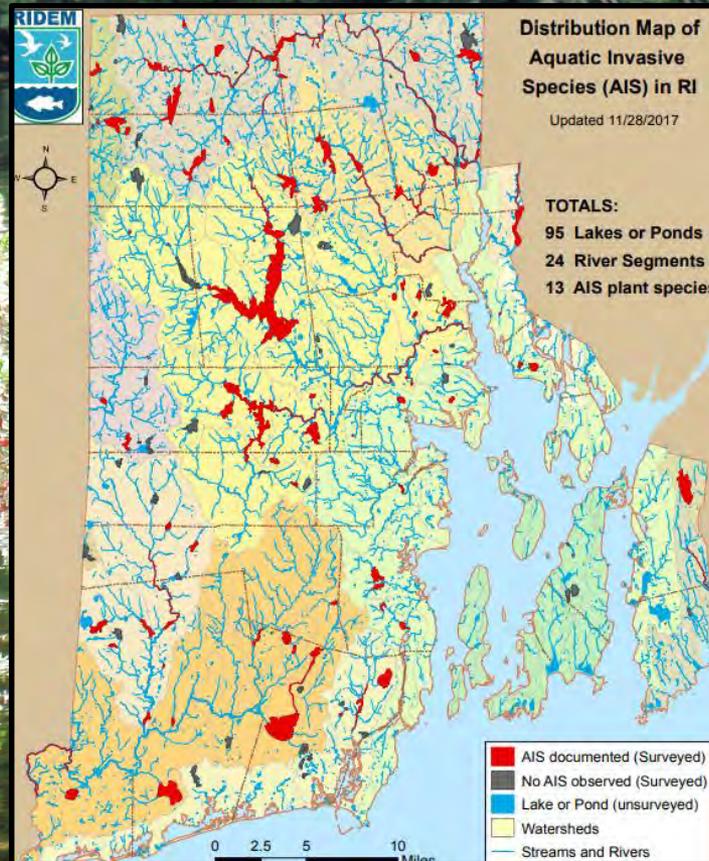


Finding Aquatic Invasive Plants and Planning Lake Management



Katie DeGoosh-DiMarzio

RIDEM Office of Water Resources

Elizabeth Herron

URI Watershed Watch

Today's AIS Workshop: Aquatic Invasive Species

- 1) Introduction to aquatic plants and AIS
- 2) How and why are AIS a problem?
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Aquatic Plants

(macrophytes, weeds)

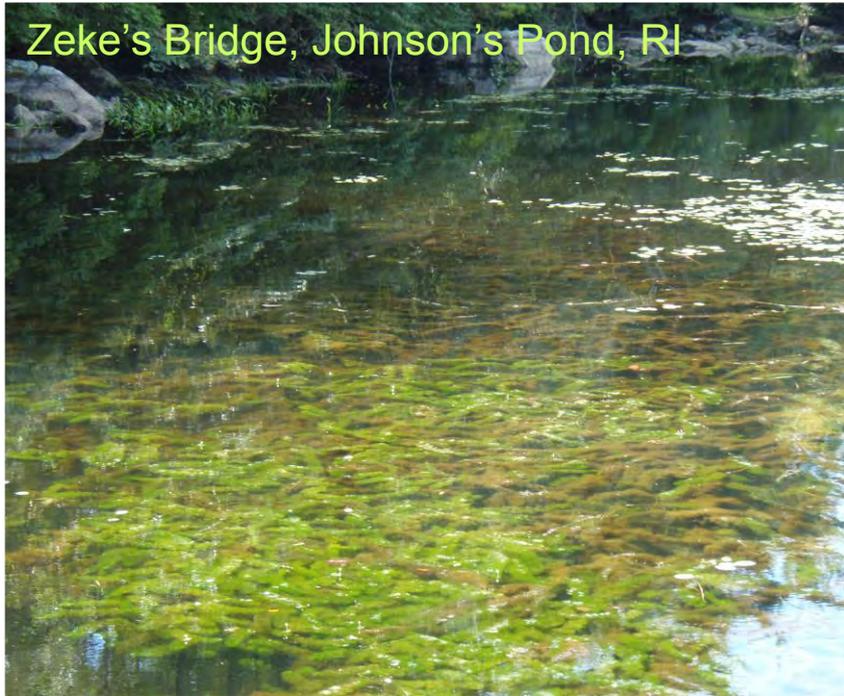


Pawcatuck River, Bradford Landing, RI

Benefits (!!) of Native Aquatic Plants

1. Provide habitat and protection
2. Act as food sources
3. Help recycle oxygen and CO₂
4. Prevent shoreline erosion
5. Help improve water clarity

What are Aquatic **Invasive** Species?



Usually non-native or “exotic” species

What are Aquatic **Invasive** Species?

Successful Invasive Plants Often:

- Have fewer predators
- Good competitors
- High reproduction & growth rates
- Adapt well to new conditions

Wyoming Pond, Hopkinton

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How are AIS a problem?

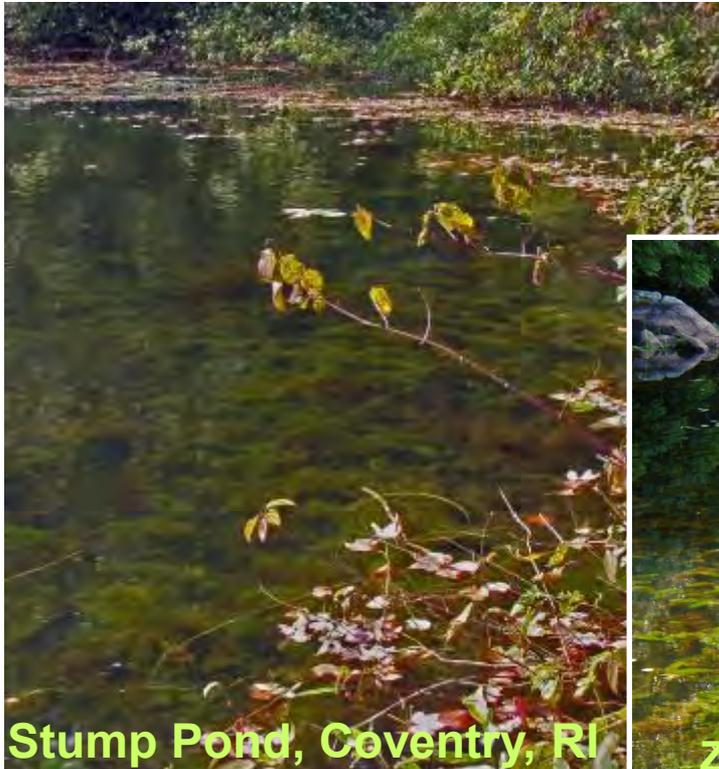
Limit Ecological Function of Lake

- Outcompete beneficial native species
- Decrease biodiversity (and angling opportunities)
- Reduce water quality
- Decompose slowly & reduce O₂
- May degrade conditions for fish

How are AIS a problem?

Impede Recreation

- Reduce aesthetics/visibility



How are AIS a problem?

Impede Recreation

- Reduce aesthetics/visibility
- Become entangled around motors
- Obstruct access to boat ramps/lanes
- Snag fishing lines

How are AIS a problem?

Cause Economic Harm

- Require substantial funds to manage
- May devalue waterfront property
- Threaten tourism/recreation
- Damage infrastructure (shellfish)

POTENTIAL IMPACTS OF EXOTIC OR INVASIVE PLANTS

FISH, WILDLIFE & NATIVE PLANTS

- Displacement of native plants
- Displacement of endangered, threatened or rare aquatic plants
- Habitat loss for fish & wildlife
- Change in spawning site availability
- Change in fish distribution
- Reduction in feeding success of predatory fish
- Reduction of open-water

WATER QUALITY

- Temperature & oxygen fluctuations
- Increased phosphorus (nutrient) loading
- Alteration in plant and algae communities
- Accelerated eutrophication rates

Source: A report from the Milfoil Study Committee on the Use of Aquatic Herbicides to Control Eurasian Watermilfoil in Vermont. VTDEC, March 1993

POTENTIAL IMPACTS OF EXOTIC OR INVASIVE PLANTS (continued)

RECREATION

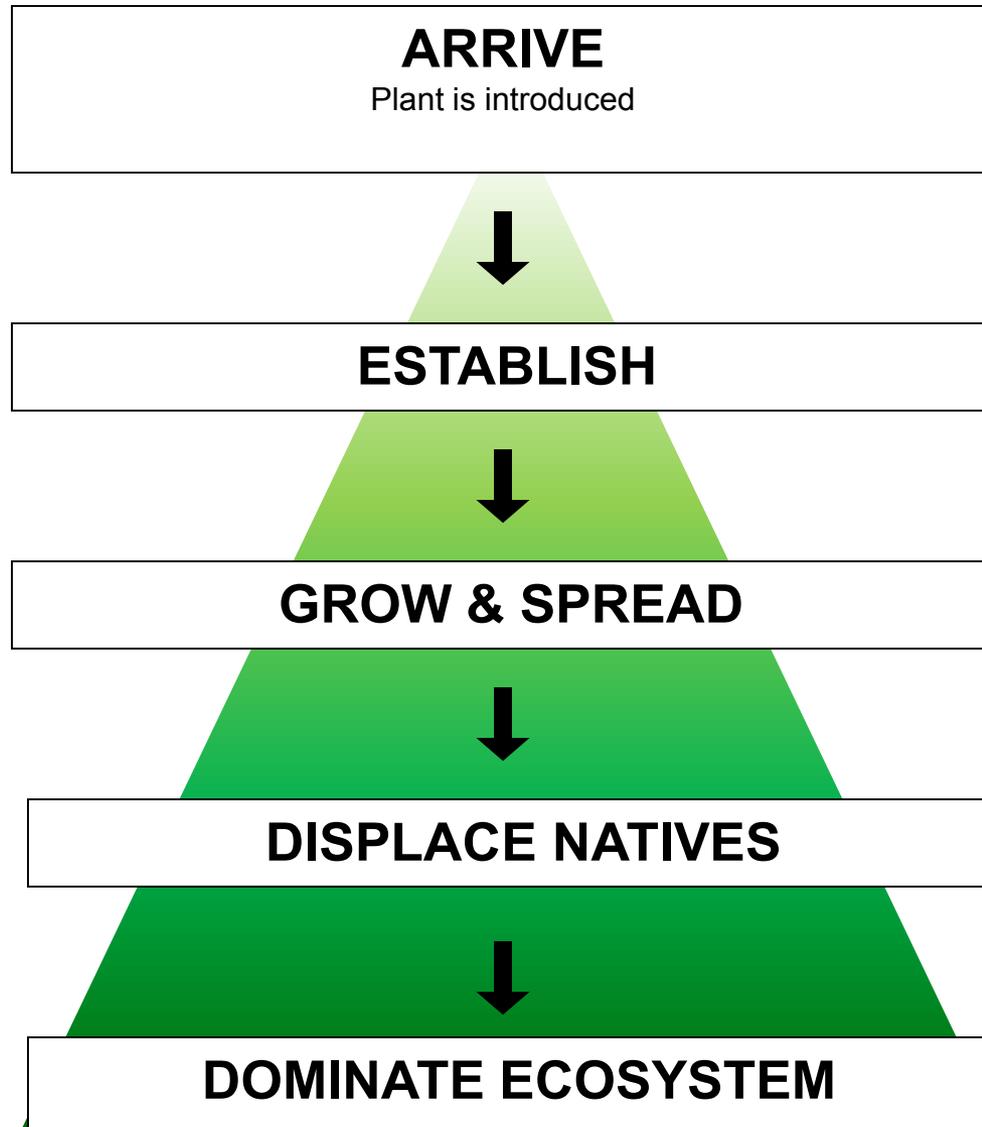
- Risk of swimmer entanglement
- Reduced access for boating & fishing
- Reduced aesthetics

LOCAL COMMERCE & REAL ESTATE

- Reduced property taxes
- Declining property values
- Renters fail to return for a second season
- Slowed business for marinas, etc.
- Declining attendance at lakefront beaches and parks

Source: A report from the Milfoil Study Committee on the Use of Aquatic Herbicides to Control Eurasian Watermilfoil in Vermont. VTDEC, March 1993

How are AIS a problem?



Stages of an Invasion

ARRIVE

Plant is introduced

ESTABLISH

GROW & SPREAD

DISPLACE NATIVES

DOMINATE ECOSYSTEM



Stages of an Invasion

ARRIVE

Plant is introduced



ESTABLISH



GROW & SPREAD



DISPLACE NATIVES



DOMINATE ECOSYSTEM



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Stages of an Invasion

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ESTABLISH



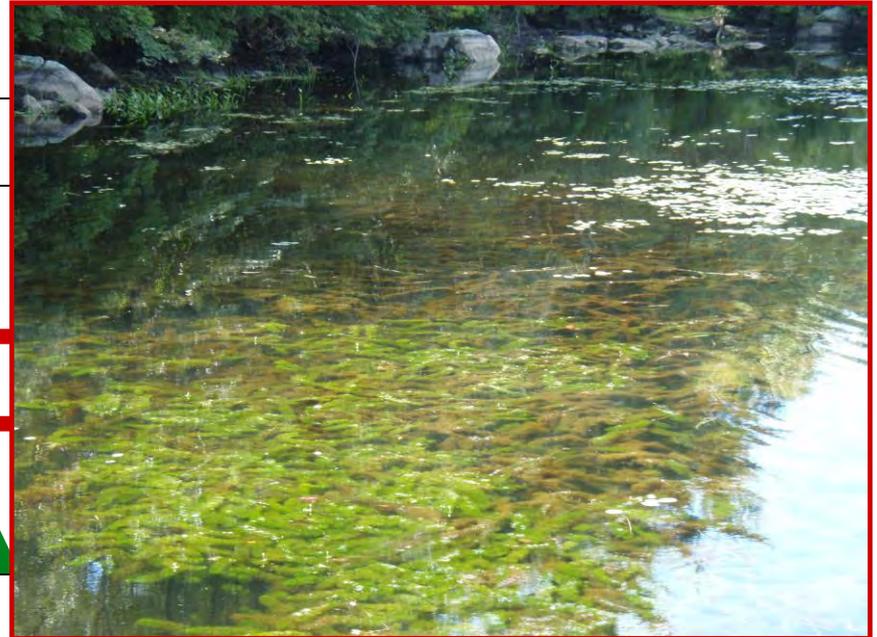
GROW & SPREAD



DISPLACE NATIVES



DOMINATE ECOSYSTEM



Stages of an Invasion

ARRIVE

Plant is introduced



ESTABLISH



GROW & SPREAD



DISPLACE NATIVES



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Where are invasives in RI?

RIDEM AIS Monitoring



Locustville Pond, Hopkinton, RI



Belleville Pond, North Kingstown, RI



Johnson's Pond, Coventry, RI

Where are invasives in RI?

RIDEM AIS Monitoring



Where are invasives in RI?

RIDEM AIS Monitoring
(includes cleaning off boats!)



Where are invasives in RI?

RIDEM AIS Monitoring and MAPPING

The screenshot shows the website for the Office of Water Resources in Rhode Island. The browser address bar displays "www.dem.ri.gov/programs/water/". The website header features the RIDEM logo and a search bar. A navigation menu includes links for Home, About Us, Offices & Divisions, Online Services, Events, In the News, and Contact Us. A vertical sidebar on the left is labeled "NEWS | FOLLOW US". The main content area is titled "Water Resources" and displays a carousel of images, with the second image of four showing a crowded beach. A "Quick Links" sidebar on the right lists various services such as "Office of Water Resources Home", "Permitting", "Professional Licensing", "Waters & Wetlands", "Financial Assistance", "Topics & Links", and "Rules & Regulations".

