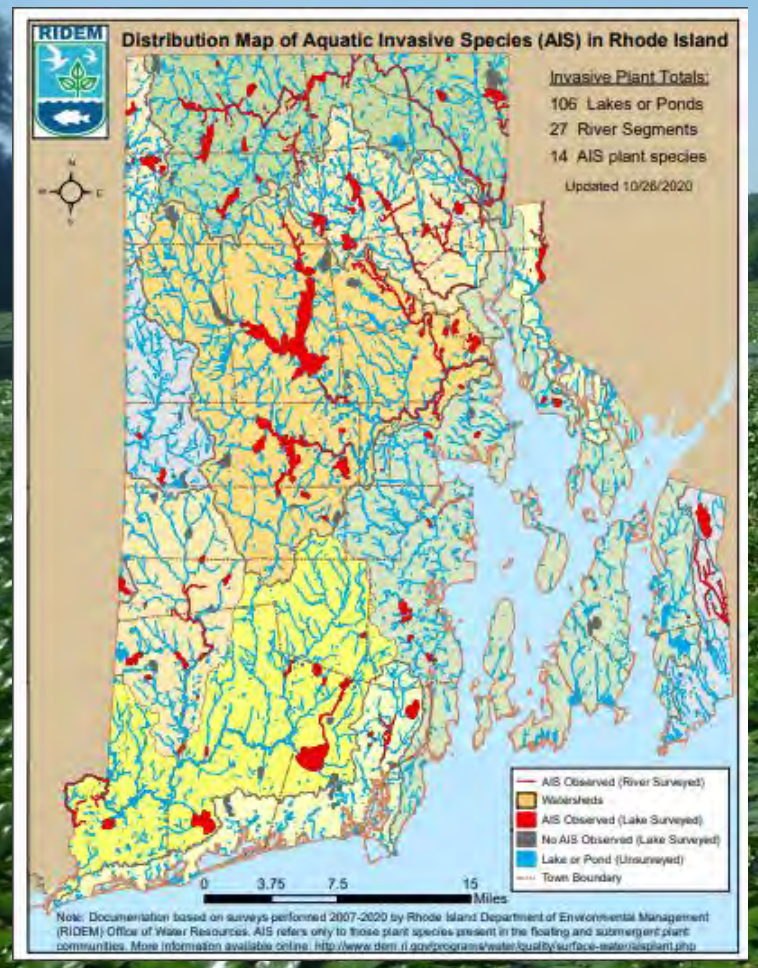
Freshwater Invasive Species in Rhode Island: Mapping & Outreach



RIDEM

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RIDEM Office of Water Resources
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RI Rivers Council Presentation Outline – January 13, 2021:

1. **Intro: Clean Water Act Monitoring & Assessment of Waterbody Conditions:**
   - Survey Lakes/ponds and Outreach for AIS (Aquatic Invasive Species)
   - Stream Macroinvert Biomonitoring, Bioassessments and Biocriteria
   - Water Quality Monitoring in Rivers

2. **Aquatic Invasive Species (AIS) Mapping – publicly available distribution info:**
   - Statewide presence/absence map & list
   - Interactive GIS mapper
   - Species-specific maps and lists
   - Two Species Highlights: Asian Clam and Water Chestnut

3. **AIS Management:**
   - Quick Overview of Options
   - RIDEM Dispatches seasonal interns to hand-pull water chestnut
   - A water chestnut case study – lessons learned from Lake Champlain

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1. **Intro: Clean Water Act Monitoring & Assessment of Waterbody Conditions:**

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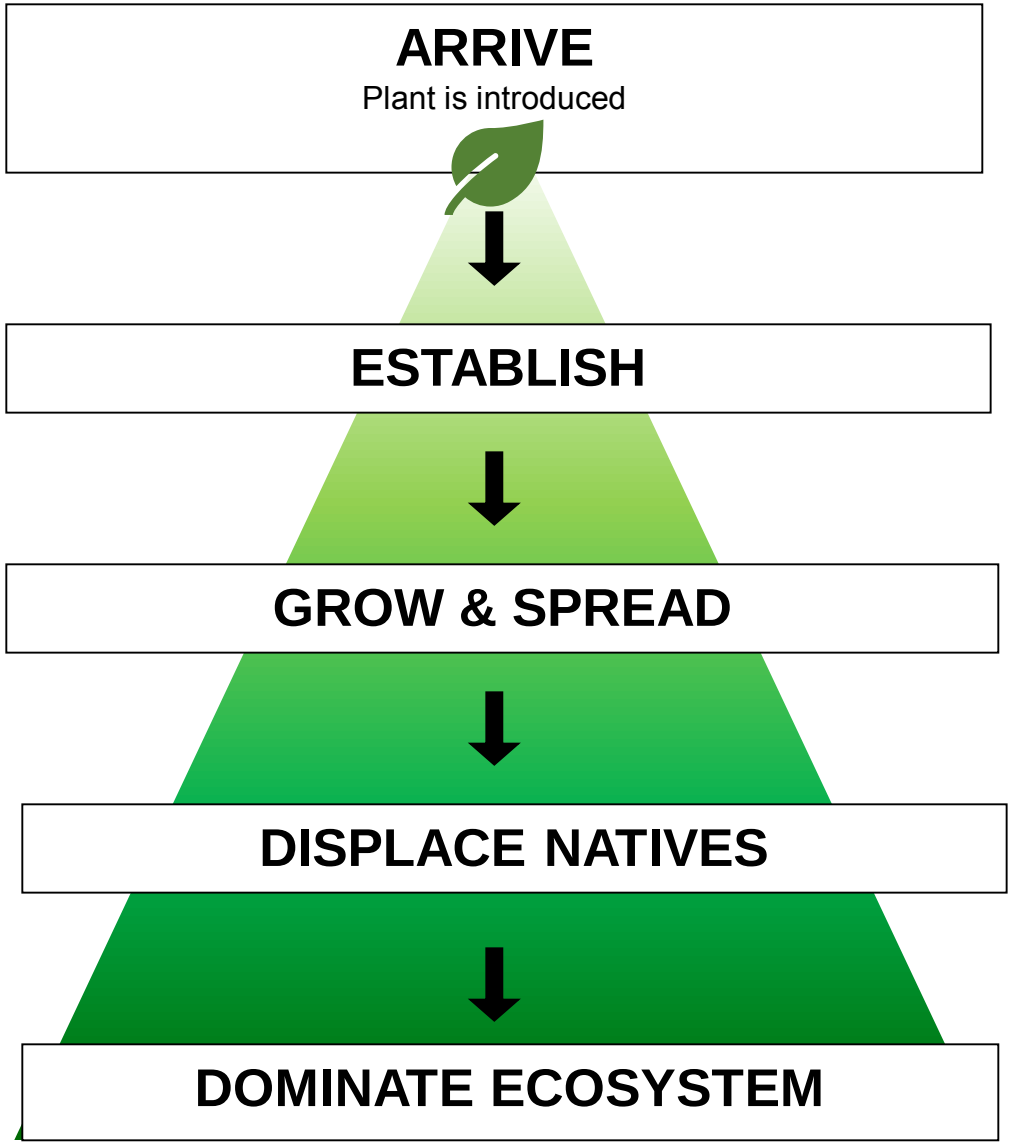
Water Quality Monitoring in Rivers

RIDEM

What are Aquatic Invasive Species (AIS)?

- Non-native plants/animals (no natural predators in Rhode Island)
- Introduced (accidentally or intentionally)
- Grow quickly or have another competitive advantage over natives
- Growth threatens the diversity/abundance of natives
- Jeopardize stability of the ecosystem
- Impedes use (swim, fish, boat) of the infested water body
- Can cause economic losses (recreation, property values & tax revenues, high cost to manage invasive plants annually and over the long term)

Its important to understand how big the problem is



Stages of an Invasion

ARRIVE
Plant is introduced

ESTABLISH

GROW & SPREAD

DISPLACE NATIVES

DOMINATE ECOSYSTEM

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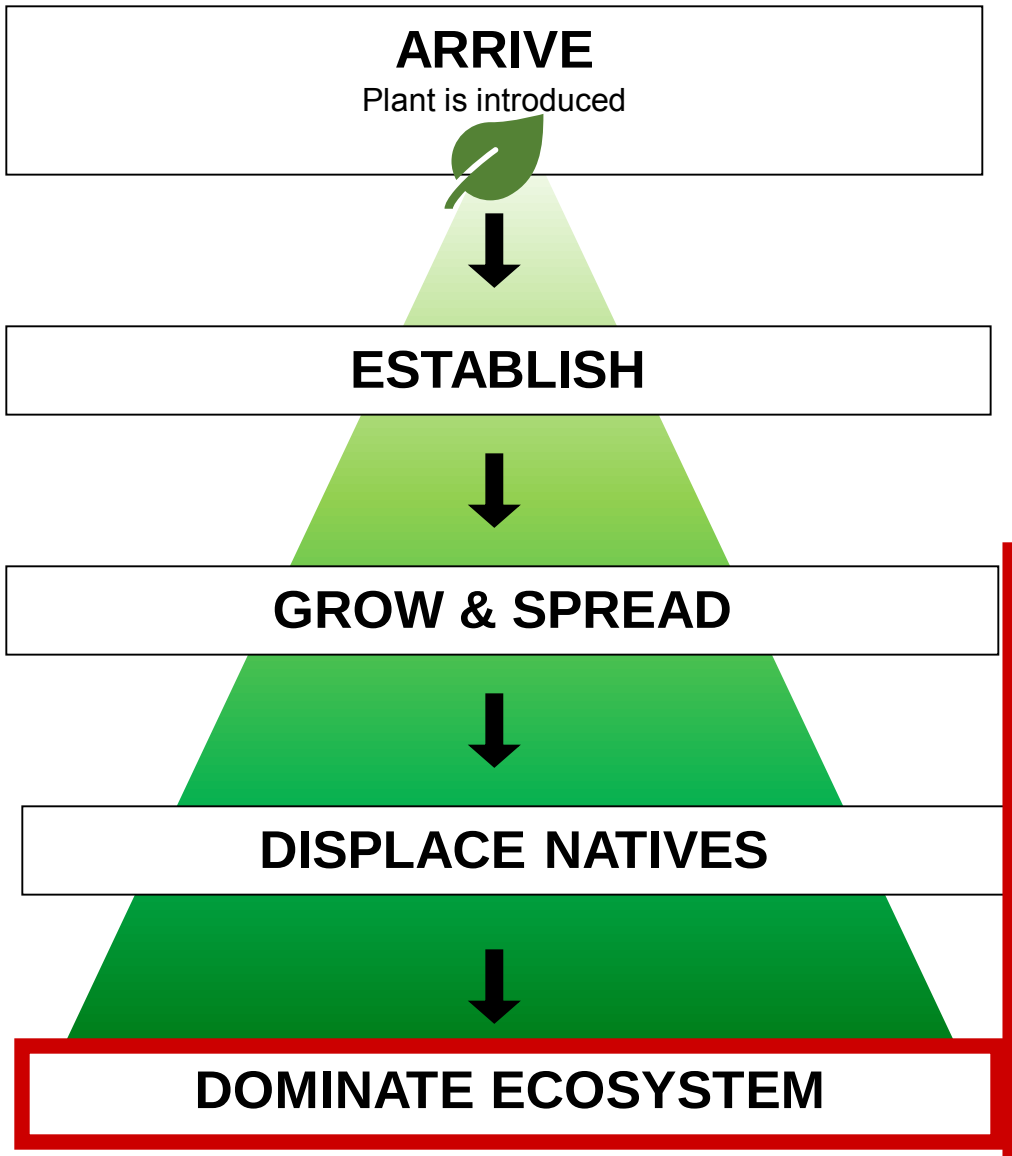
Valley Falls Pond, Central Falls, RI

Stages of an Invasion



This is why we MONITOR

RIDEM

RIDEM Aquatic Invasive Species (AIS) Monitoring Process

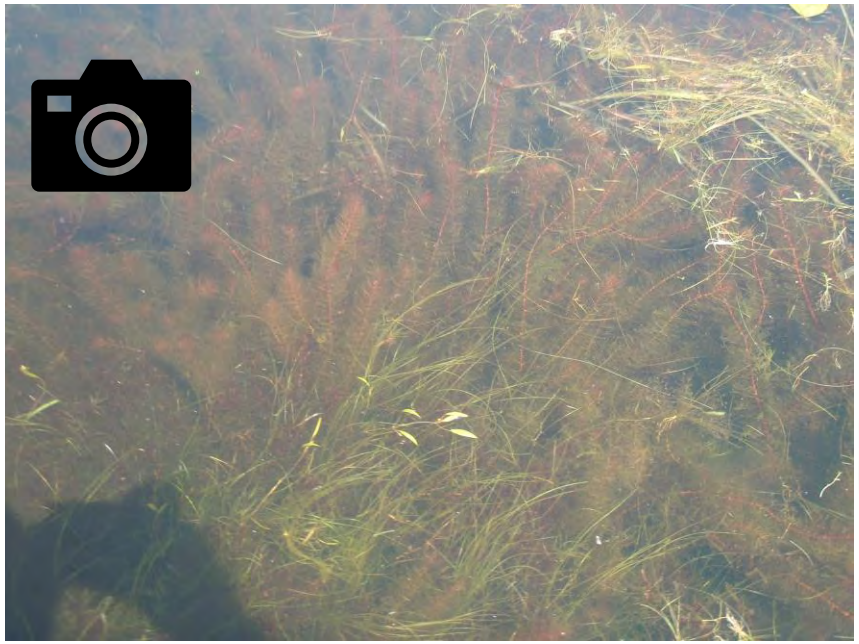

Belleville Pond, North Kingstown, RI


Locustville Pond, Hopkinton, RI

Johnson’s Pond, Coventry, RI

How Does RIDEM Survey?

Survey Form



Aquatic Invasive Species Monitoring Survey Form
Department of Environmental Management - Office of Water Resources
235 Promenade Street, Providence, Rhode Island
(401) 222-4700
last revision 9-11-2017

Name of Water Body: Town: Date:

Watershed: WBID: Survey Personnel:

Weather: clear sunny partially cloudy overcast windy Water Clarity: clear cloudy tannic/brown cyanobacteria bloom

Survey Level:
L1: Visited shoreline
L2: Boated Perimeter
Other:

Access: ☐ Public ☐ State ☐ Town ☐ Private
Cement Ramp
Smallcraft Launch
Fishing Trail Access
Roadside pull-off

Location of Access Point
(If private, address and contact information)

Species Visually Observed in Water Body— Check Below

INVASIVE SPECIES (take a picture)

Floating
- ☐ Trapa natans (water chestnut)
- ☐ Utricularia inflata (inflated bladderwort)
- ☐ Nelumbo lutea (American lotus)
- ☐ Nymphoides peltata (yellow floating heart)
- ☐ Eichhornia crassipes (water hyacinth)
- ☐ Callitriche stagnalis (pond water-starwort)
- ☐ Pistia stratiotes (water lettuce)
- ☐ Glossostigma cleistanthum (mudmat)
- ☐ Hydrocharis morsus (European frog-bit)
- ☐ Salvinia minima (water fern)
- ☐ Salvinia molesta (giant salvinia)
- ☐ Marsilea quadrifolia (European water-clover)

Submergent
- ☐ Myriophyllum heterophyllum (variable milfoil)
- ☐ Cabomba caroliniana (fanwort)
- ☐ Potamogeton crispus (curly-leaf pondweed)
- ☐ Myriophyllum spicatum (Eurasian milfoil)
- ☐ Najas minor (spiny naiad)
- ☐ Egeria densa (Brazilian elodea)
- ☐ Myriophyllum aquaticum (parrot feather)
- ☐ Hydrilla verticillata (hydrilla)

ANIMALS
- ☐ Cipangopaludina chinesis (mystery snail)
- ☐ Corbicula fluminea (Asian clam)

List Birds / Shellfish / wildlife observed

Native Aquatic Plants:

Floating
- ☐ Nymphaea odorata (white water lily)
- ☐ Nuphar variegata (YWL / cow WL / spatterdock)
- ☐ Brasenia sp. (water shield)
- ☐ Lemna minor (duckweed—one root)
- ☐ Spirodela polyrhiza (big duckweed—many roots)
- ☐ Nymphoides cordata (little floating heart)

Emergent
- ☐ Pontederia cordata (pickerel weed)
- ☐ Sagittaria sp. (arrowhead)
- ☐ Typha sp. (cattails / typha)
- ☐ Peltandra virginica (arrow arum)

Submergent
- ☐ Utricularia sp. (bladderwort, unspecified)
- ☐ Utricularia radiata (floating bladderwort)
- ☐ Potamogeton sp. (pondweed, unspecified)
- ☐ Potamogeton robbinsii (Robinson's pondweed)
- ☐ Vallisneria americana (tapegrass / eelgrass)
- ☐ Ceratophyllum demersum (coontail)
- ☐ Proserpinaca palustris (mermaid weed)
- ☐ Elodea canadensis (native / common elodea)
- ☐ Myriophyllum humile (native milfoil / low watermilfoil)

Other

Comments (problems, unusual observations, fishing/boating observed?, take any unknown sample to RIDEM, label!):

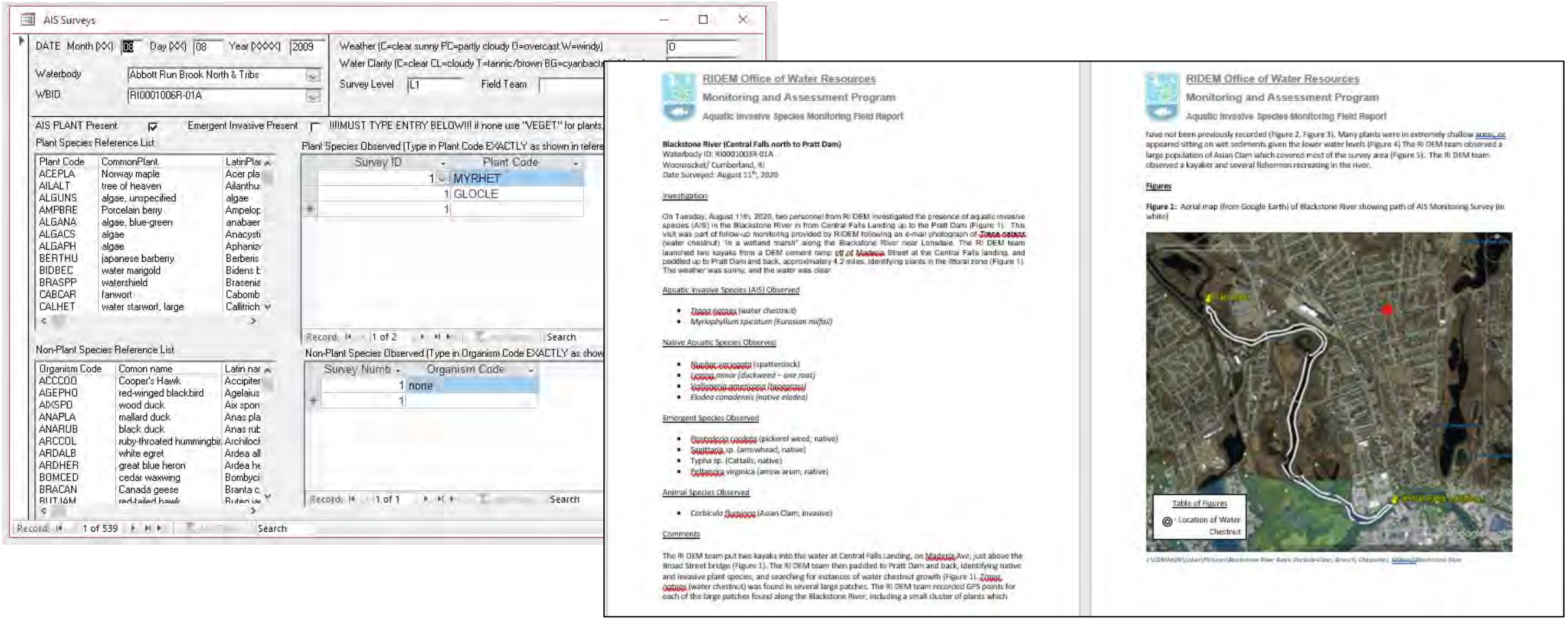
IN OFFICE: Photos saved: J:\COMMON\Lakes\Pictures_____

OFFICE USE ONLY
☐ This survey has been entered into the AIS and Herbicide Database on (date):_____ by: (initials) _____
☐ The data here have been QAQC'd in the database on (date): _____ by (initials) _____

J:\COMMON\AIS\Monitoring\AIS Survey Form.pub

RIDEM

Enter Data into Database & write Field Reports



RIDEM Office of Water Resources
Monitoring and Assessment Program
Aquatic Invasive Species Monitoring Field Report

Blackstone River (Central Falls north to Pratt Dam)
Waterbody ID: RI0001003R-01A
Woonsocket/ Cumberland, RI
Date Surveyed: August 11th, 2020

Investigation

On Tuesday, August 11th, 2020, two personnel from RI DEM investigated the presence of aquatic invasive species (AIS) in the Blackstone River in from Central Falls Landing up to the Pratt Dam (Figure 1). This visit was part of follow-up monitoring provided by RIDEM following an e-mail photograph of *Trapa natans* (water chestnut) "in a wetland marsh" along the Blackstone River near Lonsdale. The RI DEM team launched two kayaks from a DEM cement ramp off of Madeira Street at the Central Falls landing, and paddled up to Pratt Dam and back, approximately 4.2 miles, identifying plants in the littoral zone (Figure 1). The weather was sunny, and the water was clear.

