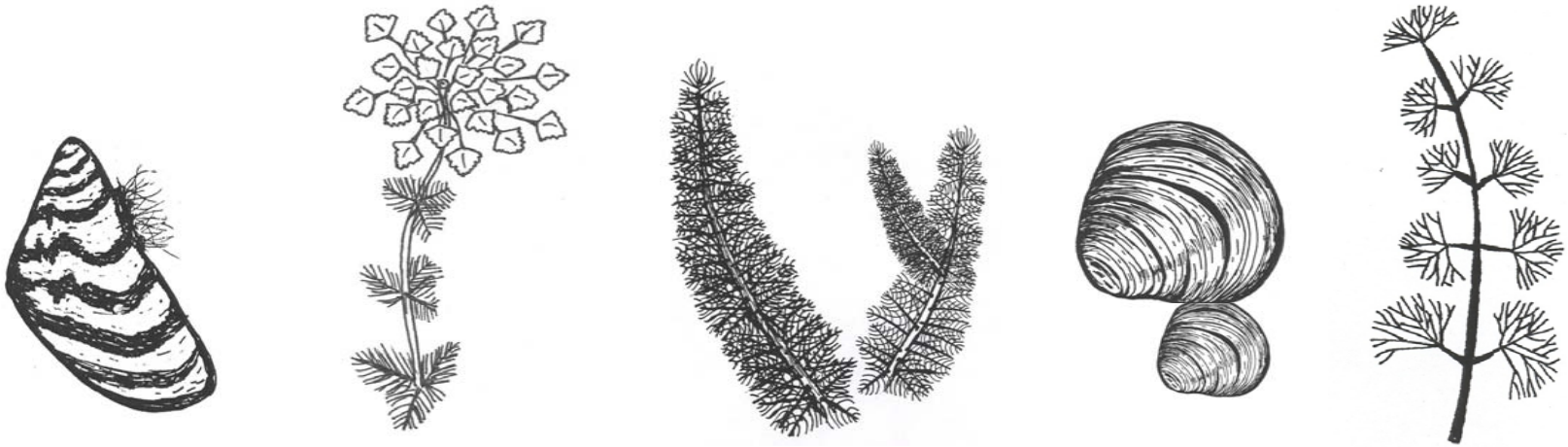
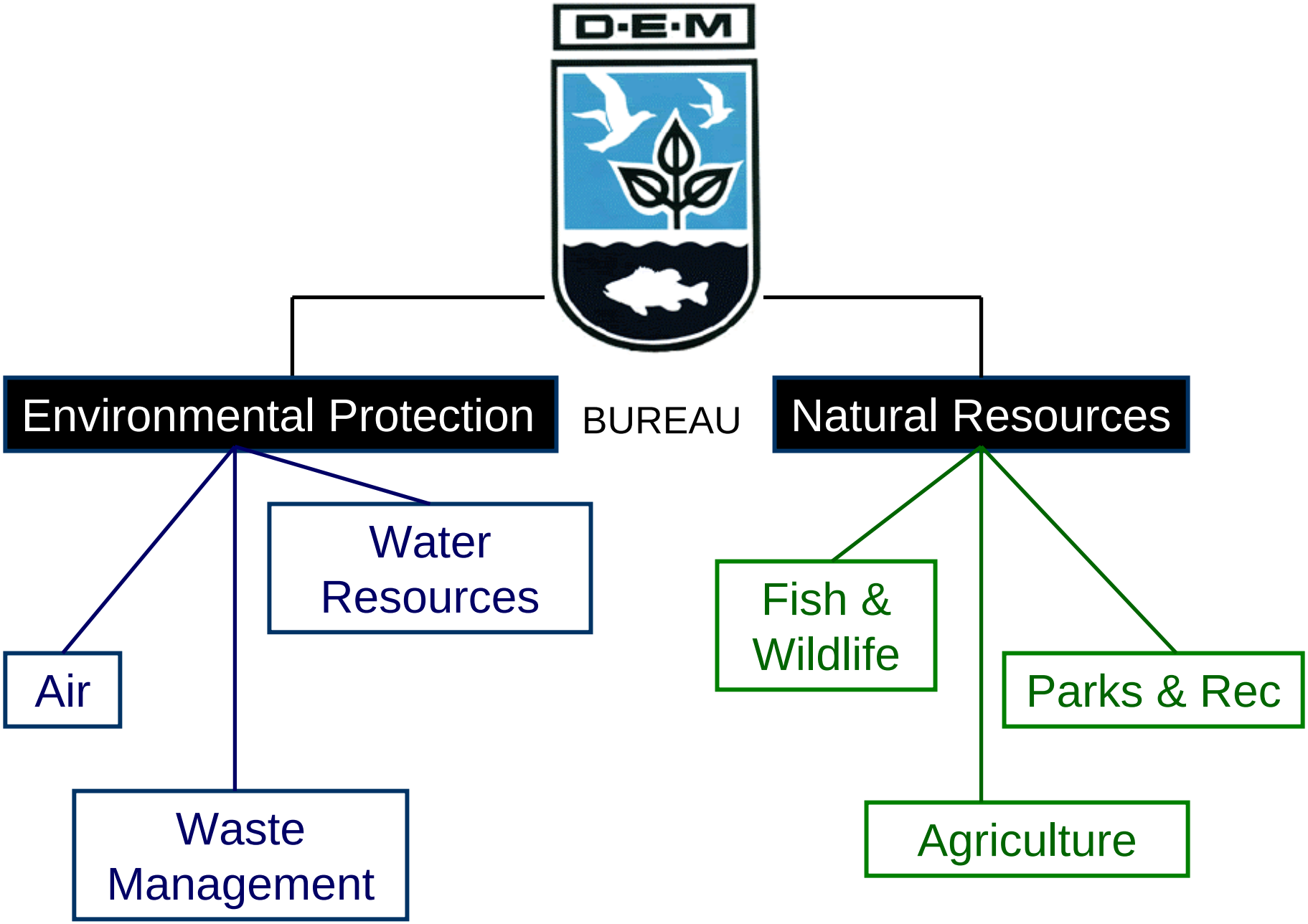
Identification and Management of Aquatic Invasive Species

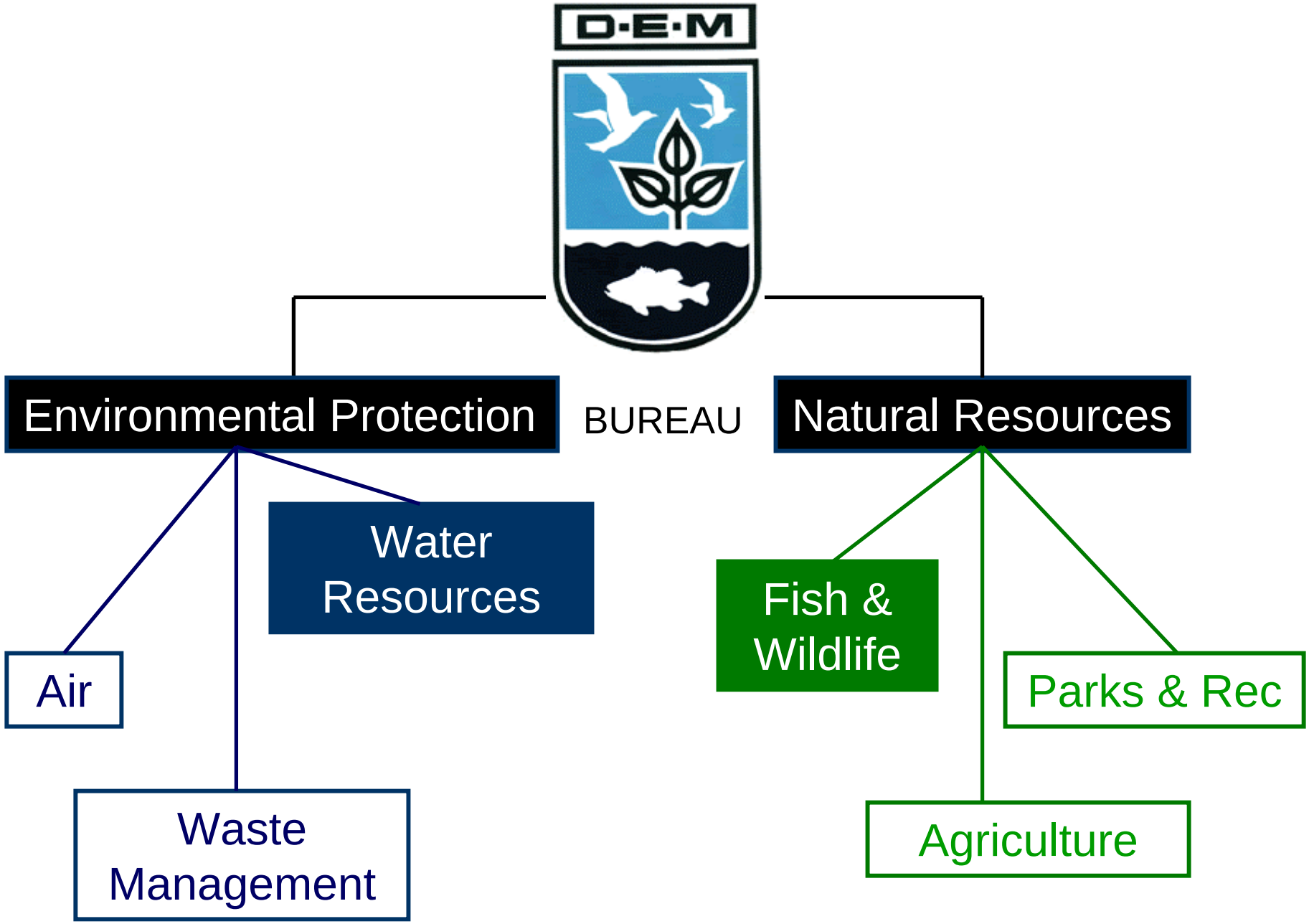


Rhode Island Department of Environmental Management

Katie DeGoosh
Office of Water Resources

Christine Dudley
Division of Fish & Wildlife


D·E·M
Environmental Protection
BUREAU
Natural Resources
Water Resources
Air
Waste Management
Fish & Wildlife
Parks & Rec
Agriculture


D·E·M
Environmental Protection
BUREAU
Natural Resources
Water Resources
Air
Waste Management
Fish & Wildlife
Parks & Rec
Agriculture

TODAY: I.D. & Management

- Aquatic Invasive Species (AIS)
- Problems with AIS
- Plants
  - Benefits of native plants
  - Identifying invasives
  - Elements contributing to successful plant invasions
- Aquatic invasive animals
- Planning AIS management
- Stages of an invasion
- Lake management
  - AIS Control strategies

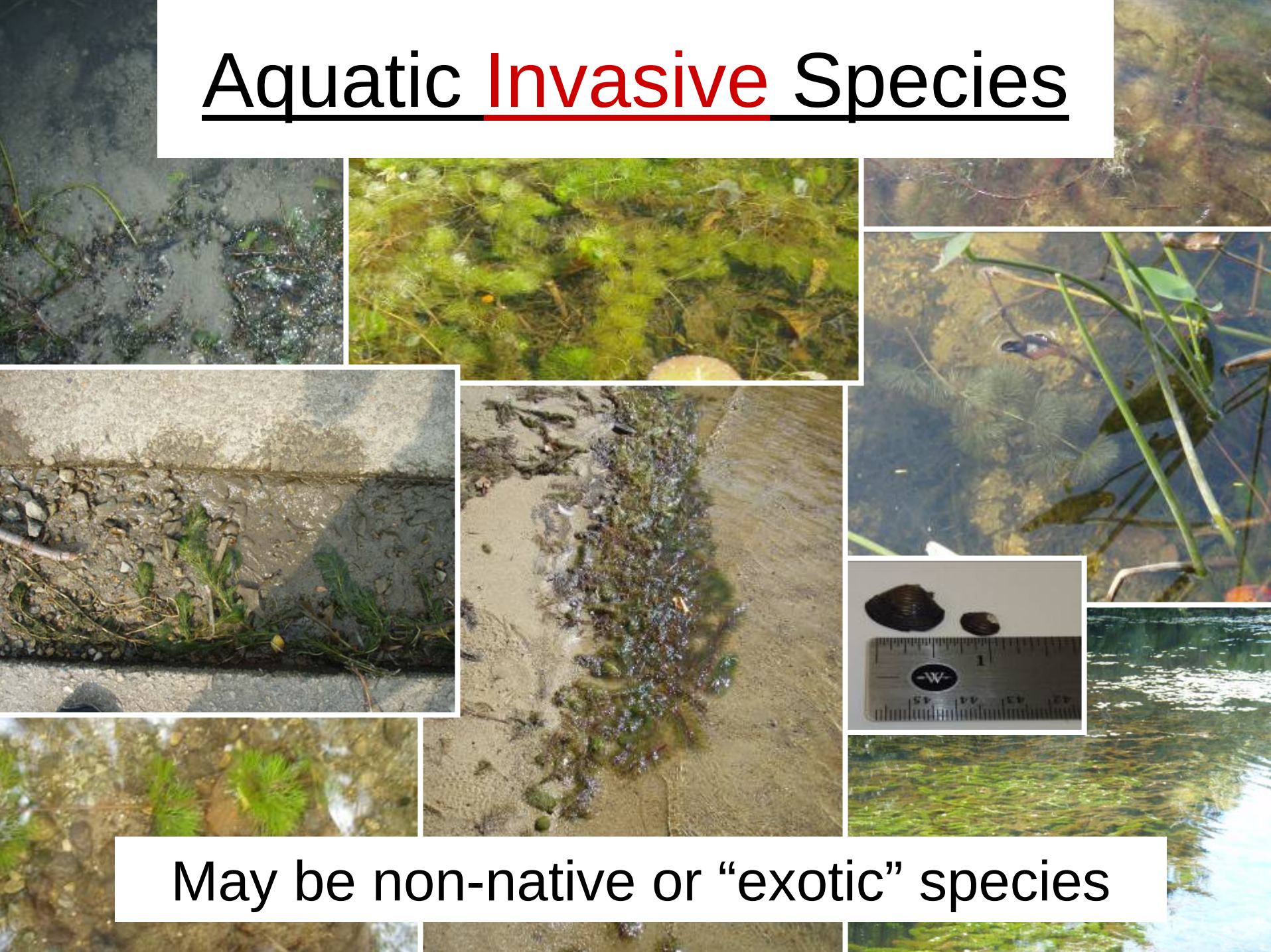
Aquatic Plants

(macrophytes)

