



Town of Mt. Washington MA

Landscape and Forest Stewardship Plan

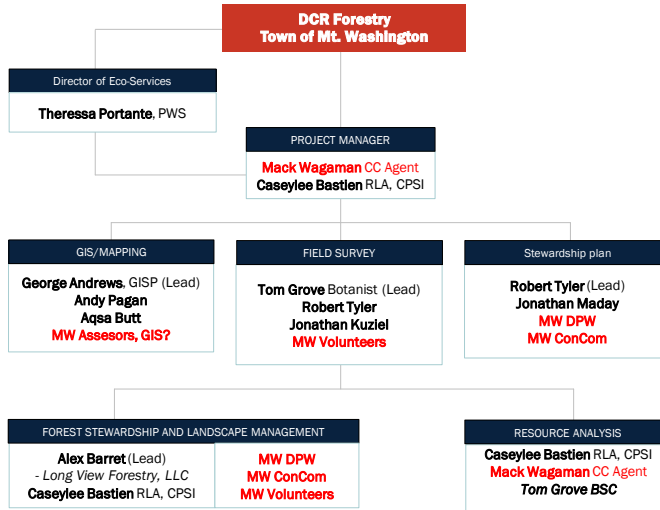
Invasive species management and best site construction/ maintenance practices

February, 2024

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Select "Change Picture"
Select "From a File"
Navigate to folder to find new image
Select image and size accordingly

DESIGN TIP: Feel free to make the white box smaller in height if the title is small to reveal more of the image.

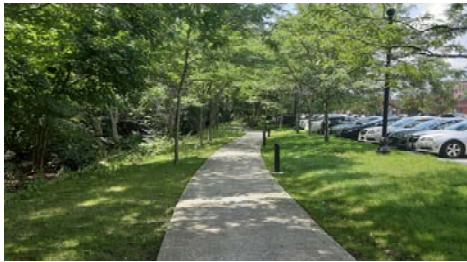
Team Organization



Guiding Principles of Stewardship Approach



Before -
Knotweed



After -
Riparian
groundcover
& shrubs

- **Combine desktop and mapping tools with Ecological observations**
- **Evaluate site specific needs and opportunities**
- **Apply the latest research, to support least use of chemical herbicides**
- **Plan for practical, scalable implementation**
- **Sensitive to budget and manpower parameters**
- **Educate and empower the community and its agents**

The nature of a species is only half of what makes a species invasive, the other half. The one you have more lasting opportunities for control over their context. Species have habitat strategies.

Most invasive species have ruderal strategy they rely on disturbance so historic land development and typical maintenance provide what they need.

Killing invasive plants isn't a goal its one of the steps toward natural resilience and habitat value.

What we want to promote is context for Native Control strategy plants to fill niches that create their own degree of defensible context.

The strategies we recommend for each site will be about controlling or changing context to help native communities protect themselves and serve our needs. Silviculture, water management, recreation.

Old

There are lots of places where people are cutting back invasive plants digging them up or spraying them with poison. In the short term these may seem to be the only thing to do.

This is roadside example of a mitigation area formerly all Japanese stilt grass. The stilt grass isn't gone its in that photo, but by changing maintenance type and cycle it no longer dominates.

Strategic Approach to Invasive Species Management



Phase 2

- Detailed assessments and measurements for implementation scoping
- Prototype, test, and adjust

If you are familiar with the pareto principal it is a natural model that shows up in almost everything but it shows that 20% of causes result in 80% of effects in the context of forest and landscape the balance of species and disturbance are those core drivers so we will focus on controlling those.

We will identify boundaries nodes and corridors to either convert land to resilient habitat or contain and slow infestations preventing them from spreading to vulnerable or valuable landscapes. The maintenance guides we provide will include guidance on why spaces or species get the treatment they need.

That's the important difference and advantage of having a strategy rather than a simple policy or simple maintenance contract.

Invasive removal upland

Water quality

Non herbicide vs herbicide

Database

Seasonal management database

Phenology

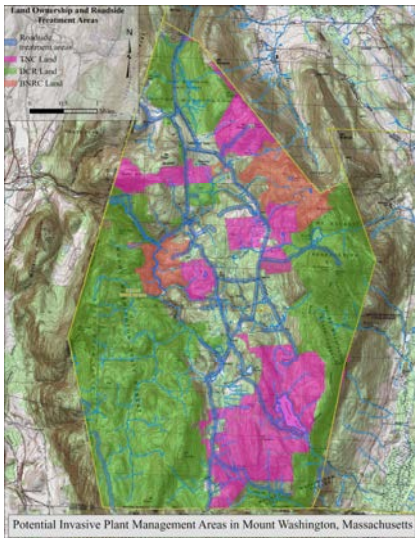
Timeline for management

What, how, expectations. Incorporation of legacy plans.