Aquatic Invasive Species (AIS) Observed

- *Trapa natans* (water chestnut)
- *Myriophyllum spicatum (Eurasian milfoil)*

Native Aquatic Species Observed

- *Nuphar variegata* (spatterdock)
- *Lemna minor (duckweed – one root)*
- *Vallisneria americana (tapegrass)*
- *Elodea canadensis (native elodea)*

Emergent Species Observed

- *Pontederia cordata* (pickerel weed; native)
- *Sagittaria* sp. (arrowhead; native)
- Typha sp. (Cattails; native)
- *Peltandra virginica* (arrow arum; native)

Animal Species Observed

- *Corbicula fluminea* (Asian Clam; invasive)

Comments

The RI DEM team put two kayaks into the water at Central Falls Landing, on Madeira Ave, just above the Broad Street bridge (Figure 1). The RI DEM team then paddled to Pratt Dam and back, identifying native and invasive plant species, and searching for instances of water chestnut growth (Figure 1). *Trapa natans* (water chestnut) was found in several large patches. The RI DEM team recorded GPS points for each of the large patches found along the Blackstone River, including a small cluster of plants which

RIDEM Office of Water Resources
Monitoring and Assessment Program
Aquatic Invasive Species Monitoring Field Report

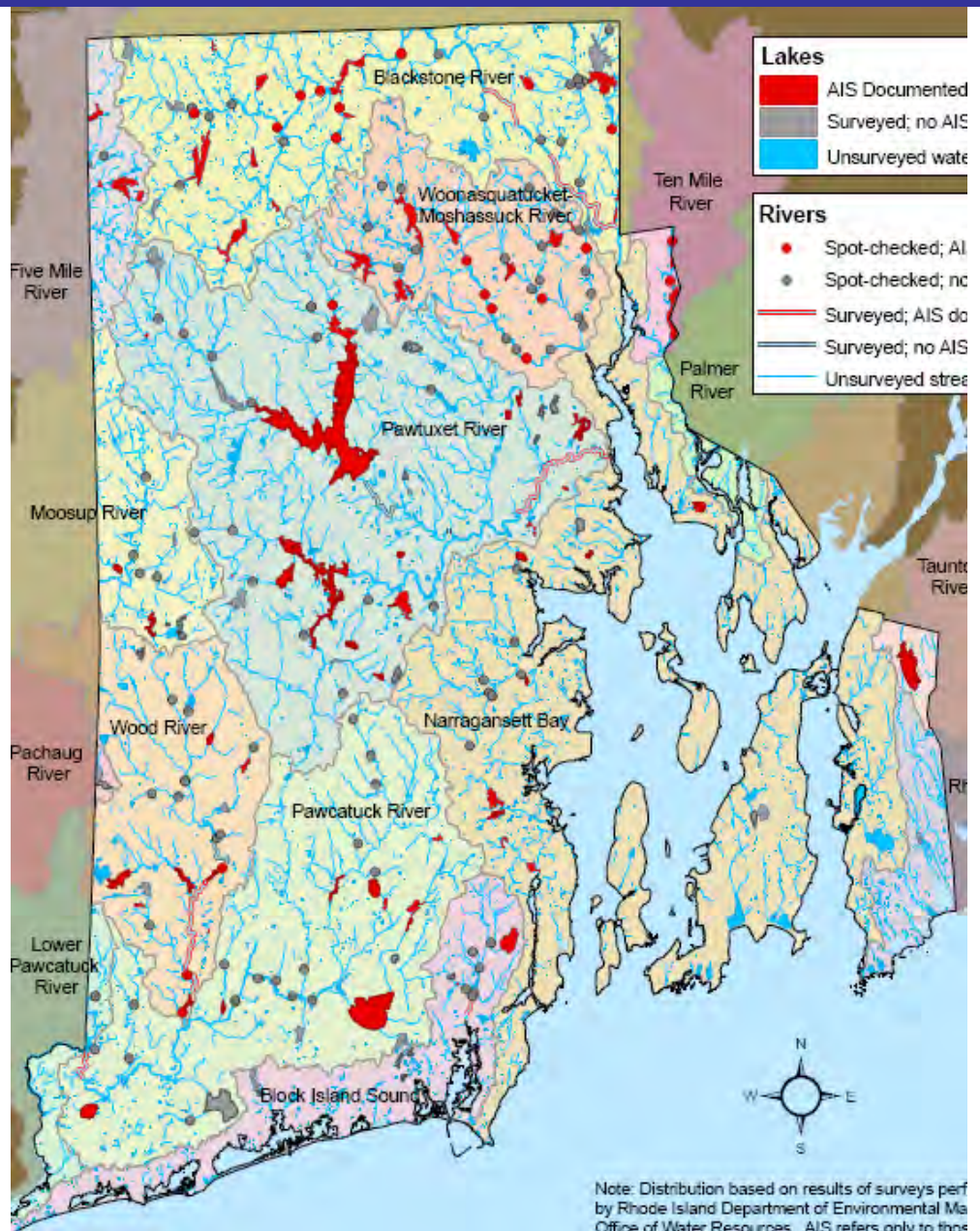
have not been previously recorded (Figure 2, Figure 3). Many plants were in extremely shallow areas, or appeared sitting on wet sediments given the lower water levels (Figure 4) The RI DEM team observed a large population of Asian Clam which covered most of the survey area (Figure 5). The RI DEM team observed a kayaker and several fishermen recreating in the river.

Figures

Figure 1: Aerial map (from Google Earth) of Blackstone River showing path of AIS Monitoring Survey (in white)

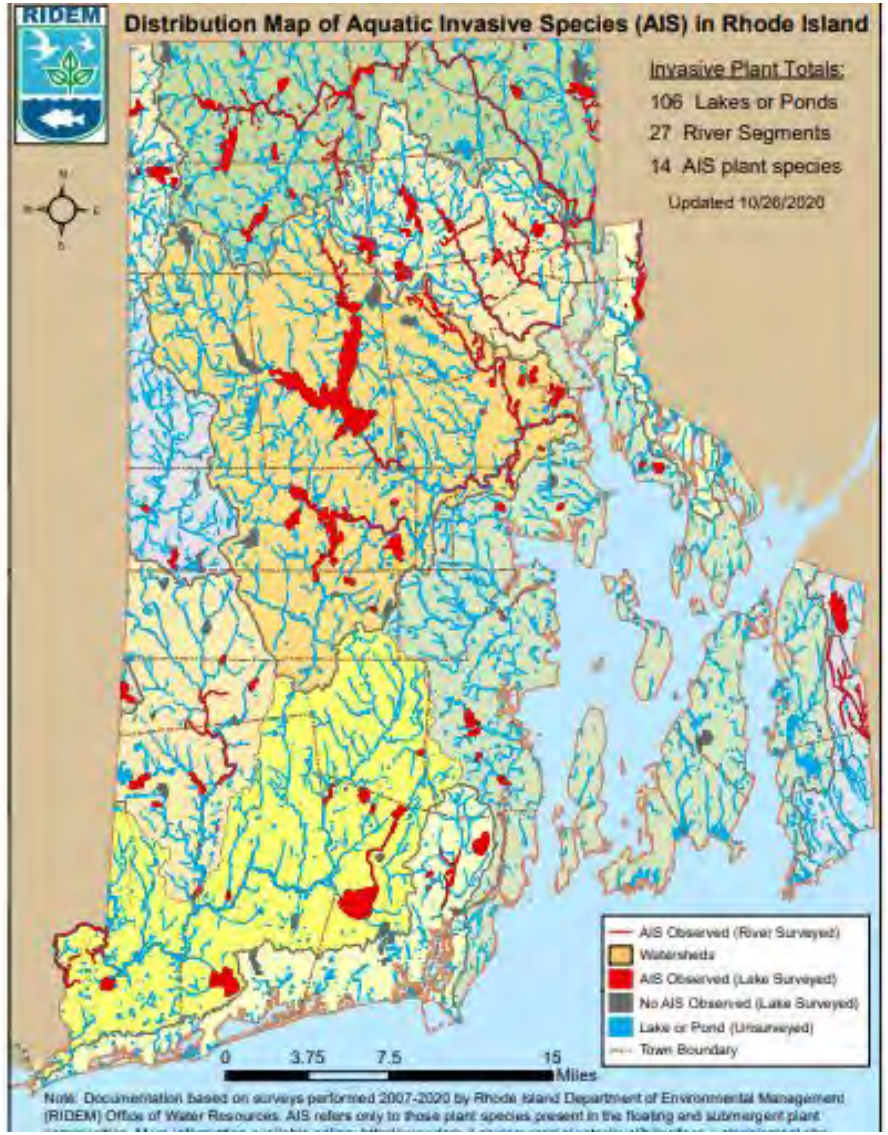
If you are interested in the report for a particular water body, or are interested in data from any particular location, please email to request it: Katie.degoosh@dem.ri.gov

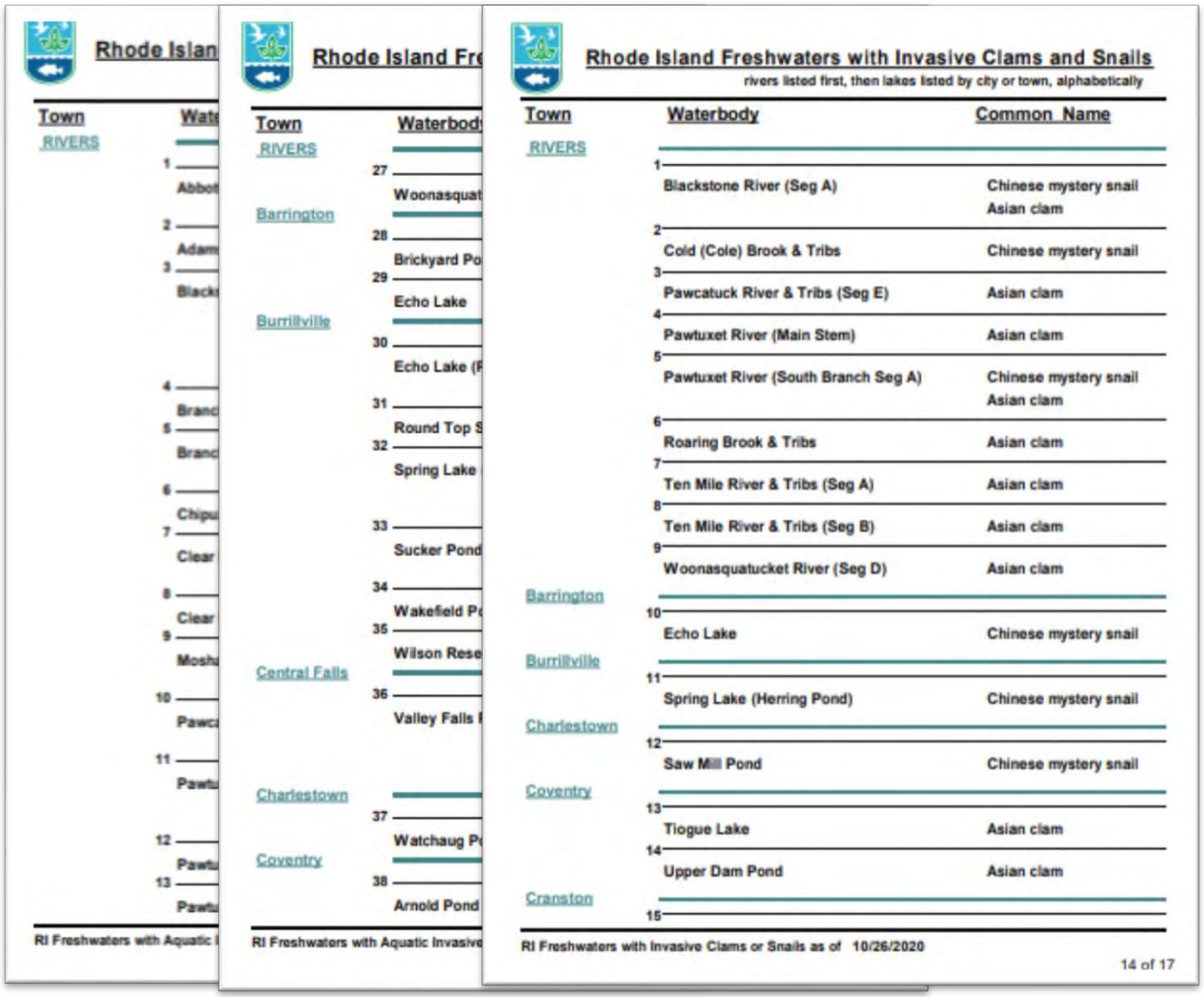
Map with GIS – static and online maps



Mapping AIS Distributions: Statewide presence/absence map & list:

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





Rhode Islan

Town	Wate
RIVERS	
	1 Abbot
	2 Adam
	3 Black
	4 Branc
	5 Branc
	6
	7 Chipu
	Clear
	8 Clear
	9 Mosh
	10 Pawc
	11 Pawtu
	12 Pawtu
	13 Pawtu

RI Freshwaters with Aquatic

Rhode Island Fre

Town	Waterbod
RIVERS	
	27 Woonasquat
Barrington	
	28 Brickyard Po
	29 Echo Lake
Burrillville	
	30 Echo Lake (F
	31 Round Top S
	32 Spring Lake
	33 Sucker Pond
	34 Wakefield Pc
	35 Wilson Rese
Central Falls	
	36 Valley Falls F
Charlestown	
	37 Watchaug Pc
Coventry	
	38 Arnold Pond

RI Freshwaters with Aquatic Invasive

Rhode Island Freshwaters with Invasive Clams and Snails

rivers listed first, then lakes listed by city or town, alphabetically

Town	Waterbody	Common Name
RIVERS		
	1 Blackstone River (Seg A)	Chinese mystery snail, Asian clam
	2 Cold (Cole) Brook & Tribs	Chinese mystery snail
	3 Pawcatuck River & Tribs (Seg E)	Asian clam
	4 Pawtuxet River (Main Stem)	Asian clam
	5 Pawtuxet River (South Branch Seg A)	Chinese mystery snail, Asian clam
	6 Roaring Brook & Tribs	Asian clam
	7 Ten Mile River & Tribs (Seg A)	Asian clam
	8 Ten Mile River & Tribs (Seg B)	Asian clam
	9 Woonasquatucket River (Seg D)	Asian clam
Barrington		
	10 Echo Lake	Chinese mystery snail
Burrillville		
	11 Spring Lake (Herring Pond)	Chinese mystery snail
Charlestown		
	12 Saw Mill Pond	Chinese mystery snail
Coventry		
	13 Tiogue Lake	Asian clam
	14 Upper Dam Pond	Asian clam
Cranston		
	15	