Benefits (!!) of Native Aquatic Plants

1. Provide habitat and protection
2. Act as food sources
3. Help recycle oxygen and CO_2
4. Prevent shoreline erosion
5. Help improve water clarity

Aquatic Invasive Species



May be non-native or “exotic” species

Aquatic Invasive Species (AIS)

Invasive vs. Native

Successful Invaders Often:

- Have fewer predators
- Become better competitors
- Adapt well to new conditions

Problems with AIS

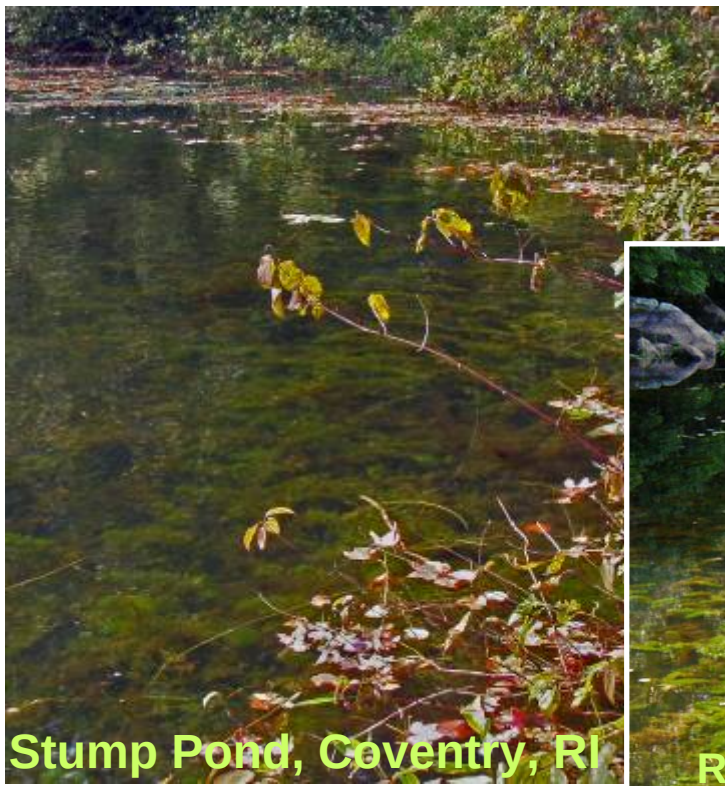
Limit Ecological Function of Lake

- Outcompete beneficial native species
- Decrease biodiversity (and angling opportunities)
- Reduce water quality
- Decompose slowly & reduce O_2
- May degrade conditions for fish

Problems with AIS

Impede Recreation

- Reduce aesthetics/visibility



Problems with AIS

Impede Recreation

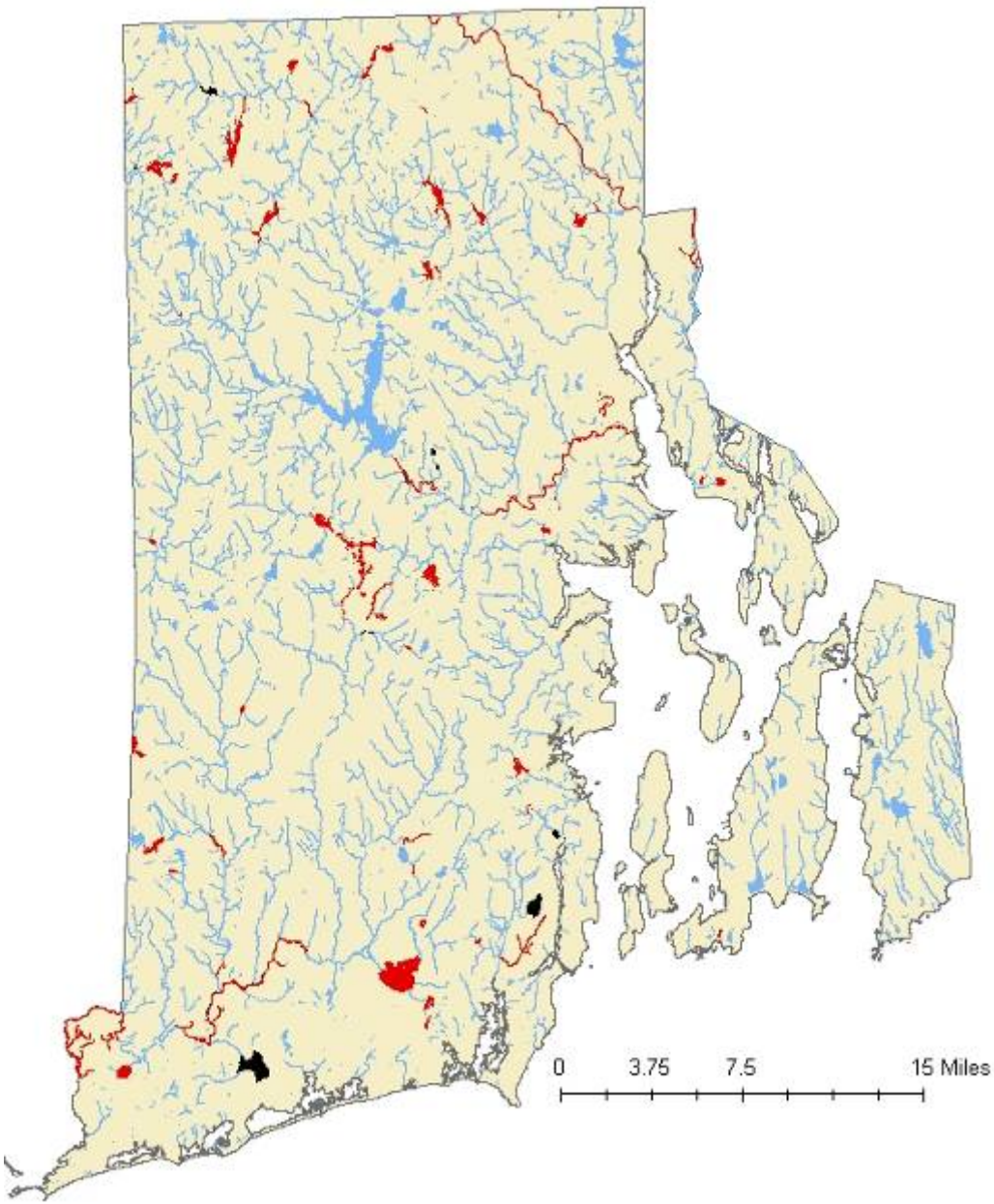
- Reduce aesthetics/visibility
- Become entangled around motors
- Snag fishing lines
- Deter or alarm swimmers

Problems with AIS

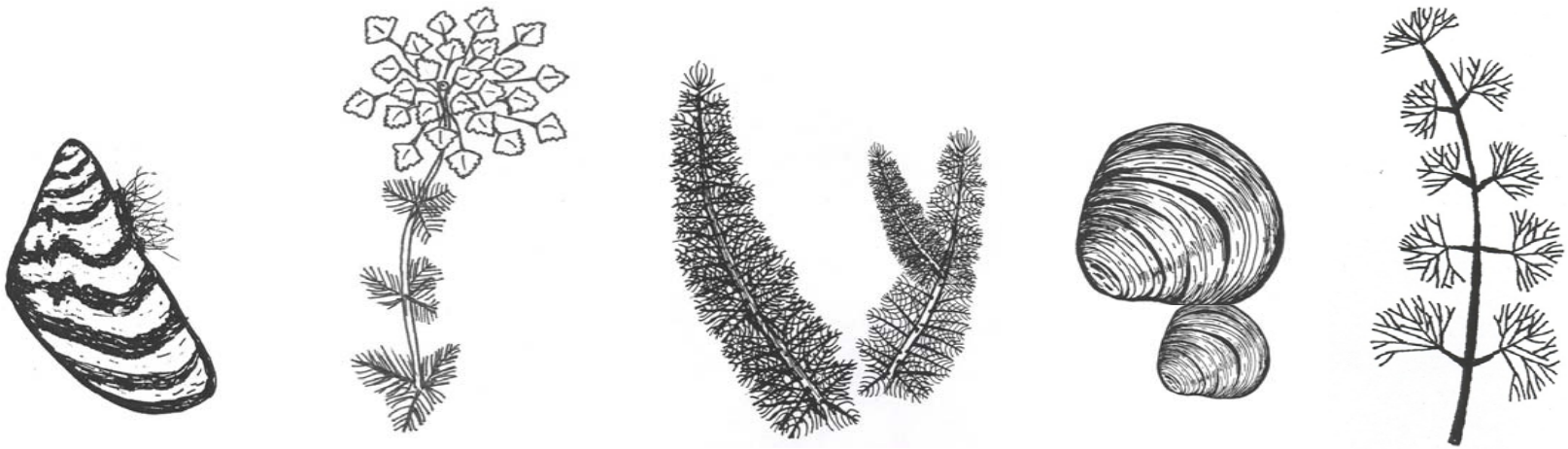
Cause Economic Harm

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

Known Statewide AIS Distribution



Identifying Invasives



Invasive Plants Threatening RI

Reed canary grass

Yellow iris

Forget-me-not

European water nymph

Yellow floating heart

European frogbit

Brazilian waterweed

Parrot feather

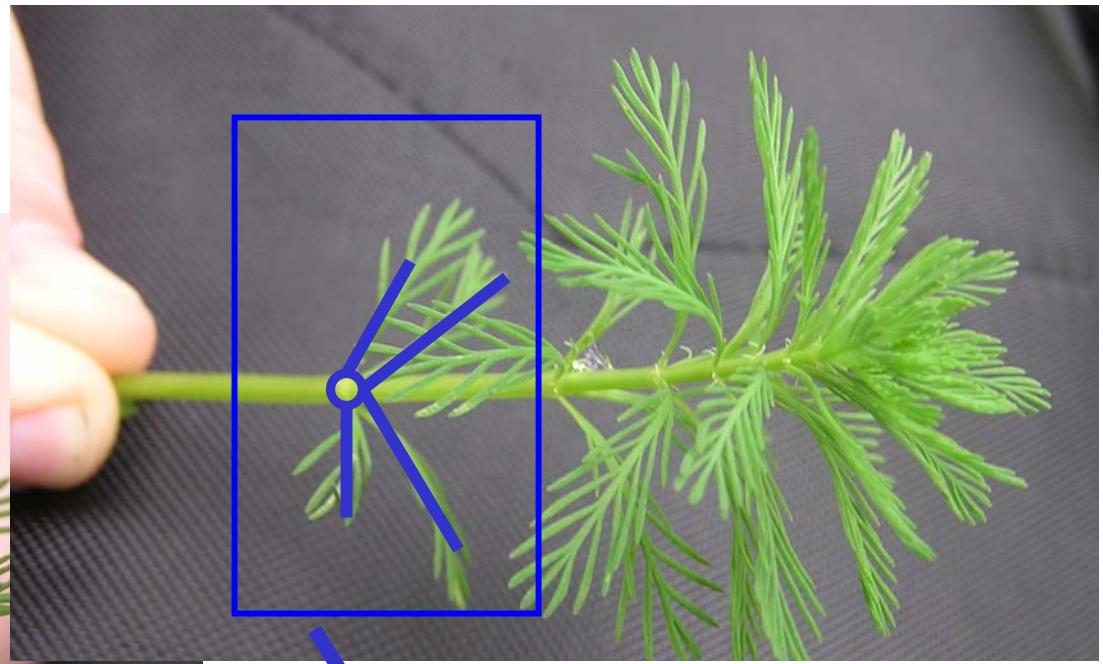
Hydrilla

Parrot Feather *Myriophyllum aquaticum*

Photos courtesy of the Auckland Regional Council

Parrot Feather *Myriophyllum aquaticum*

Photos courtesy of the Auckland Regional Council



- Whorls of 4-6 leaves

Parrot Feather *Myriophyllum aquaticum*

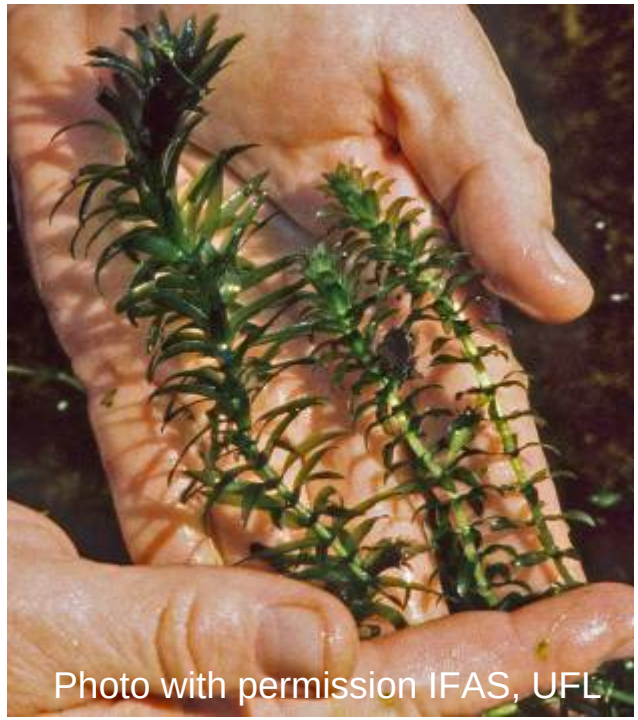
Photos courtesy of the Auckland Regional Council

- Whorls of 4-6 leaves
- Marketed for aquariums & sold in pet stores
- Spreads by fragments!