Own the outcome deliver expectations chemical management will be necessary for specific

conditions at this scale.

Creating a Stewardship plan



- **Conduct Desktop Analysis**
- **Conduct Field inspections of Key Sites**
- **Confirm Priority Sites and species**
- **Rate sites and features for decision makers**
- **Guide reduction of vulnerabilities, preventative maintenance, and treatment**
- **Equip staff and the public to manage as effectively as possible**

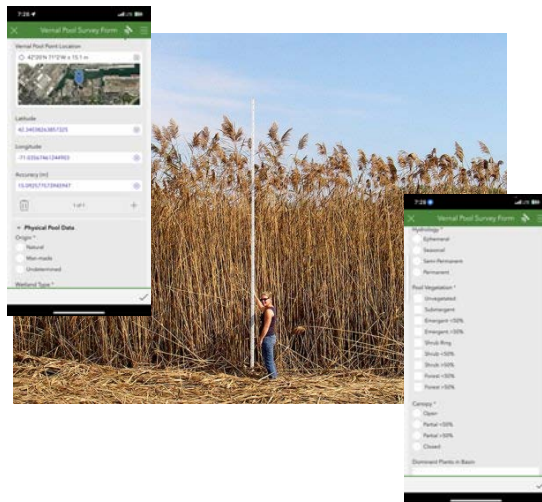
We will work with you to confirm the priority sites for planned intervention and provide guides to ensure proper focus on priority species of concern.

We will conduct a desktop analysis of all priority sites, including a review of iNaturalist records of rare endangered vs invasive species.

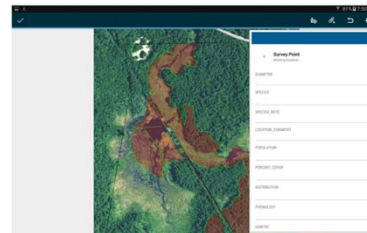
Our GIS team will work with the project manager and field lead to create a customized ArcGIS Survey123 data form that field crews use to cross check map to ground data.

Field surveys will be led by experienced ecologists that have extensive knowledge of invasive plants and will be planned for the later half of our project when the greatest number of species can be positively identified. There is a small number of species that, if mapped but not detected, would warrant a second look by town volunteers to verify in summer.

Data collection and management

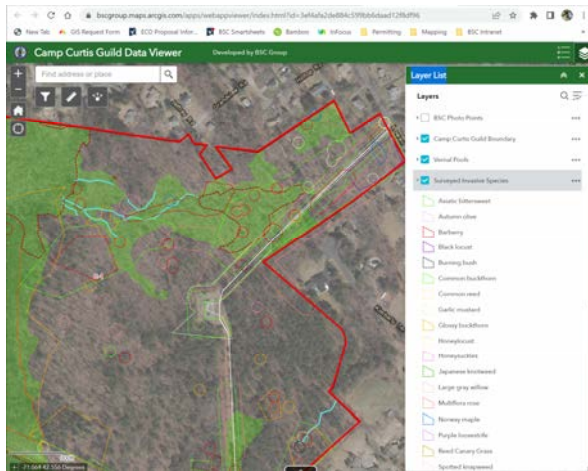


- **Data Collection** will rely on hand-held devices to record data including
 - Species
 - Population size/extent of infestation
 - Landscape location (wetland/upland)
 - Site conditions that may affect invasives management



Field staff will utilize hand-held devices to collect geo-referenced data including presence/absence, relative abundance and percent cover, landscape location and notes that may be important in implementing management

Data viewer Combining site and species information



- **Develop on-line interactive map** using ArcGIS on-line mapping tools to create a community-centered tool for assessing observations of natural features and invasive plants.
- supports adaptive management strategies over the long-term

BSC employs ArcGIS online interactive mapping tools including story maps and customized data viewers for projects such as this. These allow us to work with you in the development of management plans and provide a baseline for evaluation of project work over time. We will integrate the database we develop for this project with iNaturalist to engage residents in invasive species monitoring