RI Freshwaters with Invasive Clams or Snails as of 10/26/2020

14 of 17

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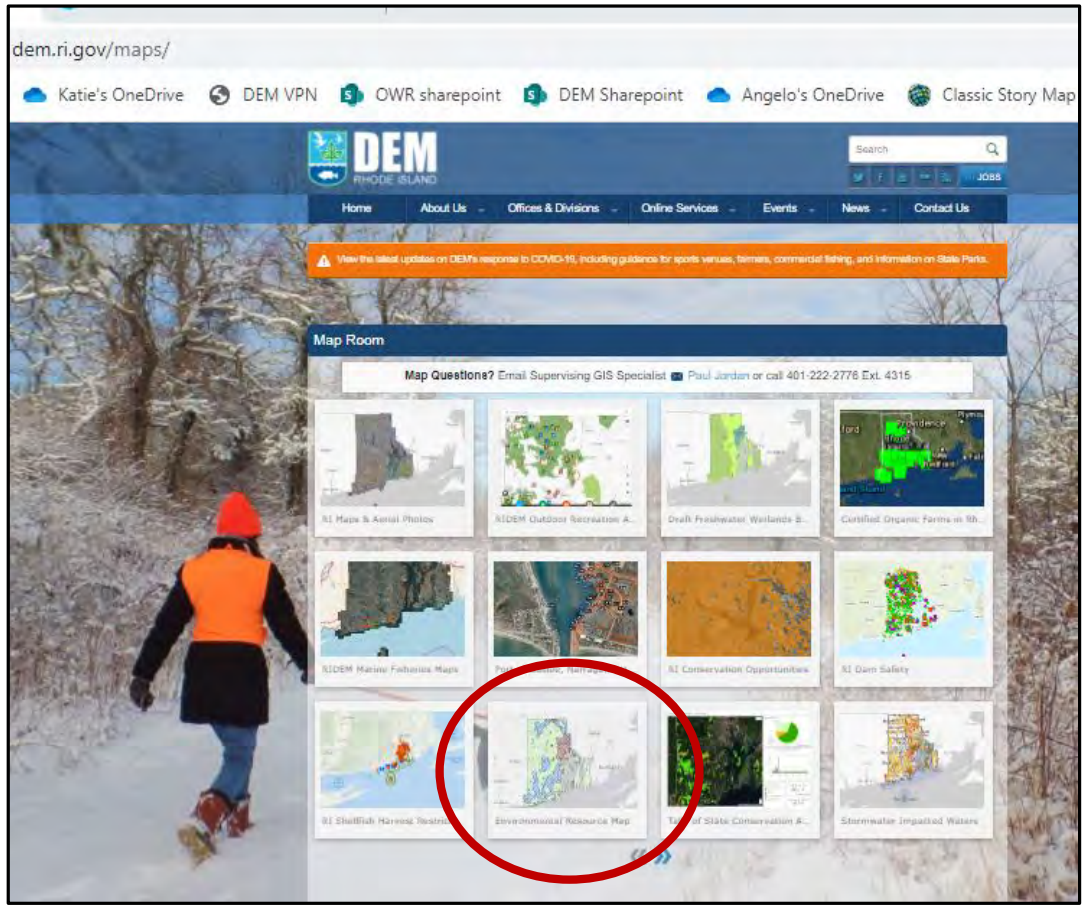
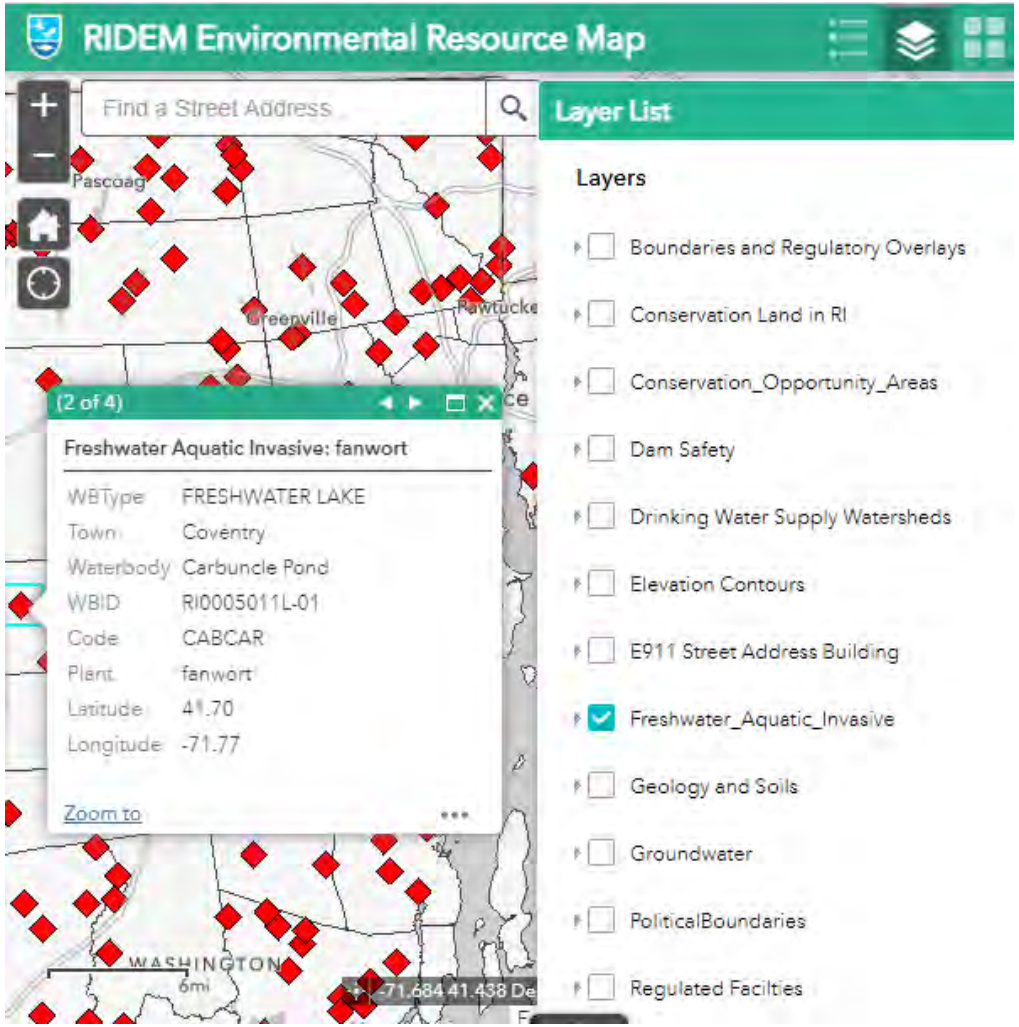
Mapping AIS Distributions: Interactive GIS Mapper:

dem.ri.gov/maps/ → Choose Environmental Resource Map

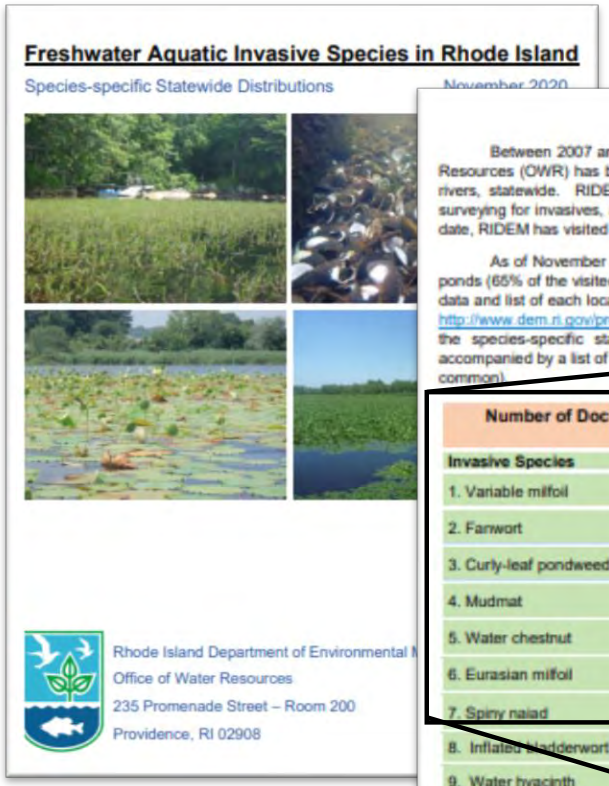
https://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5





Mapping AIS Distributions: Species-specific maps and lists:

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



Freshwater Aquatic Invasive Species in Rhode Island

Species-specific Statewide Distributions

November 2020

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

Overview and Contents

Between 2007 and 2020 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 by visually surveying for invasives, and as resources allow, may visit additional ponds in response to public concerns. To date, RIDEM has visited 164 lakes or ponds, and visited hundreds of sites on streams.

As of November 2020, at least one invasive species was documented by RIDEM staff at 106 lakes or ponds (65% of the visited locations) in addition to invasives found at sites along 27 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 16 different

accompanied by a list of locations where the species was docum

common).

Number of Documented Freshwaters with Invasiv
(listed most common to leas

Invasive Species	Scientific Name	Rivers			
1. Variable milfoil	*Myriophyllum heterophyllum*	19			
2. Fanwort	*Cabomba caroliniana*	16			
3. Curly-leaf pondweed	*Potamogeton crispus*	7			
4. Mudmat	*Glossostigma cleistanthum*	1			
5. Water chestnut	*Trapa natans*	1			
6. Eurasian milfoil	*Myriophyllum spicatum*	2			
7. Spiny naiad	*Najas minor*	0			
8. Inflated bladderwort	*Utricularia inflata*	0			
9. Water hyacinth	*Eichhornia crassipes*	1			
10. Brazilian elodea	*Egeria densa*	0			
11. Yellow floating heart	*Nymphoides peltata*	0			
12. American lotus	*Nelumbo lutea*	0	2	2	(34)
13. Parrot feather	*Myriophyllum aquaticum*	0	1	1	(36)
14. Sacred lotus	*Nelumbo nucifera*	0	1	1	(38)
15. Asian clam	*Corbicula fluminea*	8	16	24	(40)
16. Chinese mystery snail	*Cipangopaludia chinensis*	3	22	25	(43)
	Total waterbodies with at least one invasive*	27	106		*some waterbodies have more than one invasive species; therefore, total reflects distinct waterbodies

Number of Documented Freshwaters with Invasive Species (as of November 6, 2020)
(listed most common to least common)

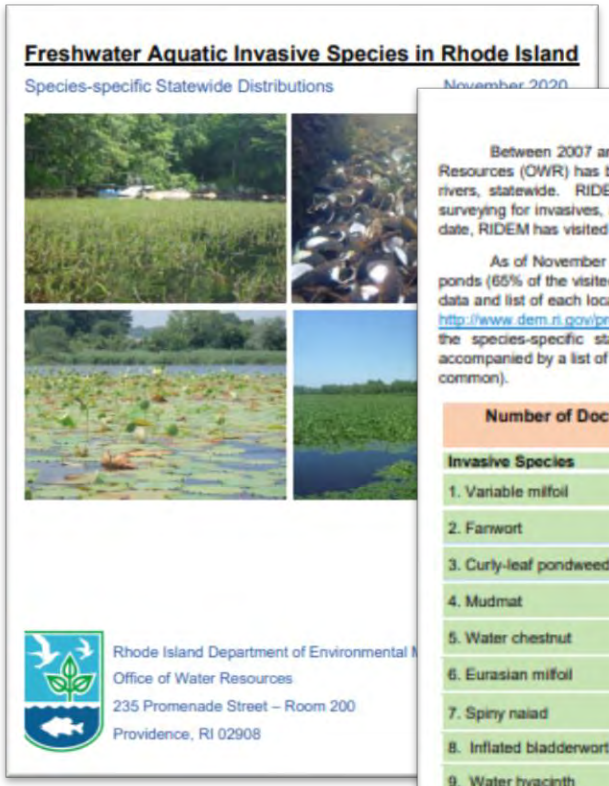
Invasive Species	Scientific Name	Rivers	Lakes/Ponds	Total	Page Number
1. Variable milfoil	*Myriophyllum heterophyllum*	19	69	88	(1)
2. Fanwort	*Cabomba caroliniana*	16	61	77	(8)
3. Curly-leaf pondweed	*Potamogeton crispus*	7	13	20	(14)
4. Mudmat	*Glossostigma cleistanthum*	1	12	13	(17)
5. Water chestnut	*Trapa natans*	1	13	14	(19)

RIDEM

Page 4 lists links to factsheets for more info on each species

Mapping AIS Distributions: Species-specific maps and lists:

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



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Number of Documented Freshwaters with Invasive Species (as of November 6, 2020)
(listed most common to least common)

Invasive Species	Scientific Name	Rivers	Lakes/Ponds	Total	Page Number
1. Variable milfoil	*Myriophyllum heterophyllum*	19	69	88	(1)
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5. Water chestnut	*Trapa natans*	1	13	14	(19)
6. Eurasian milfoil	*Myriophyllum spicatum*	2	11	13	(22)
7. Spiny naiad	*Najas minor*	0	9	9	(24)
8. Inflated bladderwort	*Utricularia inflata*	0	7	7	(26)
9. Water hyacinth	*Eichhornia crassipes*	1	4	5	(28)
10. Brazilian elodea	*Egeria densa*	0	5	5	(30)
11. Yellow floating heart	*Nymphoides peltata*	0	3	3	(32)
12. American lotus	*Nelumbo lutea*	0	2	2	(34)
13. Parrot feather	*Myriophyllum aquaticum*	0	1	1	(36)
14. Sacred lotus	*Nelumbo nucifera*	0	1	1	(38)
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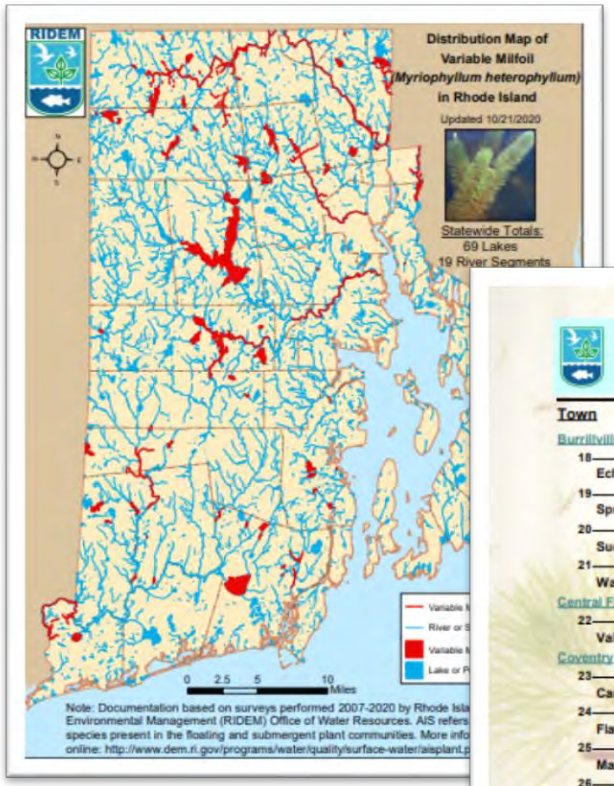
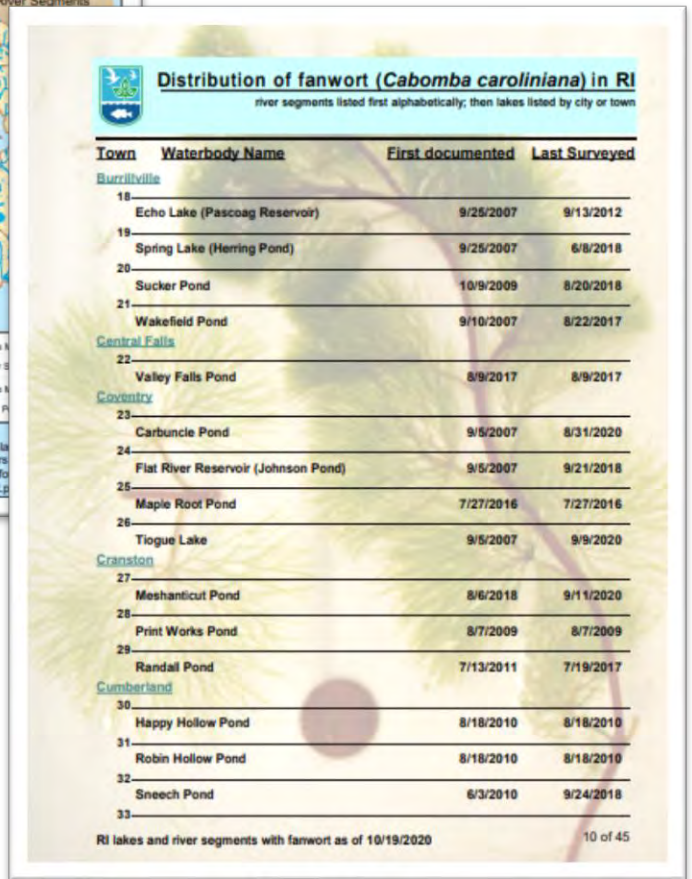


49 pages (wait for download)



Distribution of fanwort (*Cabomba caroliniana*) in RI

river segments listed first alphabetically; then lakes listed by city or town

	Town	Waterbody Name	First documented	Last Surveyed
	Burrillville			
18		Echo Lake (Pascoag Reservoir)	9/25/2007	9/13/2012
19		Spring Lake (Herring Pond)	9/25/2007	6/8/2018
20		Sucker Pond	10/9/2009	8/20/2018
21		Wakefield Pond	9/10/2007	8/22/2017
	Central Falls			
22		Valley Falls Pond	8/9/2017	8/9/2017
	Coventry			
23		Carbuncle Pond	9/5/2007	8/31/2020
24		Flat River Reservoir (Johnson Pond)	9/5/2007	9/21/2018
25		Maple Root Pond	7/27/2016	7/27/2016
26		Tiogue Lake	9/5/2007	9/9/2020
	Cranston			
27		Meshanticut Pond	8/6/2018	9/11/2020
28		Print Works Pond	8/7/2009	8/7/2009
29		Randall Pond	7/13/2011	7/19/2017
	Cumberland			
30		Happy Hollow Pond	8/18/2010	8/18/2010
31		Robin Hollow Pond	8/18/2010	8/18/2010
32		Sneech Pond	6/3/2010	9/24/2018
33				

RI lakes and river segments with fanwort as of 10/19/2020

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January RIRC Presentation Outline – things RIDEM works on:

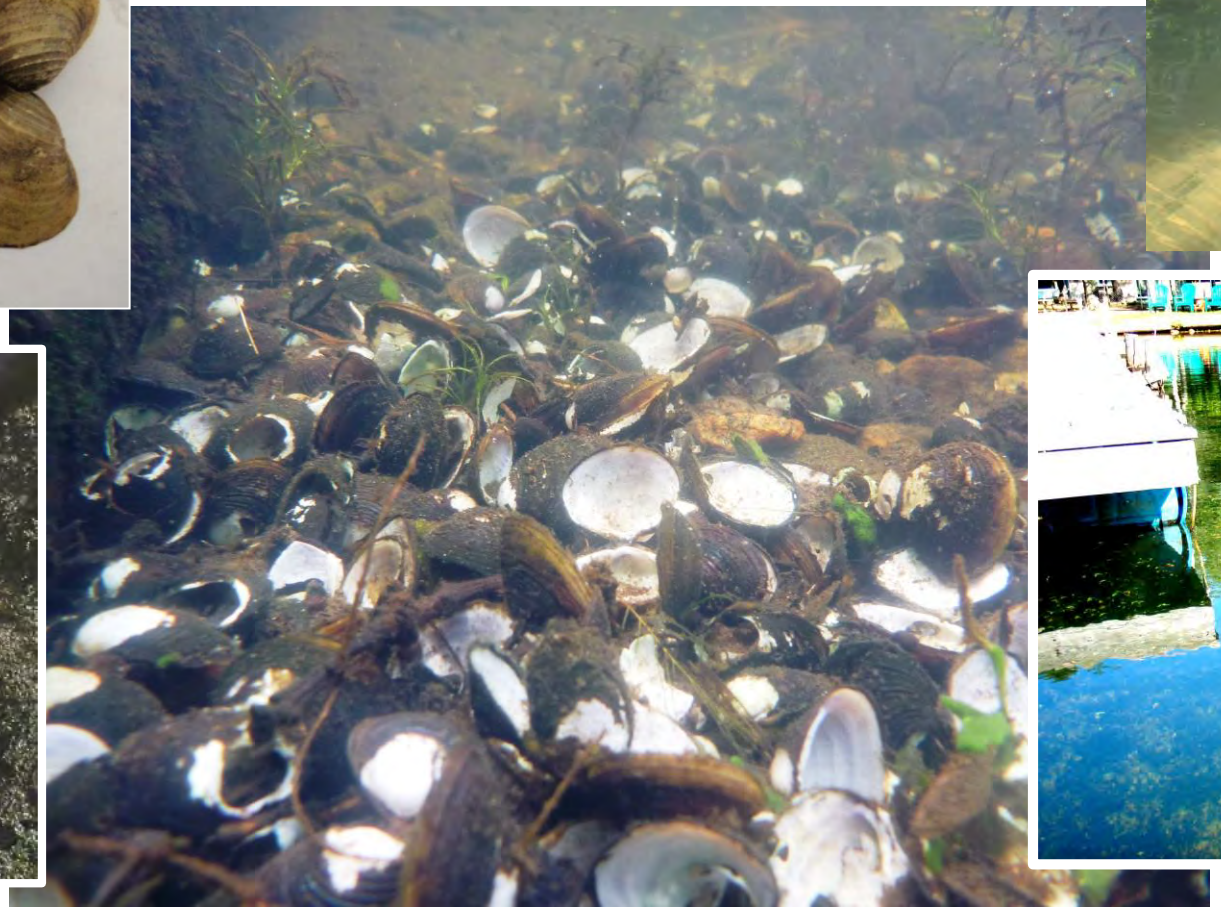
1. **Clean Water Act Monitoring & Assessment of Waterbody Conditions:**
   - Lake, pond, and river surveys for AIS (Aquatic Invasive Species)
   - Water Quality Monitoring in Rivers
   - Stream Macroinvert Biomonitoring, Bioassessments and Biocriteria

