-worts, also known as “dog-strangling vines,” are perennial, herbaceous, twining vines that grow from 2 to 6 1/2 ft. in length. Native to Eurasia, these species are adapted to a variety of habitats. Swallow-worts grow rapidly and once established can completely smother native vegetation.

Once established, swallow-wort is difficult to control. Monitor for populations in late summer, when the plants turn golden yellow and pods are present. Initial control efforts should concentrate on plants in sunny areas since they will produce the most seeds. Stay out of infested areas during seed dispersal to prevent seed dissemination to unaffected areas.

Small patches must be dug out by hand. The entire crown must be removed and destroyed. *Hand pulling* roots, however, is labor intensive and difficult since the stem base is brittle. To prevent seed dispersal, pods should be removed before they open and then burned.

Large stands can be managed to prevent new seed crops by *consistent mowing* when pods are very small (early July). *Burning plants* is not effective and may improve site conditions for seedling establishment. Large stands can also be cultivated on a yearly basis to achieve control over time.

Triclopyr or *glyphosate* can be applied to foliage around mid-September. Use of a surfactant helps herbicides penetrate the waxy leaf coating.

Cut-stem treatment with glyphosate is effective but labor intensive.

Giant Hogweed: (*Heracleum mantegazzianum*) is a tall (up to 15-20 ft.), herbaceous, biennial plant that invades disturbed areas across both the Northeast and Pacific Northwestern United States.

Hogweed is difficult to control due to its toxic effects on the skin. A small number of plants can be *hand dug*, but care should be taken to remove most of the root and to protect skin and eyes.

Giant Hogweed can also be control via Foliar herbicide application. Best if applied early in the season when plants are not full grown. Several applications may be required.

Purple loosestrife: Purple loosestrife (*Lythrum salicaria*) is an herbaceous perennial wetland plant native to Eurasia. Because of its lovely purple flowers and perceived beauty, this plant continues to be sold in the nursery trade. A prolific seed producer, an individual mature plant may produce up to one million seeds in a single season. Biological, manual and chemical controls are effective.

- *Biological control:* considered the best option for large-scale control. Four insects have been approved by the USDA as biological control agents for purple loosestrife: a root-mining weevil (*Hylobius transversovittatus*), two leaf-feeding beetles (*Galerucella californiensis* and *Galerucella pusilla*), and a leaf-eating weevil (*Nanophyes marmoratus*). We recommend **Galerucella beetles**, which feed almost exclusively on purple loosestrife.
- *Pulling/Cutting:* infestations less than 100 plants can be controlled by pulling or cutting just before the plants begin flowering to avoid spreading seed. When pulling, all root fragments should be removed and plants should be properly disposed of.
- *Mowing:* not recommended because it will spread plant segments and seeds.
- *Cut-stem treatment:* apply a solution of 30% *glyphosate* to the raw area of freshly cut stems, after the flowering portion has been removed
- *Foliar treatment:* spot treatment with *glyphosate* is effective on older plants. It is most effective when applied as plants are preparing for dormancy, but mid-summer and late-season treatments may be needed to reduce seed production.

Glossy Buckthorn: (*Rhamnus frangula*) is a small tree or shrub native to Eurasia. It produces pea-sized fruits that ripen from green to red to dark purple.

- The most effective control is *manual removal* of plants before they go to fruit. When a large number of buckthorn seedlings are present, *controlled burning* can be used. Late fall is the ideal time for *chemical control* because most native plants are dormant at that time and the chemicals are easily drawn toward the roots with the natural sap flow. *Cut-stump treatment* using 20 – 25% A.I. *Glyphosate* or 12.5% A.I. *Triclopyr* has been effective.

Japanese knotweed

- Japanese knotweed (*Polygonum cuspidatum*) is a perennial herb with bamboo-like stems. It typically grows in thickets 3-6 feet tall, but can reach as high as 15 feet. Native to Asia, Japanese knotweed was introduced to North America in the late 19th century and now can be found in most states and Canadian provinces, including Alaska.
- *Mechanical control* methods such as cutting, mowing and pulling can be effective over a long time scale, but they need to be done consistently. It is most effective for small or environmentally sensitive areas where *herbicides* cannot be used. Because even a small piece of stem will regrow wherever it touches the soil, all plant material must be removed from the site and properly disposed of to prevent re-establishment or spread to other sites.
- *Cut stem treatment*: In early fall, stems should be cut about 2 in. above the ground and followed immediately by application of glyphosate or triclopyr to the cut stem. This treatment is best when Japanese knotweed is growing mixed with or near other species.
- *Foliar treatment*: A foliar application of glyphosate can be used to control large populations, but multiple treatments may be required. It is most effective to spray in late summer or early fall after cutting the stems in late spring or early summer. Note: Care must be taken when using chemical treatment near water courses.
- *Cut stem treatment*: In early fall, stems should be cut about 2 in. above the ground and followed immediately by application of *glyphosate or triclopyr* to the cut stem. This treatment is best when Japanese knotweed is growing mixed with or near other species.
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Aquatic Plants

Water Chestnut: (*Trapa natans*) is an aquatic plant that is usually rooted in the mud; it bears a rosette of floating leaves at the tip of the submersed stem. Although it grows best in shallow, nutrient-rich lakes and rivers, it can also grow on wet, mucky substrates. It is native to southern Europe and Asia. (Note that this is not the same species used in Asian cooking).