Where are invasives in RI?

RIDEM AIS Monitoring and MAPPING

www.dem.ri.gov/programs/water

The image shows a screenshot of the Rhode Island Department of Environmental Management (DEM) website. The browser address bar displays "www.dem.ri.gov/programs/water/". The website header includes the DEM logo and navigation links such as "Home", "About Us", "Office of Water Resources", "In the News", and "Contact Us". A search bar is located in the top right corner. A yellow callout bubble points to the search bar with the text "Search: 'aquatic invasives'". Below the search bar, a "Water Resources" section is visible, showing a carousel of images. The first image in the carousel is a beach scene with people and umbrellas. A "Quick Links" sidebar is on the right, listing various services like "Office of Water Resources Home", "Permitting", "Professional Licensing", "Waters & Wetlands", "Financial Assistance", "Topics & Links", and "Rules & Regulations".

Where are invasives in RI?

RIDEM AIS Monitoring and MAPPING

www.dem.ri.gov/programs/water/quality/surface-water/aquatic-invasive-species.php

The screenshot shows the RIDEM Rhode Island website. The header includes the DEM logo, a search bar, and social media icons. The navigation menu contains: Home, About Us, Offices & Divisions, Online Services, Events, In the News, and Contact Us. The breadcrumb trail reads: OFFICE OF WATER RESOURCES / WATER QUALITY / SURFACE WATER QUALITY / INTRODUCTION TO AQUATIC INVASIVE SPECIES. The main heading is 'Introduction to Aquatic Invasive Species'. Below it are four line drawings of various aquatic organisms. A text block defines AIS as non-native plants and animals that threaten native species and ecosystems. Below the text are two photographs: 'Invasive Plants' (green leafy plants) and 'Invasive Animals' (two snails). A red circle highlights the 'Invasive Plants' image. On the right, a sidebar titled 'Lakes & Ponds Resources' lists: Overview of Lakes in RI, Nutrients in Lakes, Aquatic Invasive Species, Lake/Pond Water Quality, Cynobacteria, Recreation, and How to Protect My Lake. At the bottom, there is a 'Contact' section for the Office of Water Resources.

DEM
RHODE ISLAND

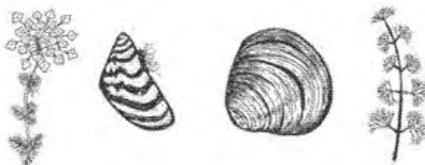
Search

RI JOBS

Home About Us Offices & Divisions Online Services Events In the News Contact Us

OFFICE OF WATER RESOURCES / WATER QUALITY / SURFACE WATER QUALITY
/ INTRODUCTION TO AQUATIC INVASIVE SPECIES

Introduction to Aquatic Invasive Species



Aquatic invasive species (AIS) are non-native plants and animals that have been introduced (accidentally or intentionally) into lakes and rivers, and whose introduction threatens the diversity or abundance of native species, the stability of the ecosystem and/or the use of the infested water body. AIS are a major threat to our freshwater ecosystems and a significant management concern because of their ecological and socio-economic costs.



Invasive Plants Invasive Animals

Lakes & Ponds Resources

- Overview of Lakes in RI
- Nutrients in Lakes
- Aquatic Invasive Species
- Lake/Pond Water Quality
- Cynobacteria
- Recreation
- How to Protect My Lake

Contact

Office of Water Resources

Where are invasives in RI?

RIDEM AIS Monitoring and MAPPING

www.dem.ri.gov/programs/water/quality/surface-water/aisplant.php

Aquatic Invasive Plants

Native aquatic plants are an essential part of a freshwater ecosystem, providing many benefits to wildlife as well as humans. These benefits include:

- Provide habitat and refuge for aquatic animals
- Act as food sources for wildlife
- Recycle oxygen and carbon dioxide
- Reduce wave action, preventing shoreline erosion and improving water clarity

Aquatic *invasive* plants are non-native species that can disrupt the ecosystem and create nuisance conditions in freshwaters. Under the right conditions, aquatic invasive plants are able to thrive in our waters and can out-compete beneficial native plants that are naturally part of our aquatic ecosystems. Once invasive plants become well established, the density of plant growth not only degrades the native habitat, but often interferes with human enjoyment of water bodies by limiting recreational uses such as swimming, fishing and various boating activities. Left uncontrolled, certain species can "choke" a waterway, completely covering what was once open water with plant material.

The Problem with Plant Fragments

Most of Rhode Island's submergent invasive plants (found primarily under the surface) can reproduce, grow and spread through fragmentation. Fragmentation is a simple form of reproduction in which a plant is split into small fragments, and each fragment can then develop into a whole new plant. This means that even one small plant fragment caught on a boat motor, trailer or equipment can be transported to a different water body and start an entirely new infestation.

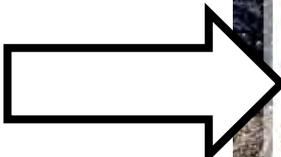
or download the pdf document of all [PDF](#) compiled species-specific distribution maps as of January 2018, allowing time for large file size due to maps and pictures.

Otherwise, you can see a summary of all invasives in the [PDF](#) AIS distribution map and full list of infested lakes by town.

For more information about each species, click on link to the species factsheet in the table below, or click here for a packet of [PDF](#) all invasive species factsheets.

Navigation Menu:

- + Water
- Surface
- Lake, I
- + River
- Narrag
- Shellfi
- Rhode
- RI Env
- Maps
- RIDOH
- Contact



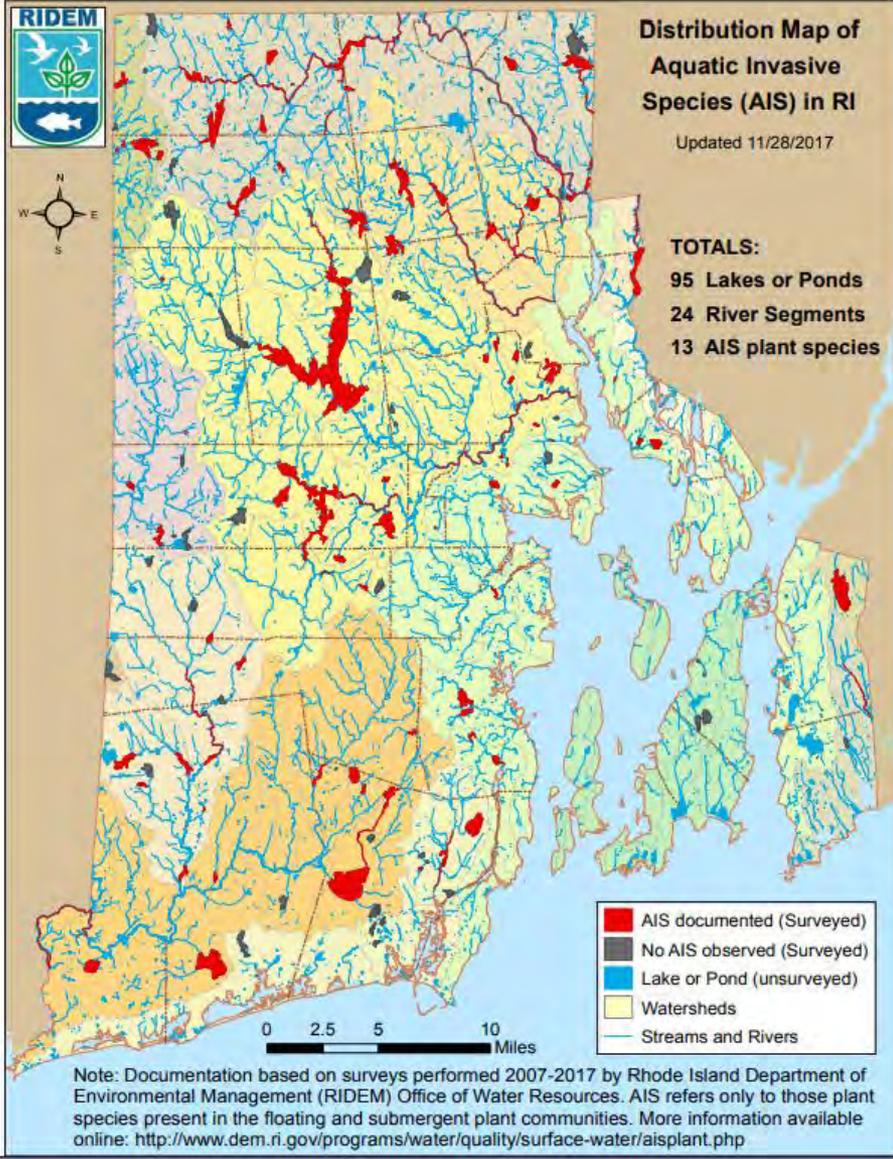
Which Aquatic Invasive Plants are in RI?





State AIS Distribution Map & List

<http://www.dem.ri.gov/programs/benviron/water/wetlands/pdfs/invasive.pdf>



Rhode Island Freshwaters with Aquatic Invasive Plants
rivers listed first, then lakes listed by city or town, alphabetically

| Town | Waterbody | Common Name |
|----------------------|--|---|
| | 29 Spring Lake (Herring Pond) | fanwort inflated bladderwort variable milfoil |
| | 30 Sucker Pond | fanwort |
| | 31 Wakefield Pond | fanwort |
| | 32 Wilson Reservoir | inflated bladderwort |
| <u>Central Falls</u> | 33 Valley Falls Pond | Eurasian milfoil fanwort variable milfoil water chestnut |
| <u>Charlestown</u> | 34 Watchaug Pond | inflated bladderwort |
| <u>Coventry</u> | 35 Arnold Pond | Brazilian elodea |
| | 36 Carbuncle Pond | fanwort mudmat variable milfoil |
| | 37 Coventry Reservoir (Stump Pond) | variable milfoil |
| | 38 Flat River Reservoir (Johnson Pond) | fanwort inflated bladderwort variable milfoil |
| | 39 Maple Root Pond | fanwort |
| | 40 Tiogue Lake | fanwort spiny naiad variable milfoil |

RI Freshwaters with Aquatic Invasive Plants as of 1/9/2018 Page 3 of 10

Where are invasives in RI?

RIDEM AIS Monitoring and MAPPING

www.dem.ri.gov/programs/water/quality/surface-water/aisplant.php

Which Aquatic Invasive Plants are in RI?

Aquatic invasive plants are widely distributed in Rhode Island freshwaters. See the table below for individual species-specific distribution maps and lists (click links in the column on the right) or download the pdf document of all [compiled species-specific distribution maps as of January 2018](#), allowing time for large file size due to maps and pictures.

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For more information about each species, click on link to the species factsheet in the table below, or click here for a packet of [all invasive species factsheets](#).

Species Present in Rhode Island

| Common Name / Fact Sheet | Species Name | Distribution Map |
|----------------------------------|-----------------------------------|-----------------------------------|
| variable milfoil | <i>Myriophyllum heterophyllum</i> | Click for pdf map |
| Eurasian milfoil | <i>Myriophyllum spicatum</i> | Click for pdf map |
| parrot feather | <i>Myriophyllum aquaticum</i> | Click for pdf map |
| fanwort | <i>Cabomba caroliniana</i> | Click for pdf map |
| Brazilian elodea | <i>Egeria densa</i> | Click for pdf map |
| mudmat | <i>Glossostigma cleistanthum</i> | Click for pdf map |
| spiny naiad | <i>Najas minor</i> | Click for pdf map |

Fax: (401) 22

[DEM Wa](#)

Where are invasives in RI?

RIDEM AIS Monitoring and MAPPING

www.dem.ri.gov/programs/water/quality/surface-water/aisplant.php

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Fax: (401) 22

 DEM Wa

Species Present in Rhode Island

 compiled species-specific distribution maps

| Common Name / Fact Sheet | Species Name | Distribution Map |
|--|-----------------------------------|---|
|  variable milfoil | <i>Myriophyllum heterophyllum</i> |  Click for pdf map |
|  Eurasian milfoil | <i>Myriophyllum spicatum</i> |  Click for pdf map |
|  parrot feather | <i>Myriophyllum aquaticum</i> |  Click for pdf map |
|  fanwort | <i>Cabomba caroliniana</i> |  Click for pdf map |
|  Brazilian elodea | <i>Egeria densa</i> |  Click for pdf map |
|  mudmat | <i>Glossostigma cleistanthum</i> |  Click for pdf map |
|  spiny naiad | <i>Najas minor</i> |  Click for pdf map |



Compiled Species-Specific Distribution Map

<http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/aisridist.pdf>

Freshwater Aquatic Invasive Species in Rhode Island

Species-specific Statewide Distributions

January 2018



Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street – Room 200
Providence, RI 02908

Overview and Contents

Between 2007 and 2017 the Rhode Island Department of Environmental Management, Office of Water Resources (OWR) has been documenting the presence of aquatic invasive species (AIS) in lakes, ponds and rivers, statewide. RIDEM OWR monitors approximately 20 lakes or ponds during the summer season by visually surveying for invasives, and as resources allow, may visit additional ponds in response to public concerns. To date, RIDEM has visited 157 lakes or ponds, and visited hundreds of sites on streams.

As of November 2017, at least one invasive species was documented by RIDEM staff at 98 lakes or ponds (62% of the visited locations) in addition to invasives found at sites along 24 distinct rivers. A map of this data and list of each location by town, with the invasives species that were identified can be downloaded here: <http://www.dem.ri.gov/programs/benviron/water/wetlands/pdfs/invasive.pdf>. Provided herein are maps showing the species-specific statewide distribution of 15 different invasive species (see page number below) accompanied by a list of locations where the species was documented (plants in order below from least to most common).