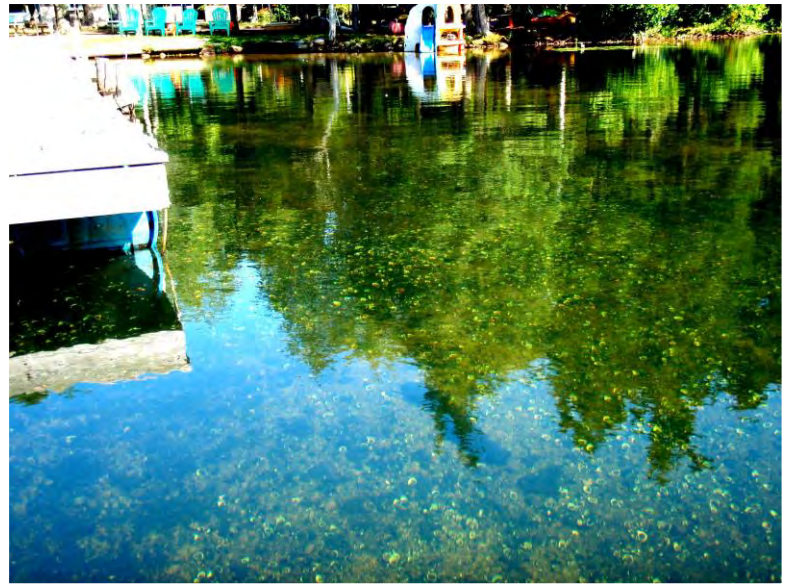
2. Mapping Resulting AIS Distributions:
   - Statewide presence/absence map & list:
   - Interactive GIS mapper
   - Species-specific maps and lists:
   - Top two concerns: Asian Clam and Water Chestnut

Mapping AIS Distributions: Species-specific maps and lists:

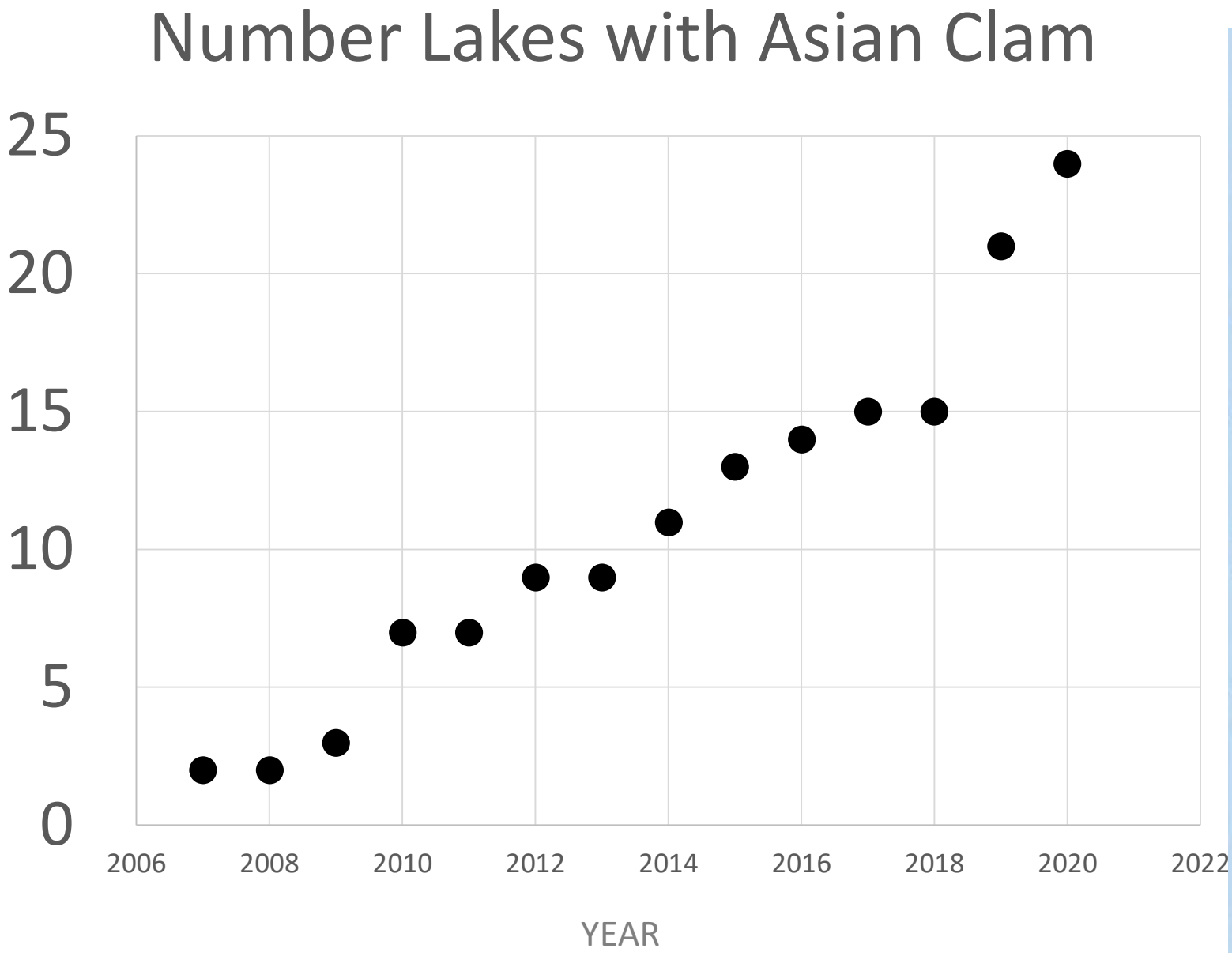
Concerns – Asian Clam is on the rise

One mature clam can release thousands of larvae per day





Mapping AIS Distributions: Species-specific maps and lists:



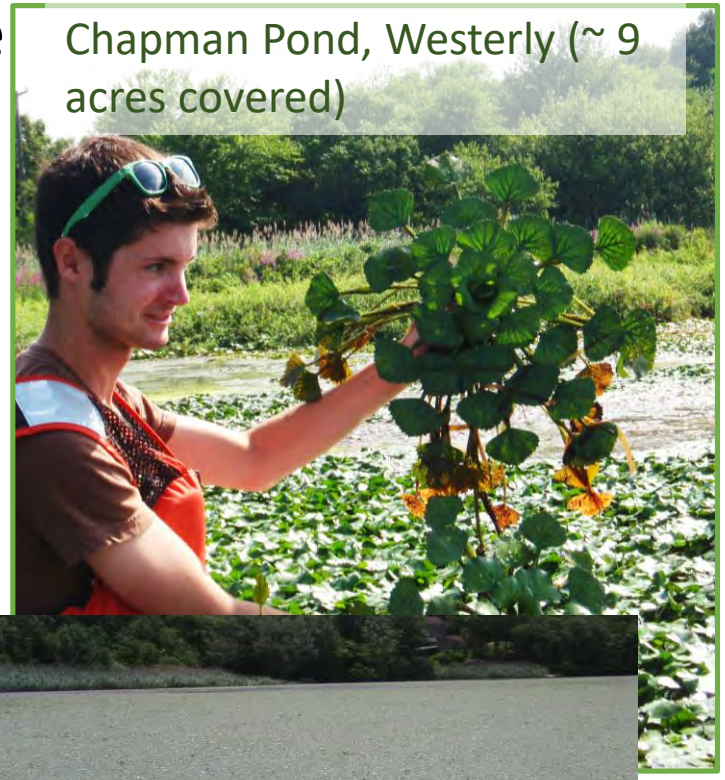
Mapping AIS Distributions: Species-specific maps and lists:

Concerns – Water Chestnut is on the rise

Valley Falls Pond, Central Falls/Lincoln (~30 acres covered)

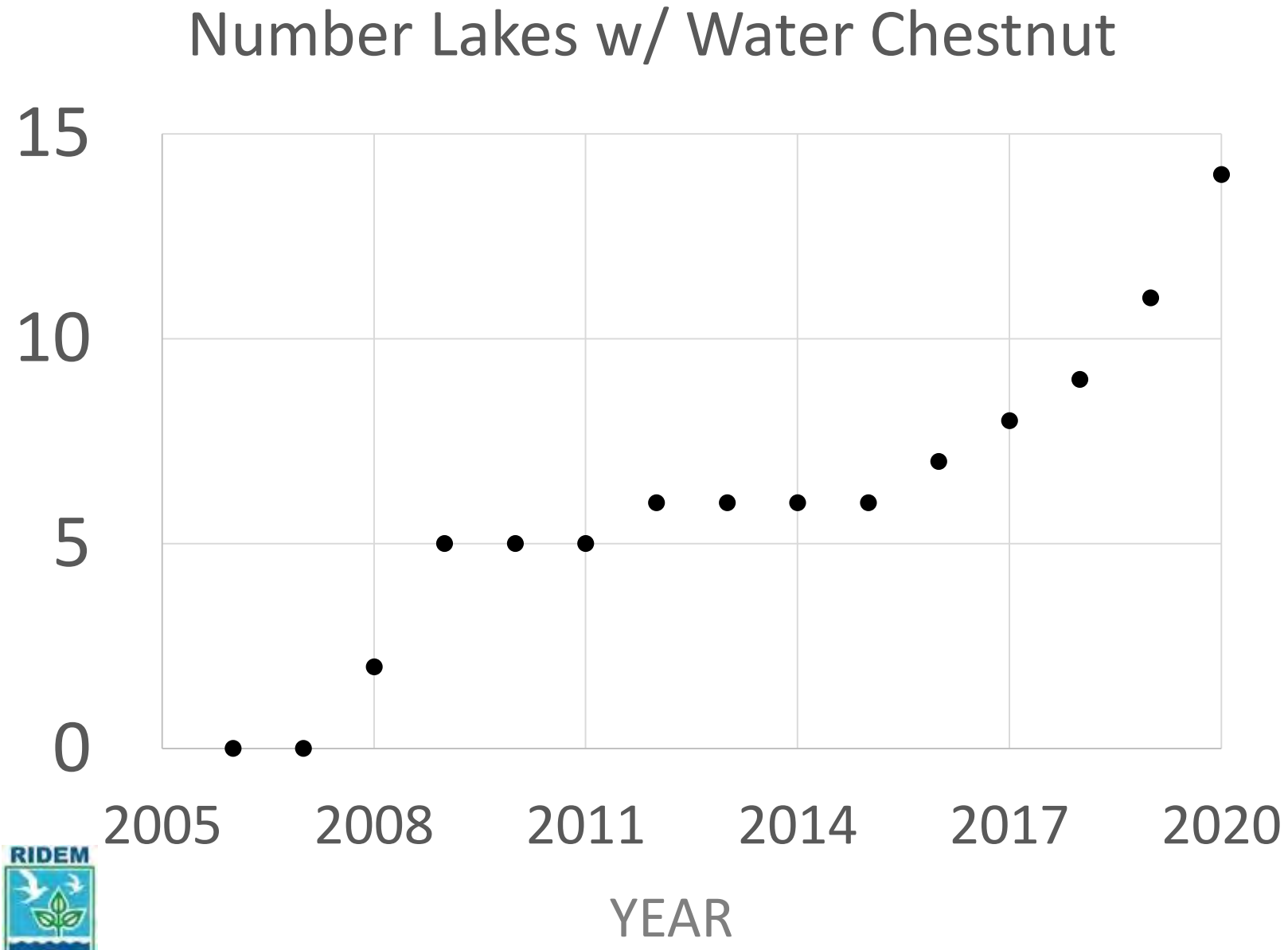
Central Pond, East Providence (~50 acres covered)

Chapman Pond, Westerly (~ 9 acres covered)



RIDEM

Mapping AIS Distributions: Species-specific maps and lists:



RI Rivers Council Presentation Outline – January 13, 2021:

1. **Intro: Clean Water Act Monitoring & Assessment of Waterbody Conditions:**
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3. **AIS Management:**
   - Quick Overview of Options
   - RIDEM Dispatches seasonal interns to hand-pull water chestnut
   - A water chestnut case study – lessons learned from Lake Champlain