Brazilian waterweed (or B. elodea)
Egeria densa

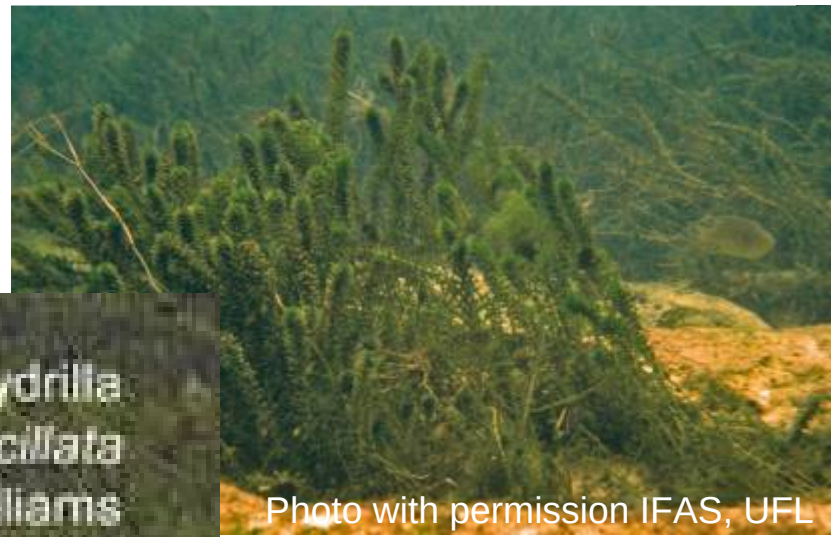
to with permission IFAS, UFL

Brazilian waterweed (or B. elodea)
Egeria densa



- Whorls of 3-6 leaves
- Marketed for aquariums & sold in pet stores
- Spreads by fragments!

Hydrilla *Hydrilla verticillata*



Hydrilla *Hydrilla verticillata*


Photo with permission IFAS, UFL


Photo with permission IFAS, UFL

- Whorls of 4-8 leaves
- Marketed for aquariums & sold in pet stores
- Spreads by fragments!

Current Invasive Plants in RI

Water chestnut

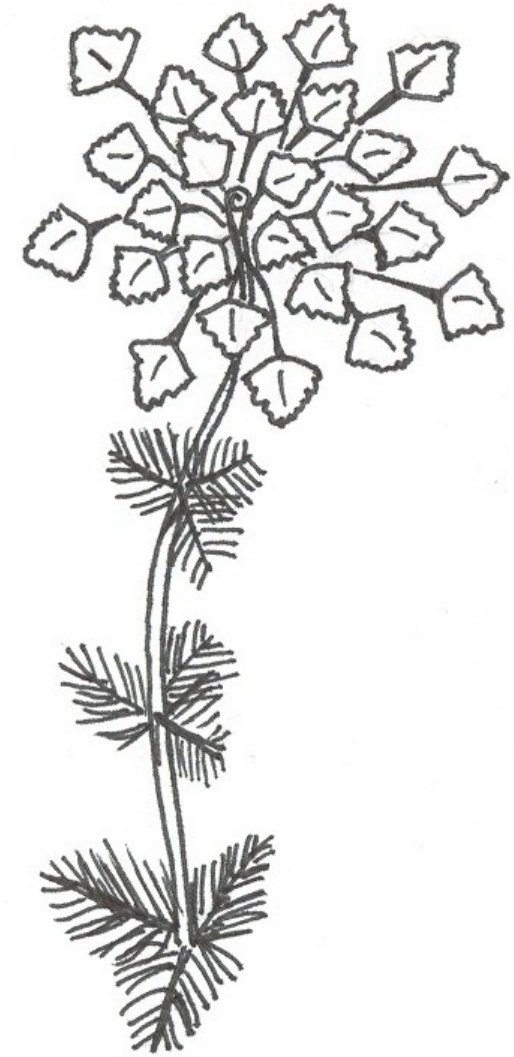
Curlyleaf pondweed

Variable watermilfoil

Eurasian watermilfoil

Fanwort

Water chestnut *Trapa natans*



Water chestnut *Trapa natans*

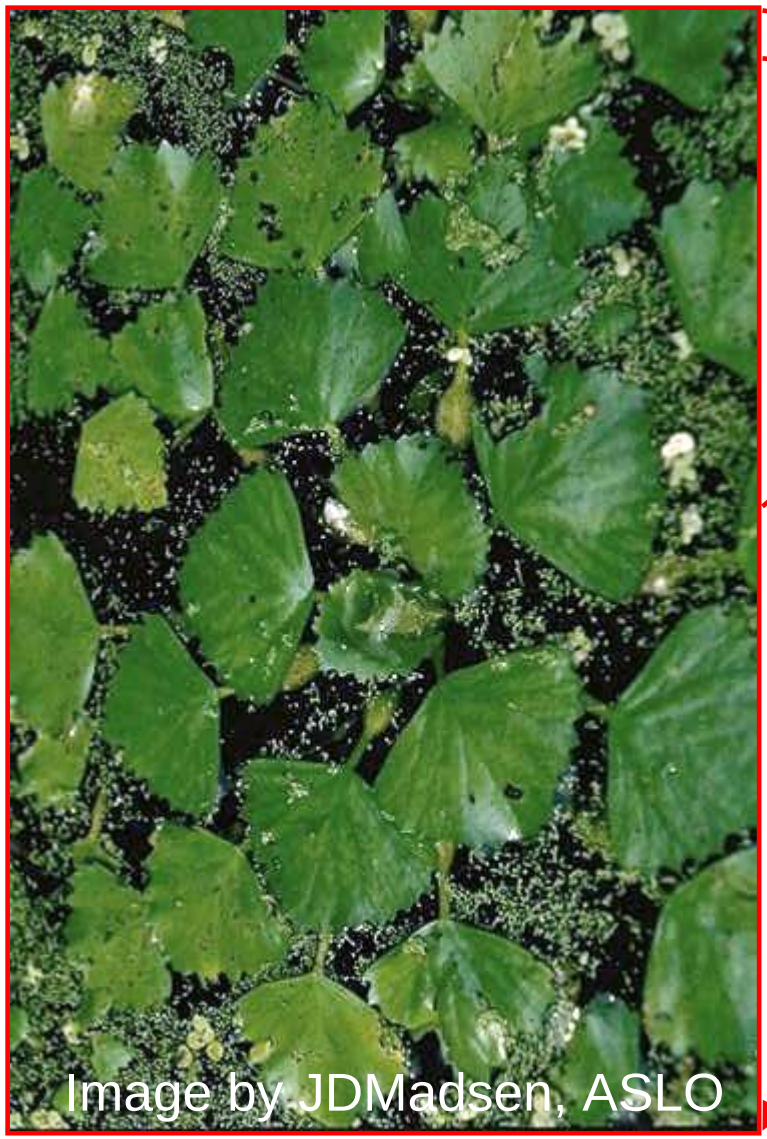
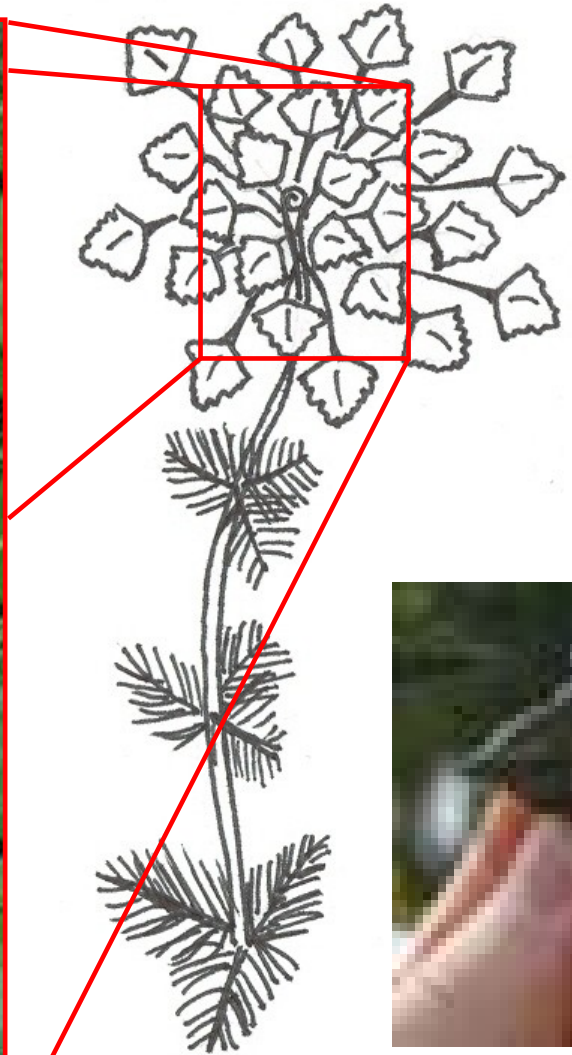


Image by JDMadsen, ASLO

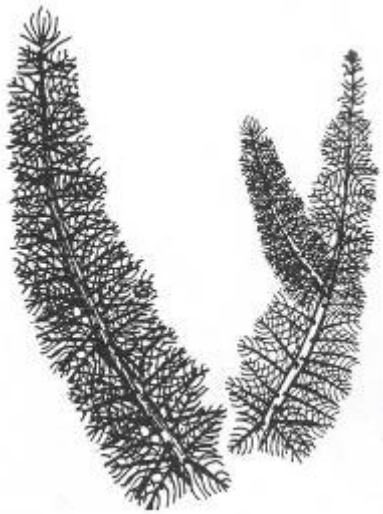


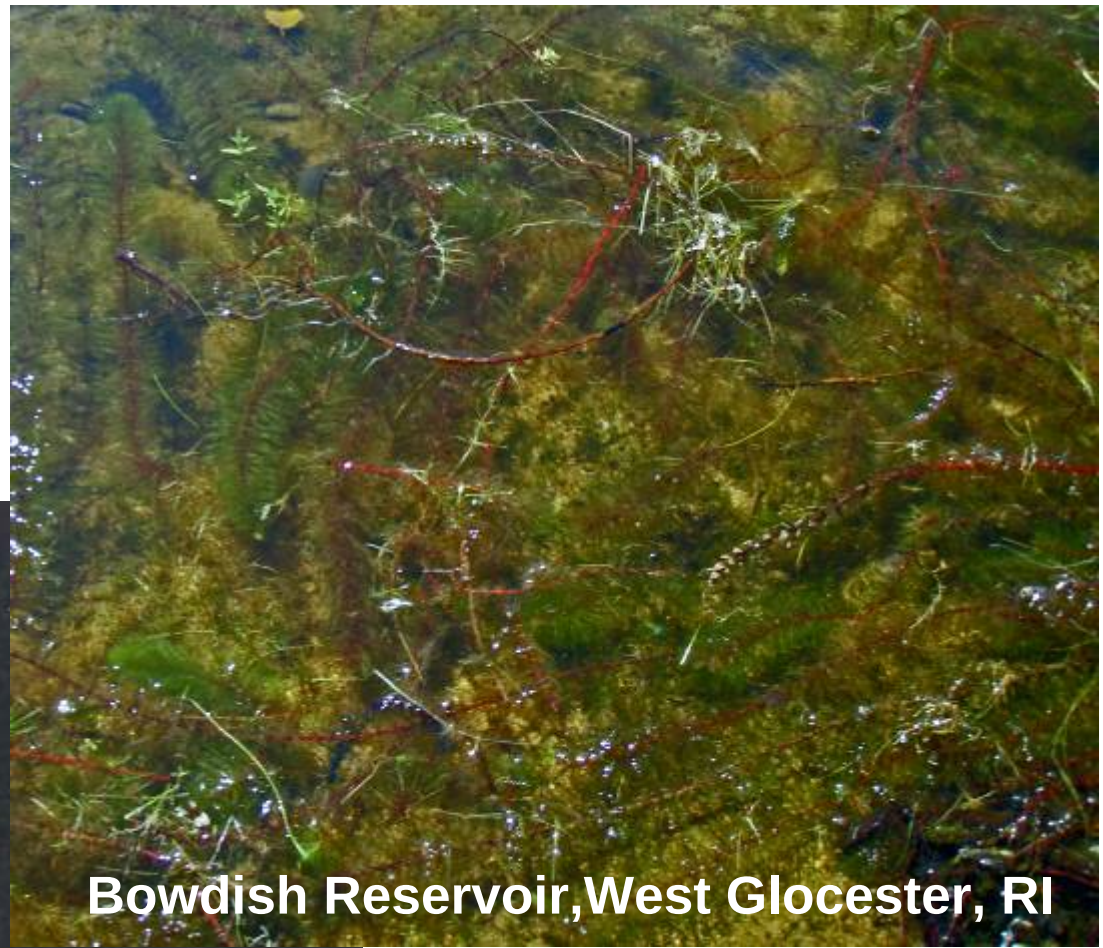
Spreads by SEEDS!

Curly leaf pondweed *Potamogeton crispus*

- Alternate leaves
- Spreads by turion buds/fruits

Variable milfoil *Myriophyllum heterophyllum*

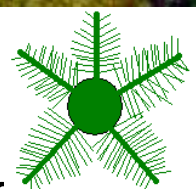




Bowdish Reservoir,West Glocester, RI

Pawtuxet River, West Warwick, RI

- Whorls of 5

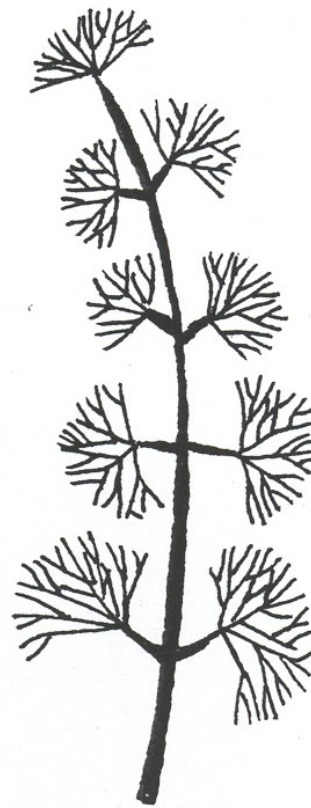


- Spreads by fragments!