Number of Documented Freshwaters with Invasive Species (as of December 1, 2017)

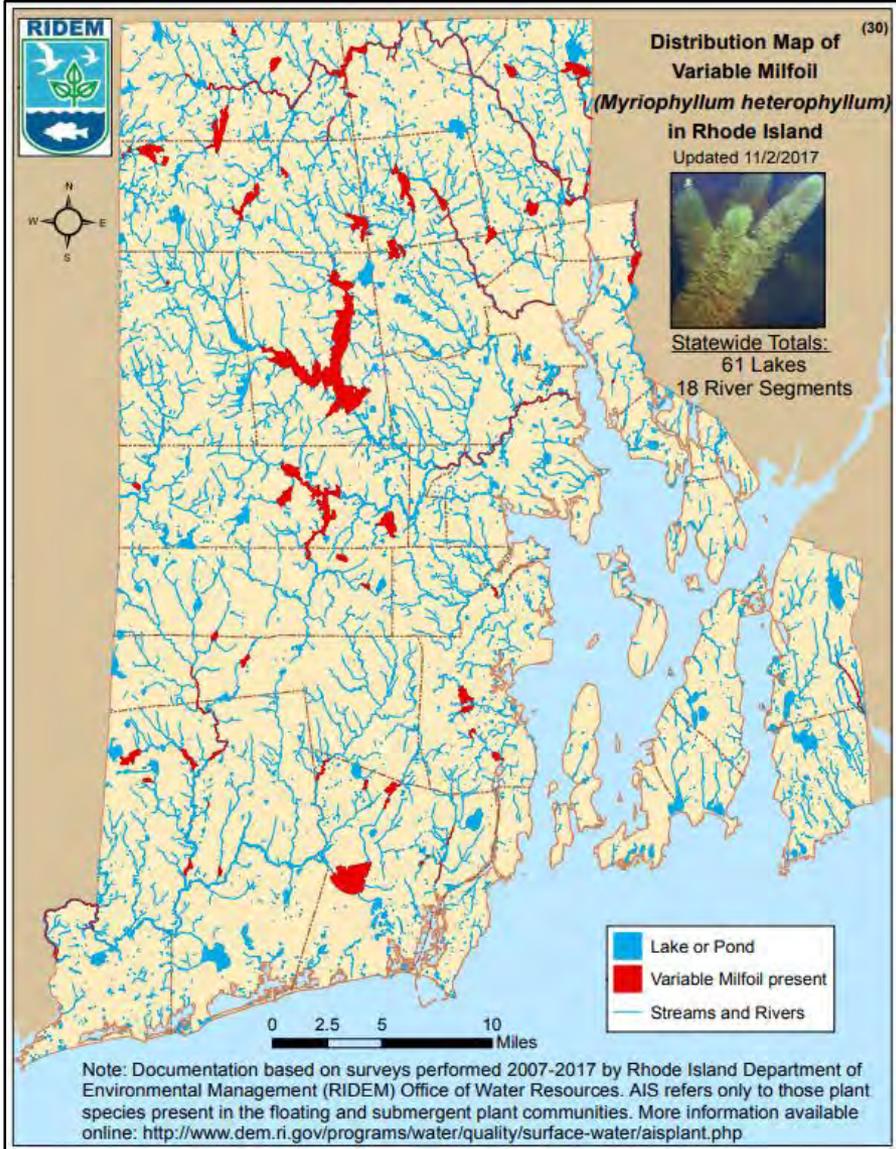
| Invasive Species | Lakes/Ponds | Rivers | Total | Page Number |
|---|-------------|-----------|-------|-------------|
| 1. Parrot Feather <i>(Myriophyllum aquaticum)</i> | 1 | 0 | 1 | (1) |
| 2. American Lotus <i>(Nelumbo lutea)</i> | 2 | 0 | 2 | (3) |
| 3. Yellow Floating Heart <i>(Nymphoides peltata)</i> | 3 | 0 | 3 | (5) |
| 4. Brazilian Elodea <i>(Egeria densa)</i> | 4 | 0 | 4 | (7) |
| 5. Water Hyacinth <i>(Eichhornia crassipes)</i> | 4 | 1 | 5 | (9) |
| 6. Inflated Bladderwort <i>(Utricularia inflata)</i> | 6 | 0 | 6 | (11) |
| 7. Water Chestnut <i>(Trapa natans)</i> | 8 | 0 | 8 | (13) |
| 8. Spiny Naiad <i>(Najas minor)</i> | 9 | 0 | 9 | (15) |
| 9. Mudmat <i>(Glossostigma cleistanthum)</i> | 9 | 1 | 10 | (17) |
| 10. Eurasian milfoil <i>(Myriophyllum spicatum)</i> | 8 | 2 | 10 | (19) |
| 11. Curly-leaf Pondweed <i>(Potamogeton crispus)</i> | 12 | 5 | 17 | (21) |
| 12. Fanwort <i>(Cabomba caroliniana)</i> | 55 | 12 | 67 | (24) |
| 13. Variable Milfoil <i>(Myriophyllum heterophyllum)</i> | 61 | 18 | 79 | (30) |
| 14. Asian Clam <i>(Corbicula fluminea)</i> | 11 | 3 | 14 | (36) |
| 15. Chinese Mystery Snail <i>(Cipangopaludina chinensis)</i> | 14 | 1 | 15 | (38) |
| Total waterbodies with at least one invasive* | 98 | 24 | | |

*some waterbodies have more than one invasive species; therefore, total reflects distinct waterbodies.



Compiled Species-Specific Distribution Map

<http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/aisridist.pdf>



Distribution of variable milfoil (*M. heterophyllum*) in RI
river segments listed first alphabetically; then lakes listed by city or town

| Town | Waterbody Name | First documented | Last Surveyed |
|---------------------|---------------------------------------|------------------|---------------|
| RIVERS | | | |
| 1 | Abbott Run Brook North & Tribs | 5/13/2009 | 7/7/2009 |
| 2 | Adamsville Brook & Tribs | 9/7/2012 | 9/7/2012 |
| 3 | Blackstone River (Seg A) | 7/22/2009 | 8/2/2017 |
| 4 | Branch River & Tribs (Seg A) | 7/15/2009 | 7/20/2009 |
| 5 | Branch River & Tribs (Seg B) | 7/15/2009 | 7/15/2009 |
| 6 | Clear River & Tribs (Seg C) | 8/1/2007 | 6/11/2010 |
| 7 | Clear River (Seg D) | 8/1/2007 | 8/1/2007 |
| 8 | Pawcatuck River & Tribs | 8/6/2009 | 9/6/2012 |
| 9 | Pawtuxet River (Main Stem) | 6/28/2010 | 9/18/2015 |
| 10 | Saugatucket River & Tribs | 7/20/2010 | 7/20/2010 |
| 11 | Tarkiln Brook & Tribs (Seg A) | 7/20/2009 | 7/20/2009 |
| 12 | Tarkiln Brook & Tribs (Seg B) | 5/20/2009 | 7/20/2009 |
| 13 | Ten Mile River & Tribs | 8/10/2007 | 6/30/2011 |
| 14 | Wood River & Tribs (Seg A) | 7/9/2009 | 7/10/2009 |
| 15 | Wood River (Seg B) | 9/30/2008 | 8/2/2011 |
| 16 | Woonasquatucket River & Tribs (Seg B) | 6/1/2009 | 6/1/2009 |
| 17 | Woonasquatucket River & Tribs (Seg C) | 6/1/2009 | 8/25/2009 |
| 18 | Woonasquatucket River (Seg D) | 6/17/2009 | 6/17/2009 |
| Burrillville | | | |
| 19 | Echo Lake (Pascoag Reservoir) | 9/12/2008 | 9/13/2012 |

RI lakes and river segments with variable milfoil as of 1/17/2018

Page 1 of 5

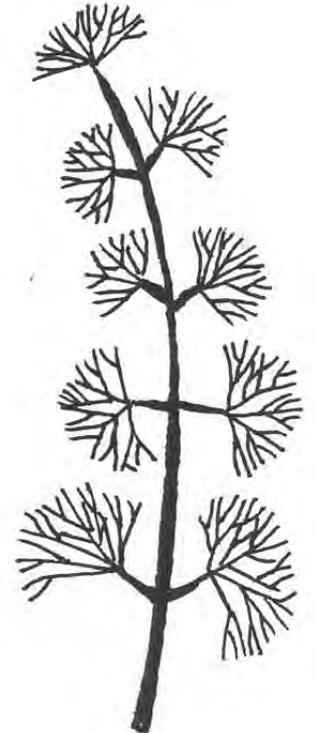
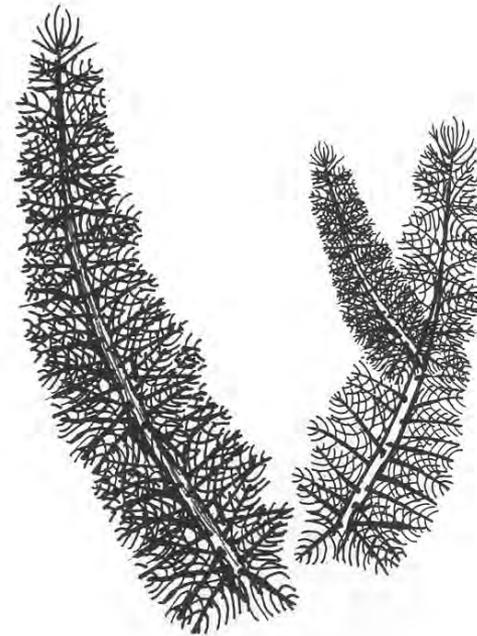
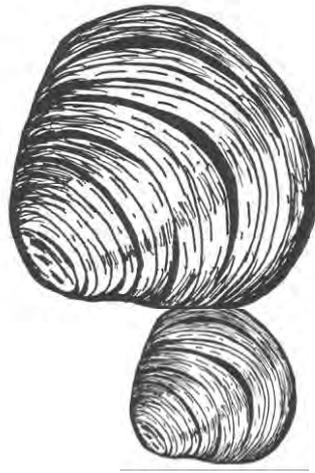
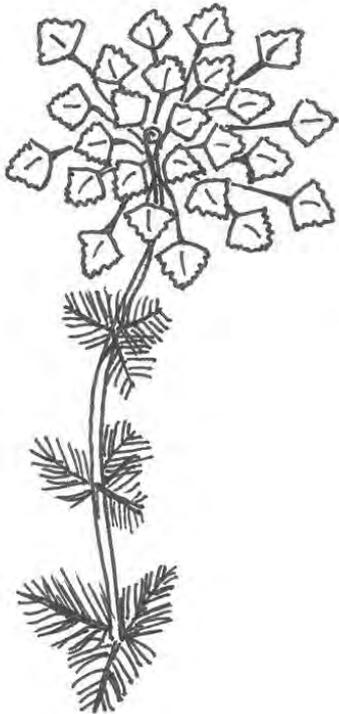
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What can you do?

1. Identify problem

Know your enemy!



What's in MY Lake?

URIWW Invasives Monitoring Materials

- Plant Monitoring Protocol (manual)
- Aquatic Plant Identification Handbook
- Glossary of terms
- Key to Non-native and invasive species
- How to use the Key
- RIDEM Guide to Keying Out Plants

<https://web.uri.edu/watershedwatch/learning-about-aquatic-invasive-species/#>



What can you do?

2. GET ORGANIZED!



Lake Management Plans



- Written document for specific lake



- Outlines & prioritizes specific goals of management (eradicate or control)



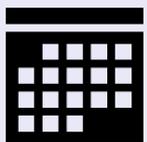
- lists factors at a particular lake that contribute to a specific plant problem



- Provides options and recommends strategies for specific goals

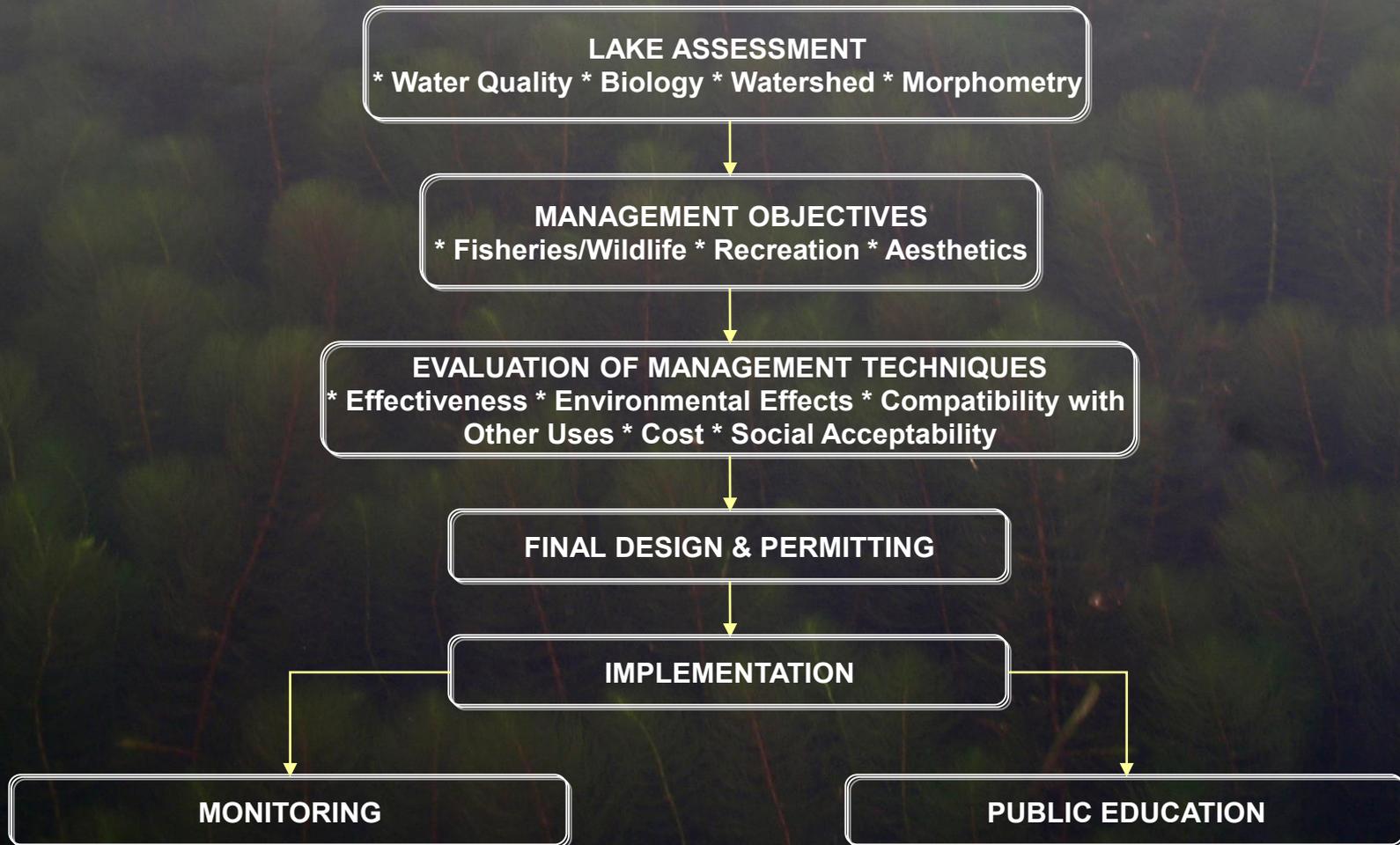


- Names which people will complete management strategies



- Provides a specific, measurable timeframe with quantifiable endpoints

DEVELOPMENT OF A COMPREHENSIVE AQUATIC VEGETATION MANAGEMENT PLAN



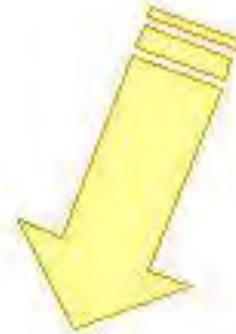
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Aquatic Plant Requirements



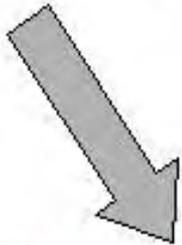
NUTRIENTS



* Nutrients promote plant growth



NUTRIENTS



Sources of Nutrients in a Watershed

- Surface & storm water runoff
- Lawn or agricultural fertilizers
- Leaking septic systems
- Wastewater treatment facilities
- Animal waste
- Atmospheric deposition

Work to reduce
nutrient loading in a
watershed! →

Watershed Management Plan

Source Reduction

- Agricultural Best Management Practices
- Bank and Slope Stabilization
- Behavior Modifications
- Stormwater / Wastewater Management
- Zoning and Land Use Planning

Transport Mitigation

- Buffer Strips
- Catch Basins and Street Sweeping
- Created Wetlands for Infiltration
- Detention Ponds and Infiltration Systems