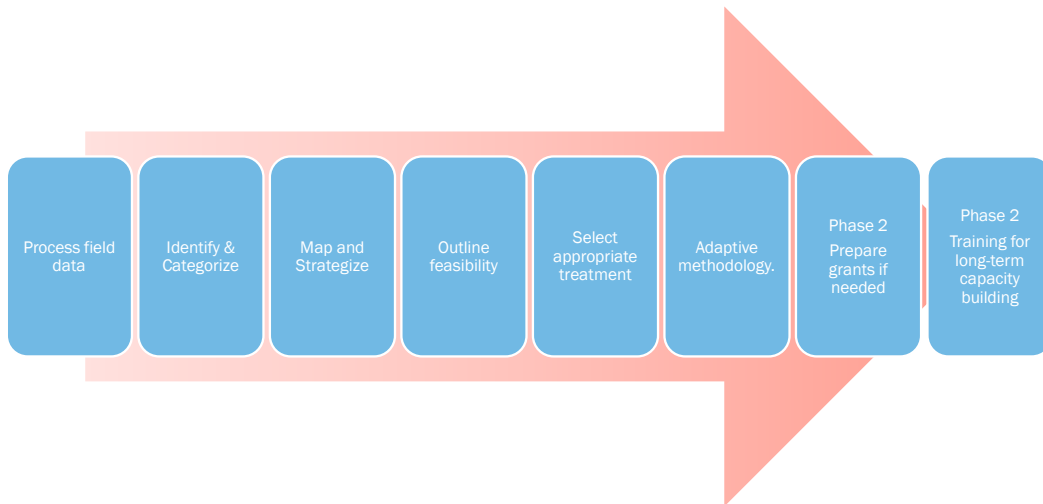
Crowd source Map tool



- **Develop on-line interactive map** using ArcGIS on-line mapping tools for public input
- **Integrate with iNaturalist** to create a community-centered tool for reporting observations of invasive plants that supports adaptive management strategies over the long-term
- <https://www.inaturalist.org/pages/video+tutorials>

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Stewardship Plan Approach



- Receive and process field survey data.
- Identify size and species make up of each infestation of invasive species
- Working with GIS teams, create mapping that depicts invasive populations with respect to land uses, current land management regimes
- Outline the feasibility of management methods with regards to species and specific locations needs.
- Select appropriate treatment methods and TOY approaches for each location. Begin structuring these into a 5-year plan with emphasis on priority parks.
- Finalize management plan ensuring to account for the need to be adaptive in methodology. Prepare permits for Chemical use if needed.
- Coordinate with All Habitats to ensure training will account for all plan needs and coordinate with City representatives to ensure long-term invasive “awareness and monitoring” is in place.

Stewardship Plan Approach

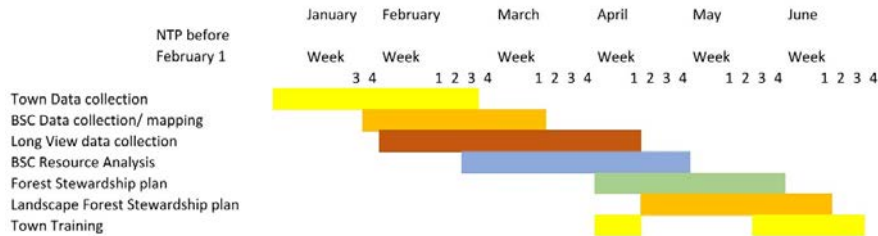
- The plan will be constructed in a way to be adaptative to changing environments and needs over the next 50 years.
- The plan will focus on priority sites and will entail an outreach element to engage the community and to help prevent future infestations
- The plan will consider surrounding land use. This will be used with regards to selecting methodology of treatments, identifying source populations and to avoid impacts to/from neighboring properties.
- The plan will be supported with species specific data and GIS mapping to allow for it to be easily digested and utilized by both Town Officials and management technicians.



The strategic analysis of the proposed maintenance plan will look at the community and region as a whole defined by natural and built boundaries and vectors for species movement. The plan will look at the potential for spread or control and reclamation. This will help identify key areas within each parks to be prioritized (such as areas adjacent to trails and historic viewshed area) which will help avoid the spread of invasives and provide related pest protection in the future like ticks, longhorn beetles, bores, or lanternflies.