Eurasian milfoil *Myriophyllum spicatum*

- Whorls of 4
- Spreads by fragments!

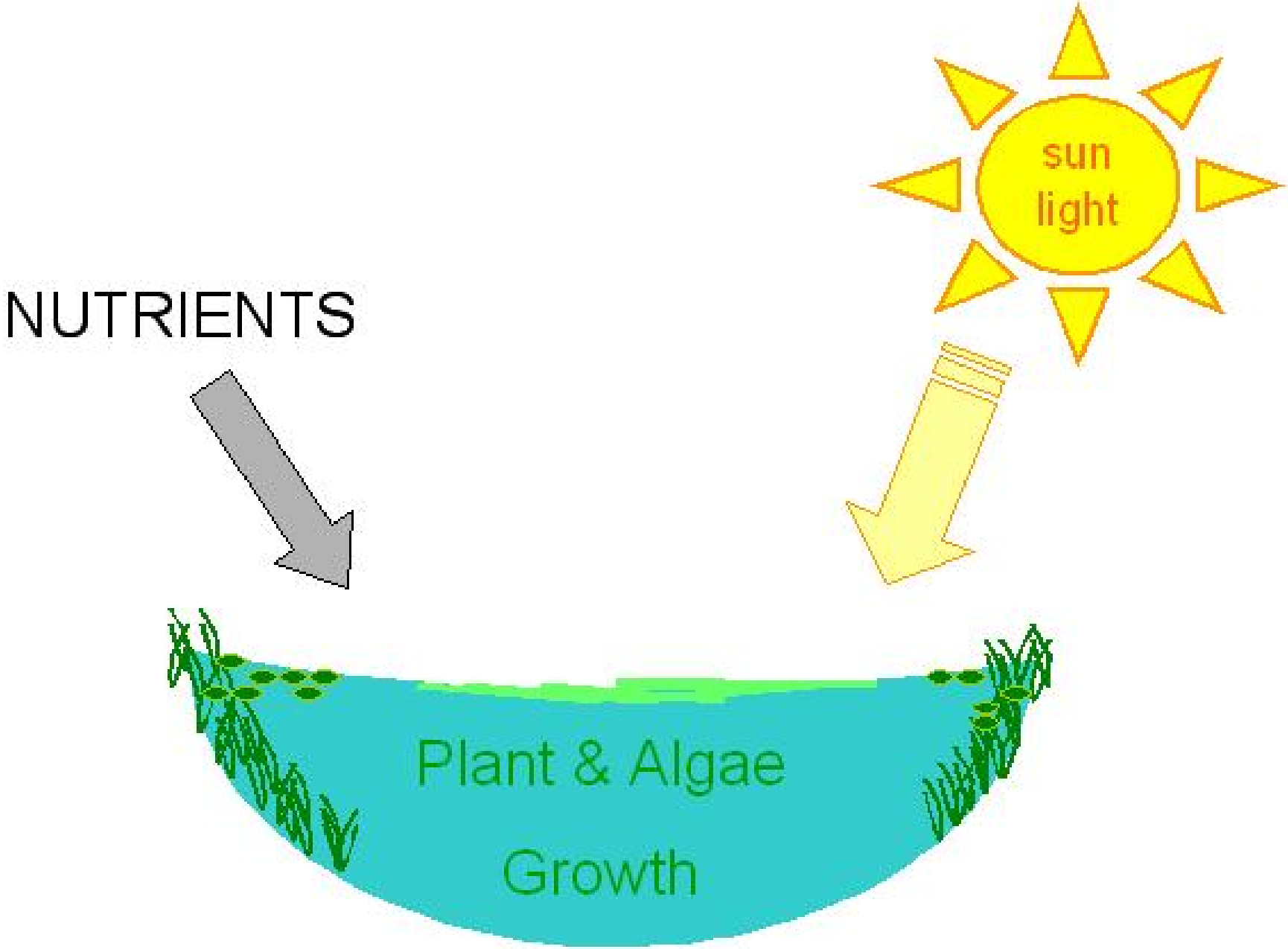
Fanwort *Cabomba caroliniana*



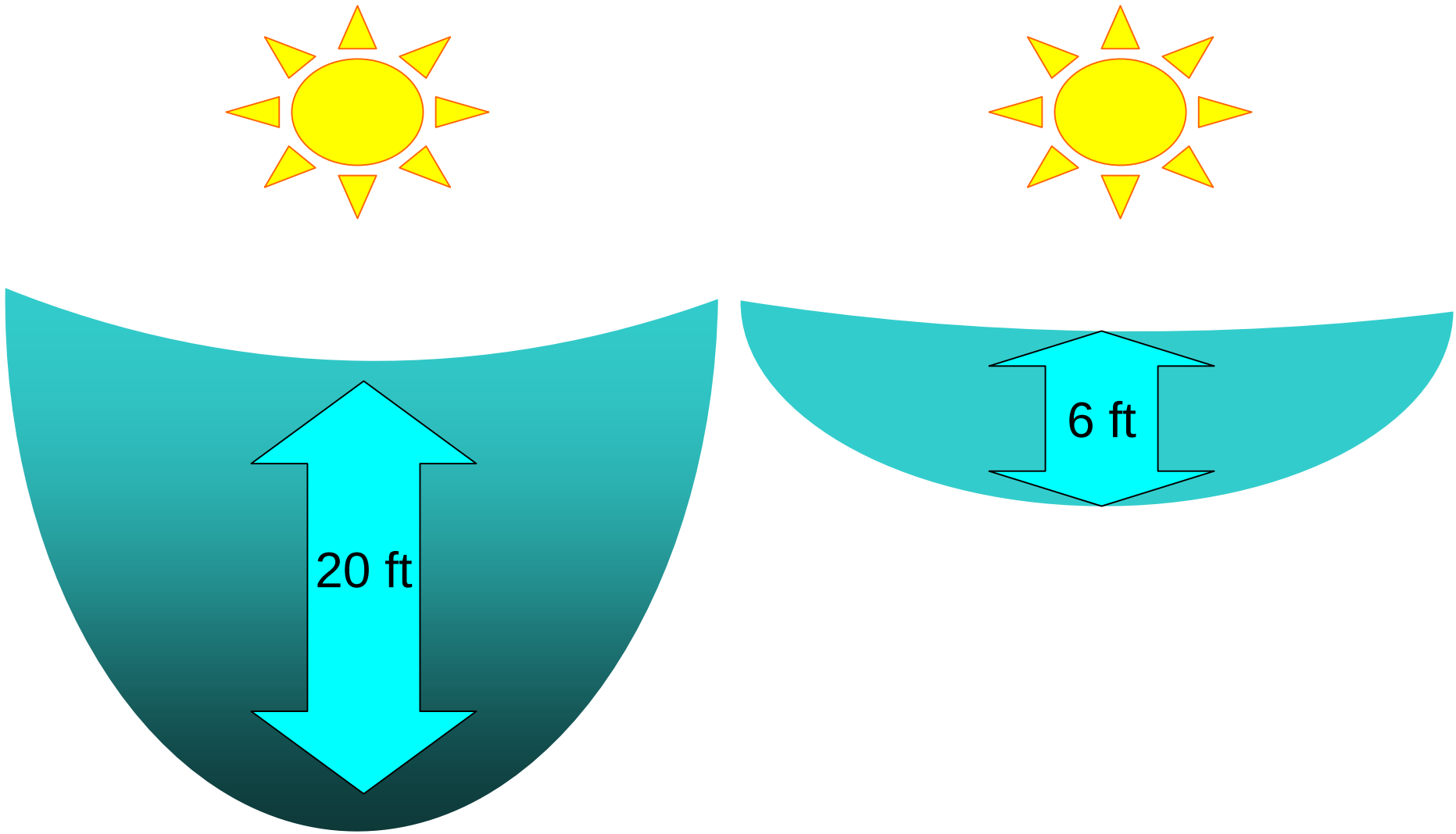
- Spreads by fragments!
- Leaves are opposite ("whorls of 2")

Elements Contributing to Successful Plant Invasions

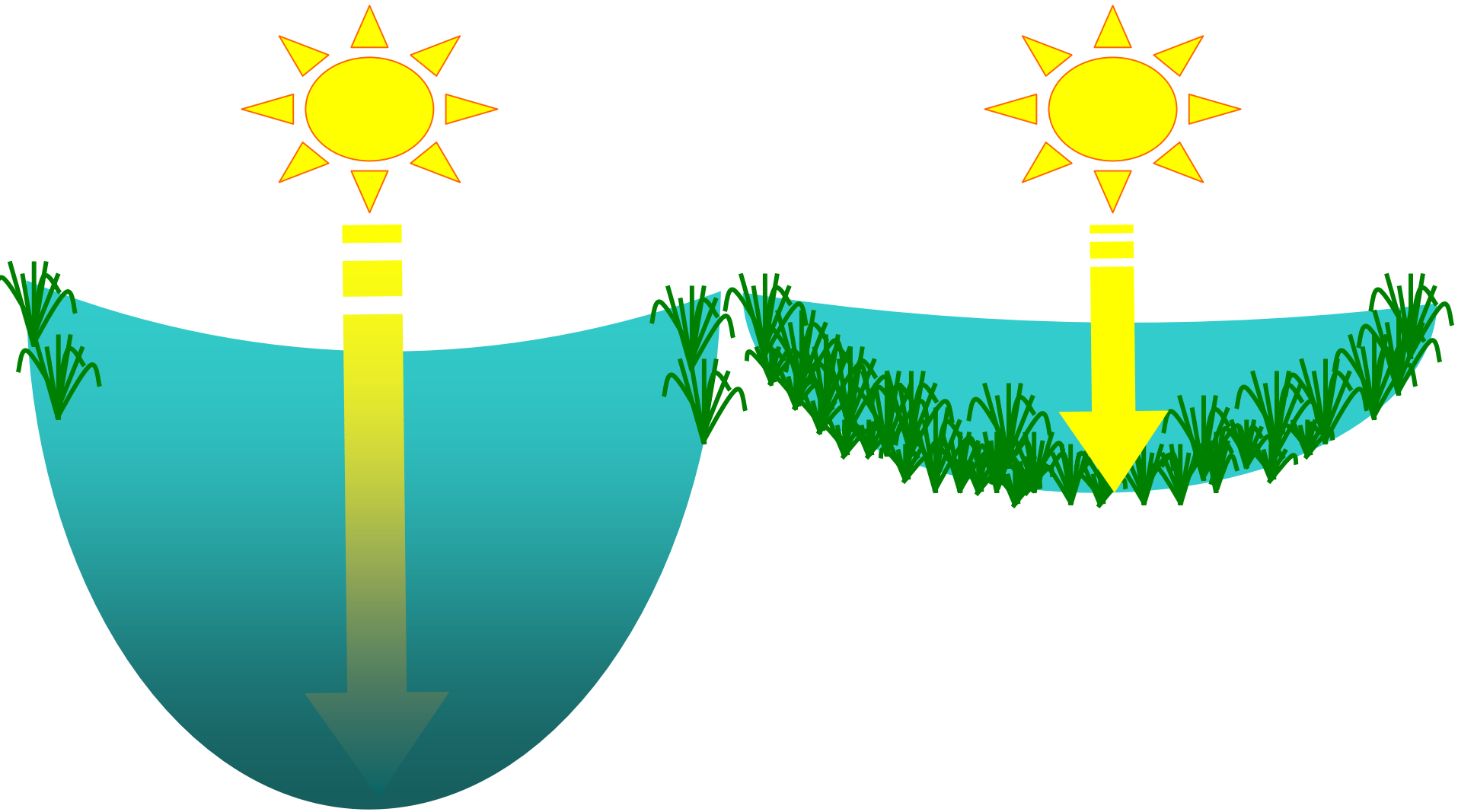
Aquatic Plant Requirements



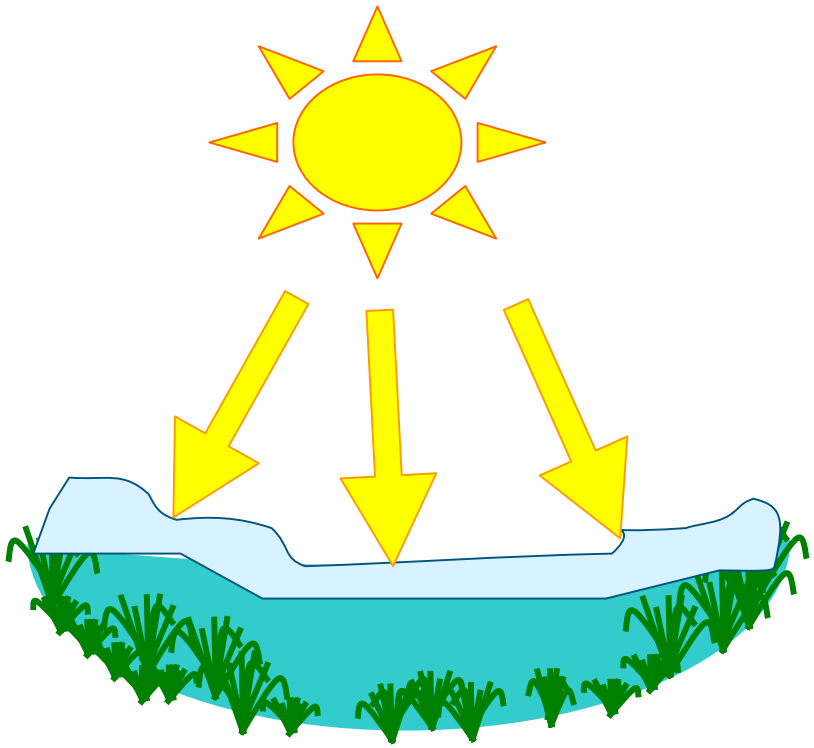
* Bathymetry (depth) is important



* Bathymetry is important

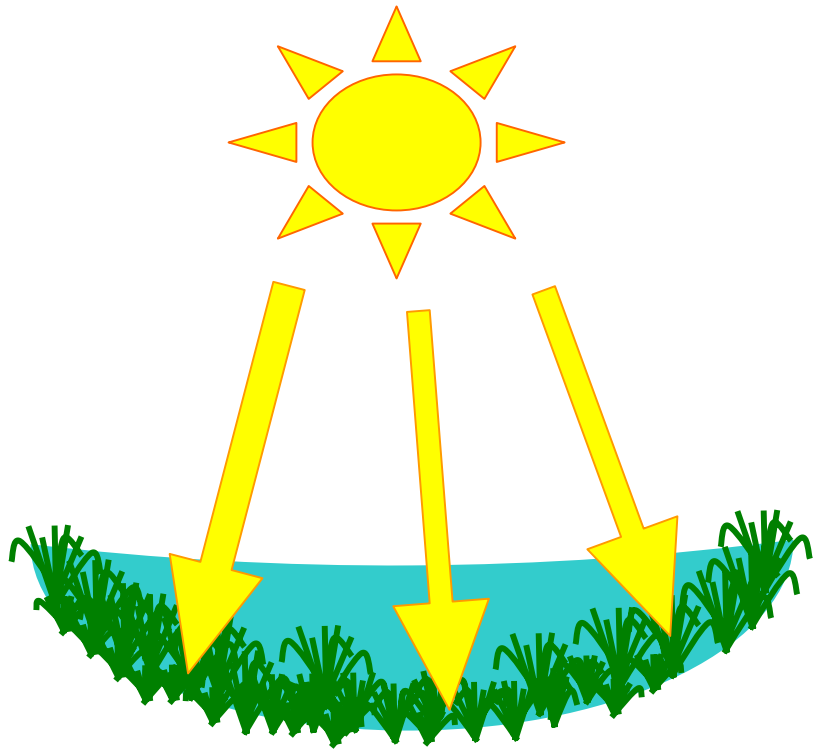


* Winter ice/snow is important



Colder Winters

Ice & snow accumulate & provide shade



Milder Winter

Plants have longer time to access sunlight

* Nutrient loading is important

NUTRIENTS

Sources of Nutrients in a Watershed

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

Invasive Animals

Common Carp

Grass Carp (White Amur)