- Can be removed *mechanically, by hand*, or with *2,4-D*, which is the only licensed chemical known to control this species.

Eurasian Water Milfoil: (*Myriophyllum spicatum*). This submerged aquatic plant is native to Eurasia and northern Africa. It has the ability to stay alive over winter and grow rapidly in the spring, blocking out sunlight needed by native plants. It keeps out larger fish and impairs the ability of some fish to spawn.

- Hand-pulling is the best method. Raking is also an option. All plant fragments must be removed from the water and shoreline. Manipulating the water level may help if that is possible to do. 2,4-D and Fluridone are the most commonly used chemicals used against this species. However, both of these have mixed results and can affect native plant populations.

Researchers have found a native North American weevil that feeds on Eurasian Water-milfoil, but this method also has mixed results.

Didymo: (*Didymosphenia geminata*), is a species of diatom that grows in shallow waters. It is native to the Northern Hemisphere in areas including Europe and Asia. More recently, rock snot has been found in North America and in New Zealand. A single drop of water can transport this fast-growing microscopic algae.

A research project (spring, 2009) at the University of Colorado at Boulder has discovered that high water flows greatly decrease the amount of Didymo in the system. This control method is still being researched and is not 100% proven yet. Fishermen should take the following precautions after fishing in didymo infested waters. These methods will help reduce the spread of didymo.

Check: Before leaving the river, remove all obvious clumps of algae and look for hidden clumps. Leave them at the site. If you find clumps later don't wash them down the drain, treat them with the approved methods below, dry them and put them in a rubbish bin.

Clean: Soak and scrub all items for at least one minute in either hot (60°C) water, a 2% solution of household bleach or a 5% solution of salt, antiseptic hand cleaner or dishwashing detergent.

Dry: If cleaning is not practical (e.g. livestock, pets), after the item is completely dry wait an additional 48 hours before contact or use in any other waterway.

European Frog-bit

European frog-bit (*Hydrocharis morsus-ranae*) is a free-floating plant that resembles water lily, though its smaller leaves are distinctly heart-shaped and its flowers are three- rather than multi-petaled. Native to Eurasia, the plant can quickly form dense floating mats in wetlands and other slow-moving water systems.

- Plants can be *collected by hand or mechanical harvesters*, with all parts composted away from wetlands, rivers, or lakes. Care must be taken to prevent plant fragments from escaping the infestation site. Sites should be checked annually for re-infestations.

Insects:

Emerald Ash Borer

Insecticide treatment is an option for protecting high-value ash trees from attack by the Emerald Ash Borer (EAB).

New York State residents can only use products labeled for use in NYS and have to work with certified pesticide applicators to apply restricted use pesticides. One of the important concepts to consider is that when there are few EAB around, as in Tier I infestations at this time, just about any product will keep your trees looking green for one year. EAB can take years to kill trees in Tier I infestations. However, when EAB populations build to Tier II & III, tree death is more rapid and only the most efficacious insecticides are effective.

Another issue to consider is that some products currently registered in NY need to be applied every year and others every two or three years. Products registered for homeowner use need to be applied once a year to protect your tree from EAB. In the Midwest, EAB remains active in an area for 10 years or more. We don't know how long EAB will be lurking in NY forests, but assuming it will be similar to the Midwest, the costs of insecticide application add up over time. All research at this time indicates the need to regularly treat trees as long as EAB is in the area and if you neglect to treat your tree when it needs a booster, your whole investment may be in jeopardy. Maps of current infestations in NYS and many educational materials for are available on the Cornell Cooperative Extension website: <http://nyis.info/eab> Current infestation maps and many other resources are also available at the DEC website: <http://www.dec.ny.gov/animals/7253.html>. (Whitmore 2011).

Asian Longhorned Beetle

Preventing the Asian Longhorned Beetle (ALB) can be accomplished using tree injections of an insecticide known as Imidacloprid. Imadacloprid is a registered pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Approved for ALB program use, the insecticide has proven to reduce beetle populations in research completed in the United States and China.

Once an infestation has occurred however, the most common method of treatments is to remove the trees and chip all material.

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