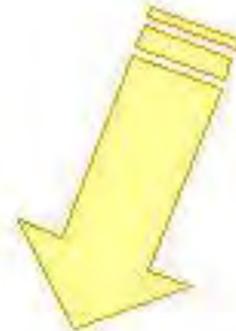
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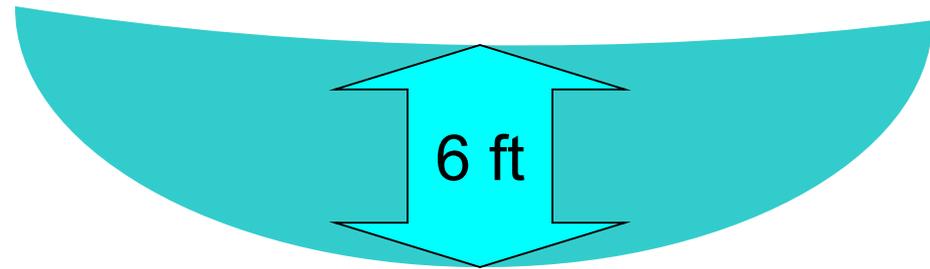
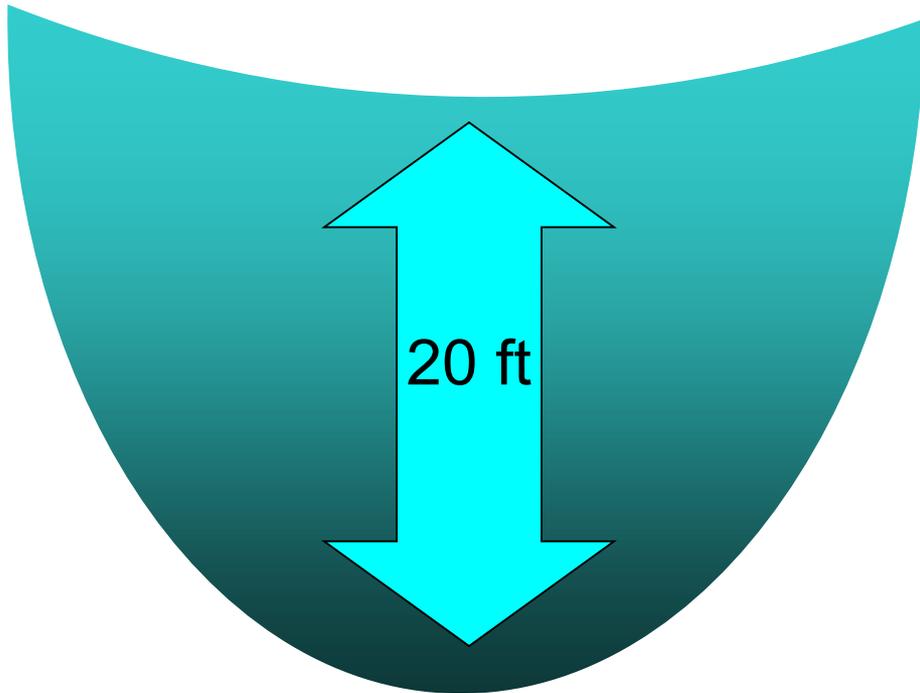
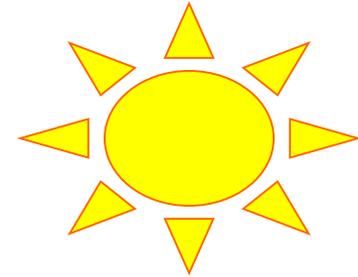
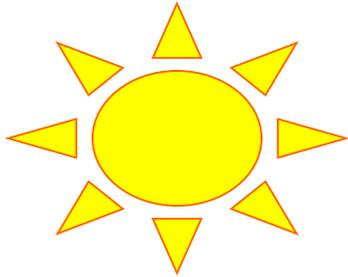
Plant Requirements: In-lake considerations



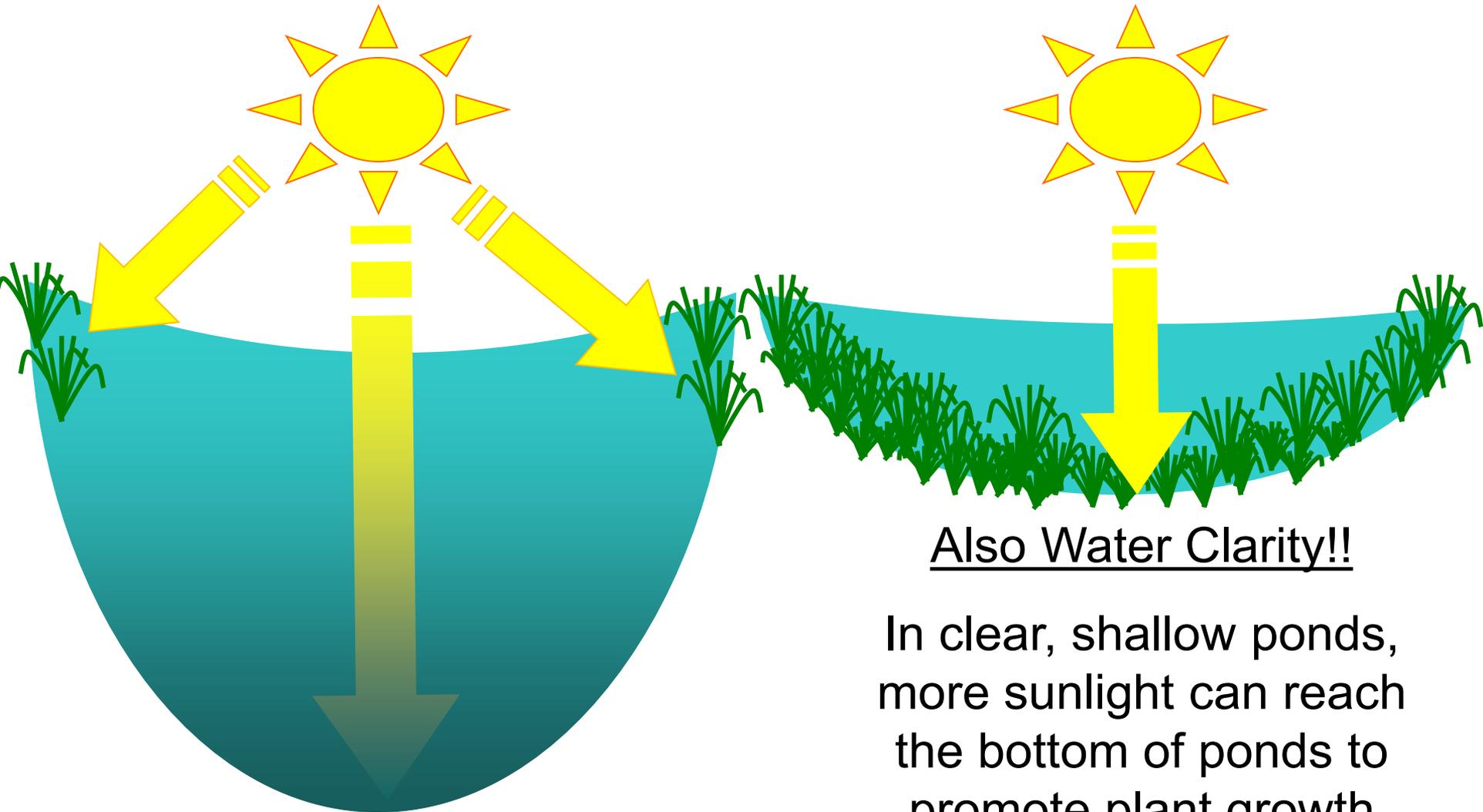
NUTRIENTS



* Bathymetry (depth) – morphometry:
important factor concerning sunlight
exposure



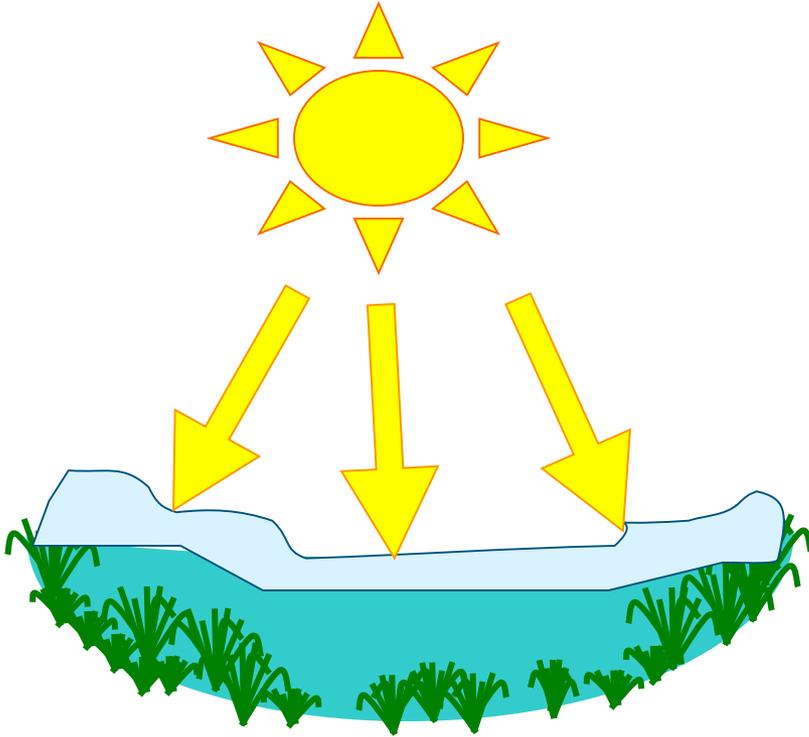
* Bathymetry (depth) is an important factor concerning sunlight exposure



Also Water Clarity!!

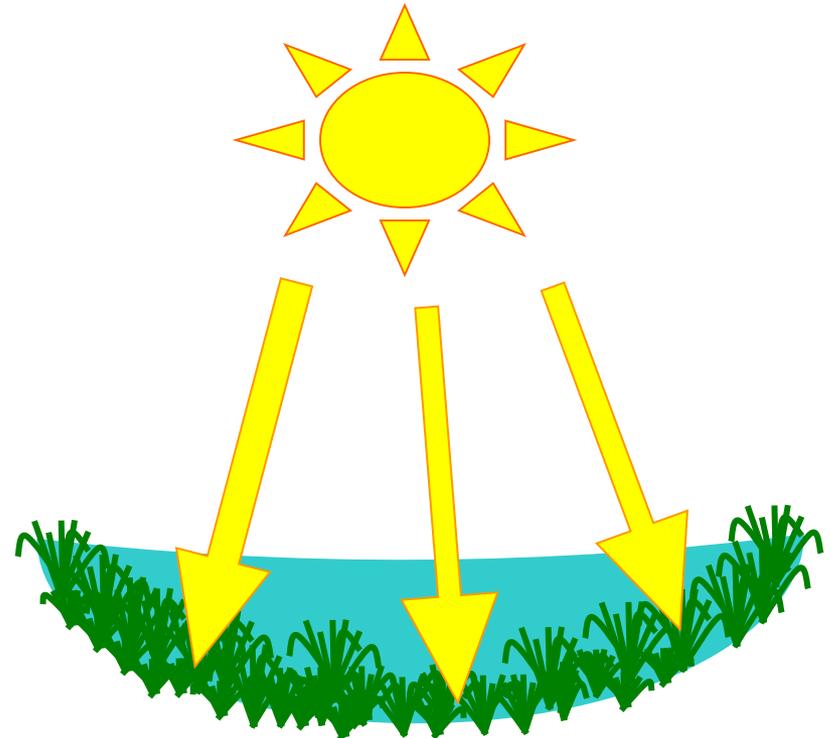
In clear, shallow ponds, more sunlight can reach the bottom of ponds to promote plant growth

* Winter ice/snow is also an important factor concerning sunlight exposure



Colder Winters

Ice & snow
accumulate &
provide shade

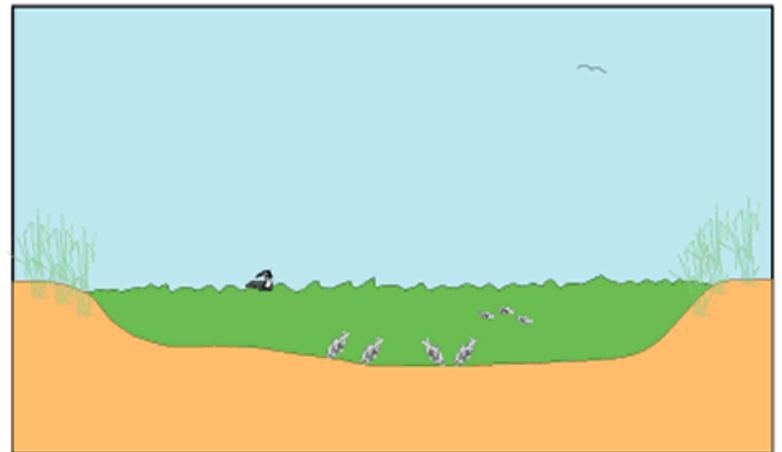
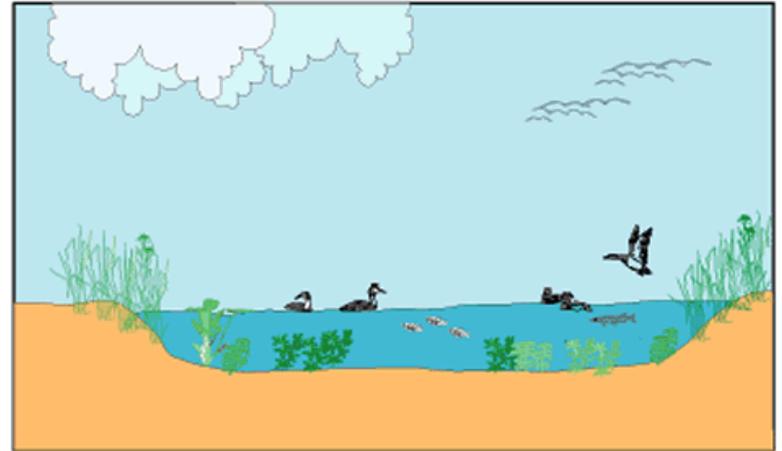


Milder Winter

Plants have longer
time to access
sunlight

Shallow Lake Alternative States

- Nutrients drive growth
- In shallow lakes (< 10 m) where sunlight can reach the bottom
 - Plant dominated
 - Algae dominated
- Understand that we need to manage expectations & nutrients



Lake Management Plans

What is the problem?