Schedule

Work with Mack to produce graphic schedule



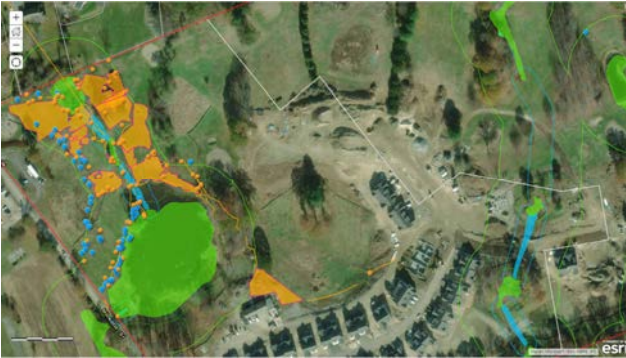
- **Initial, existing data sets added to maps**
- **Survey will be conducted to supplement this and identify areas of concern that need follow up in Phase 2. during the appropriate identification period for the invasive plant species.**
- **Late summer blooms (such as Japanese stiltgrass) may be difficult to confirm but have been mapped and can be quantified in phase 2**

Due to the Grant funding cycle this initial assessment and guide will come relatively quickly fortunately we are building off of many layers of effort from partners at DCR, TNC, BRPC, EOEA and related projects we have completed for the region with tools developed for similar purposes. Our goal is to have a regular series of meeting and events leading to a comprehensive vision by the beginning of June.

Prioritizing changes and treatment



KM0



Factors for Targeting Treatments

Harm avoidance

1. Priority habitats Risk to resource
2. Compound threats
3. Noxious aspect/ public exposure
4. Habitat benefit outweighs disturbance risk

Strategic intervention (Habitat Go)

1. Nodes, corridors and thresholds
2. Frequent disturbance
3. Physical boundaries
4. Probability of conversion
5. Feasibility and cost

Measured response

1. Lethal intervention
2. Seasonal control
3. containment

It's a big task so we will organize it to be comprehensible and scalable We want to know where the best value actions are.

Harm avoidance means being aware of :

- Proximity to Wetlands and Watercourse, Aquifer Protection Areas, Drinking Water Supply
- Exposure to Trail Users (ivy, odor, deadfall, fire, dust, bacterial bloom aesthetics, and education) (waterchesnut fiasco if asked)
- Avoidance of desirable species

Strategic intervention and a measured responses avoid wasted efforts

Some techniques and locations may require Permitting which may

contribute to prioritization. Fortunately Mack and a large team of supporters are preparing a permit parallel this effort so you will have a clear path to taking well informed actions in the future.

Slide 12

KMO

Anything else to add to this?

Kaplan, Melissa, 2023-04-13T01:37:48.922

Tools for decision support (by Species)



Negative Triage modifiers													Positive Triage Modifier											
Combined Modifier	Species	Hosts problem insects, fungi, disease	Alelopathic	Blinding	Smother	Wetland impact	Tree	Noxious	Control Strategist	Stress Tolerator	Ruderal rapid succession	Species	Bio-control In place	Bio-control In development	Has a native counterpart	Ruderal/ Annual	Native	Beneficial	Combined Modifier					
45	Tree of heaven	7	9			5	5	5	5	5	5	Tree of heaven							-2	45				
38	Knotweed		9			5	5	5	9	7	7	Knotweed			-5	-3			-1	38				
36	Black swallow-wort	7	9	3	4				7	3	5	Black swallow-wort				-5			-1	36				
34	Pale swallow-wort	7	9	3	4				7	4	4	Pale swallow-wort				-5			-1	34				
33	Norway maple	5	5				5	7	7	4	4	Norway maple							-1	33				
31	Oriental bittersweet			8	7	5			4	4	3	Oriental bittersweet							-2	31				
30	Common reed				5	8			5	5	5	Common reed							-1	30				
30	Mile-a-minute vine				5	5			5	5	3	Mile-a-minute vine							-1	30				
26	Japanese barberry	3			5				5	5	5	Japanese barberry							-2	26				
24	Common buckthorn		5			5			5	5	5	Common buckthorn							-1	24				
24	Japanese hops	5		3	6				5		5	Japanese hops						5	1	24				
23	Mugwort								5	6	6	Mugwort								23				
22	Reed canary grass					5				7	5	Reed canary grass							-1	22				
21	Leafy spurge					5			4	4	4	Leafy spurge								-1	21			
20	Japanese stilt grass					3				7	6	Japanese stilt grass							-3	20				
19	Sycamore maple	5	2			5	5			7	4	Sycamore maple							-5	-2	19			
19	Border privet					4				6	5	Border privet								-2	19			
19	California privet					5				5	5	California privet								-2	19			
19	European privet					4				4	5	European privet								-5	19			
19	Goutweed					5				6	4	Goutweed								-1	19			
19	Princess tree					5				5	4	Princess tree								-2	-3	19		
18	Moneywort					5				5	4	Moneywort									-1	18		
18	Honeysuckle			5		5				5	5	Honeysuckle								-5	-2	18		
17	Multiflora rose					5			5	4	3	Multiflora rose									-4	-5	17	
17	Porcelainberry					4				4	3	Porcelainberry											17	
17	Winged euonymus					4				7	5	Winged euonymus											17	
16	Perennial pepperweed					3				3	5	Perennial pepperweed									-2	-1	16	
16	Garlic mustard											Garlic mustard									-2	-2	-2	16