Stages of an Invasion

PREVENT

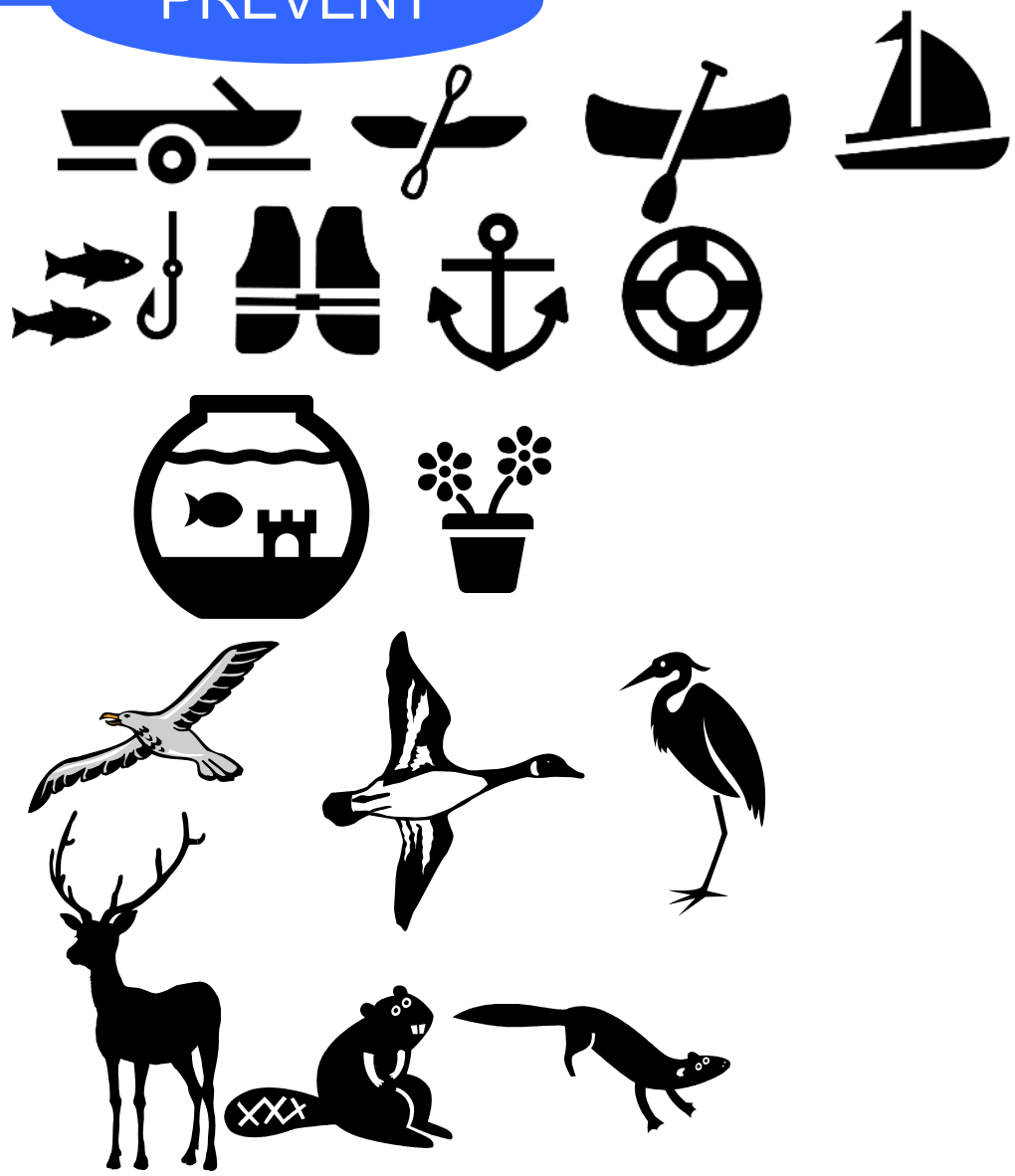
ARRIVE
Plant is introduced

ESTABLISH

GROW & SPREAD

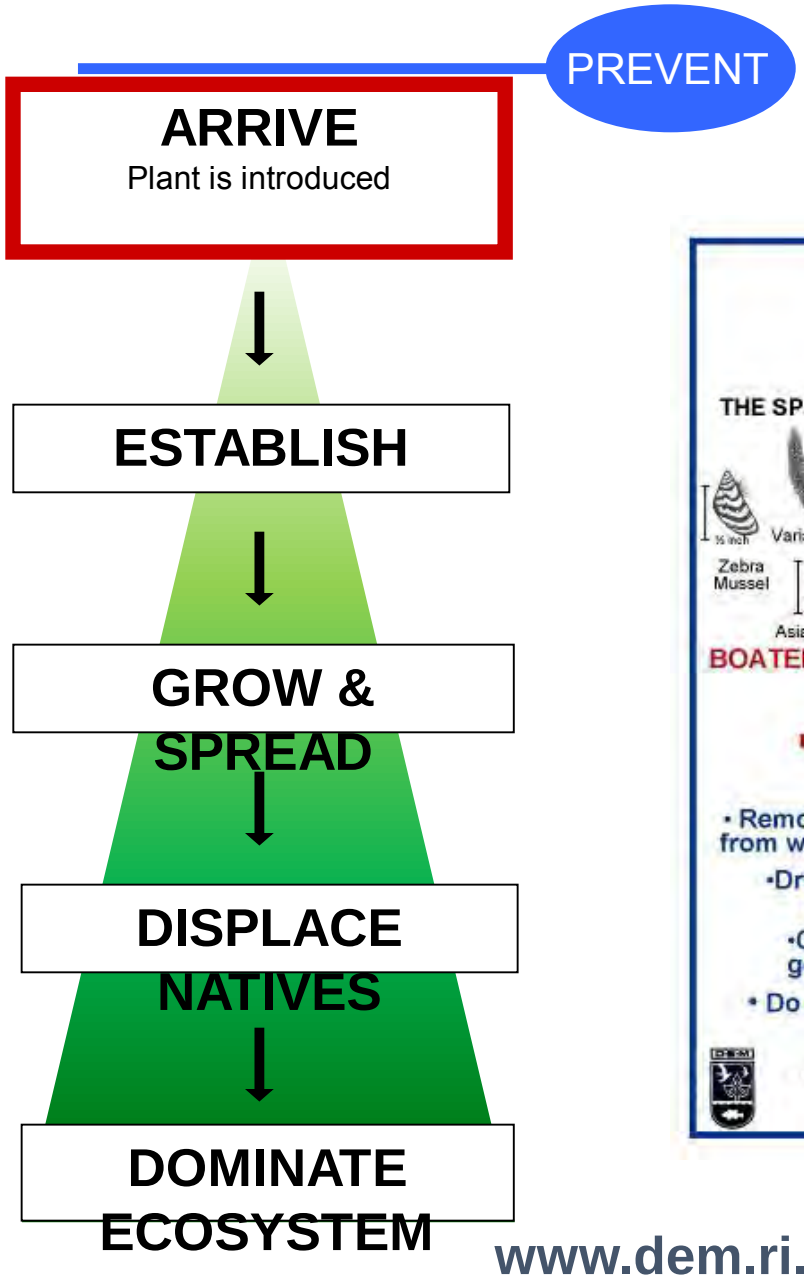
DISPLACE NATIVES

DOMINATE ECOSYSTEM



Education and Outreach

Reminders at Boat Ramps



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

Education and Outreach

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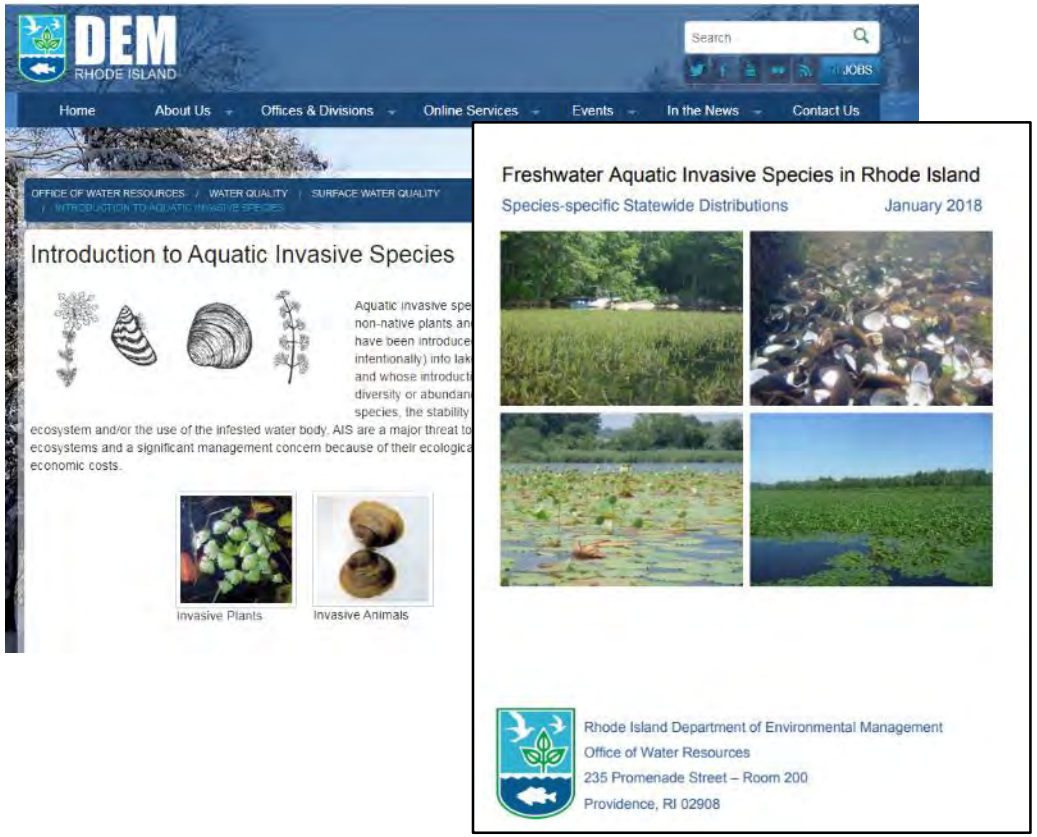
Website info



Social Media

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

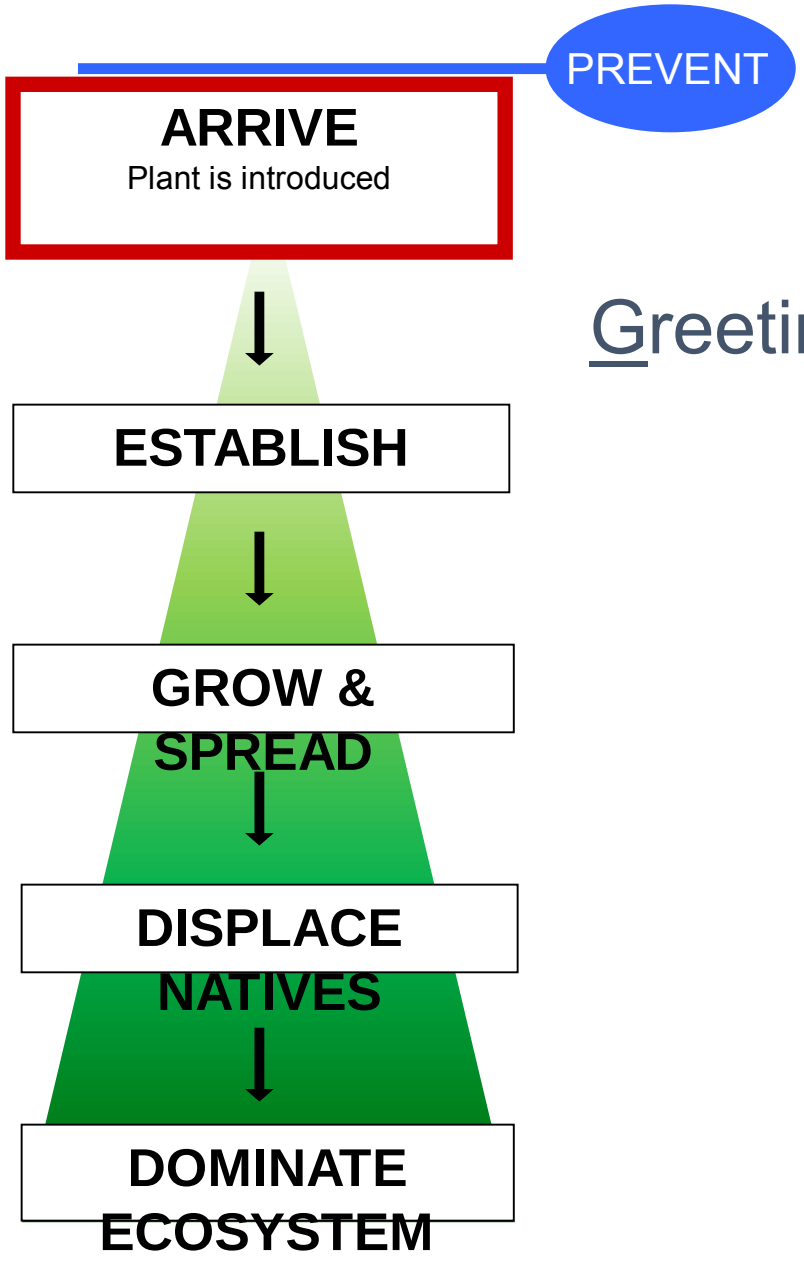
RIDEM

Education and Outreach

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

Greeting Recreationalists to Empower And Train Boaters

Education and Outreach



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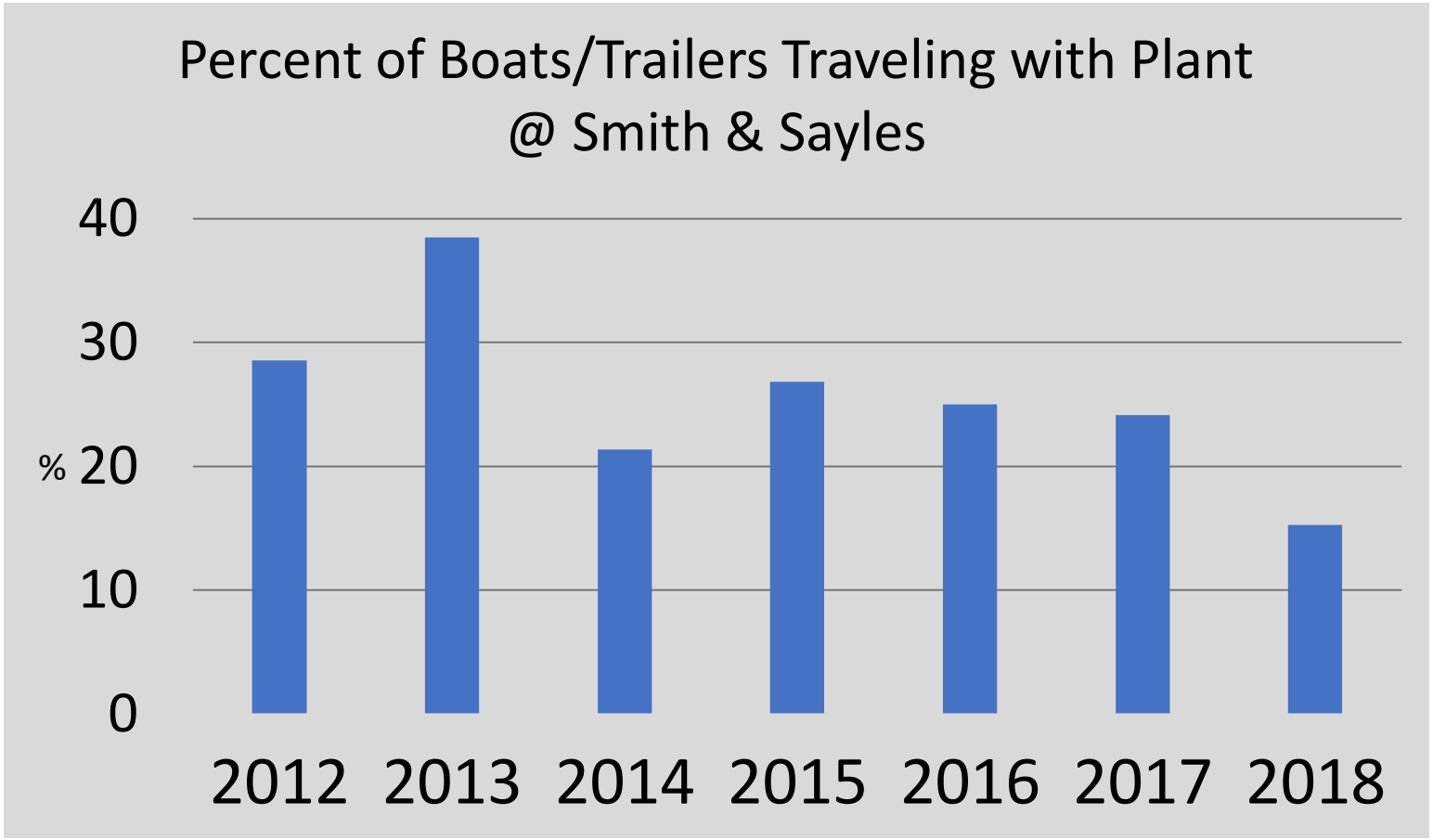

Education and Outreach

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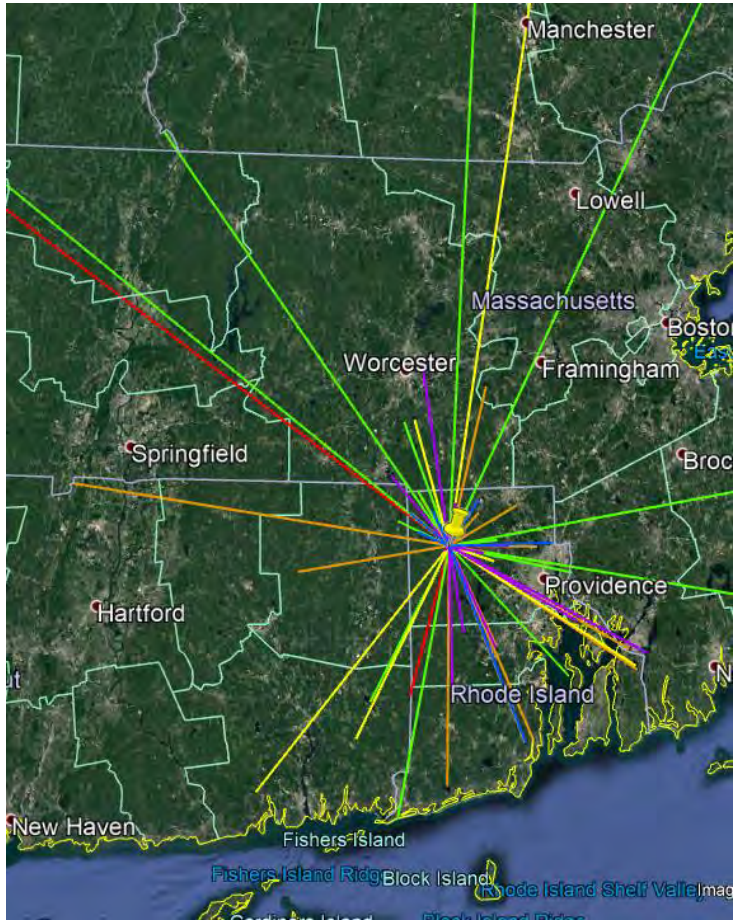
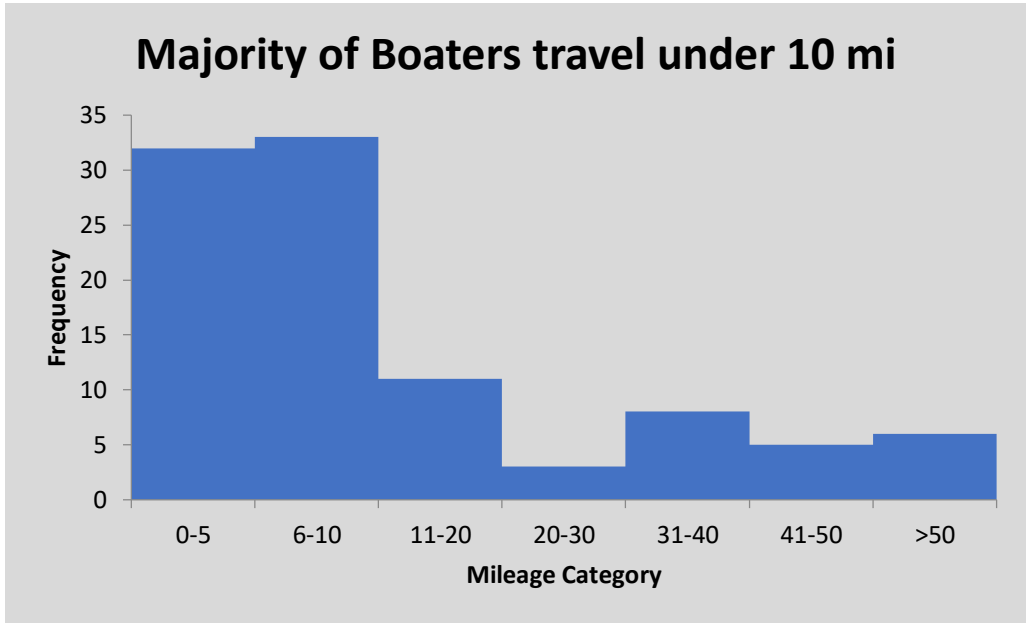
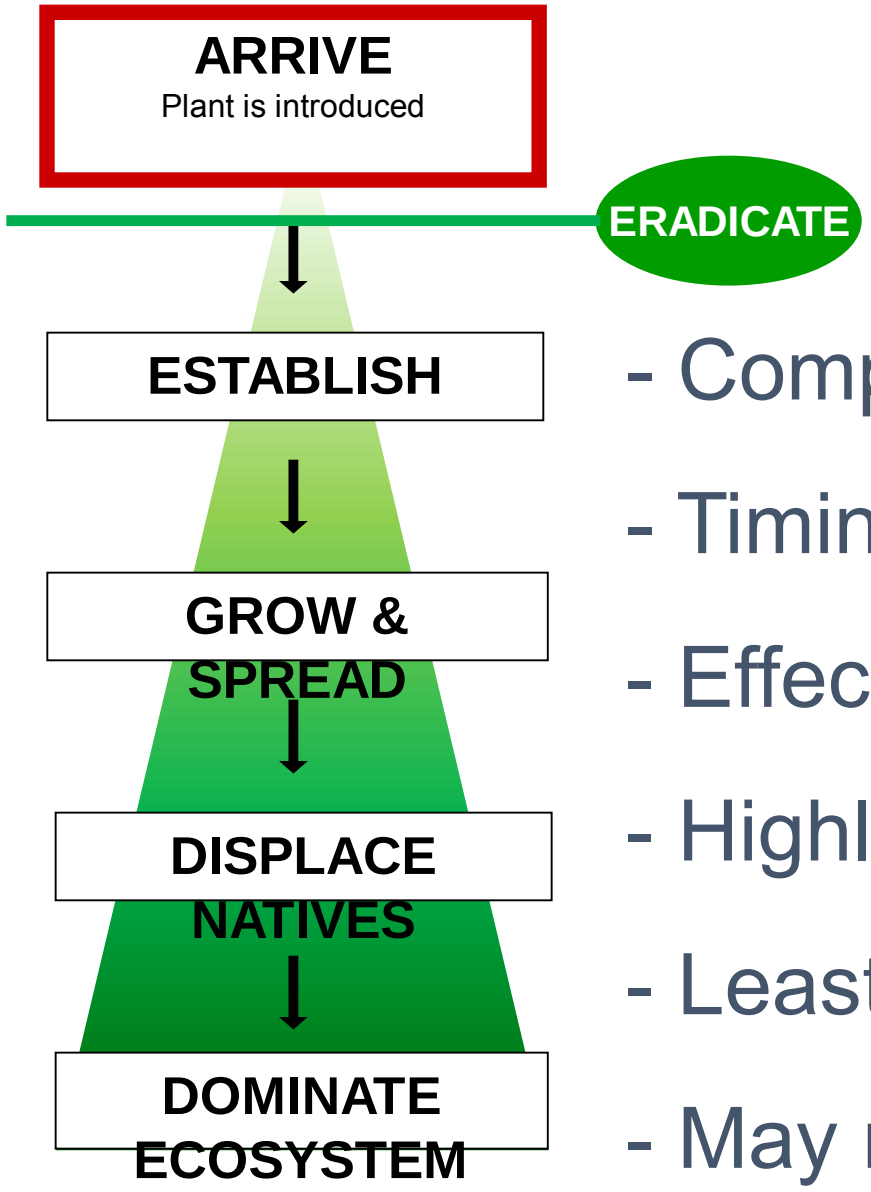