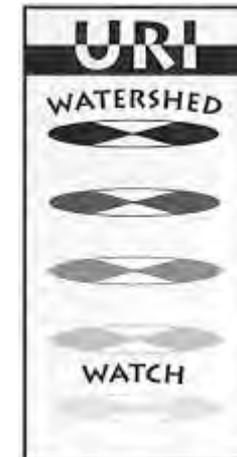


Curly-leaf pondweed, RI

Requires Data to describe:

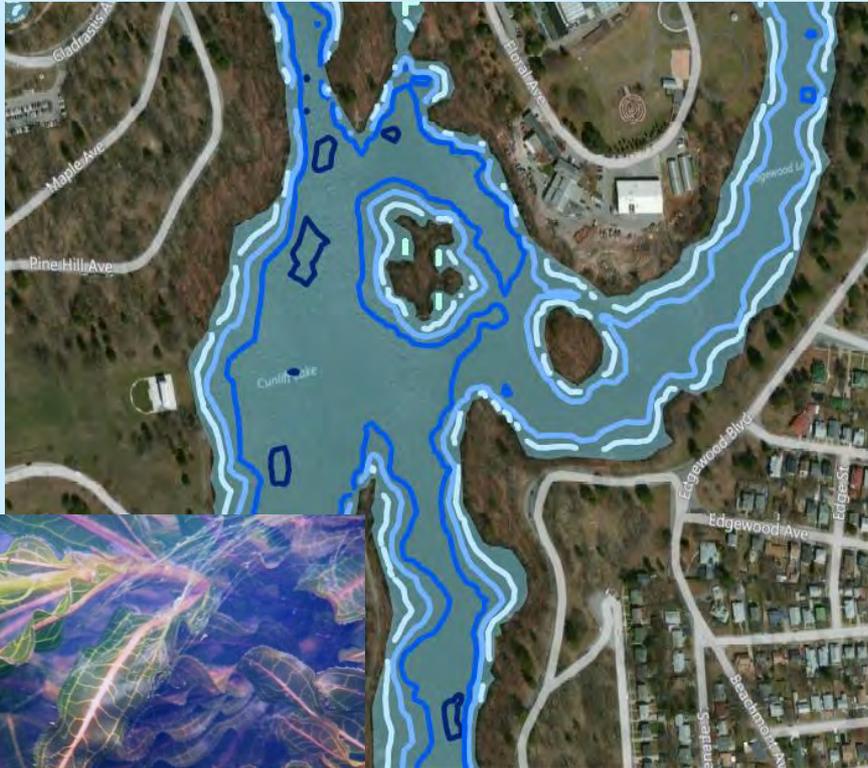
- Target species information
- Plant distribution maps
- Plant abundance/coverage
- Lake information

Water quality



Lake Management Plans

What is the problem?



Curly-leaf pondweed, RI

Requires Data to describe:

- Target species information
- Plant distribution maps
- Plant abundance/coverage
- Lake information

Water quality

Bathymetry

Size

Water volume/level

Flushing rate/method

Connectivity? Ramps?

Lake Management Plans

What is the problem?

Where in the lake?

What is the goal?

Lake Management Plans

Where? How big is the population?

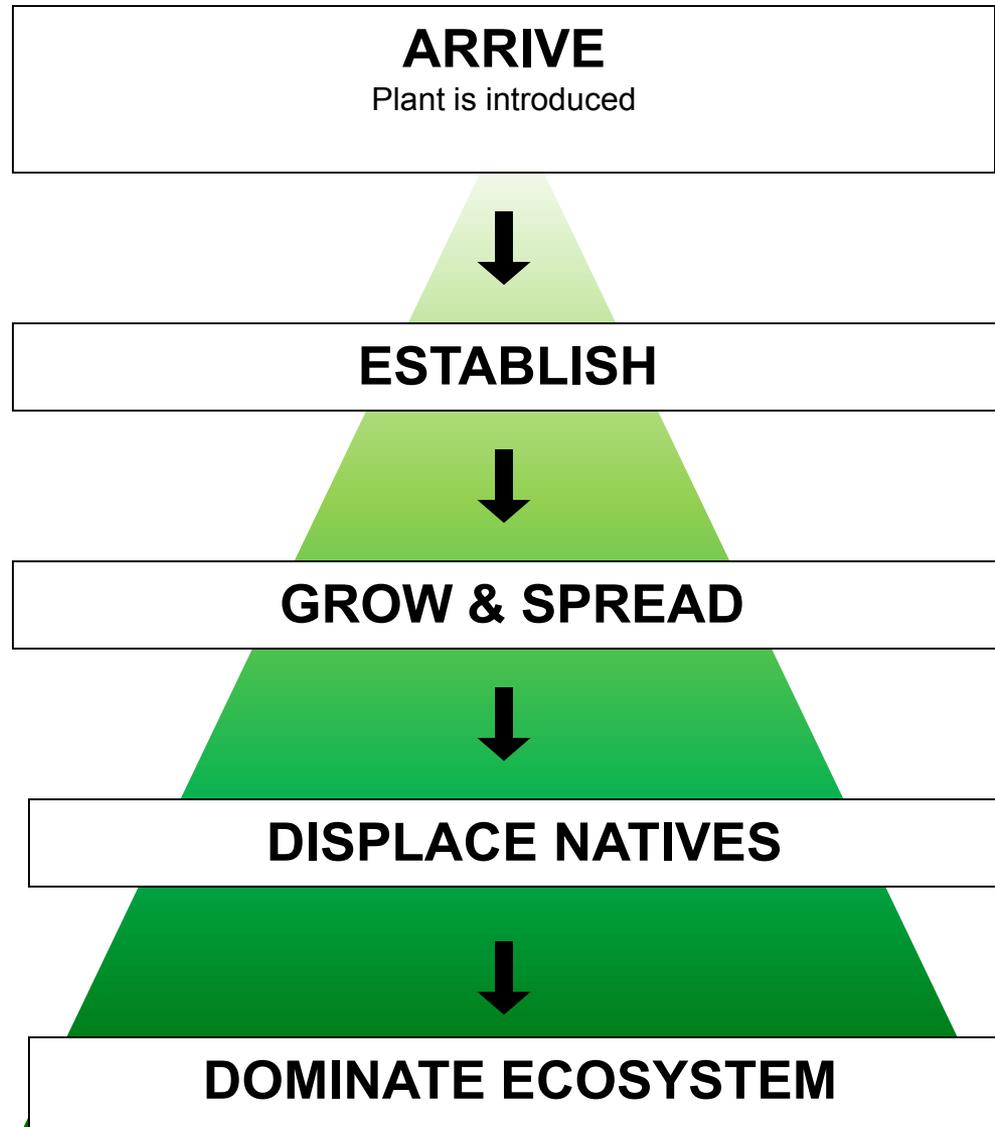
August 2014



August 2017



Plan based on size of population:



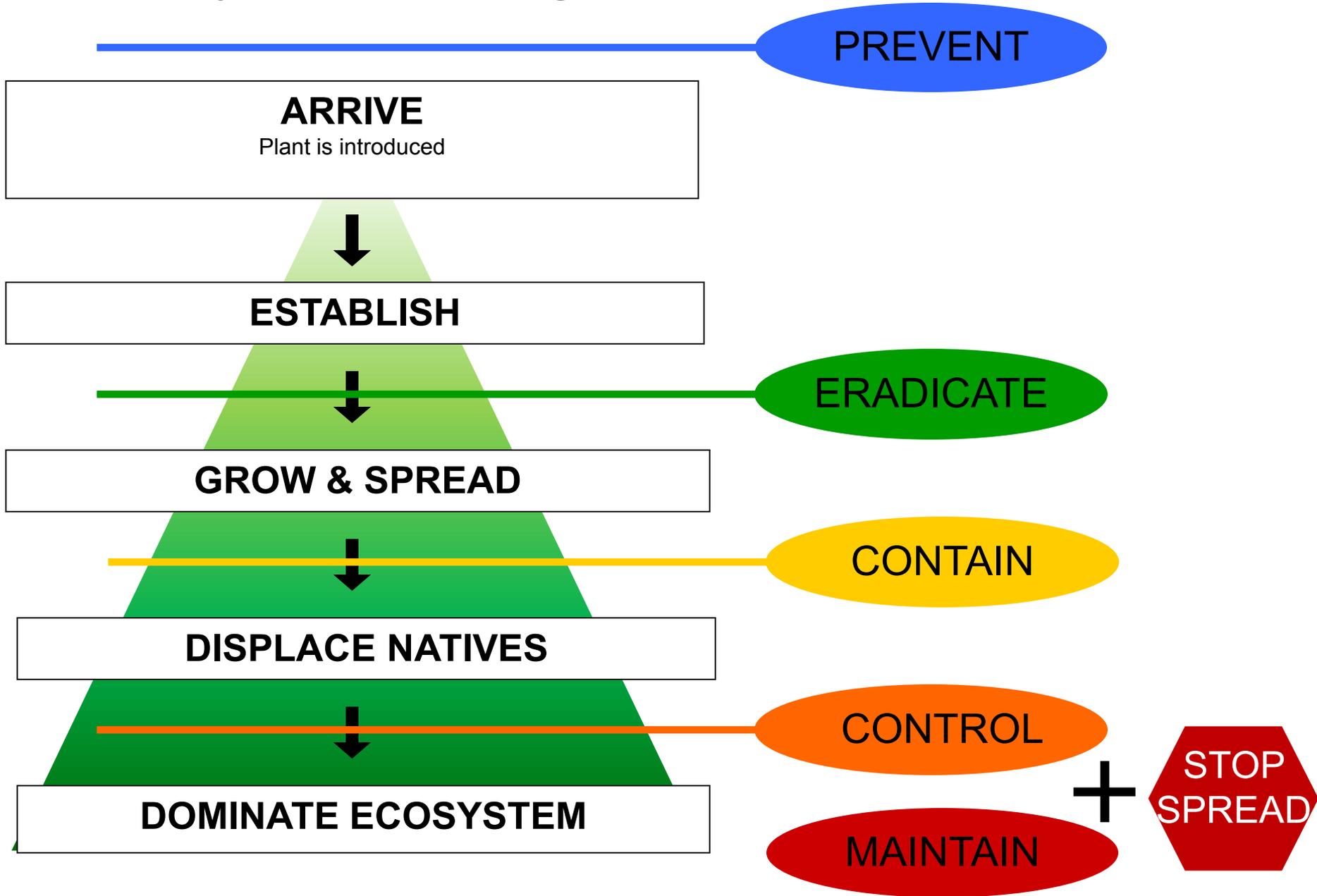
Lake Management Plans

What is the problem?

Where in the lake?

What is the goal?

Identify the Stage, Goal & then plan



Lake Management Plans

What is the problem?

Where in the lake?

What is the goal?

Who will do what?



Lake Management Plans

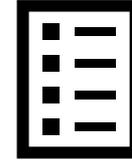
What is the problem?

Where in the lake?

What is the goal?

Who will do what?

When will it happen?



Lake Management Plans

What is the problem?

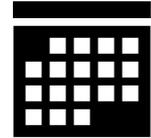
Where in the lake?

What is the goal?

Who will do what?

When will it happen?

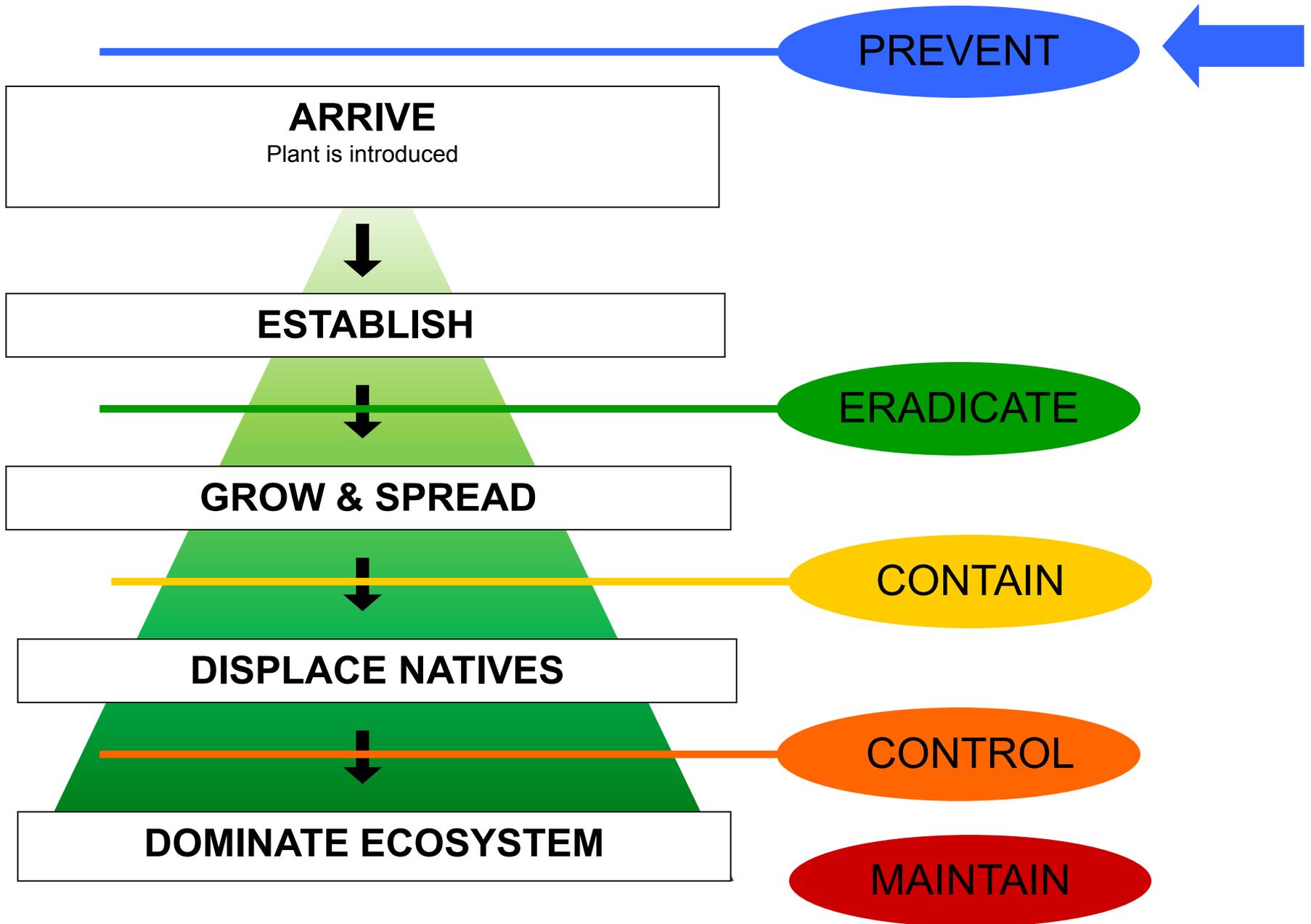
How long will it take?



Today's AIS Workshop: Aquatic Invasive Species

- 1) Introduction to aquatic plants and AIS
- 2) How and why are AIS a problem?
- 3) Finding AIS in Rhode Island
- 4) What can you do about AIS in your lake?
- 5) Watershed Management vs Lake Management Plans
- 6) Lake Management Plan Considerations
- 7) **AIS Management Goals & Control Strategies**

AIS Management Goals & Strategies



PREVENT

= Educate!

Boat Ramp Signs

Website info

STOP

THE SPREAD OF AQUATIC INVASIVE SPECIES

1/2 inch
Zebra Mussel
Variable Milfoil
Water Chestnut
Eurasian Milfoil
Fanwort
Carp
Goldfish
Koi
1/2 inch
Asian Clam

BOATERS: INSPECT VESSEL CAREFULLY BEFORE & AFTER USE!

- Remove ALL weeds and plant fragments from watercraft & trailer before & after use
- Drain boat & motor far from water; allow to dry before next use
- Clean off all waders, boots and gear after use in any waterbody
- Do not release bait or aquarium fish, shellfish or plants

For more information contact:
RI DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Division of Fish and Wildlife
(401) 789-0281 or (401) 789-7481
www.dem.ri.gov

DEM RHODE ISLAND

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OFFICE OF WATER RESOURCES / WATER QUALITY / SURFACE WATER QUALITY
INTRODUCTION TO AQUATIC INVASIVE SPECIES

Introduction to Aquatic Invasive Species

Aquatic invasive species (AIS) non-native plants and animals have been introduced (accident intentionally) into lakes and rivers and whose introduction threatens diversity or abundance of native species, the stability of the ecosystem and/or the use of the infested water body. AIS are a major threat to our freshwater ecosystems and a significant management concern because of their ecological and socio-economic costs.