Rate the individual functions then aggregate these to prioritize

We will compile a list of your current invasive species and potential regional species to watch for. In this table we rate those species on multiple criteria to give us a threat and value rating. Too often the most talked about or hated weed gets preferential treatment while more sinister issues should be included. This simple spread sheet is meant to help make stronger decisions about what to focus on.

Tools for decision support (by context/ site)



SPECIES MANAGEMENT OPPORTUNITIES TABLE

Triage Rating: Higher numbers to receive greater focus

Levine Site		RESTORATION OPPORTUNITY													
Species modifier #	Site Map Reference & Individual Site Map #s	xxx		Has native re-seed resource	Early control opportunity	Dense stands	Non-disturbance Hazard	Vector control	Ease of access	High visibility	Human resource	Easily isolated	Site specific stress:	Threatens Resource	
Line #	Area	Site Triage Rating:	Combined Triage Rating:												
1	34205, 71079														
2	495	75	17125	6	7	7	1	1	6	8	7	1	1	10	
3	158														
4	65	Tree of heaven													
5	23	Norway maple													
6	21	Oriental bittersweet													
7	26	Japanese barberry													
8	23	Mugwort													
9	19	Bonker privet													
10	28	Knocweed													
11	17	Multiflora rose													
12	17	Porcelainberry													
13	17	Winged euonymus													
14	13	Autumn olive													
15	18	Honeysuckle													
16	7	Eutasia													
17	6	Black locust													
18	6	Wineberry													
19	5	Ground soy													
20	18	Garlic mustard													
21	Average Site rating														
22	Rating per meter														

Rate the individual threats and opportunities then aggregate these to overcome bias

Making informed decisions in complex context means focusing from many perspectives. We developed this simple spread sheet as a way to rate sites based on multiple criteria to cut down on bias and provide an informed and rated priority of where to take action first.

Treatment and Prevention Methods

- Shading
- Replacement/ occupation
- Manual cutting and removal
- Machine cutting
- Girdling
- Smothering
- Flooding
- Excavation
- Flooding
- Biological Introductions
- Burning
- Organic Herbicides (oils acids)
- Non-organic chemical treatment



There are A lot of methods, we can employ. We will provide reasons, costs and benefits so you can prioritize per your needs and abilities with understanding and authority.

Physical/Mechanical Control



**Low Ground
Pressure
Machine
Mounted**



ELI TO TALK

Back to Caseylee



Herbicide Techniques



Cut Surface Application



Low Volume Basal Application



Ultra Low Volume (ULV) vs. Water Applications



Low Volume Foliar Results



ULV Thinvert Spray



ULV Thinvert Backpack Results

Invasive Vegetation Management Techniques

Chemical Control



Wiping, Wicking and Injection Applications





Chemical Control

- Use of herbicides with the highest environmental health, safety, and ecological fate profiles
- Herbicide chemistries with established safe food tolerances



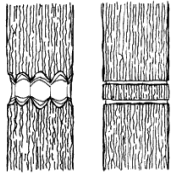
Eli to Talk

Invasive Vegetation Management Techniques

Physical/Mechanical Control



- **Pulling:** effective on young shoots and plants with a shallow root network. Works best when ground is relatively soft
- **Cutting:** varying degrees of success depending on target species characteristics
- **Girdling:** useful for larger shrubs and trees – may be accompanied by an herbicide application



Hand Operated



Hybrid Control Method Examples



1. Herbicide for initial suppression of Phragmites
2. Followed by Sacrificial cover crop and spot treatment.
3. Then Irrigate and hand pull during replacement.