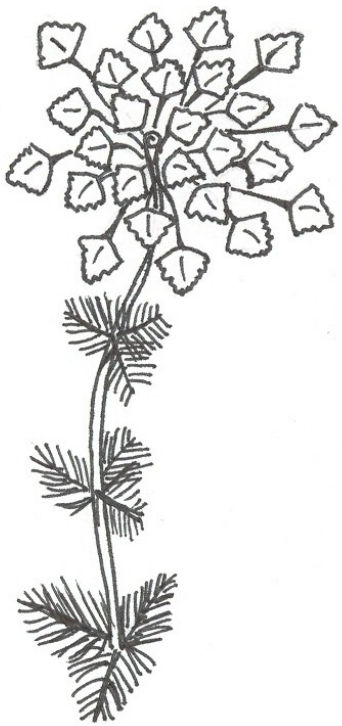
Goldfish

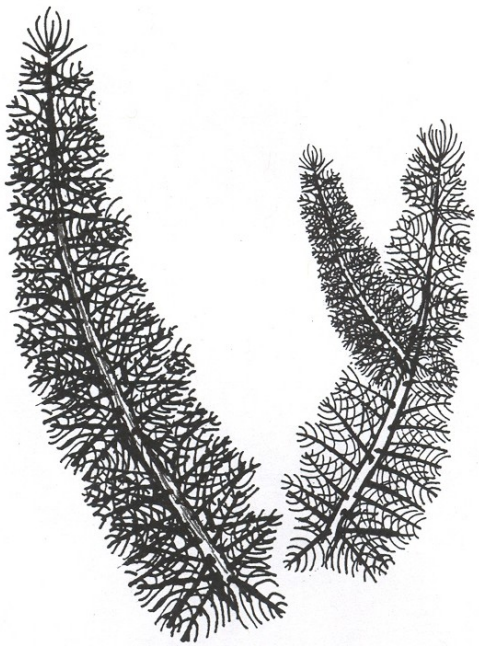
Koi

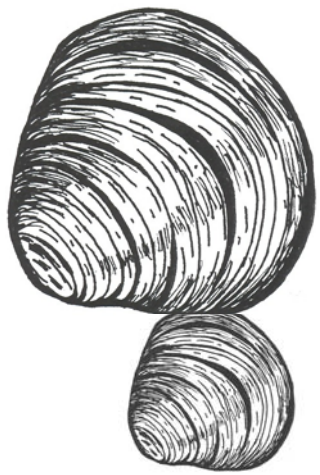
AIS Management Planning

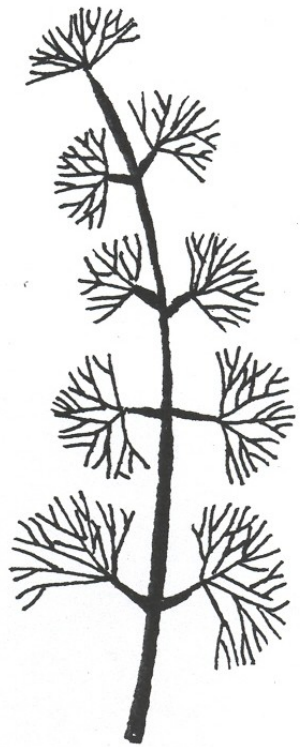
AIS Management Planning

Know your enemy:
Identify problem species









AIS Management Planning

Plan

Who?

What?

When?

Where?

How?

How long?

*Requires Data

- Target species information
- Plant distribution maps
- Plant abundance/coverage
- Lake information
  - Bathymetry
  - Size
  - Water volume/level
  - Flushing rate/method
  - Connectivity
  - Rare/endangered sp.?

AIS Management Planning

How big is the population?

Stages of an Invasion

ARRIVE
Plant is introduced

⬇

ESTABLISH

⬇

GROW & SPREAD

⬇

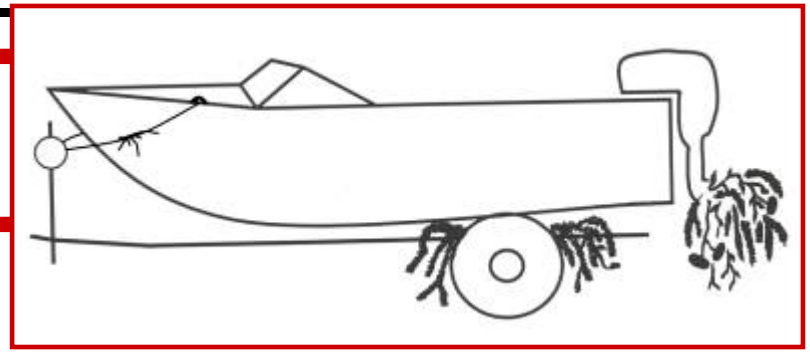
DISPLACE NATIVES

⬇

DOMINATE ECOSYSTEM

Stages of an Invasion

ARRIVE
Plant is introduced



⬇

ESTABLISH

⬇

GROW & SPREAD

⬇

DISPLACE NATIVES

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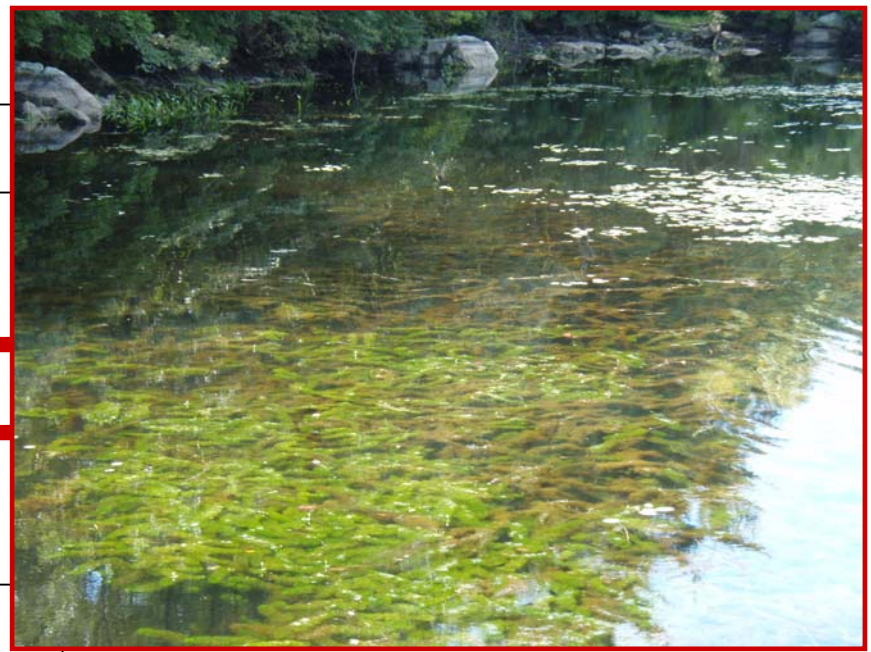
DOMINATE ECOSYSTEM