Freshwater Aquatic Invasive Species in Rhode Island
Species-specific Statewide Distributions January 2018

Invasive Plants Invasive Animals

Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street – Room 200
Providence, RI 02908

www.dem.ri.gov/programs/benviron/water/quality/surfwq

PREVENT

= Educate!

G.R.E.A.T. Boaters Program:

Greeting Recreationalists to Empower And Train
Boaters



Smith and Sayles Reservoir, RI

PREVENT

= Monitor!

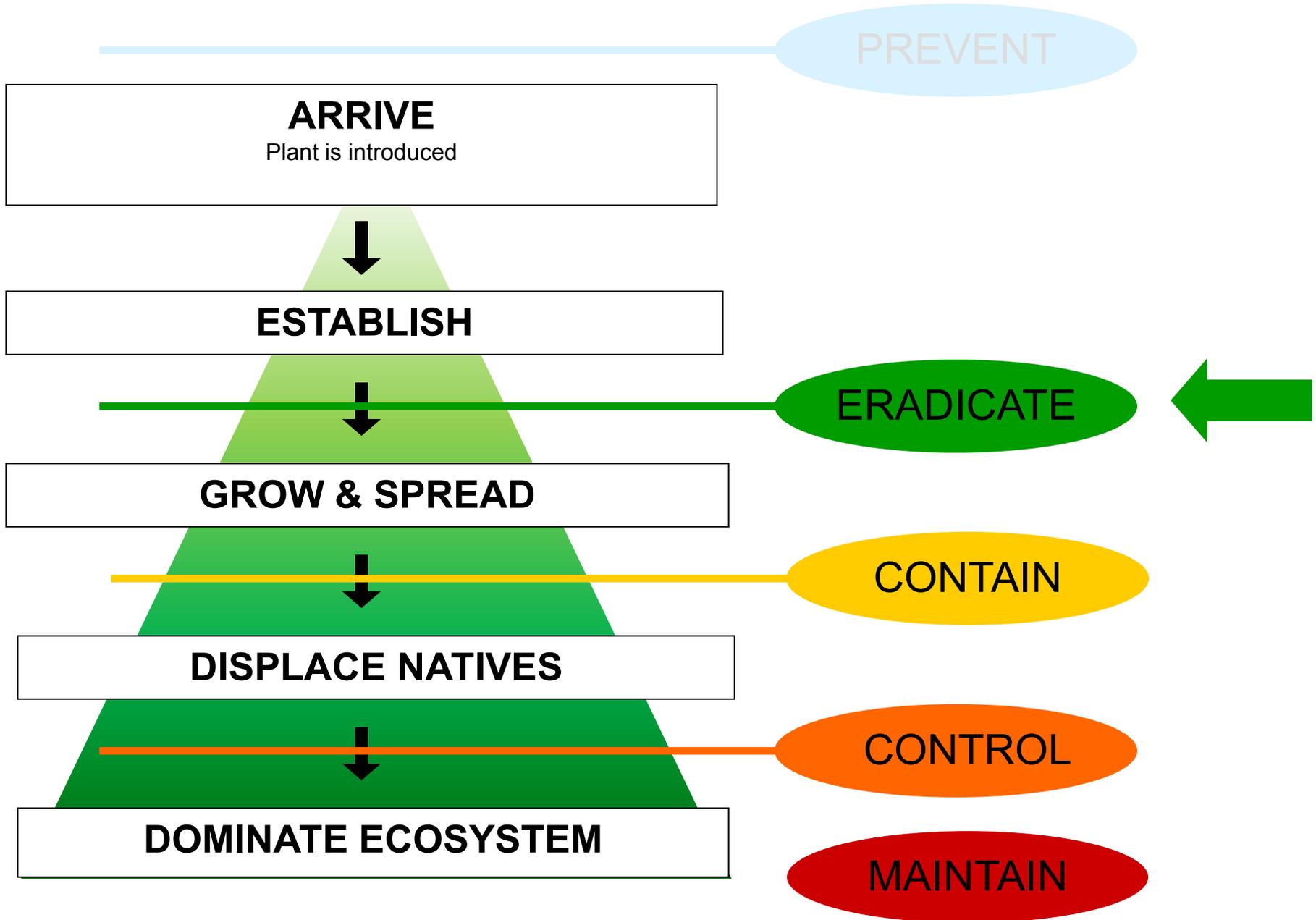
Contact Katie DeGoosh-DiMarzio
to verify invasive species

401-222-4700 x 7211

Email pictures:

katie.degoosh@dem.ri.gov

AIS Management Goals & Strategies



MANAGEMENT TECHNIQUES

Different Approaches

- **Physical/Manual**
- **Mechanical**
- **Chemical**
- **Biological**



Determining Which One to Use

- **Program goals and objectives**
- **Accurate plant identification**
- **Environmental constraints**
- **Social acceptability**
- **Cost \$\$\$**



ERADICATE

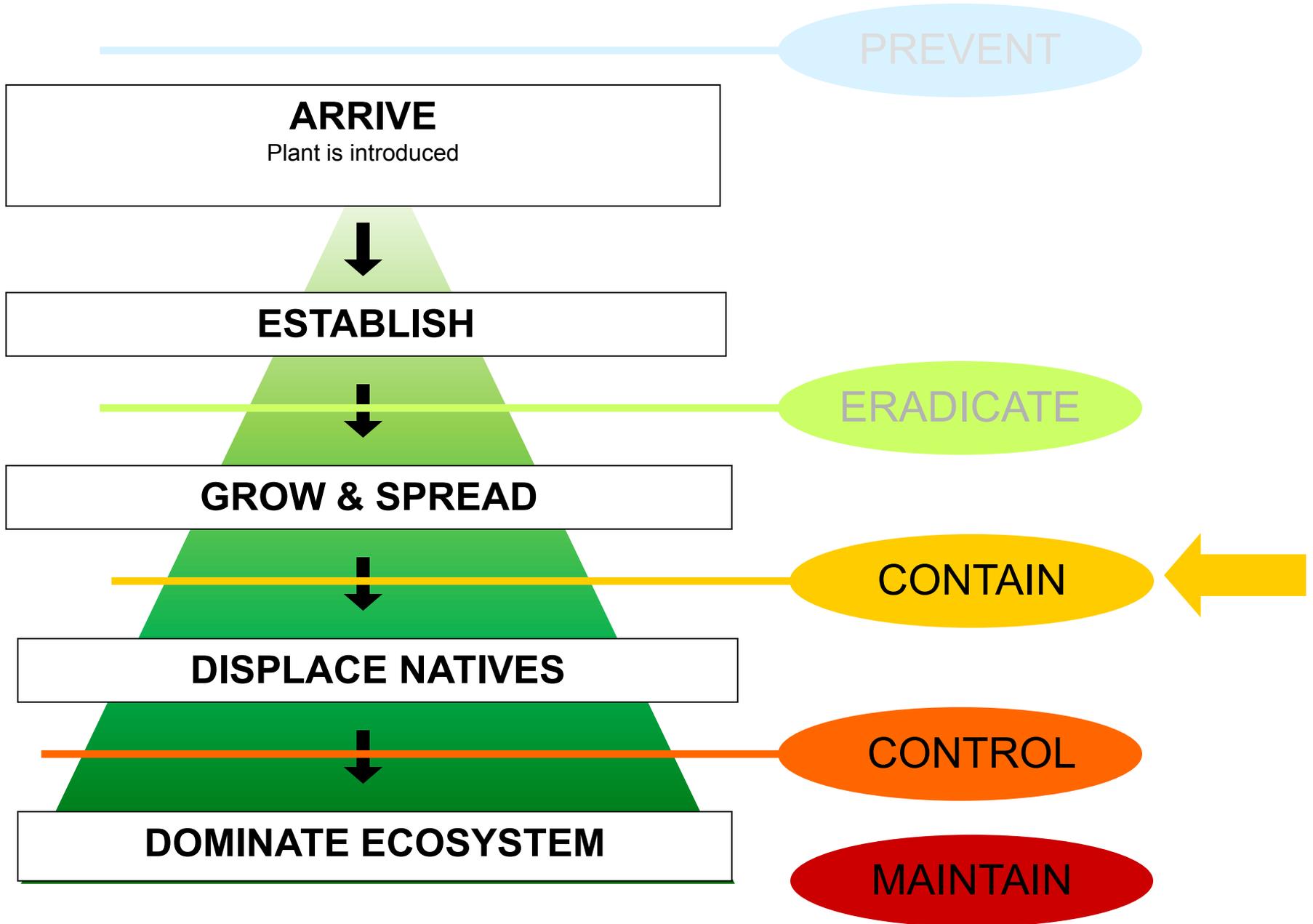
= Removal

Hand Pulling

- Completely removes plant
- Timing is important
- Effective on individual plants (small areas)
- Highly specific to target (plant species)
- Least environmentally abrasive option
- May require DEM Wetlands permit



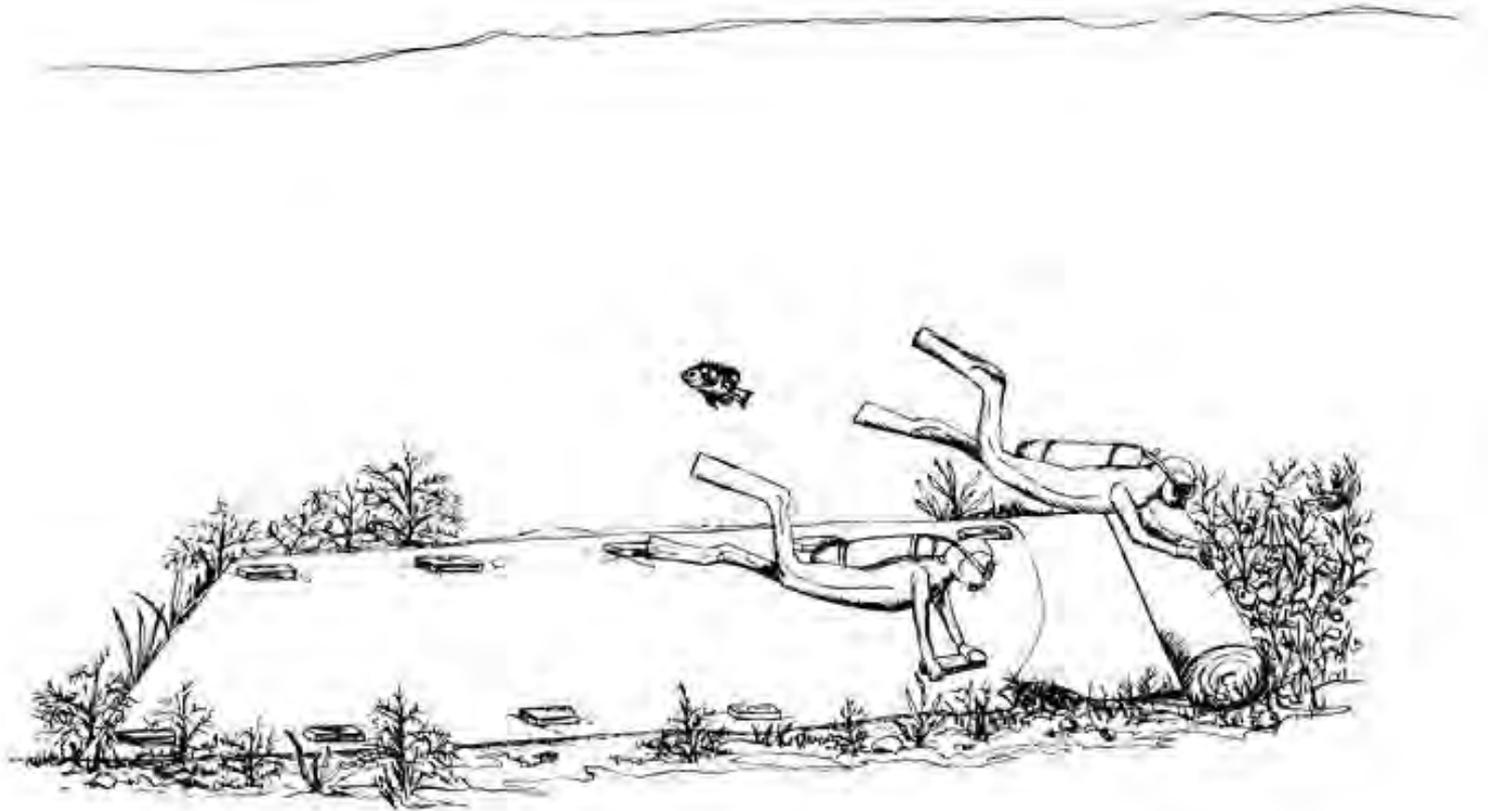
AIS Management Goals & Strategies



CONTAIN

= Enclose Small Area

Benthic Barriers

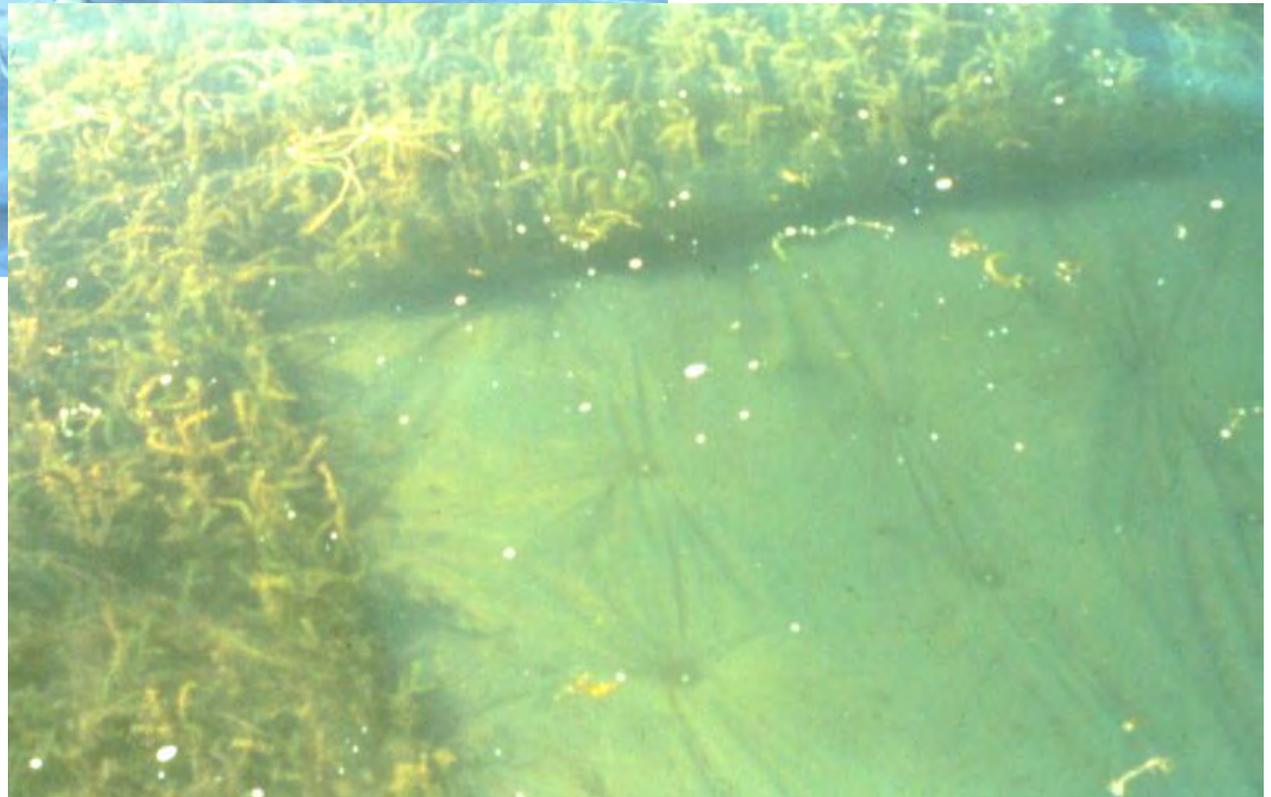


Bottom barriers



Small areas:

- Beaches
- Docks
- Boat ramps
- Require maintenance



CONTAIN

= Enclose Small Area

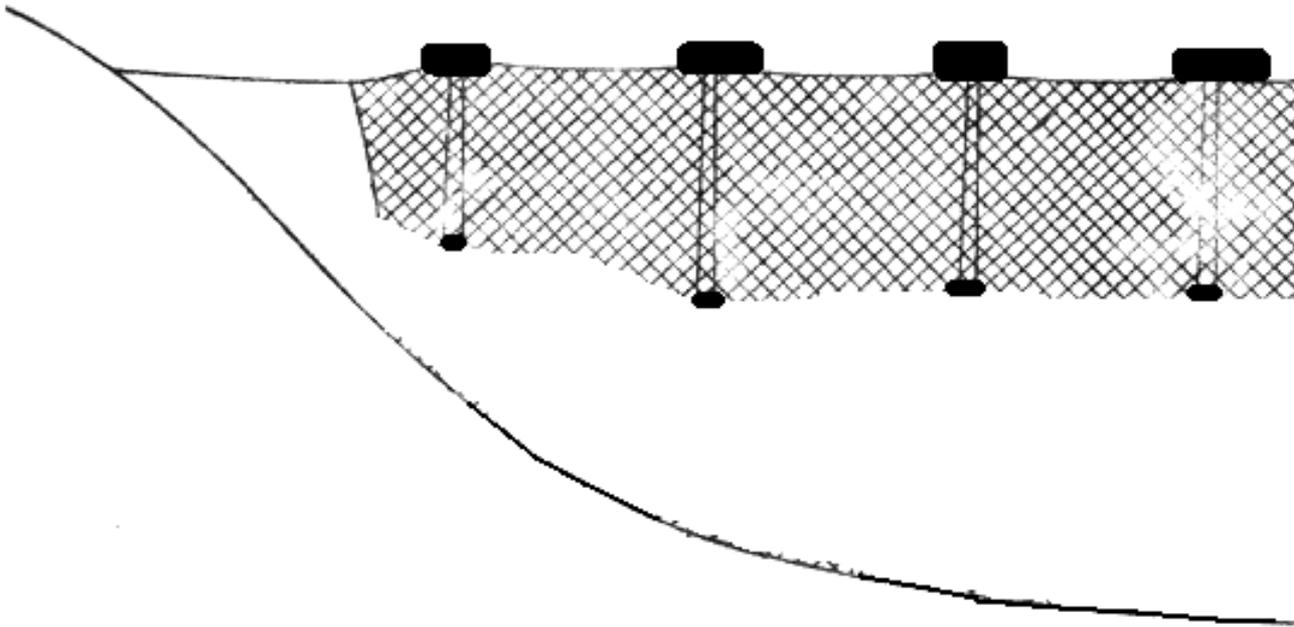
Benthic Barriers

- Opaque screen/tarp secured to lake bottom
- Blocks sunlight and prevents growth
- Impedes fragmentation
- Not specific to target (plant species)
- Materials may be costly
- Maintenance required

CONTAIN

= Enclose Small Area

Floating Nets



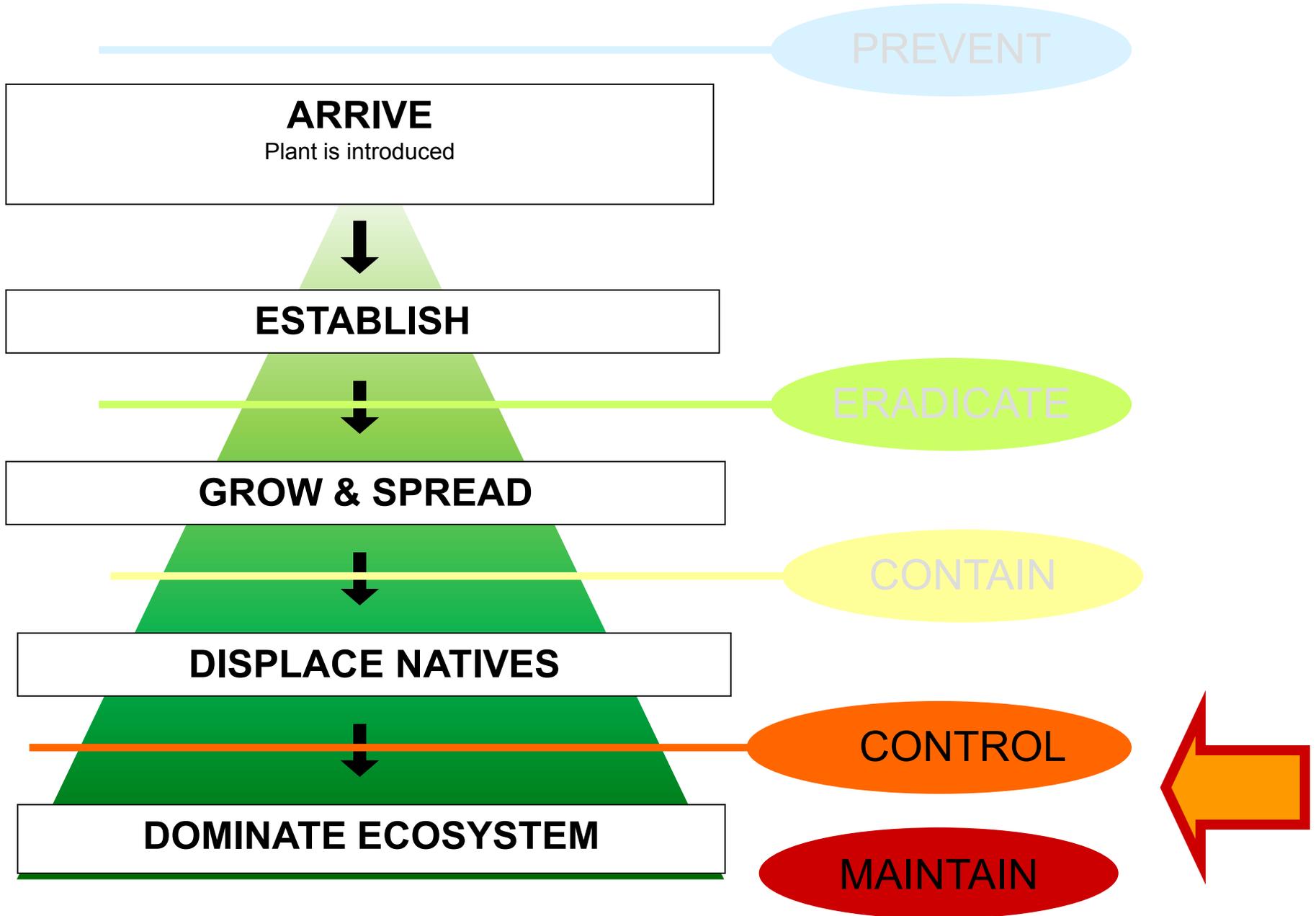
CONTAIN

= Enclose Small Area

Floating Nets

- Drape net across cove or inlet opening
- Inhibits spread of plant fragments
- Not target specific
- Requires proper anchors and maintenance
- May impede boating, swimming
or fish movement

AIS Management Goals & Strategies



AIS Management Goals & Strategies

PREVENT

ERADICATE

CONTAIN

CONTROL

MAINTAIN

Control Types:

- Mechanical Methods
- Physical Habitat Alteration
- Chemical Methods
- Biological Methods

CONTROL

MAINTAIN

Mechanical Options

Mechanical or Suction Harvesting



CONTROL

MAINTAIN

Mechanical Options

Hydro-raking



CONTROL

MAINTAIN

Mechanical Options

Mechanical or Suction Harvesting & Hydroraking

- Machinery used to remove ALL plant material from large area
- Not target-specific; may spread fragments
- Requires follow-up maintenance
- High cost for short term solution
- Disturbs soils & habitats; causes turbidity
- Requires DEM Wetlands Permit

CONTROL

MAINTAIN

Physical Habitat Alteration

Lake-level Drawdowns



CONTROL

MAINTAIN

Physical Habitat Alteration

Lake-level Drawdowns

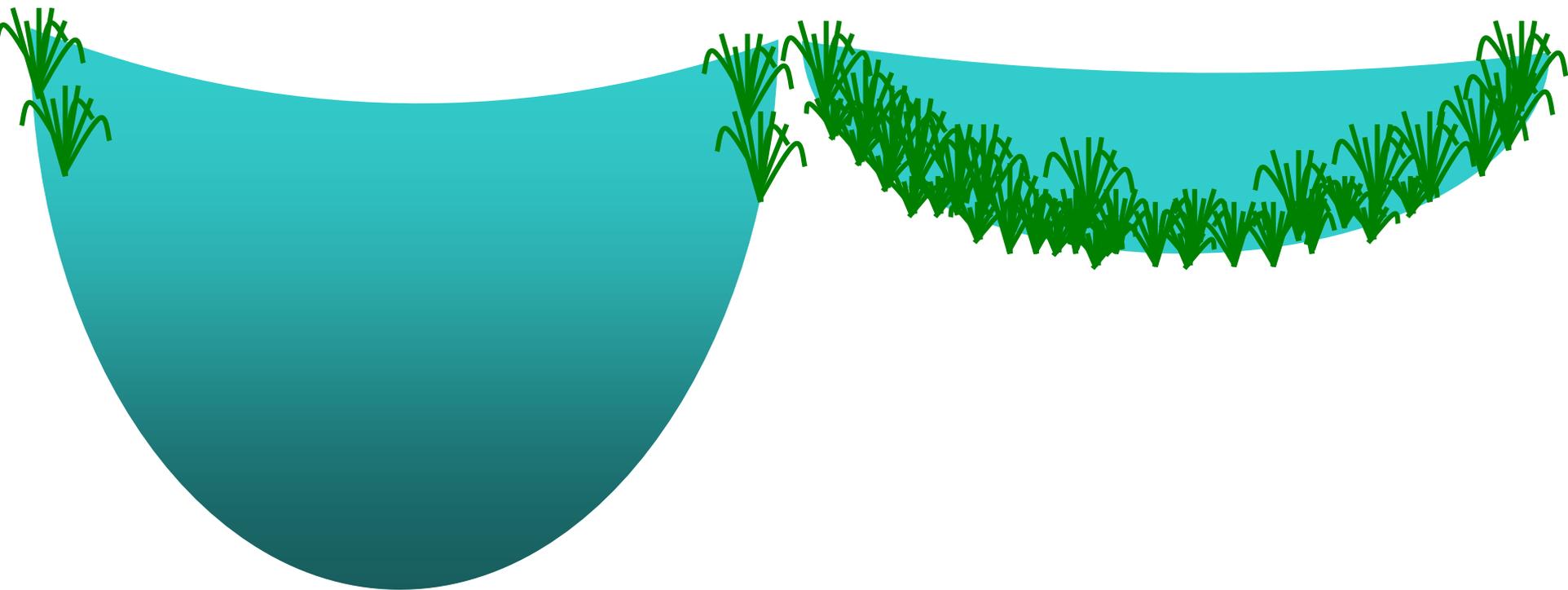
- Lower water level in Fall via dam structures
- Sediments and perimeter plants freeze/dry
- Not target specific; effects all littoral plants
- May effect access to water supplies
- May require DEM Wetlands permit
- Rate integral to avoid fish/frog/mussel kill