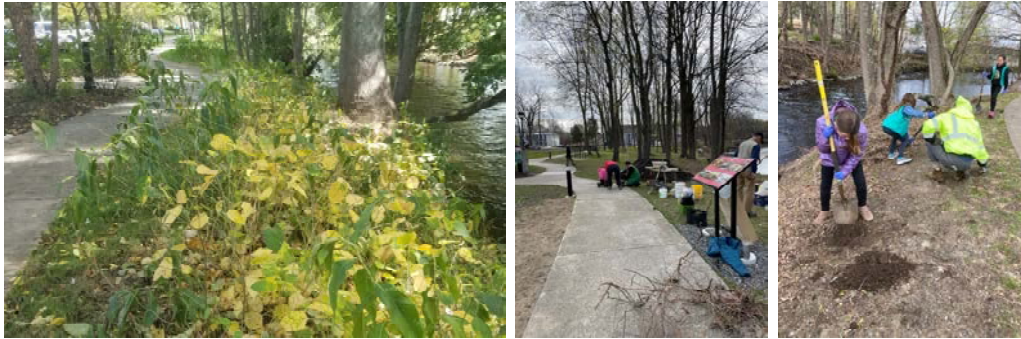


4. Rapid successional development of layered meadow species for shade and soil occupancy.
5. Perpetual maintenance

In most cases A combination of methods are the effective measured response to achieve lasting improvement to land. Simply killing is not an ends in itself, and because there are always new sources and threats the only lasting solution is to re-build soil structure and native plant community specifically the control strategy plants that fill a niche so you don't have to endlessly weed it.

Almost every serious invasive species plot has two problems; disturbed soil ,and lack of a functioning native plant community. Areas without those two deficiencies are often receiving similar invasive seed pressure but are resilient because they have structure and community. We will help you get the damaged landscapes back to healthy function.

Choosing treatment methods responsibly



1. Exhaustive alternatives
2. Assess efficacy
3. Degree of monoculture
4. Sensitive resources/potential for erosion
5. Utilize non-chemical or hybrid, ecosystems based options

Regardless of the method and your choices you will have an informed decision. However much you can do it should be working in positive directions.

This example started with mechanical soil removal by a contractor followed by spring volunteer hand pulling to weaken the survivors, then allowing knotweed to sprout and at the ideal season a foliar foam treatment. This was later followed by overplanting and mycorrhizal inoculations to re-build the soil and species.

That strategy was based on proximity to the river and soil contamination from a former shoe factory with the sort of disturbance that eliminated any functioning plant community.

Conversion & Restoration

1. Girdling of Ailanthus as snags
2. Timed cutting of new growth for late tender greens
3. Insects: Example – Introduce or promote a parasite
4. Overplant with habitat species for shade/ resource control
5. Use ecology of the plants. For example: Repairing, upgrading culverts to flood out Phragmites
6. Hydrogel and organic smother layer where flooding is not possible



Example:

Rivergreen Park Everett MA, Conversion of wetland and buffer Phragmites and Ailanthus to a habitat with, forest, heath and meadow

Inset: Pairing of a native parasite (Webworm) with girdling and timed cuttings to successionaly suppress and replace invasive species.

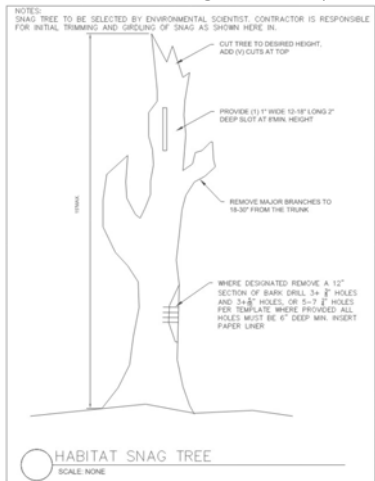
Here are some examples of alternative or strategic combinations we've used when moving areas from invasive dominated landscape to new plant and soil communities.

An invasive control rehab is like the millennium falcon I just got this meadow flying again Ill be damned if I'm going to let Ailanthus rip it apart. This is not like a construction project it is a relationship with your land.

Details for vulnerability reduction



Details for Site drainage/ soil and species management



1 page Project primer memo's for scope development

Project Number per matrix: (8)

Project Name: **Pollinator Hedgerow Buffer**

Description:

Hedgerows with select high nectar/ high pollen canopy and understory trees are to be planted in place of existing wooded margins or where wind breaks are desired. Hedge trees to be half cut and turned down to grade to prevent shading.

Contour buffer strips are strips of grass or a mixture of grasses and legumes that run along the contour of a farmed field. They alternate down the slope of a field with wider cropped strips to reduce erosion and improve pollination and natural pest predation. For solar exposure limits perform half cut/ topple to preserve root base vigor.

.....