Stages of an Invasion

ARRIVE
Plant is introduced

⬇

ESTABLISH

⬇

GROW & SPREAD

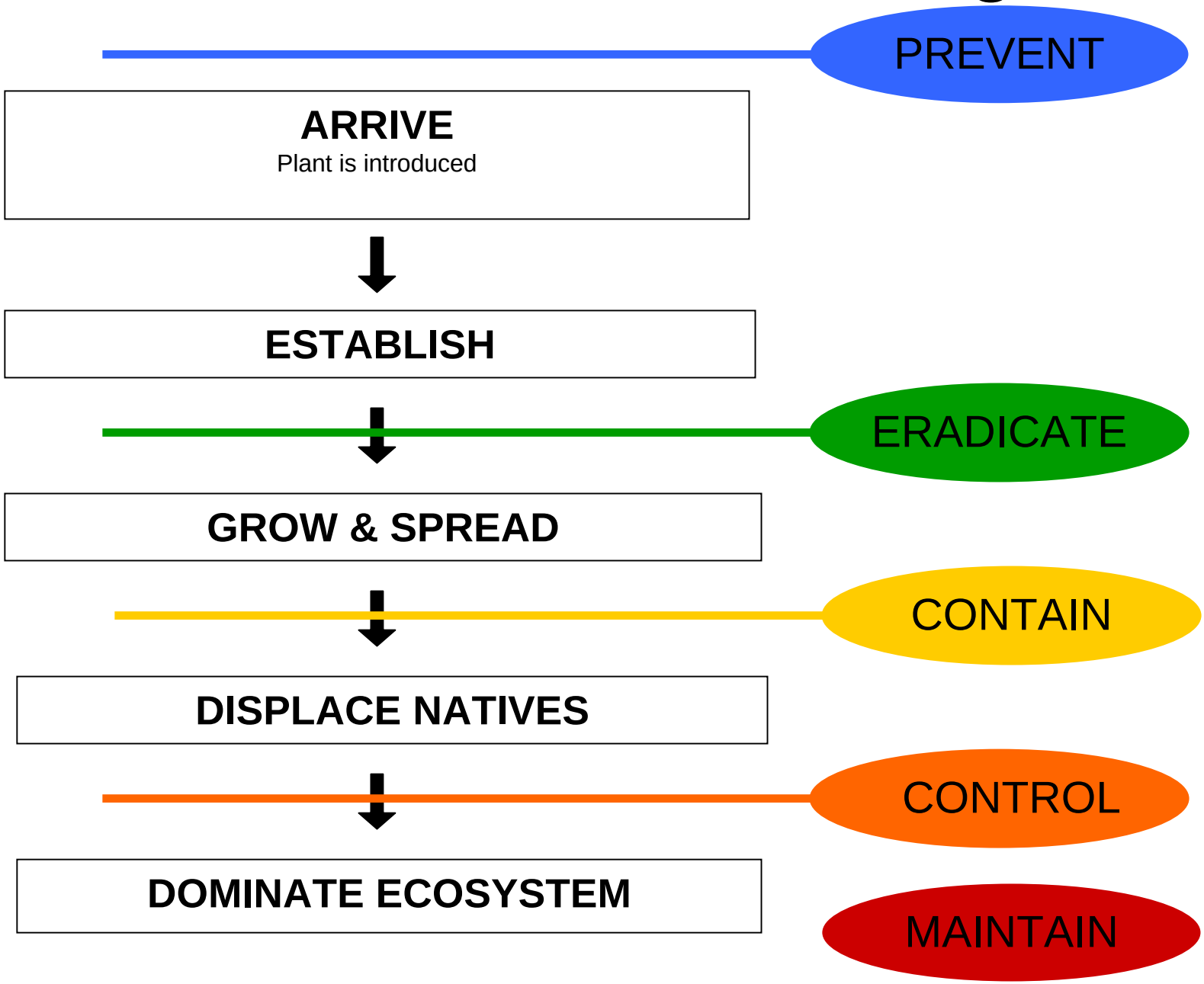
⬇

DISPLACE NATIVES

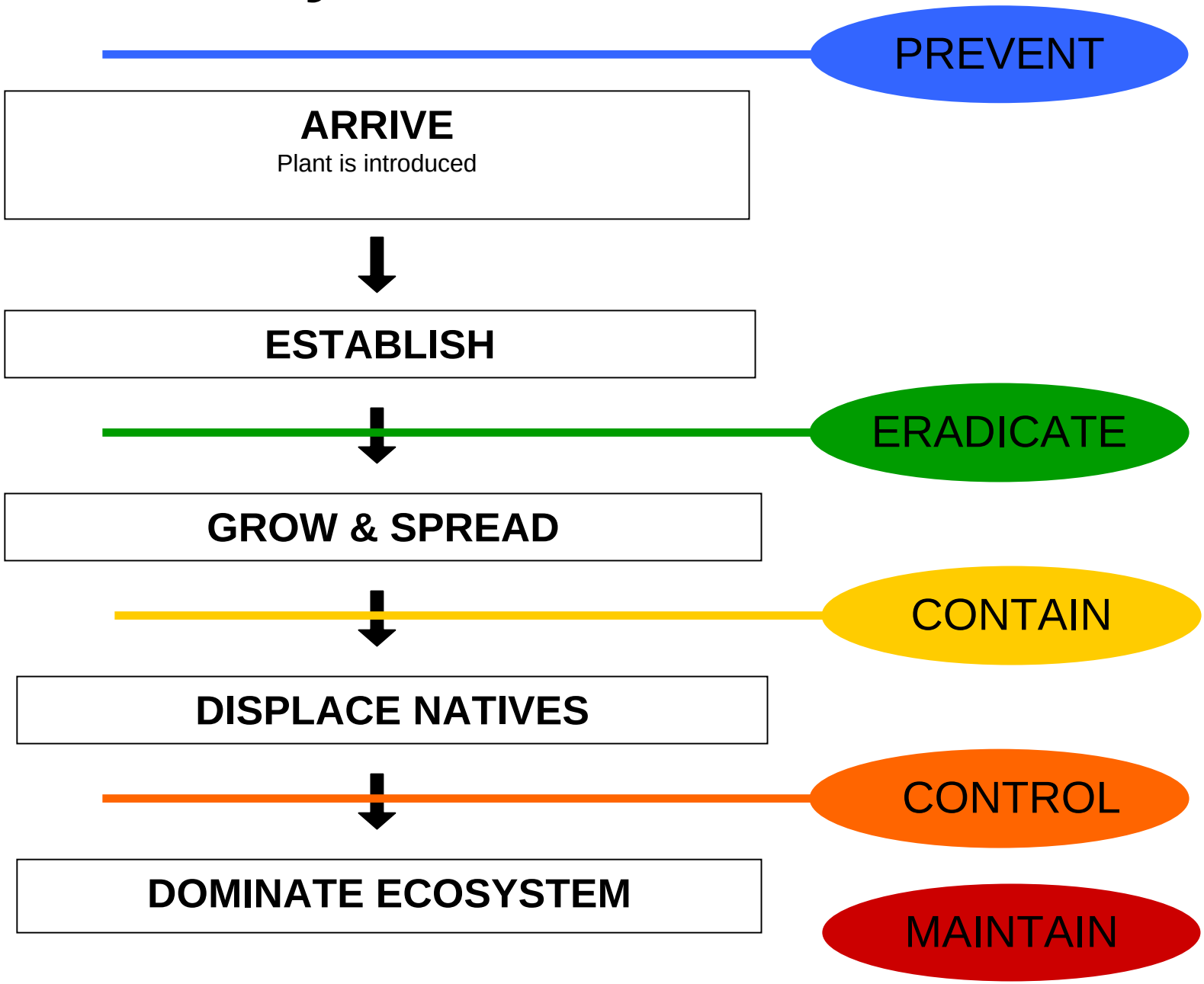
⬇

DOMINATE ECOSYSTEM

AIS Control Strategies



Identify the Goal & Start to Plan



Invasive Management Planning

Plan

Who?

What?

When?

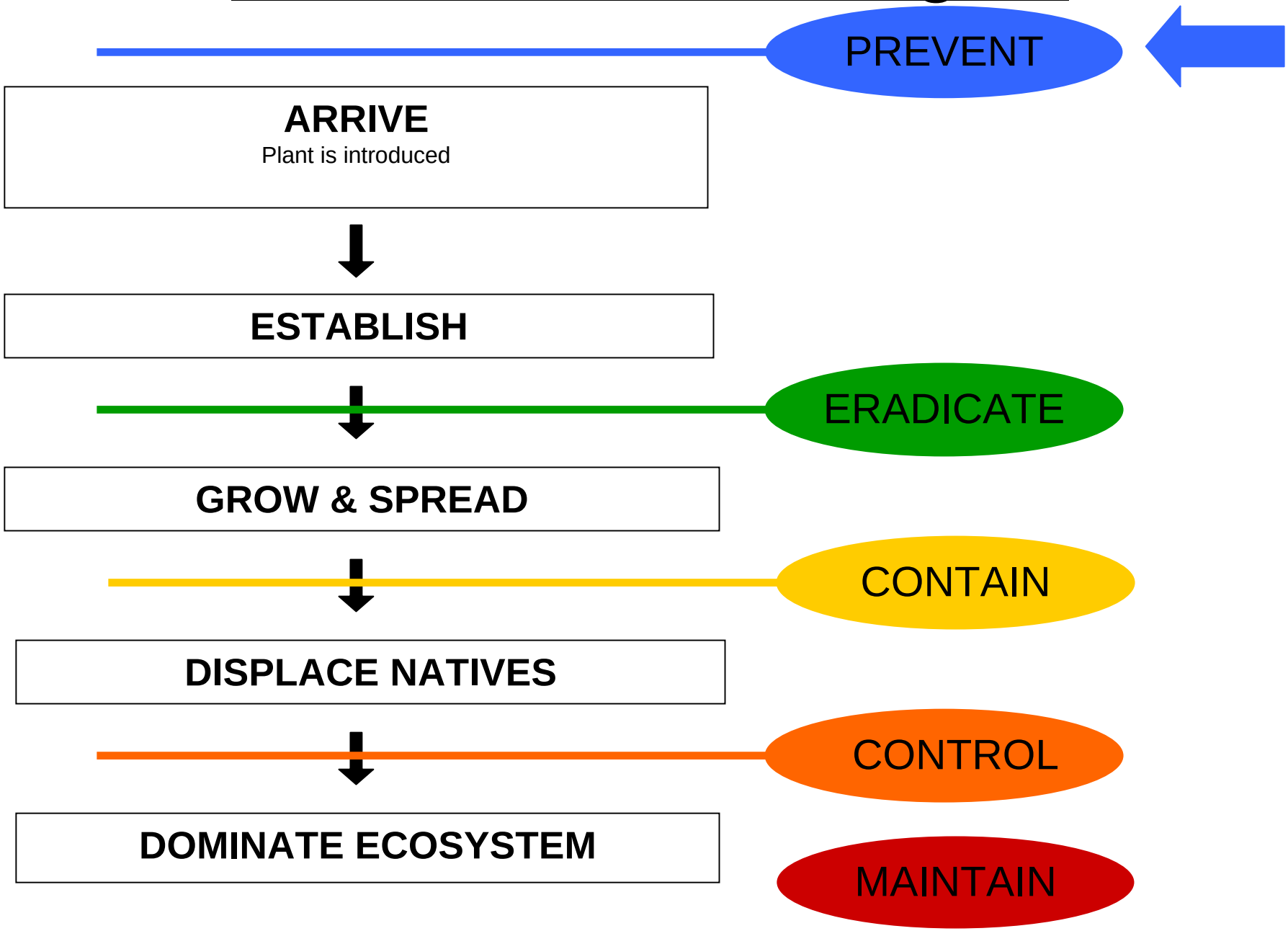
Where?

How?

How long?

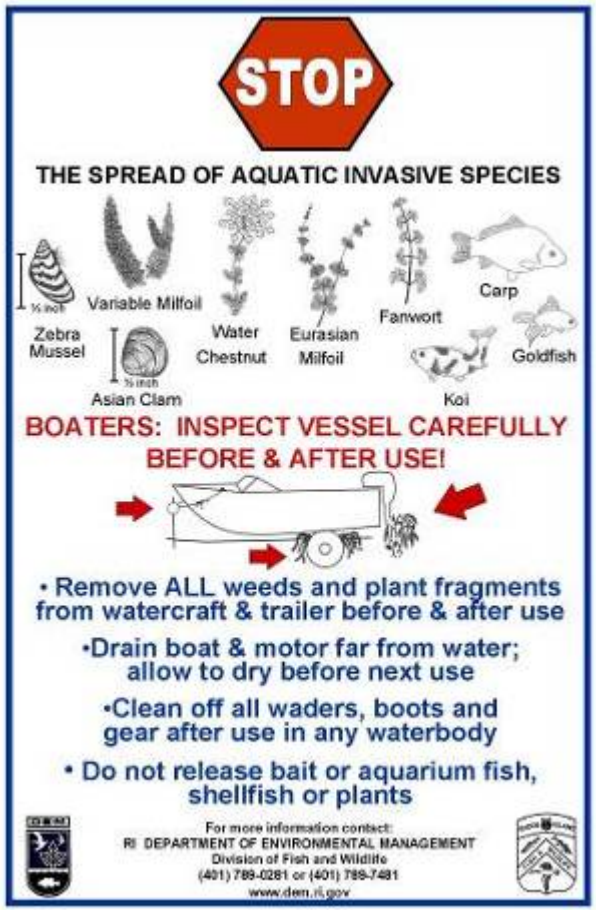
1. Recruit whole community participation
2. Identify problem species
3. Identify goals of plan
4. Evaluate all control options

AIS Control Strategies

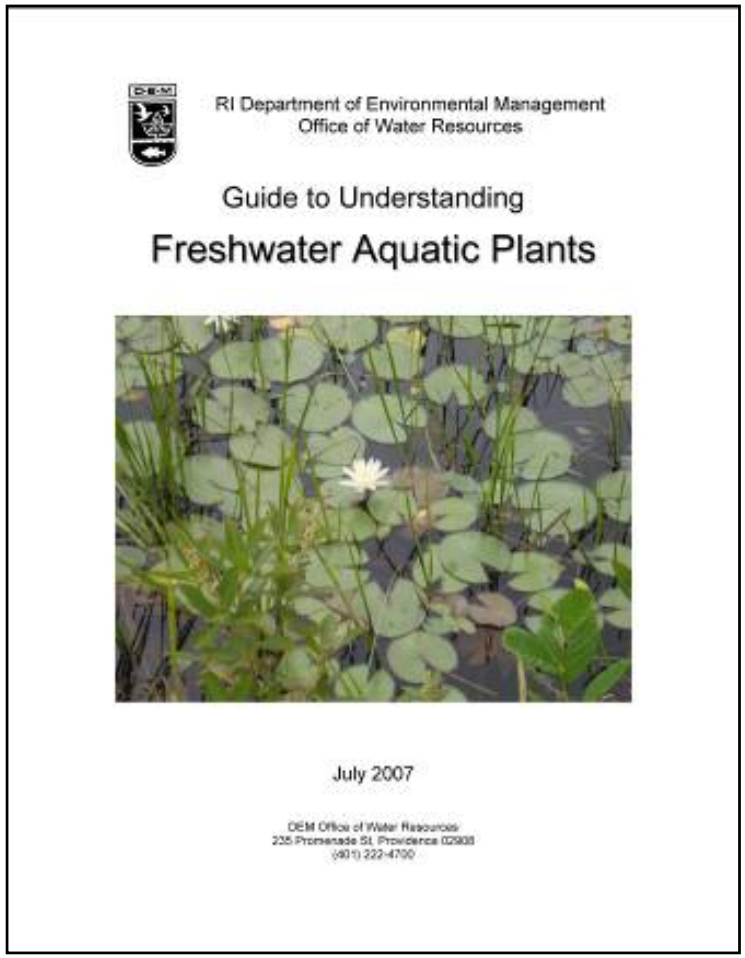


PREVENT = Educate!

Boat Ramp Signs



Informational Handouts



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

PREVENT = Monitor!

Lake hosts monitor for invasives

PREVENT = Enact Legislation

All New England States except RI regulate AIS transport/import/export etc..

PREVENT = Enact Legislation

All New England States except RI regulate AIS transport/import/export etc..

Contact your Representatives

2008 House Bill: H-7522

2008 Senate Bill: S-2369

PREVENT = Report Suspicions!