Lake-level Drawdowns

* Bathymetry is important

Lake A: deep

Lake B: shallow

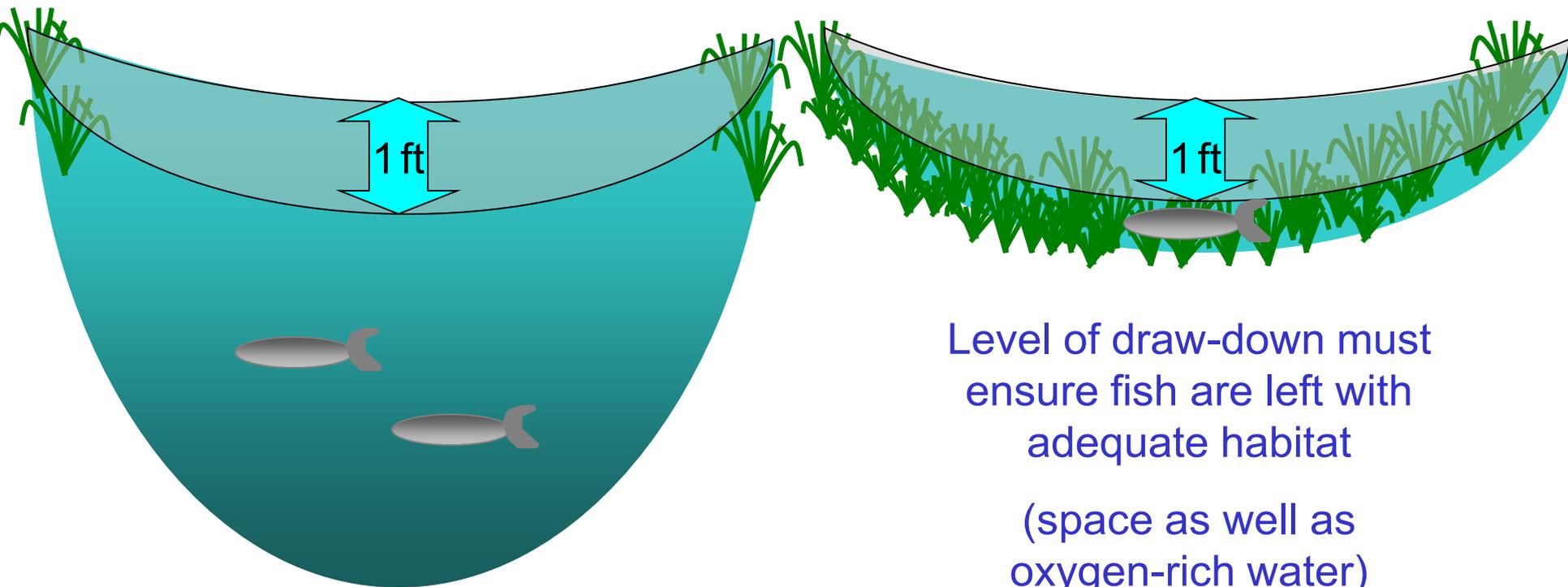


Lake-level Drawdowns

* Bathymetry is important

Lake A: deep

Lake B: shallow

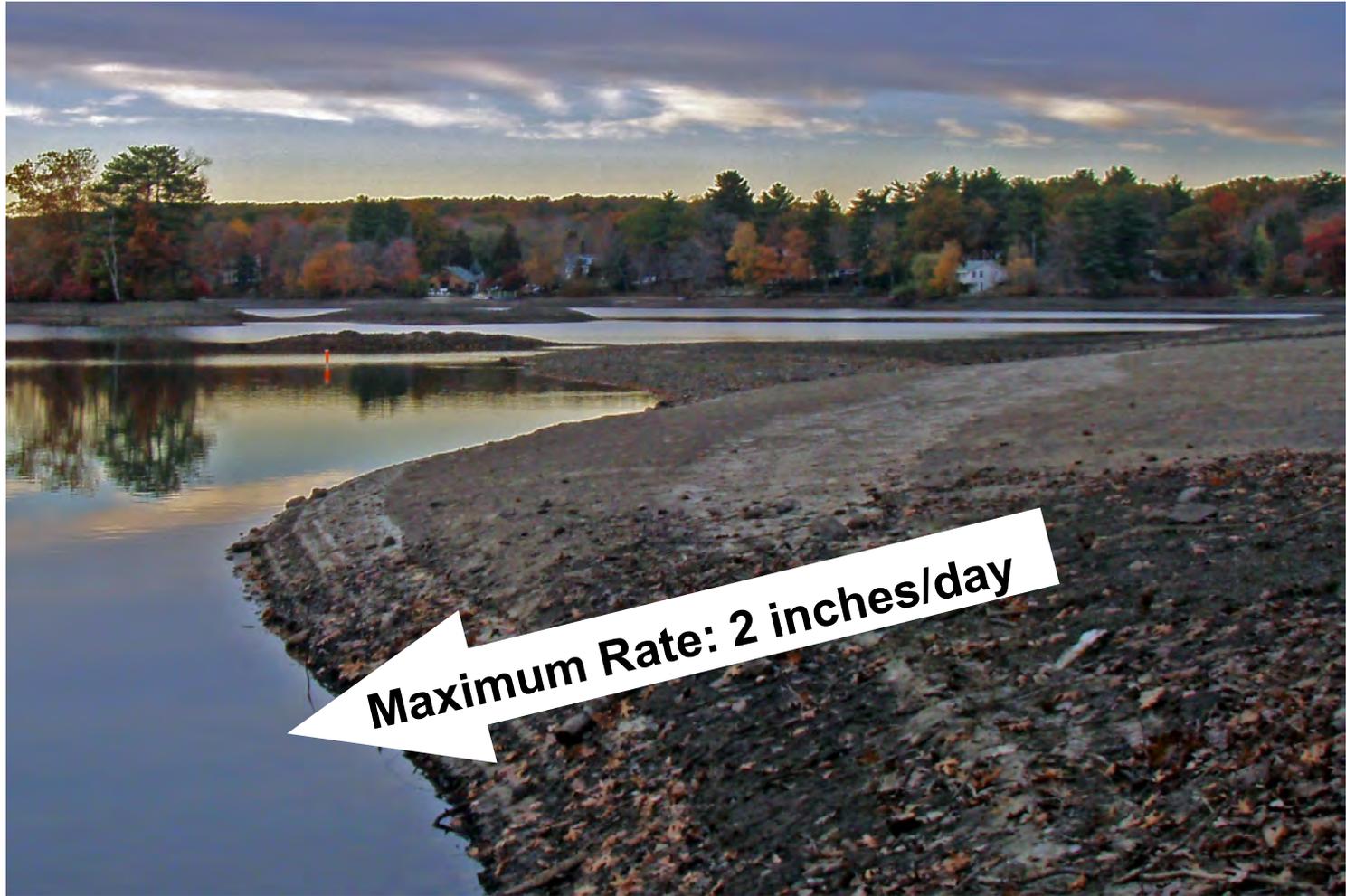


Level of draw-down must ensure fish are left with adequate habitat

(space as well as oxygen-rich water)

Lake-level Drawdowns

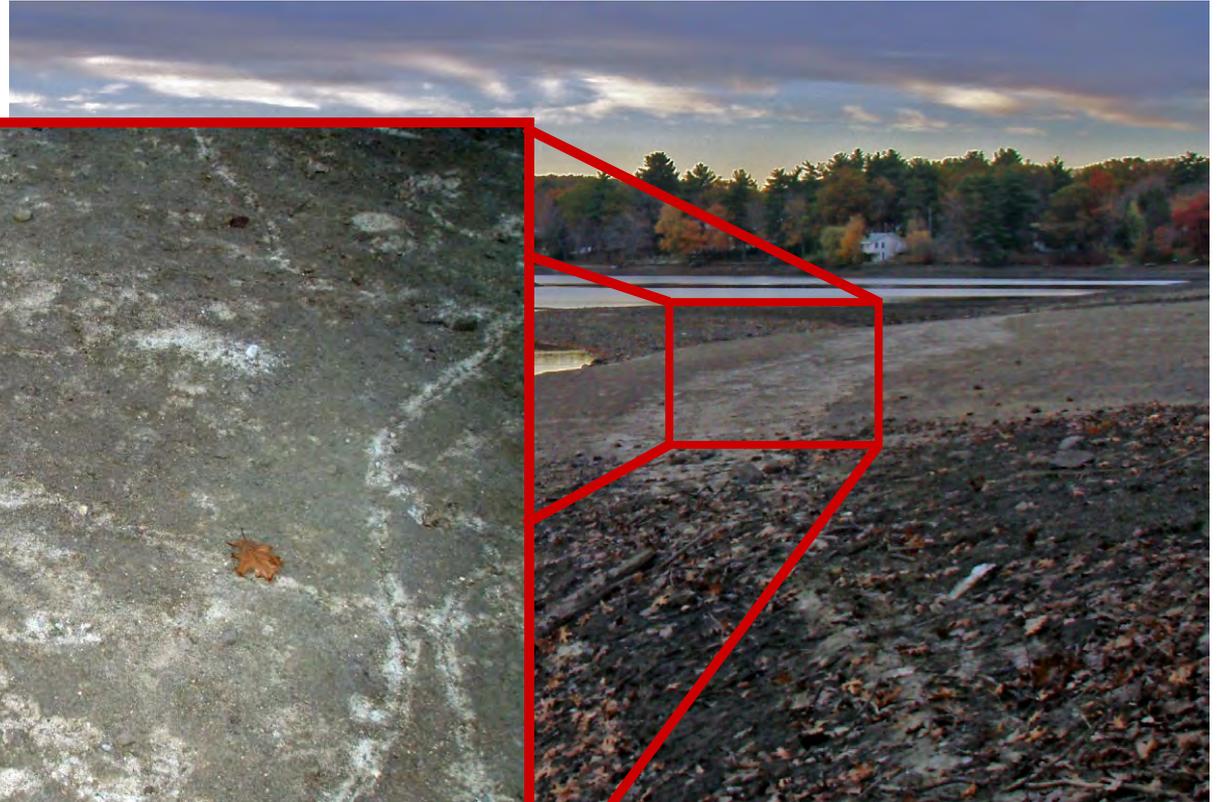
* Release Rate & Timing is important



Optimal time in October

Lake-level Drawdowns

* Release Rate & Timing is important



Draw-down rate must be slow enough to allow for freshwater mussel/snail migration with water levels, otherwise, they could be stranded in dewatered areas

CONTROL

MAINTAIN

Physical Habitat Alteration

Dredging





Suction
dredging

Also suction
harvesting



CONTROL

MAINTAIN

Physical Habitat Alteration

Dredging

- Total removal of plants and sediments
- Complete alteration of lake ecology
- Not target specific
- Impacts all plants & wildlife
- May cause water quality problems
- Costly; Requires DEM Wetlands Permit

CONTROL

MAINTAIN

Chemical Options

Herbicide Applications



CONTROL

MAINTAIN

Chemical Options

Herbicide Applications

- Many new safe and effective products
- Often very target specific
- High cost, but cover large areas, and results may be seen in 1-3 years
- DEM permit required from Fish & Wildlife

FACTORS FOR HERBICIDE SELECTION...

- Target species
- Size & configuration of treatment area
- Selectivity desired or required
- Water uses
- Flow considerations
- Timing
- Cost (\$\$\$)



CONTROL

MAINTAIN

Biological Control

Introduce Natural Predators



Purple Loosestrife Beetle



Milfoil weevil

CONTROL

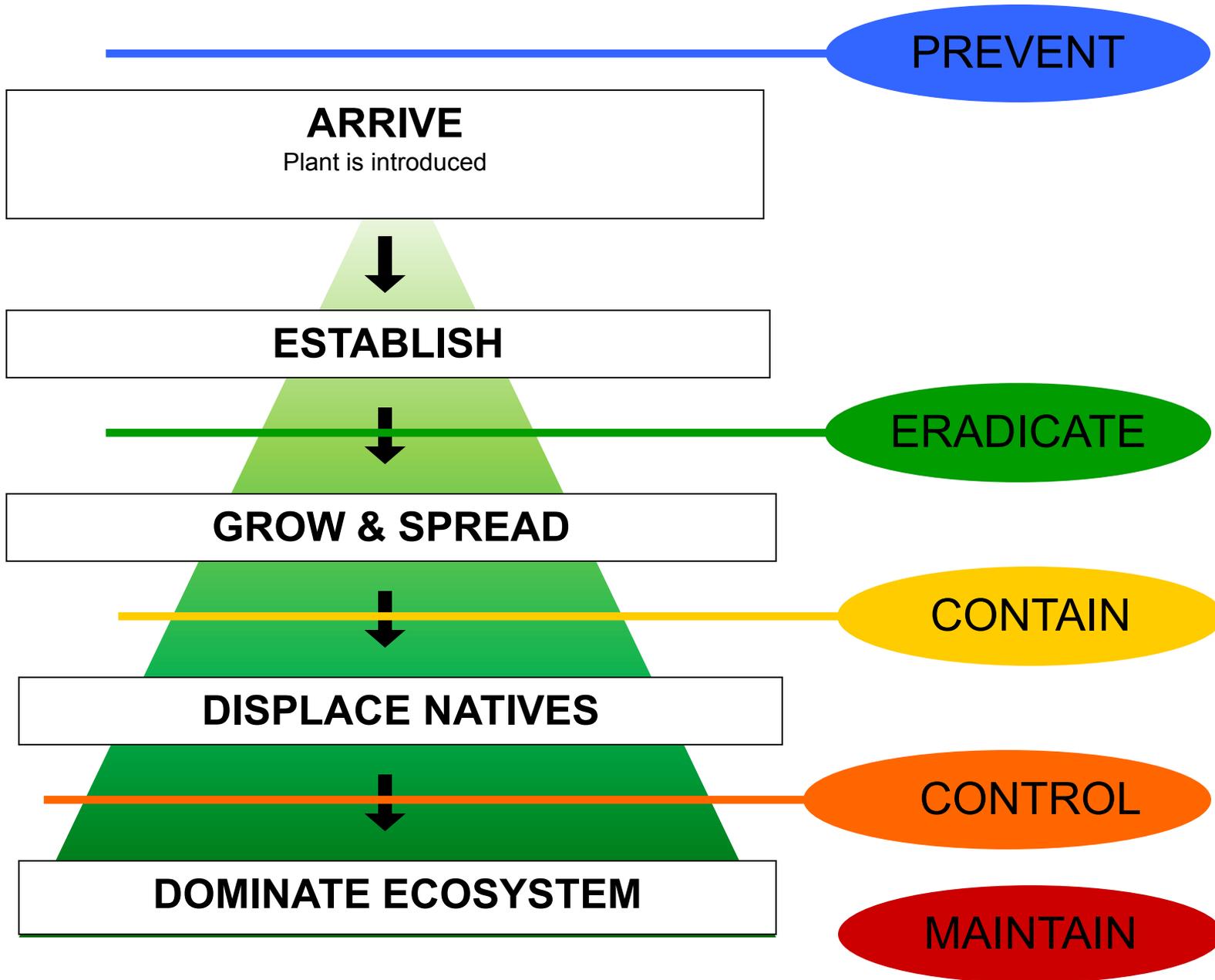
MAINTAIN

Biological Control

Introduce Natural Predators

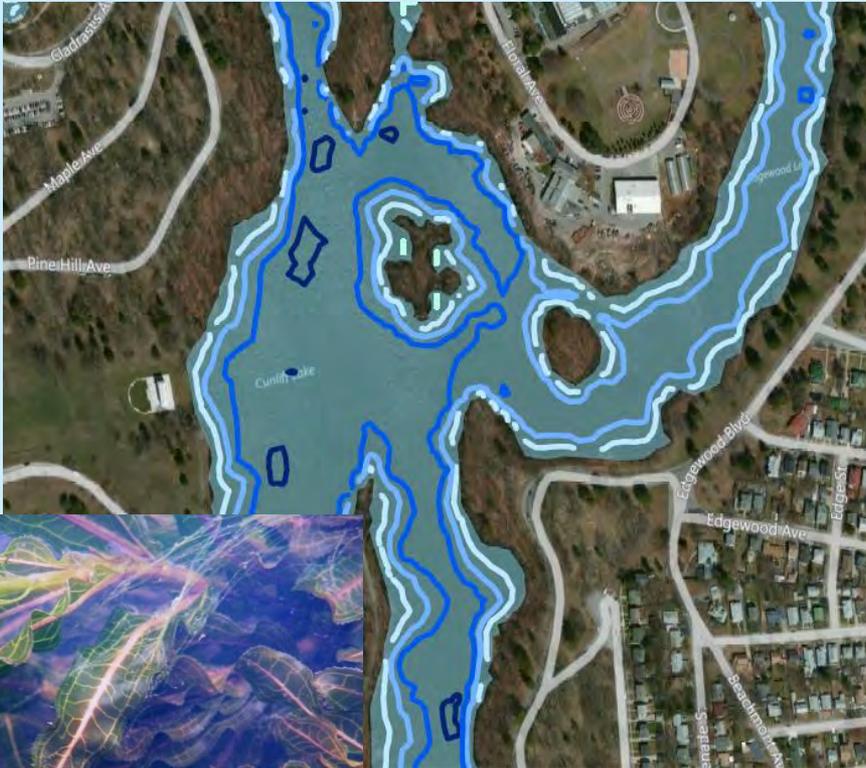
- Natural predators control plant populations
- Often highly specific to target plant
- May be experimental or problematic
- Release projects must be permitted by DEM Fish and Wildlife

AIS Management Goals & Strategies



Lake Management Plans

What is the problem?



Requires Data to describe:

- Target species information
- Plant distribution maps
- Plant abundance/coverage
- Lake information

Water quality

Bathymetry

Size

Water volume/level

Flushing rate/method

Connectivity? Ramps?

Lake Management Planning

What is the problem?

Where in the lake?

What is the goal?

Who will do what?

When will it happen?

How long will it take?

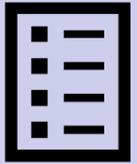
Lake Management Plans



- Written document for specific lake



- Outlines & prioritizes specific goals of management (eradicate or control)



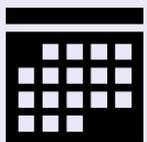
- lists factors at a particular lake that contribute to a specific plant problem



- Provides options and recommends strategies for specific goals



- Names which people will complete management strategies



- Provides a specific, measurable timeframe with quantifiable endpoints

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Questions?



Katie DeGoosh-DiMarzio

RIDEM Office of Water Resources

katie.degoosh@dem.ri.gov

<http://www.dem.ri.gov/programs/water/quality/surface-water/aisplant.php>



Elizabeth Herron

URI Watershed Watch

eherron@uri.edu

<https://web.uri.edu/watershedwatch/learning-about-aquatic-invasive-species>

Prepared for RI Land & Water Summit, March 2019