Recommendations:

Pollinator Hedge rows and forest edges of select flowering trees are the primary fodder for pollinators these provide up to 3,000lb. of nectar/sap and 100lb of pollen annually and seed/ base line insects for predatory birds.

Assess bordering threats such as proximity of established invasive seed sources.

Top Pollinator/ bird Hedge row species (in order) include Linden, Catalpa, Locust, Cherry Walnut, Willow, Pussy willow, Tupelo,

Budget Order of Magnitude: \$500-\$1000

Square Yard Cost. Minimum Area 50 yd.

Coordination costs 5%

Closing up vulnerabilities isn't just replacing plants with better plants its also how we build and how we maintain, we will apply some details and short memos to apply to projects such as the next time this road gets restored lets insist it include a swale rather than running off into the forest. Also Having that 30% design also ensures that if it is Fema grade storm damage they are can fund the design, not just replacing the value of the original and leaving you to cover the spread.

Examples/ Project experiences:

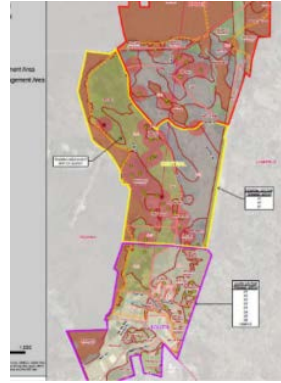
- City approached BSC regarding an ambitious plan to manage 35 city parks over a 5 year period.
- Consideration for acquiring funding, educating both public and town staff
- How to monitor annually on a low budget
- Organic-compound ban and other permits / restrictions to consider.
- Take-away: Creative utilization of resources and broad landscape approach.



Invasive Species Management Program
A Citywide mapping and analysis program
with staff and volunteer training
Stamford, CT



Project Experience



**Camp Curtis Guild – Invasive Species Vegetation,
Management Plan and Wetlands Permitting Massachusetts
Army National Guard**

Reading, Lynnfield, North Reading, Wakefield, MA



Project Experience



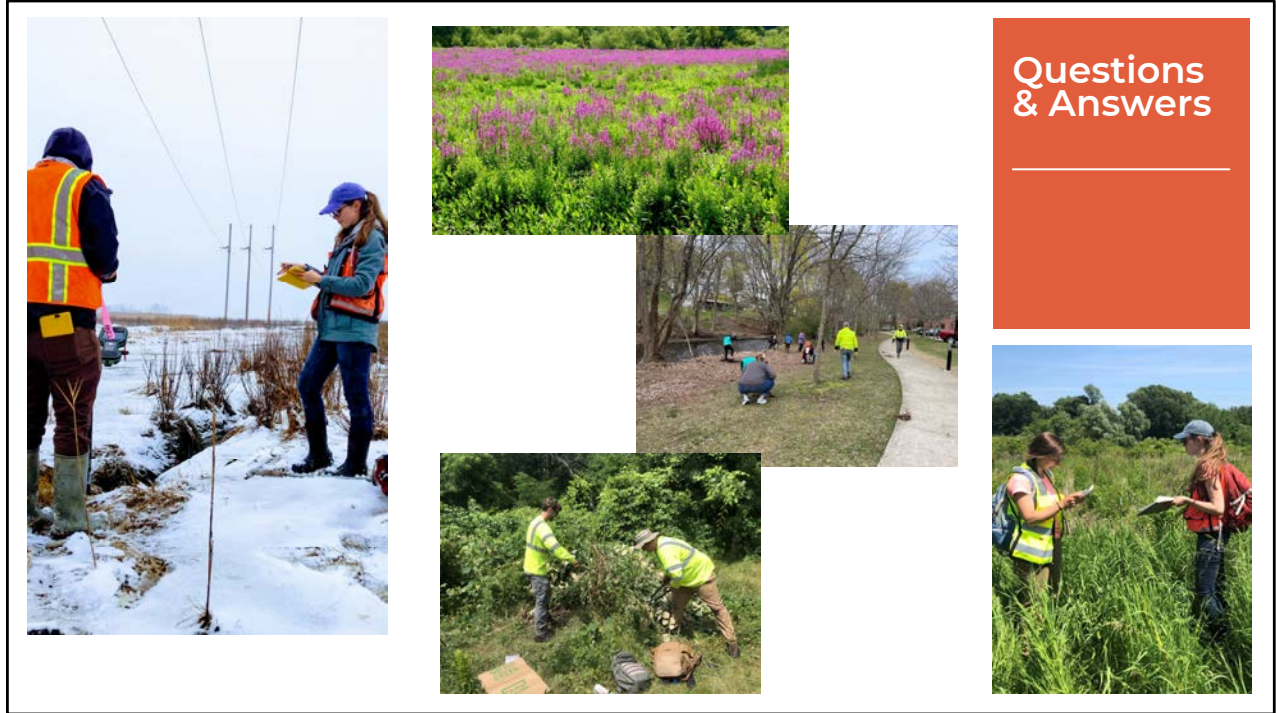
Invasive Species Management and Restoration Monitoring Massachusetts
Department of Conservation and Recreation Statewide, MA