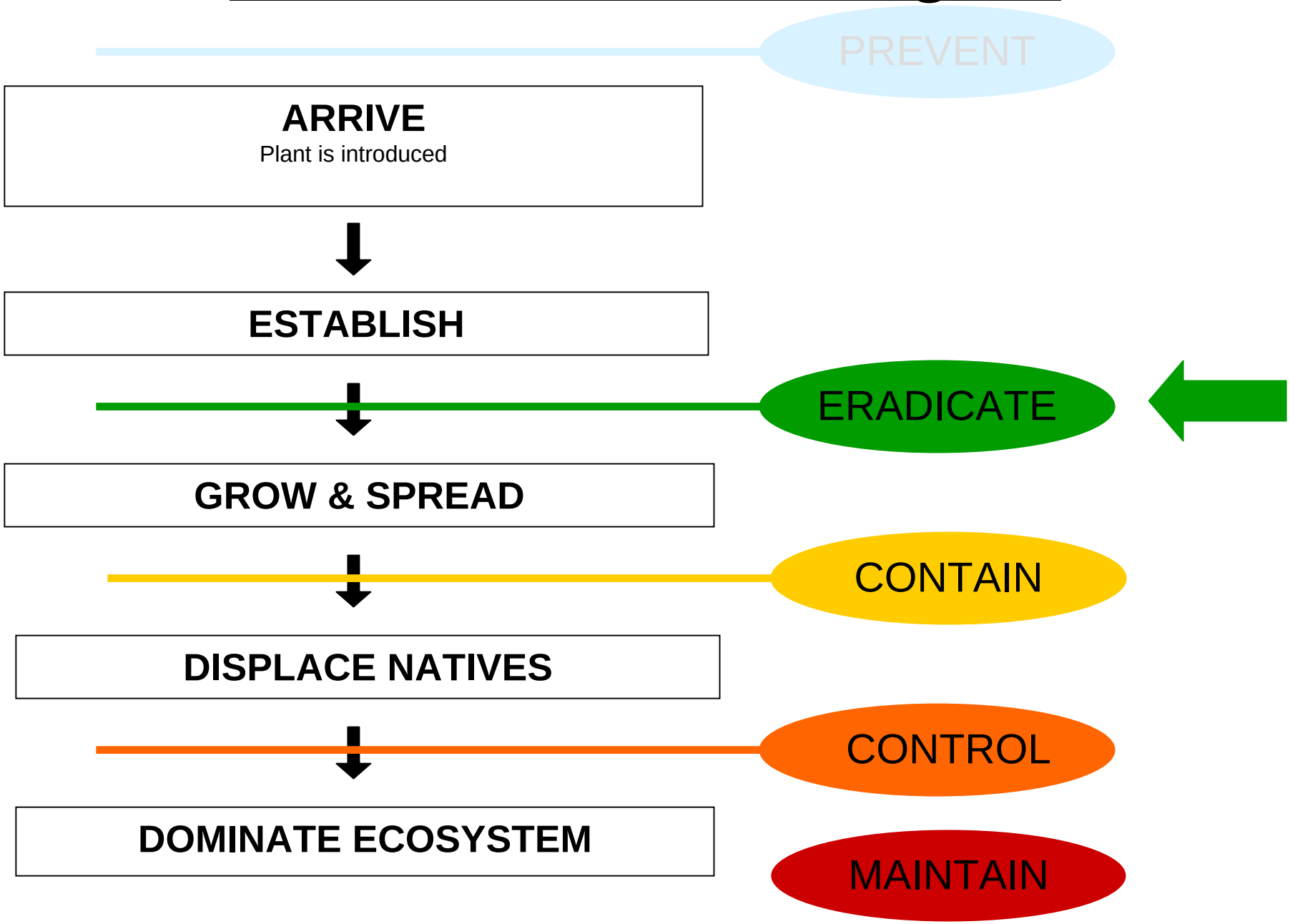
Contact Division of Fish and Wildlife

To verify invasive species

401-789-0281

401-789-7481

AIS Control Strategies

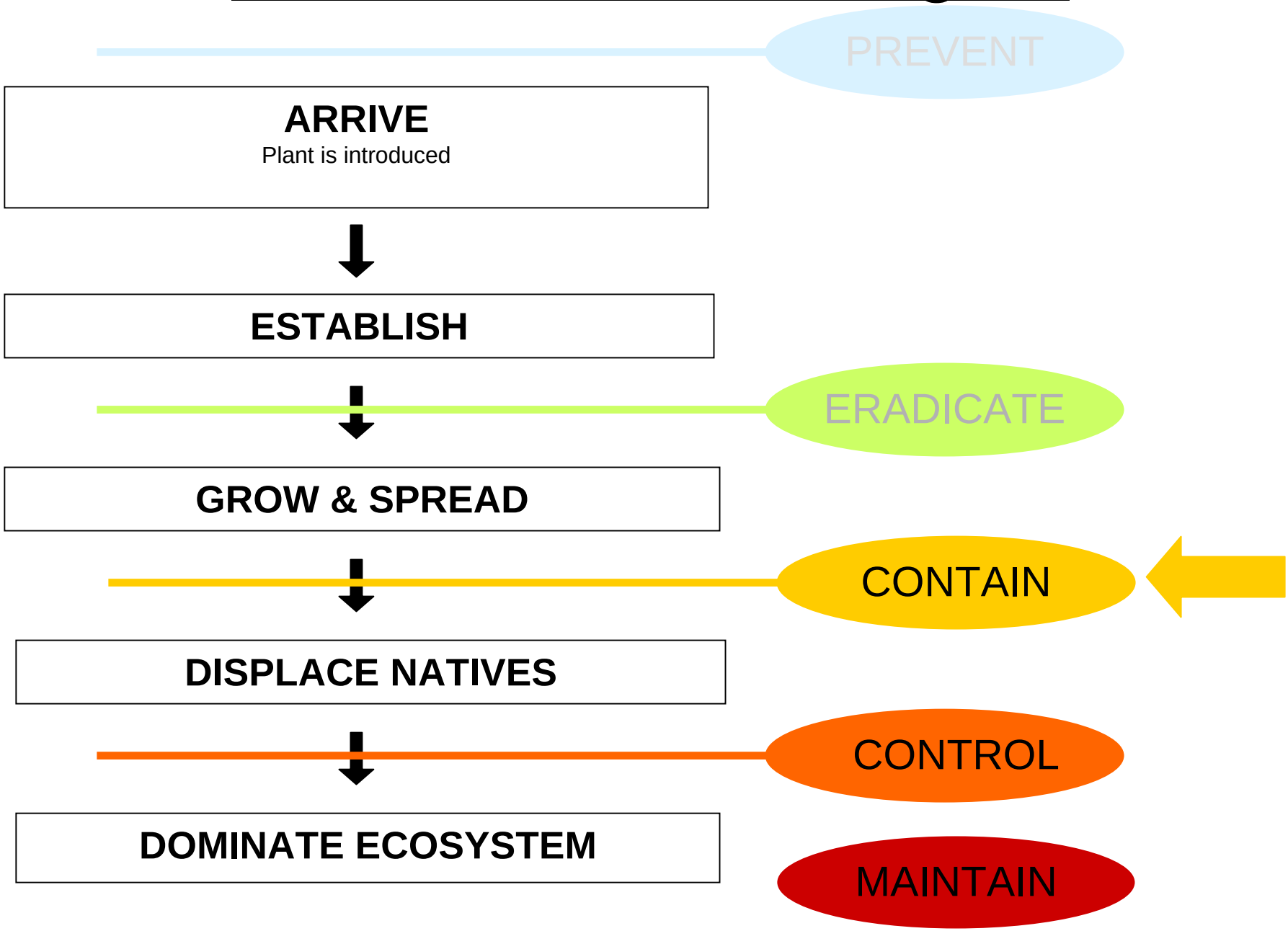


ERADICATE = Removal

Hand Pulling

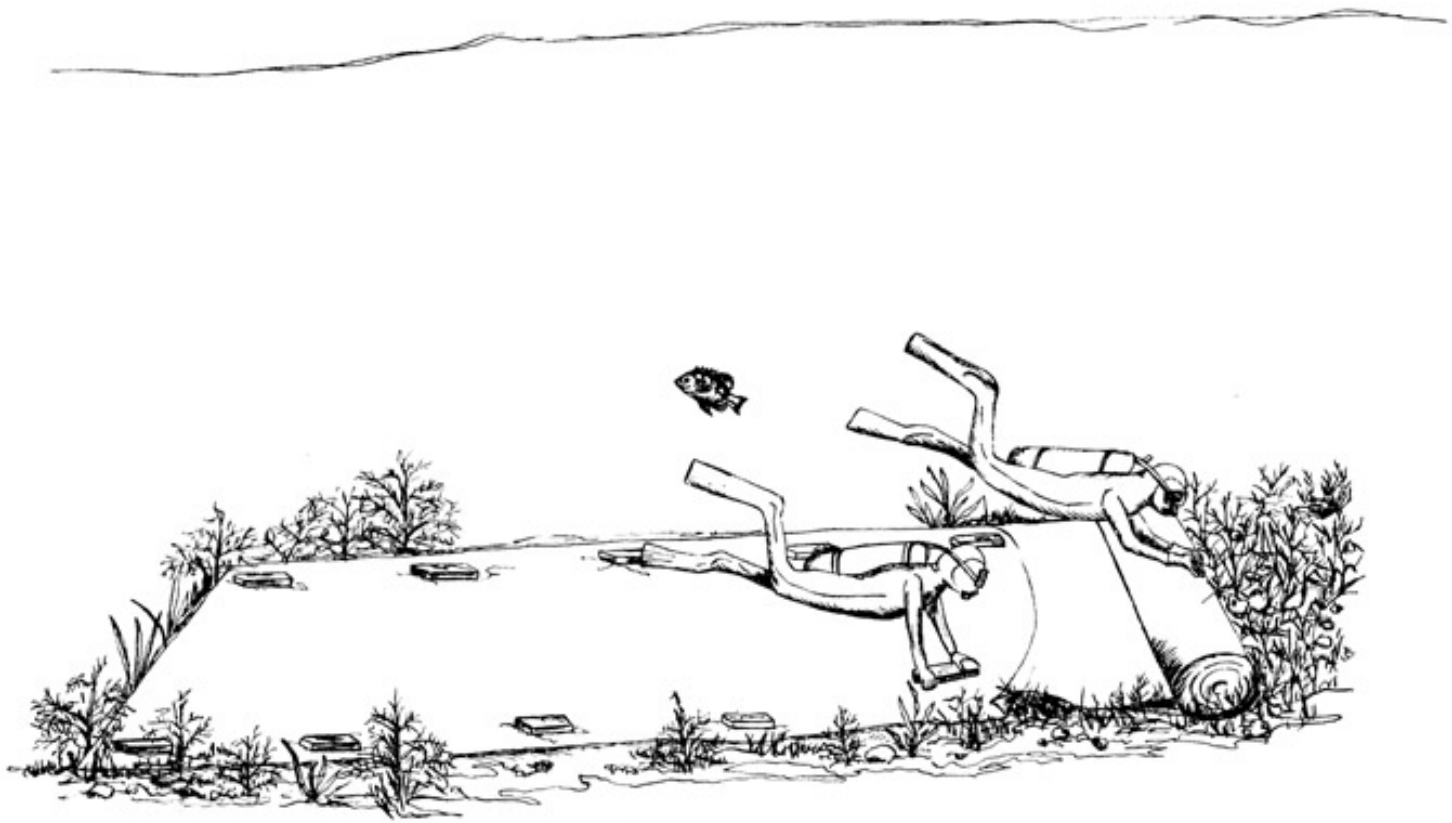
- Completely removes plant
- Effective on individual plants (small areas)
- Highly specific to target (plant species)
- Least environmentally abrasive option
- May require DEM Wetlands permit