Plant Removal

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 approval

Hand Pulling: Water Chestnut Control in RI- Volunteer Events

Volunteer Pulls organized by:

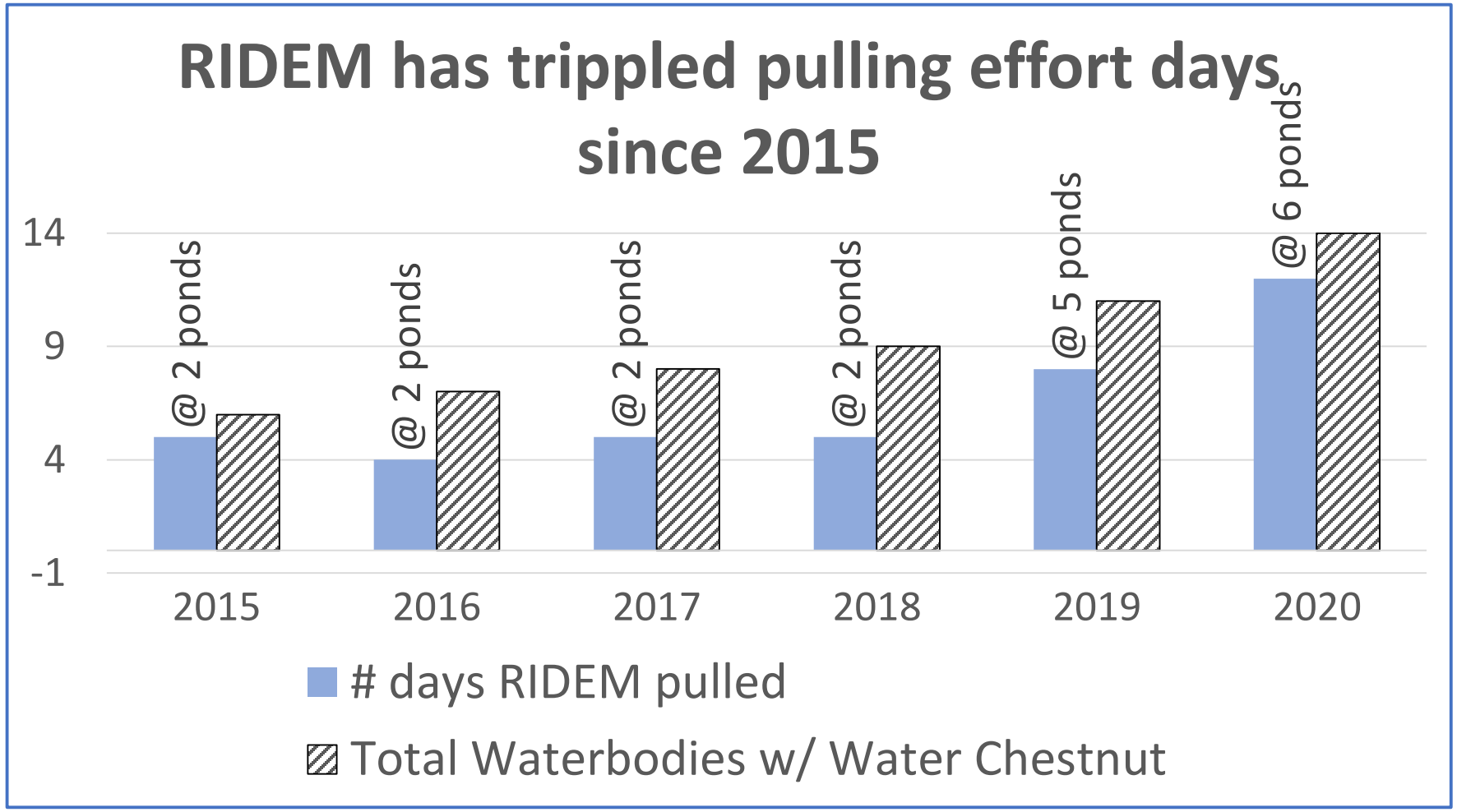
<u>2008</u>

RINHS (Belleville)

<u>2009-2011</u>

Westerly Land Trust & RINHS (Chapman Pond)

Hand Pulling: Water Chestnut Control in RI using RIDEM interns



Places to Pull in 2021:

In Blackstone Watershed:

1. Blackstone River (launch from Central Falls Landing)
2. Carle's Pond, Cumberland
3. Sylvestre Pond, Woonsocket

Ten Mile River Watershed:

4. Turner Reservoir, EP
5. Cemetery Pond, EP

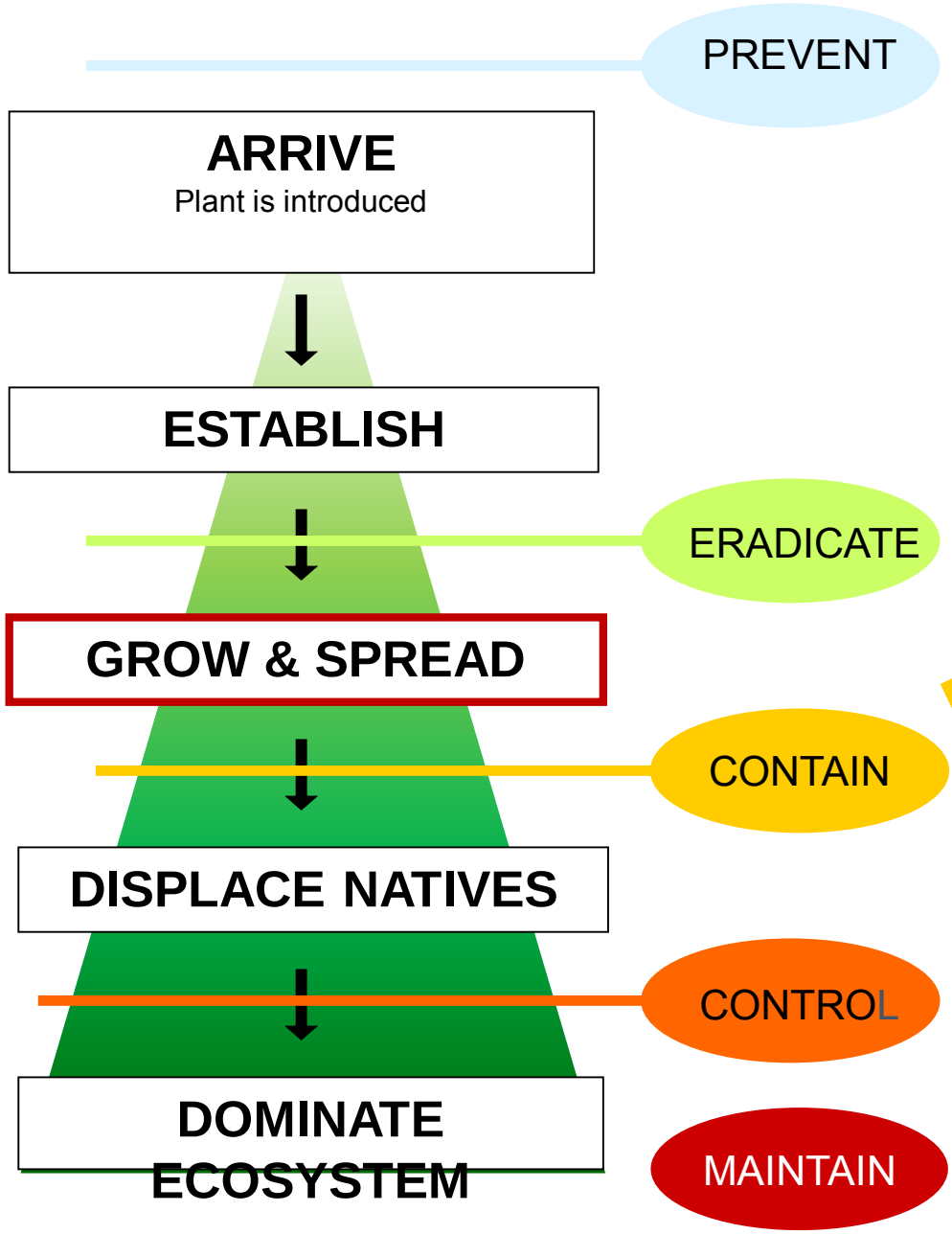
Moshassuck River Watershed:

6. Barney Pond, Lincoln
7. Olney Pond, Lincoln
8. Monitor Butterfly Pond!

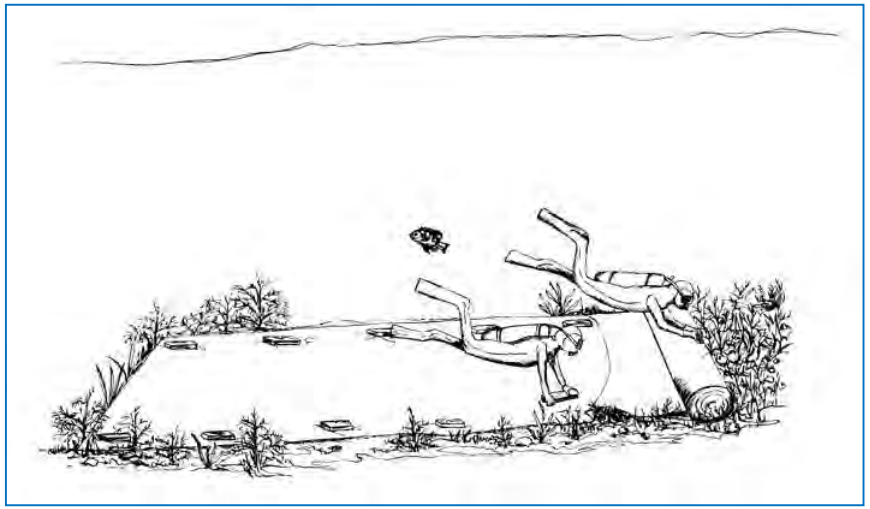
9. Belleville Pond, NK

RIDEM is currently setting up meetings with Ten Mile River WC and Blackstone River WC to talk about ways they may be able to help – if your organization is interested, please email katie.degoosh@dem.ri.gov

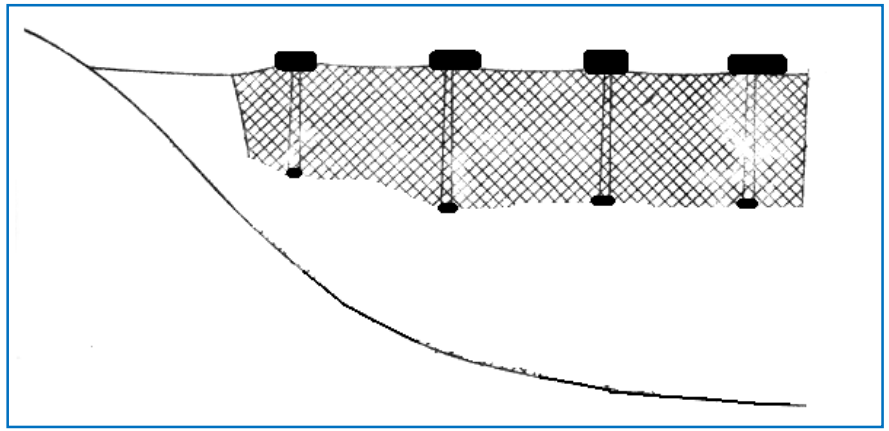
Enclose Small Area

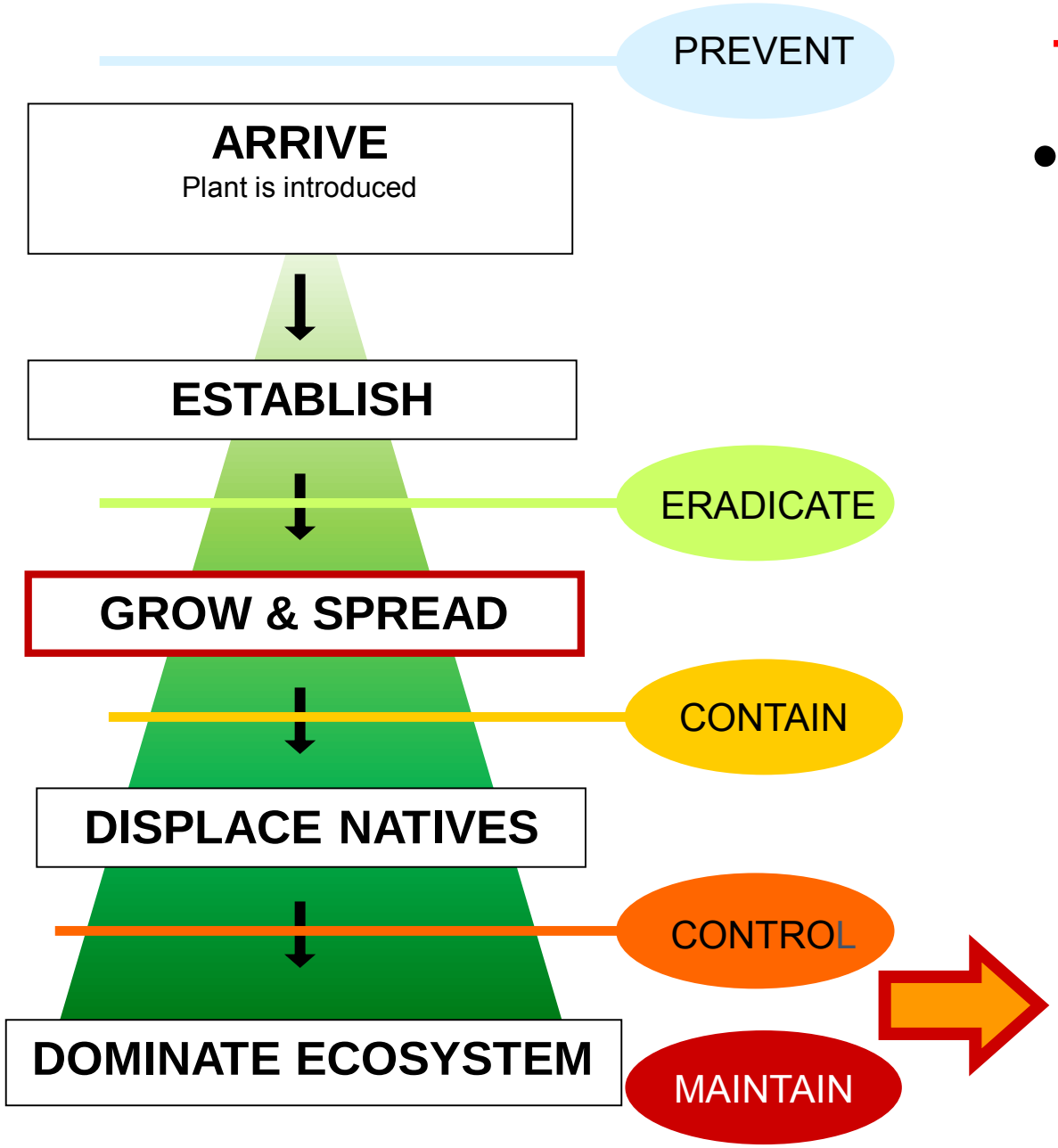


Benthic Barriers



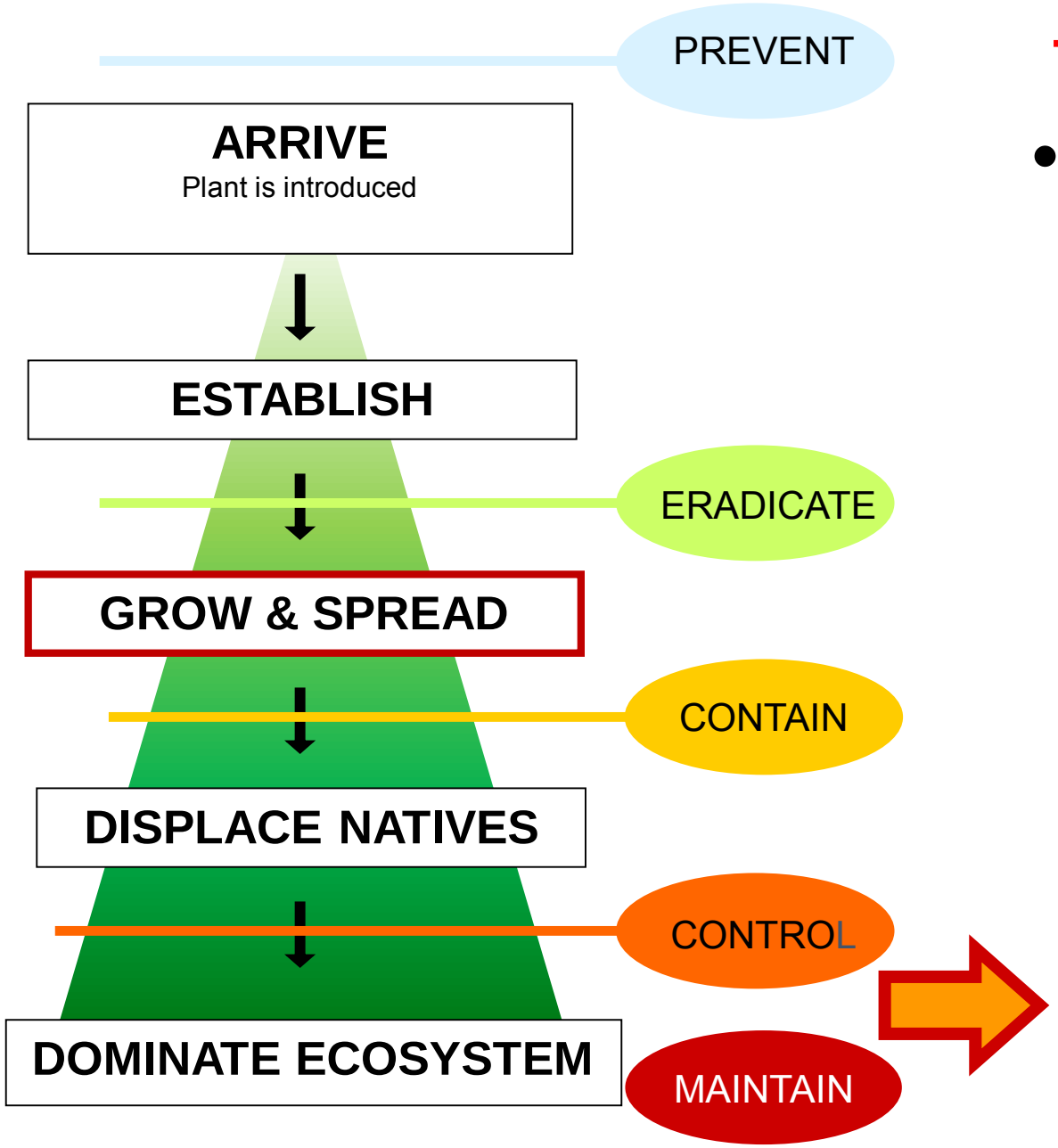
Floating Nets





Common Control Types:

- Physical Methods
  - Mechanical



Common Control Types:

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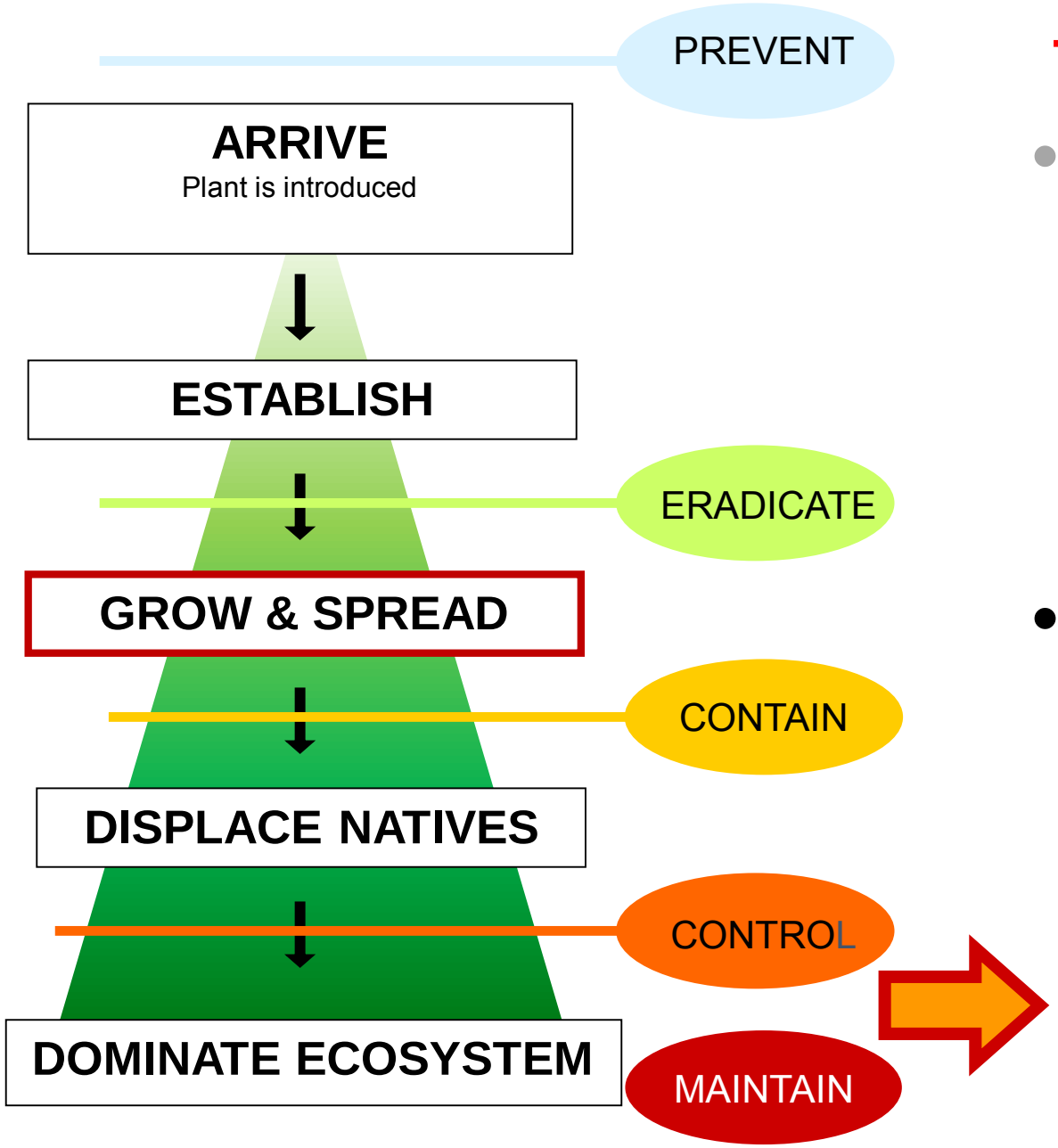
  - Mechanical
  - Hand Pulling (as discussed earlier)



Common Control Types:

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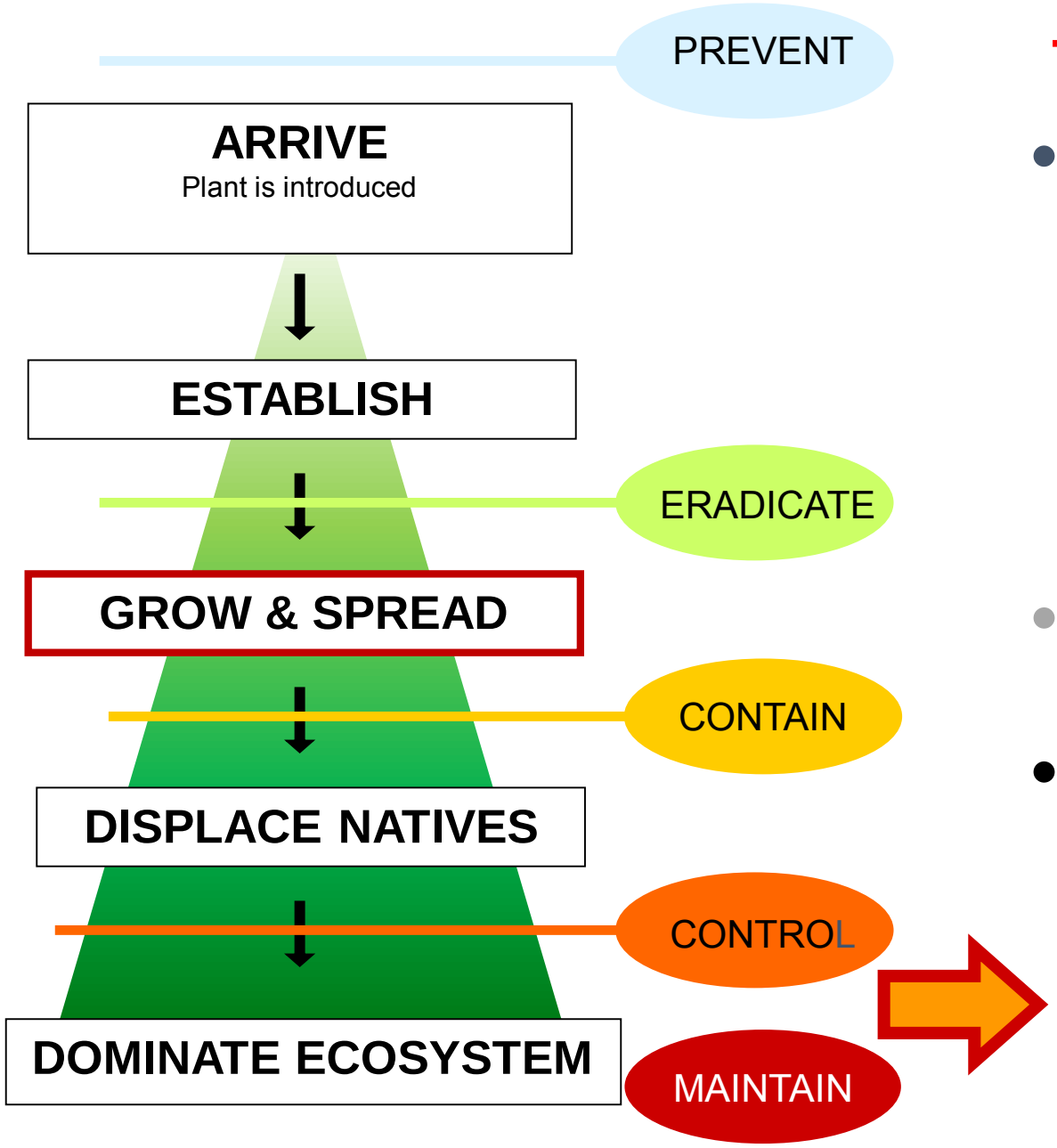
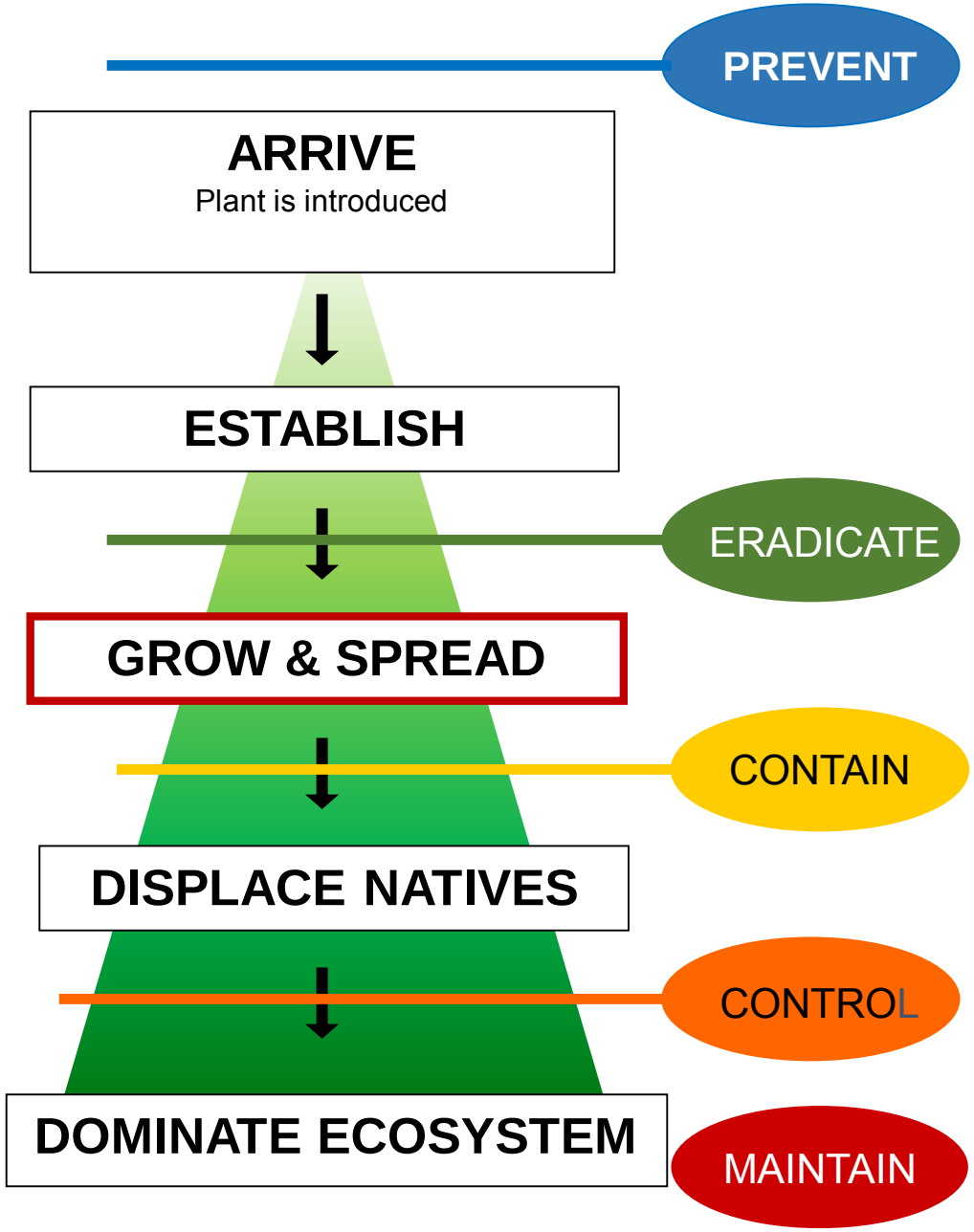
- Chemical Methods



Common Control Types:

- Physical Methods
  - Mechanical
  - Hand Pulling
- Chemical Methods
- Biological Methods

AIS Management Options



Best when PLANNED in Combination (INTEGRATED PEST MANAGEMENT)

Follow this link for a table with details of all common management options:
http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/control.pdf

Integrate Options into a Lake Management Plan

	• 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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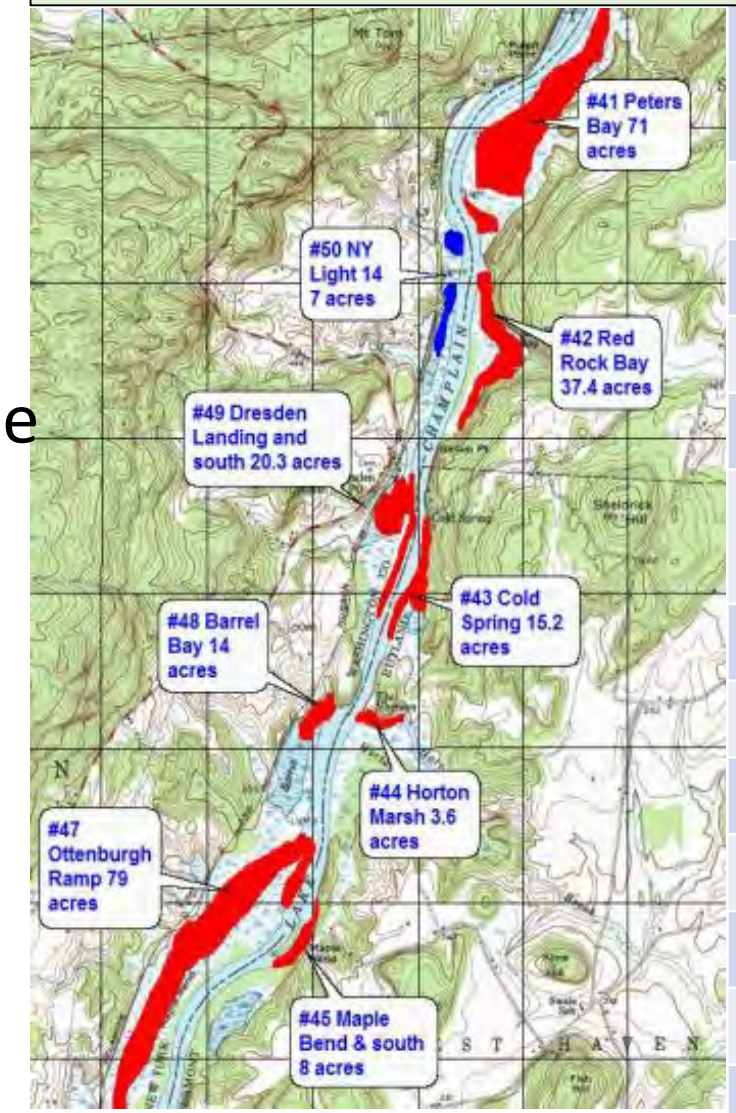
Water Chestnut Management Lessons from Lake Champlain

1. It's not so bad! Rhode Island populations are relatively small, and with resources, could also be managed over time

2014 MECHANICAL HARVESTING SITES



http://www.lcbp.org/wp-content/uploads/2017/09/

Largest Populations (acres)		
Lake Champlain (2014)	Rhode Island (2020)	RI Waterbodies
79	~ 50	Central Pond
71	~ 30	Valley Falls Pond
37.4	~ 9	Chapman Pond
20.3	< 1	Turner Reservoir
15.2	< 1	Lakeside Cem. Pond
14	< 1	Belleville Pond
8	< 1	Porters Pond
7	< 1	Blackstone River
3.6	< 1	Olney Pond
	< 1	Carls Pond
	< 1	Roger Williams Pk
	< 1	Sol Spring Farm
	< 1	Barney Pond
	< 1	Sylvestre Pond

RIDEM

Water Chestnut Management Lessons from Lake Champlain

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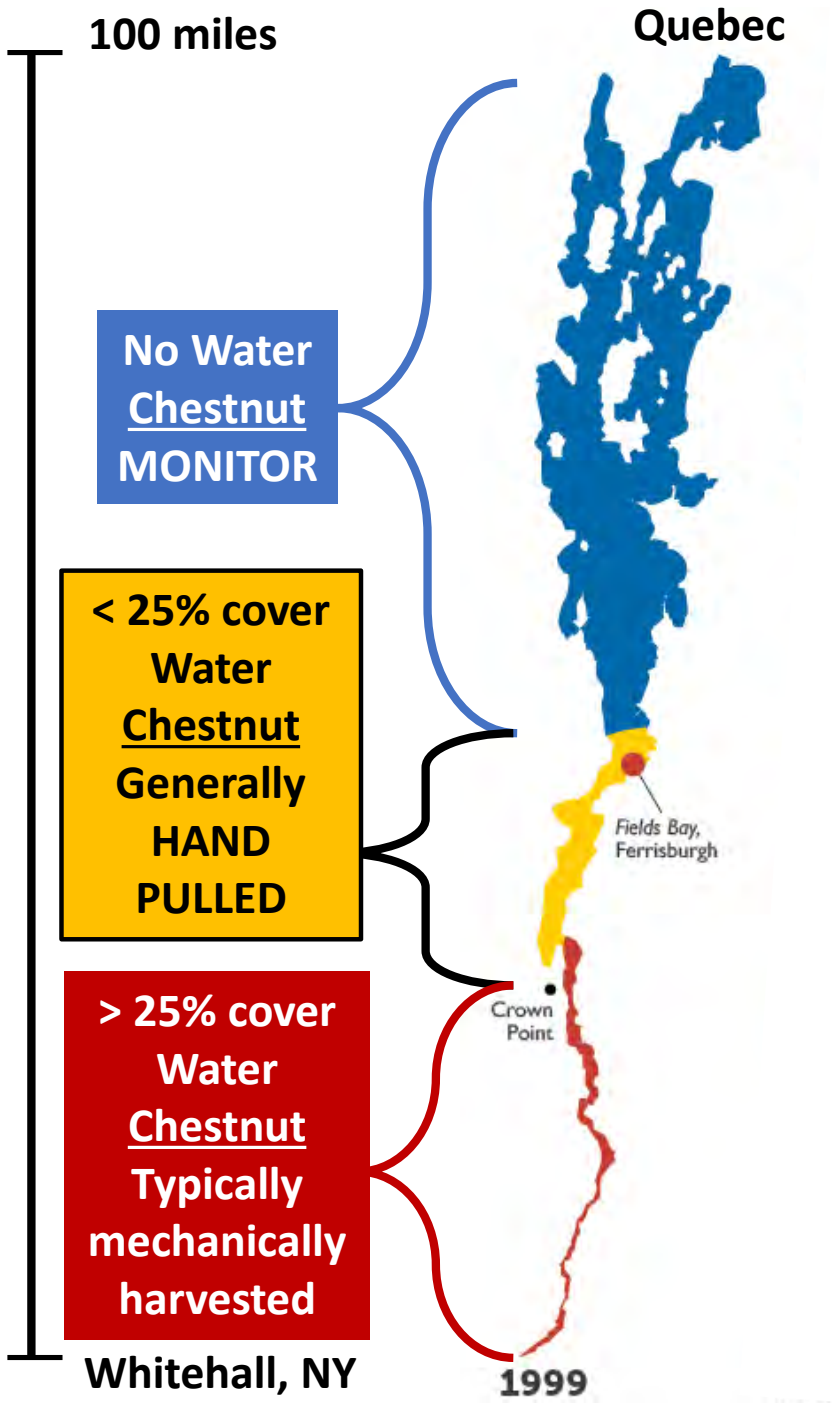