Prospect Mountain Preserve



Invasive Plant Species Management
Litchfield Land Trust
26 acres of the Prospect Mountain Preserve
Litchfield, CT



To change a picture, select image and right click
Select "Change Picture"
Select "From a File"

Navigate to folder to find new image

Select image and size to fit the current image shape

Feel free to organize the images and change image sizes, as long as the spacing between images remains consistent.

DESIGN TIP: Align all photos on the top row to the top; Align all photos on the bottom row to the bottom; keep white space between images consistent.



OFFICE LOCATIONS

HEADQUARTERS
BOSTON, MA

GLASTONBURY, CT
ANDOVER, MA
WEST YARMOUTH, MA
WORCESTER, MA
MANCHESTER, NH



Build | Support | Connect

1965

BSC
FOUNDED

180

TEAM
MEMBERS

EMPLOYEE-OWNED

ENR
TOP 500

NEW
ENGLAND
28

BBJ

LARGEST
ENGINEERING
FIRMS

About us.

Disciplines



ECOLOGICAL
SCIENCES



GIS, TECHNOLOGY, &
CUSTOM SOFTWARE
SOLUTIONS



LAND SURVEYING
& SPATIAL
SERVICES



PERMITTING &
REGULATORY
COMPLIANCE



ENVIRONMENTAL
ENGINEERING



CIVIL & SITE
ENGINEERING



TRANSPORTATION
PLANNING &
ENGINEERING



PLANNING
& DESIGN



STRUCTURAL
ENGINEERING



EMPLOYEE
-OWNED

180 staff



BOSTON, MA

GLASTONBURY, CT

ANDOVER, MA

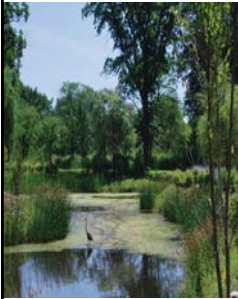
W.YARMOUTH, MA

WORCESTER, MA

MANCHESTER, NH

As an inter disciplinary team we have an opportunity to innovate by sharing our curiosity across groups and often across companies per our partnership with Long View and others. Its an opportunity to ask questions that crop up in unexpected places. Managing invasive species means adapting or inventing new circumstances especially when we move beyond 'poison and repeat'.

Ecological Sciences



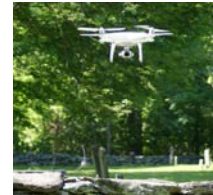
- Nature-based Solutions (NBS)
- Best Management Practices (BMP)
- Botanical Surveys and Inventories
- Mitigation Design
- Ecological Restoration
- Rare & Threatened Species Surveys
- Wildlife Surveys
- Soil Science
- Marine, Aquatic, & Terrestrial Biology
- Wetland Science Asset Management
- Wetlands Permitting
- Water Quality & Water Resources Ecology
- Coastal Beach & Dune Stabilization
- Coastal Resource Studies
- Dredge Planning & Monitoring
- Drone-Based Field Surveys
- Floodplain Management

Being truly strategic about species management means having the strategy and techniques not just for removal but, displacement, succession, and cultural education. That's a long list of capabilities and what it means for you is the wholistic thinking needed not just to fight species but to affect real change.

GIS, Technology, & Custom Software Solutions



- Advanced GIS Integration & Automation
- Asset Management
- Climate Modeling
- Cloud-Based Solutions
- Data Visualization & 3D Modeling
- GPS & Mobile Data Collection
- Document & Content Management
- Geospatial & Imagery Analysis
- Database Design
- Infrastructure Management
- Mobile & Web GIS Applications
- Spatial Data Management
- sUAS Based Remote Sensing
- Systems Planning
- UAV (Drone) Surveys
- Workflow Automation



Our GIS team has the capacity for some truly impressive customized map, model and data management tasks.

But the end product for you will be simple in field user driven map and inventory with an implementation plan and strategy detailing priorities and methods per site or species. A tool you can use.