AIS Control Strategies



CONTAIN = Enclose Small Area

Benthic Barriers



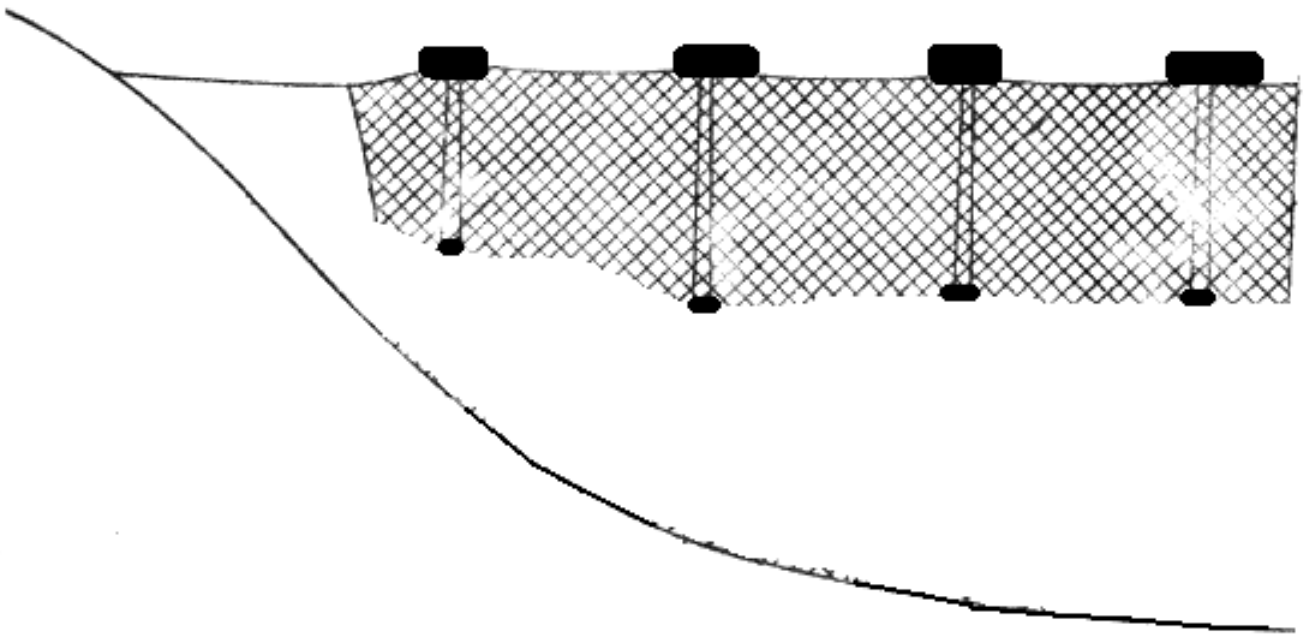
CONTAIN = Enclose Small Area

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



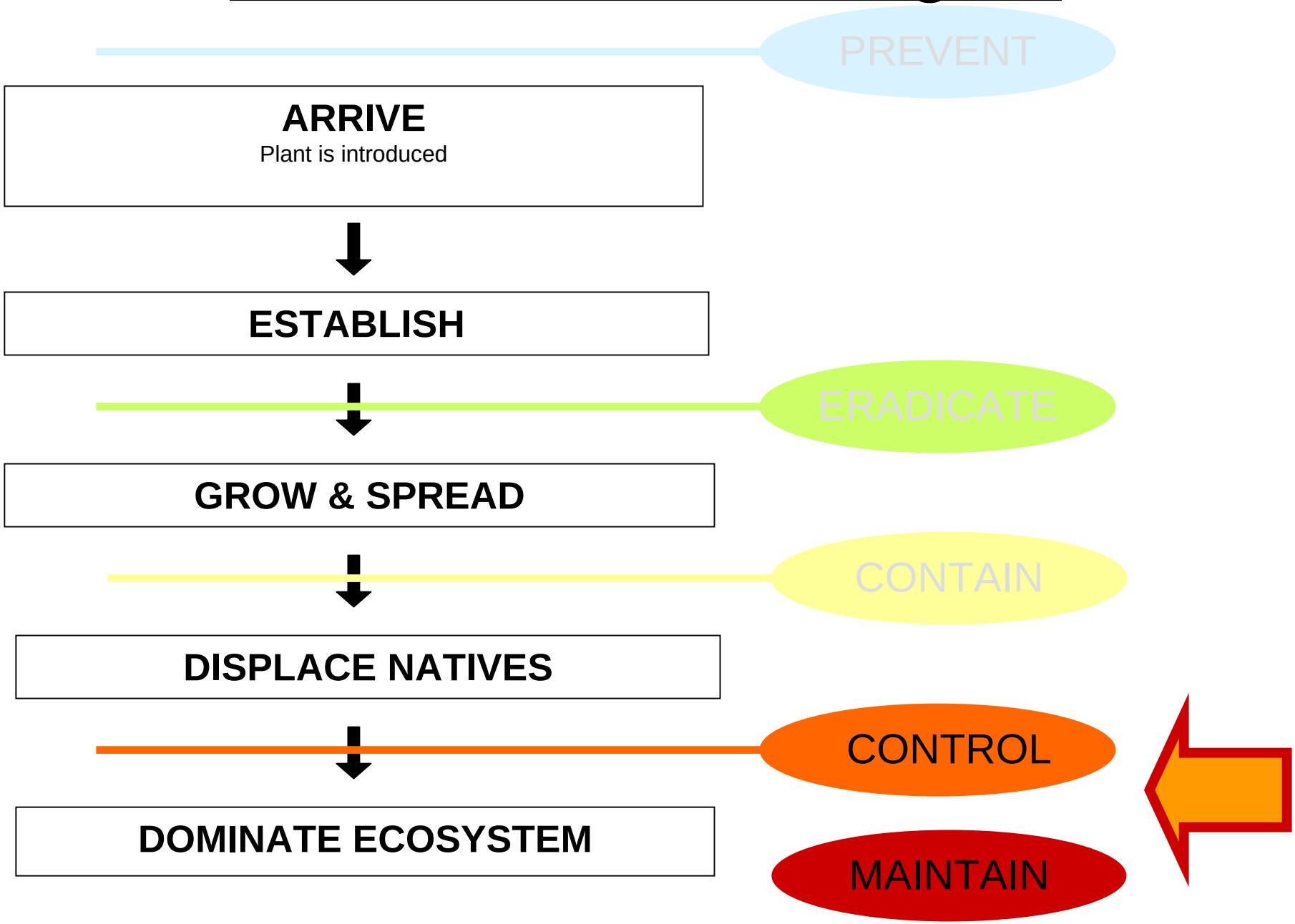
CONTAIN = Enclose Small Area

Floating Nets

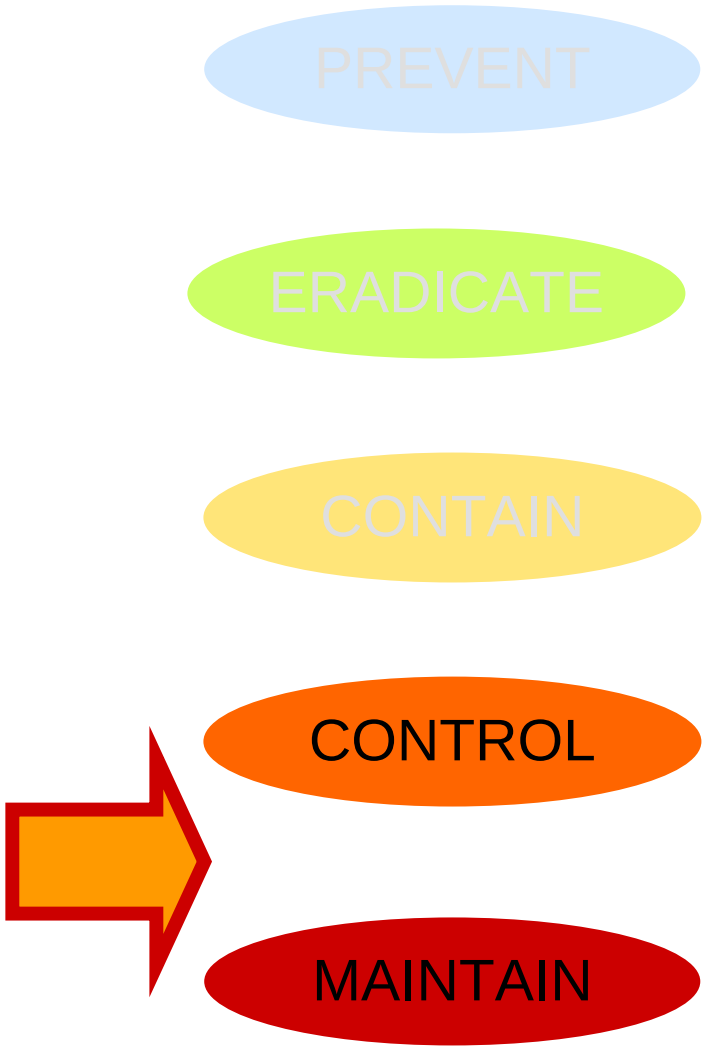
- Drape net across cove or inlet opening
- Inhibits spread of plant fragments
- Not target specific
- Requires proper anchors and maintenance
- May impede boating, swimming

  or fish movement

AIS Control Strategies



AIS Management



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

Dredging

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

Physical Habitat Alteration

Lake-level Drawdowns

CONTROL

MAINTAIN

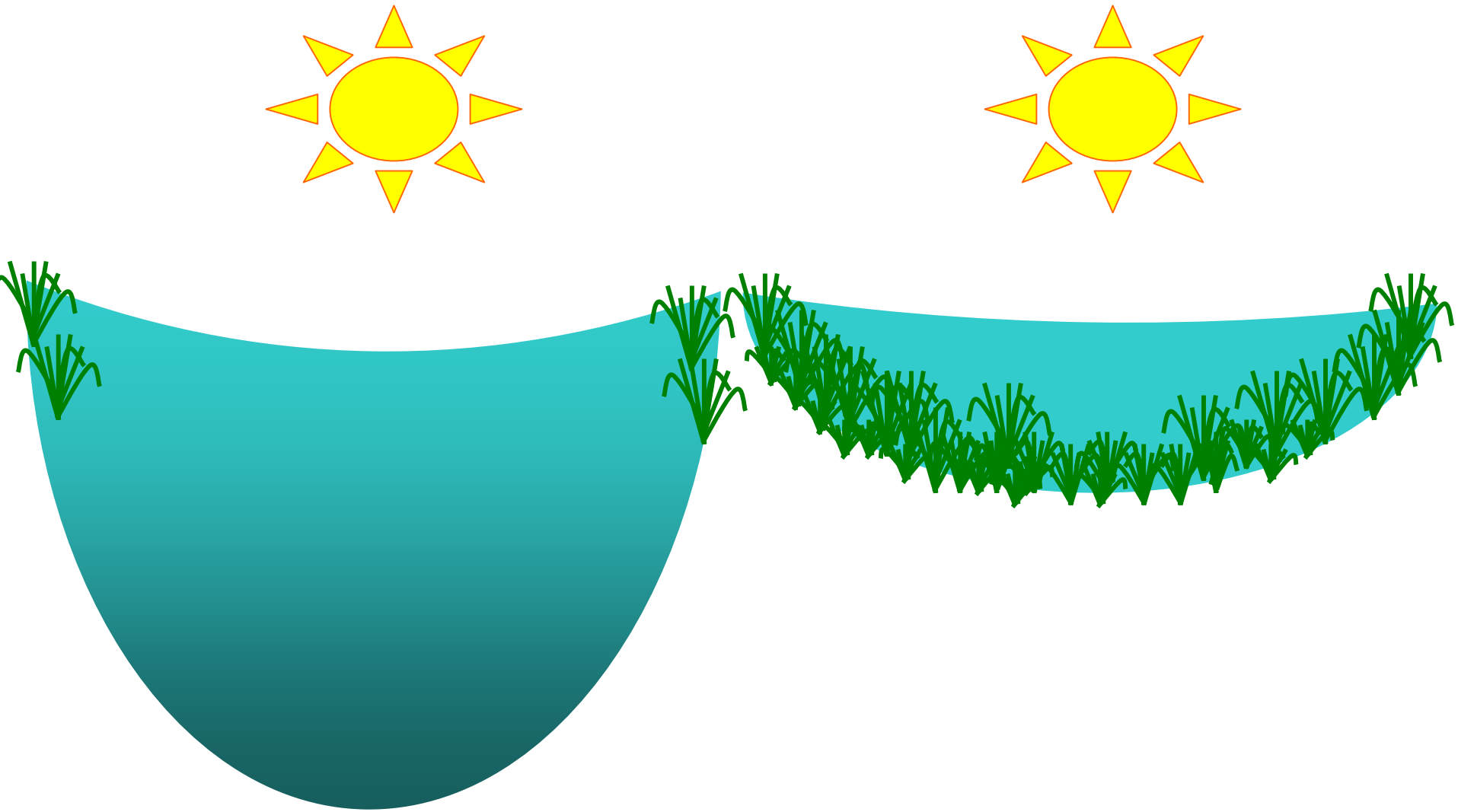
Physical Habitat Alteration

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

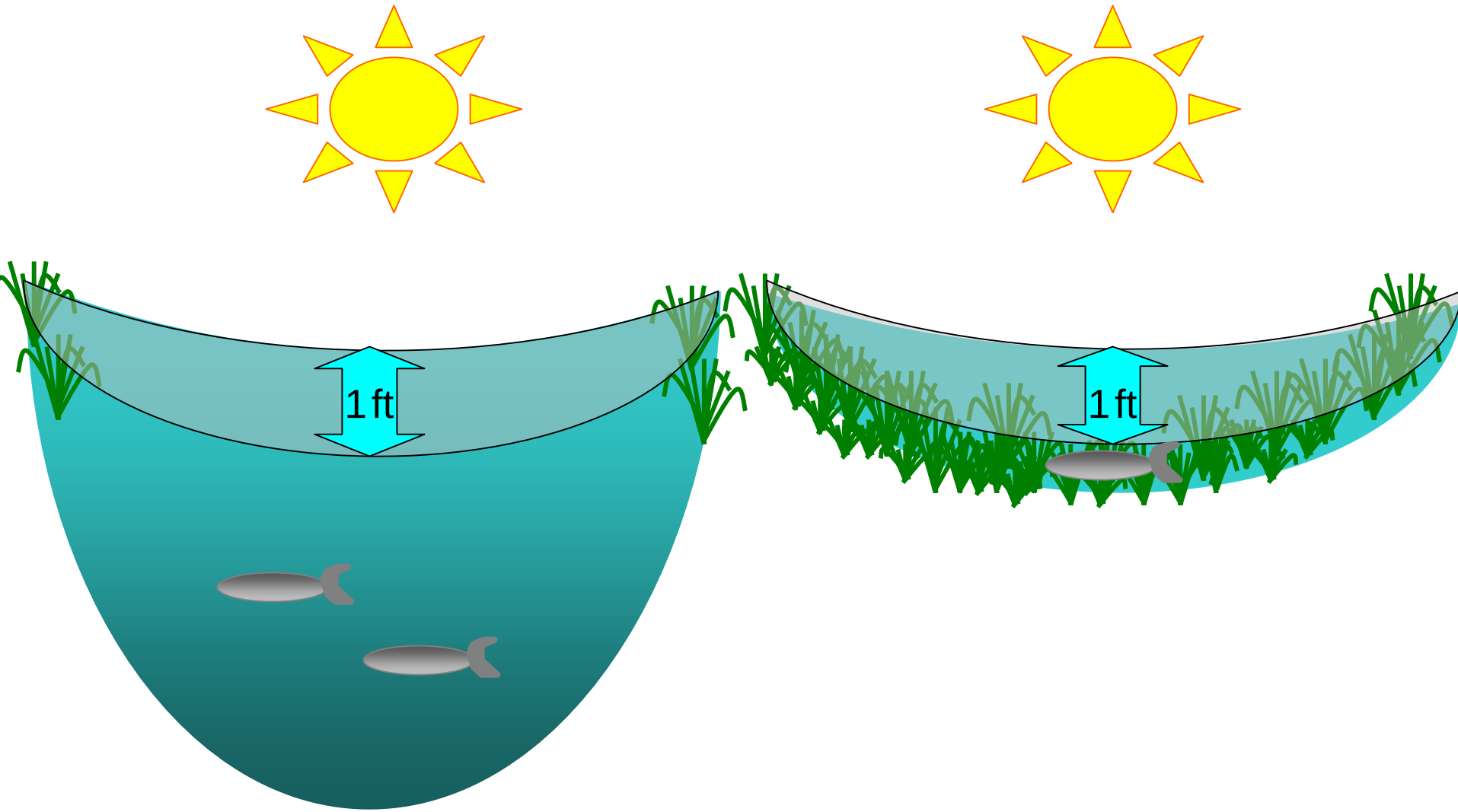
Lake-level Drawdowns

* Bathymetry is important



Lake-level Drawdowns

* Bathymetry is important



Lake-level Drawdowns

* Release Rate & Timing is important

Optimal time in October

Lake-level Drawdowns

* Release Rate & Timing is important

CONTROL

MAINTAIN

Chemical Options

Herbicide Applications

CONTROL

MAINTAIN

Chemical Options

Herbicide Applications

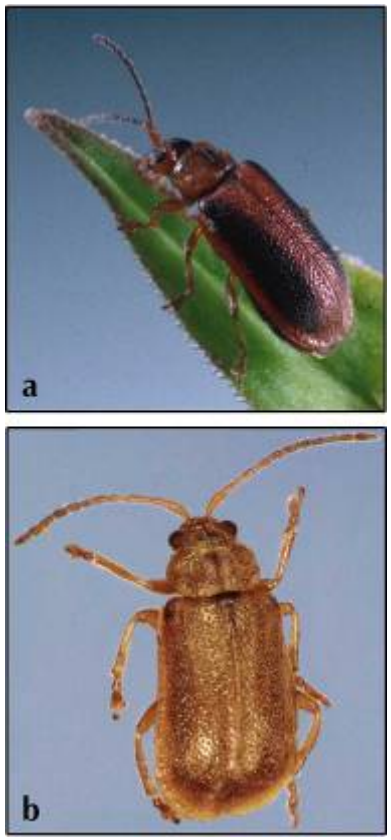
- Many new safe and effective products
- Often very target specific
- High cost, but cover large areas, and results may be seen in 1-3 years
- DEM permit required from Fish & Wildlife

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

Lake Management Planning

Ultimately, AIS control should be part of a comprehensive Lake Management Plan

Lake Management Planning

Plan

Who?

What?

When?

Where?

How?

How long?

1. Recruit whole community participation
2. Identify problems
3. Define & prioritize goals
4. Evaluate all options and think long-term!

Lake Management Planning

Plan

Who?

What?

When?

Where?

How?

How long?

- What concerns are a priority?

- How will all concerns be addressed?

- Who/ How will progress be measured?
  Monitoring?

- Who will update the plan & evaluate
  when/if goals have been met?

Questions?

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