https://sol.lcbp.org/en/figures-and-graphics/

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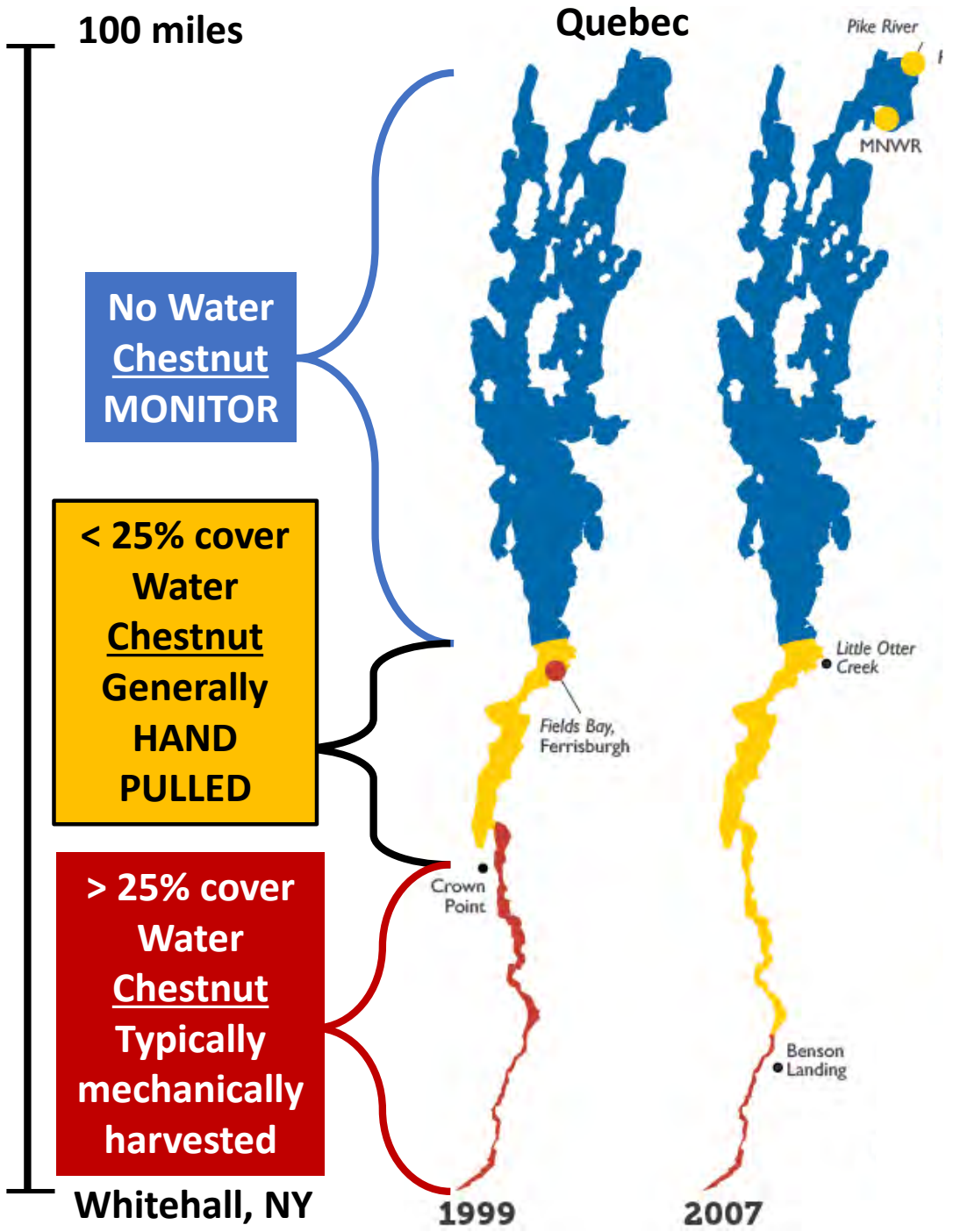

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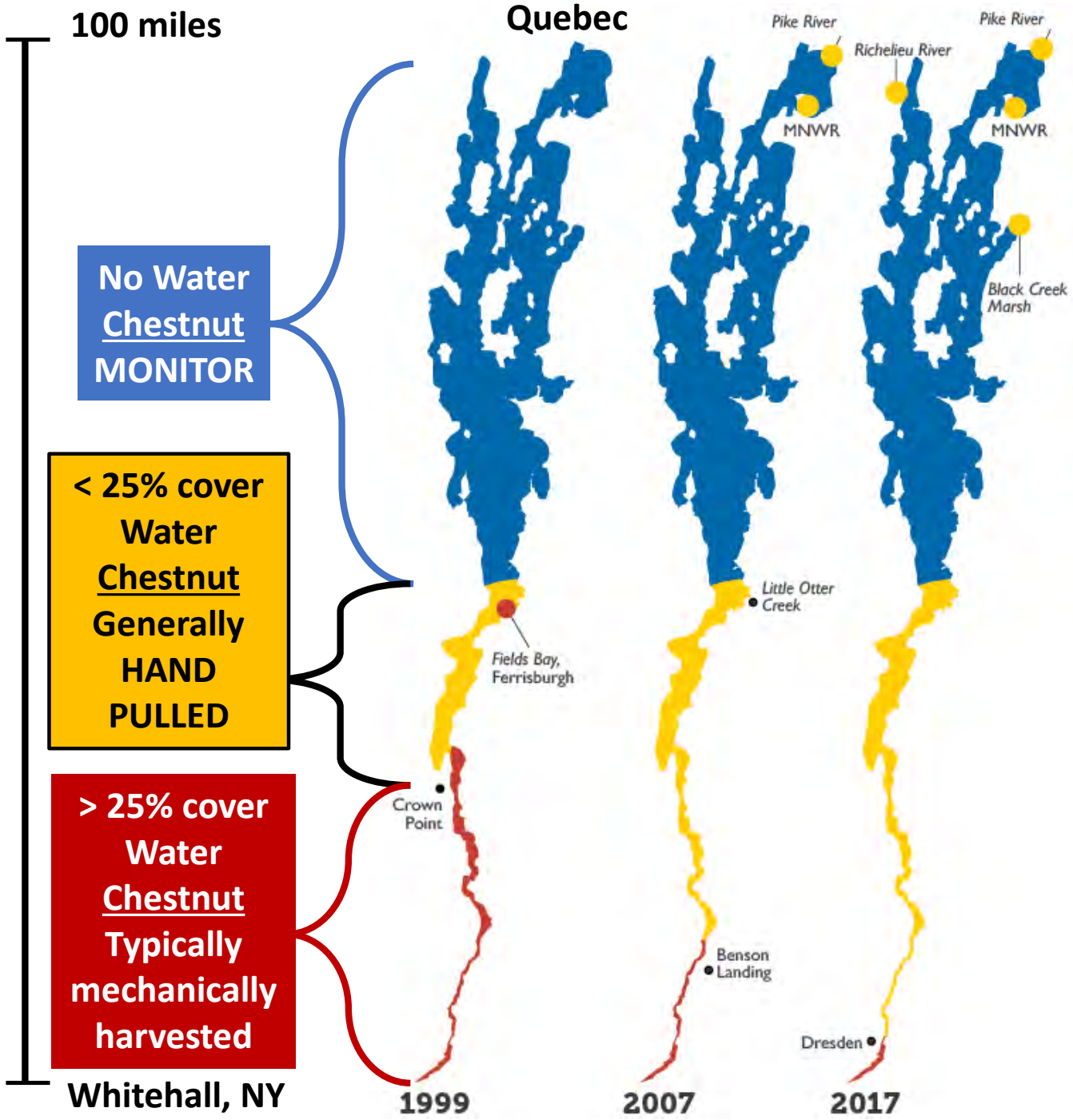

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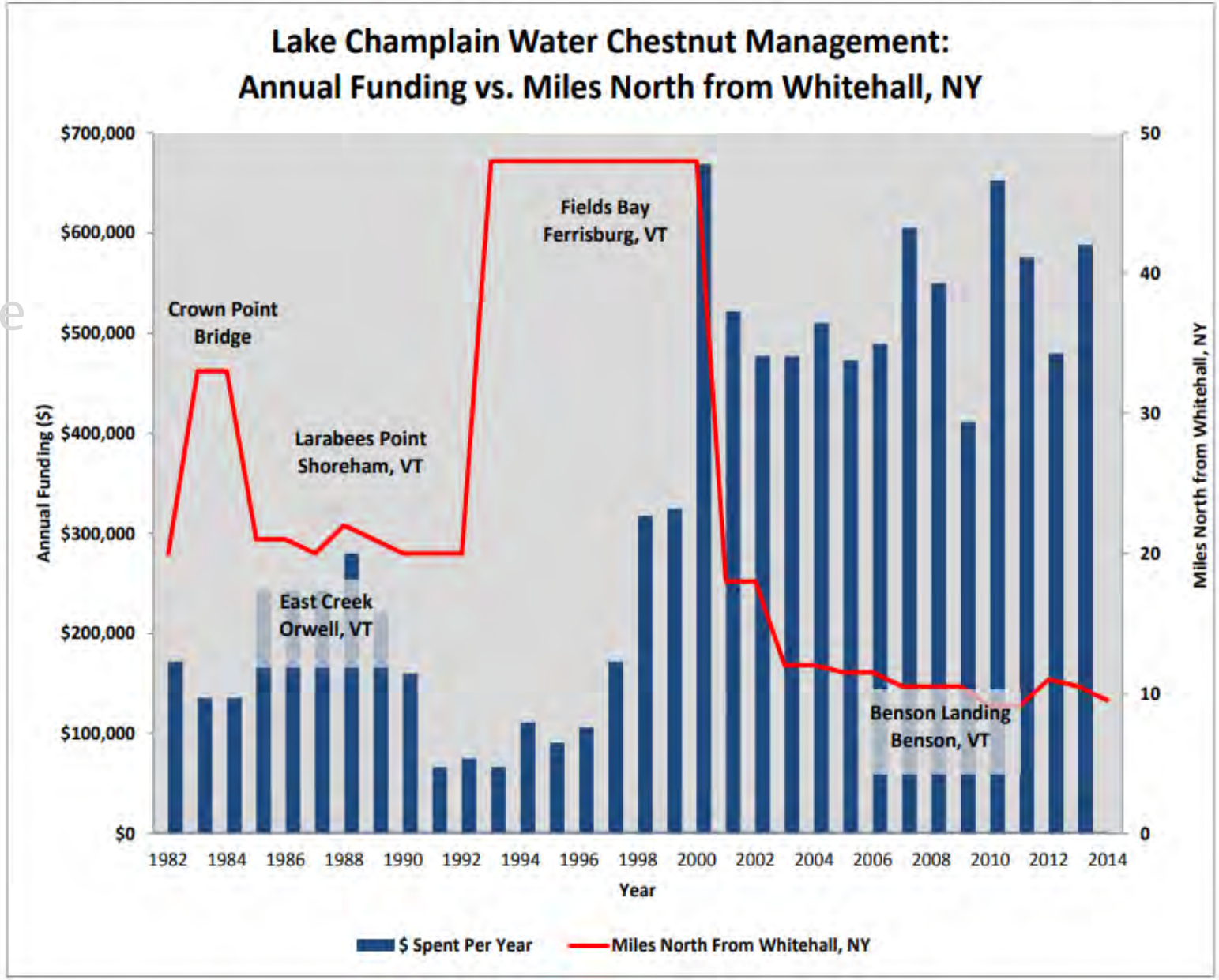
Water Chestnut Management Lessons from Lake Champlain

1. It's not so bad! Rhode Island populations are relatively small, and with resources, could also be managed over time

2. Management is a long term effort that requires sustained funding

Figure 2-5: Annual water chestnut funding vs. northernmost mechanical harvest site in Lake Champlain, 1982-2014



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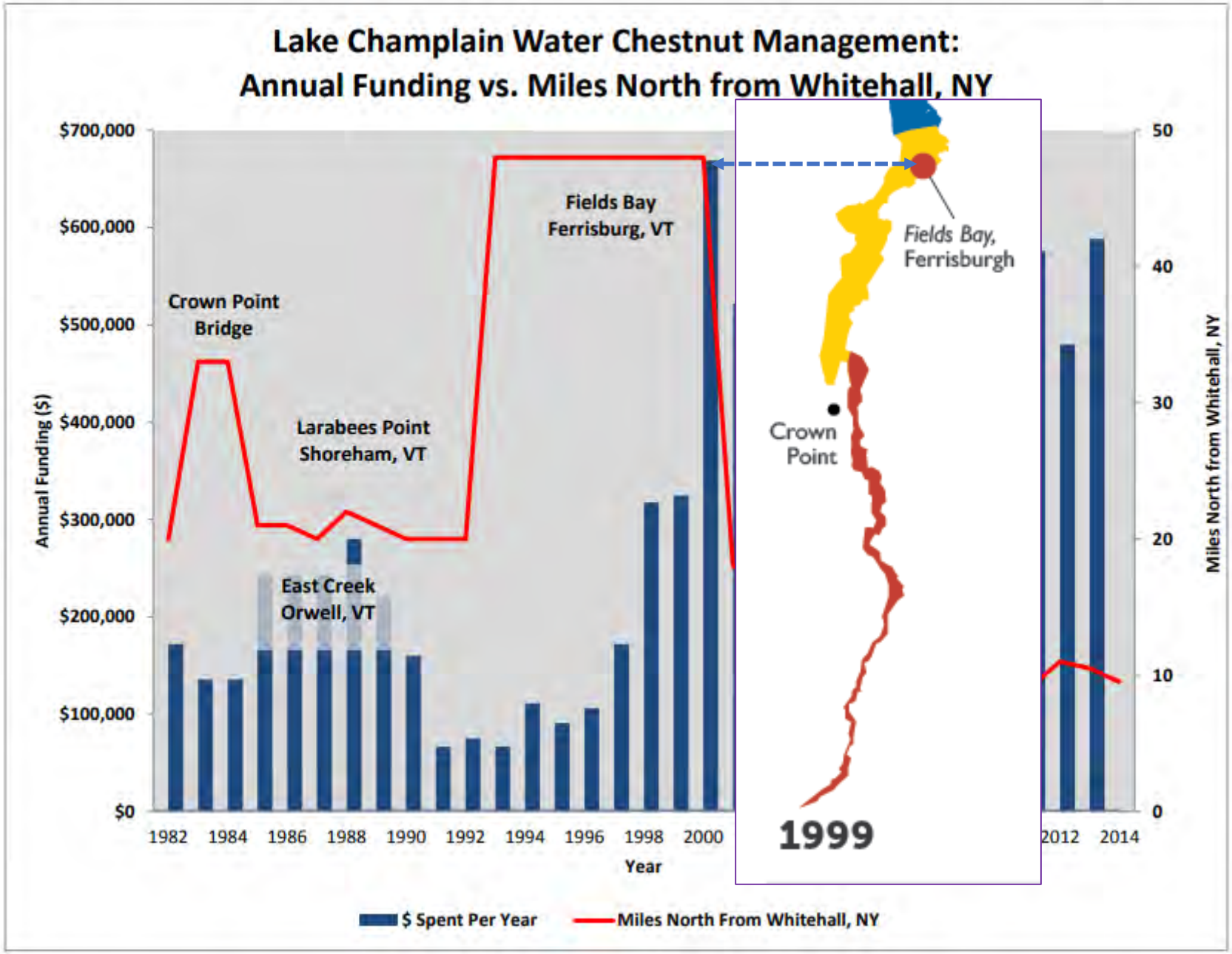

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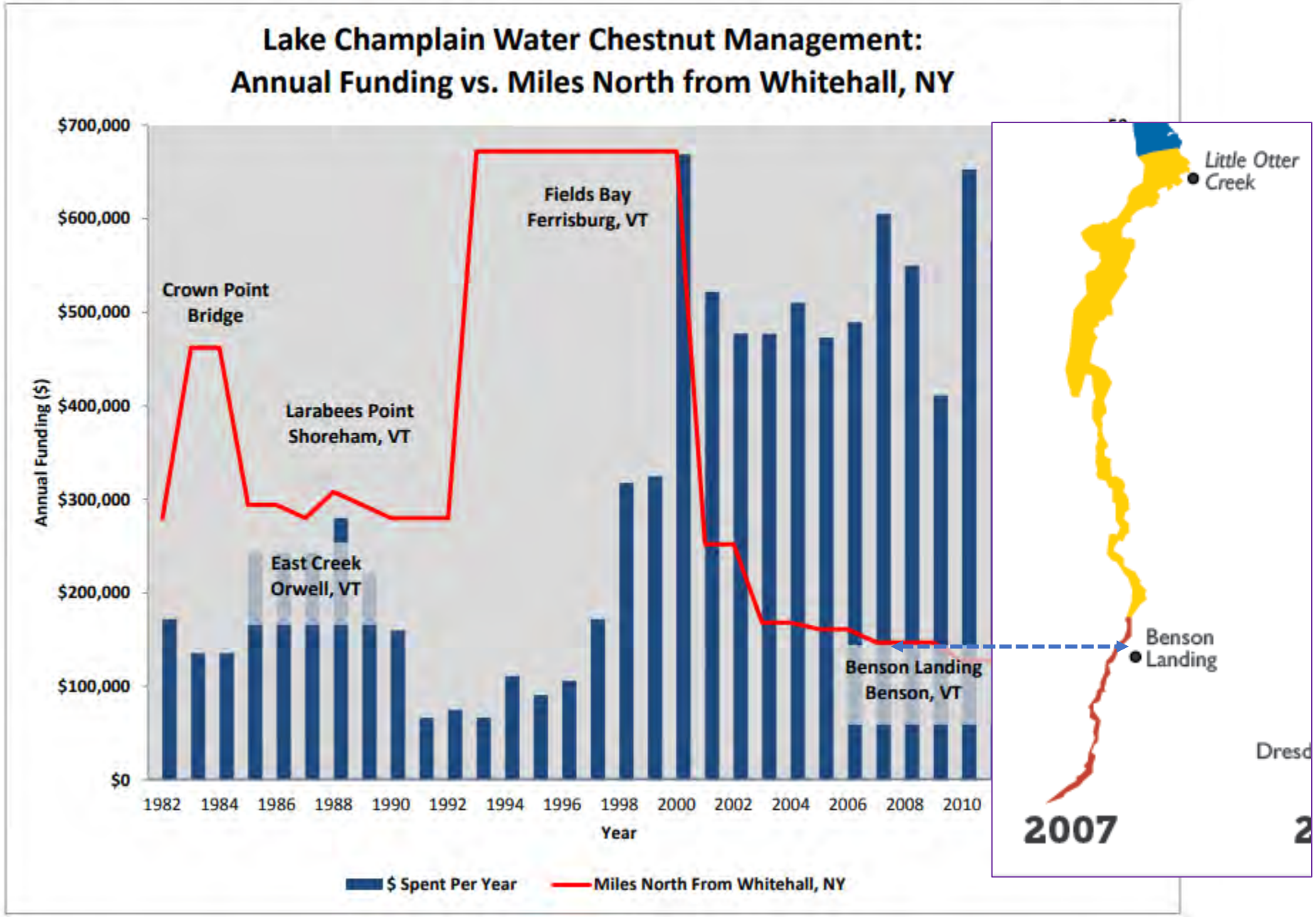

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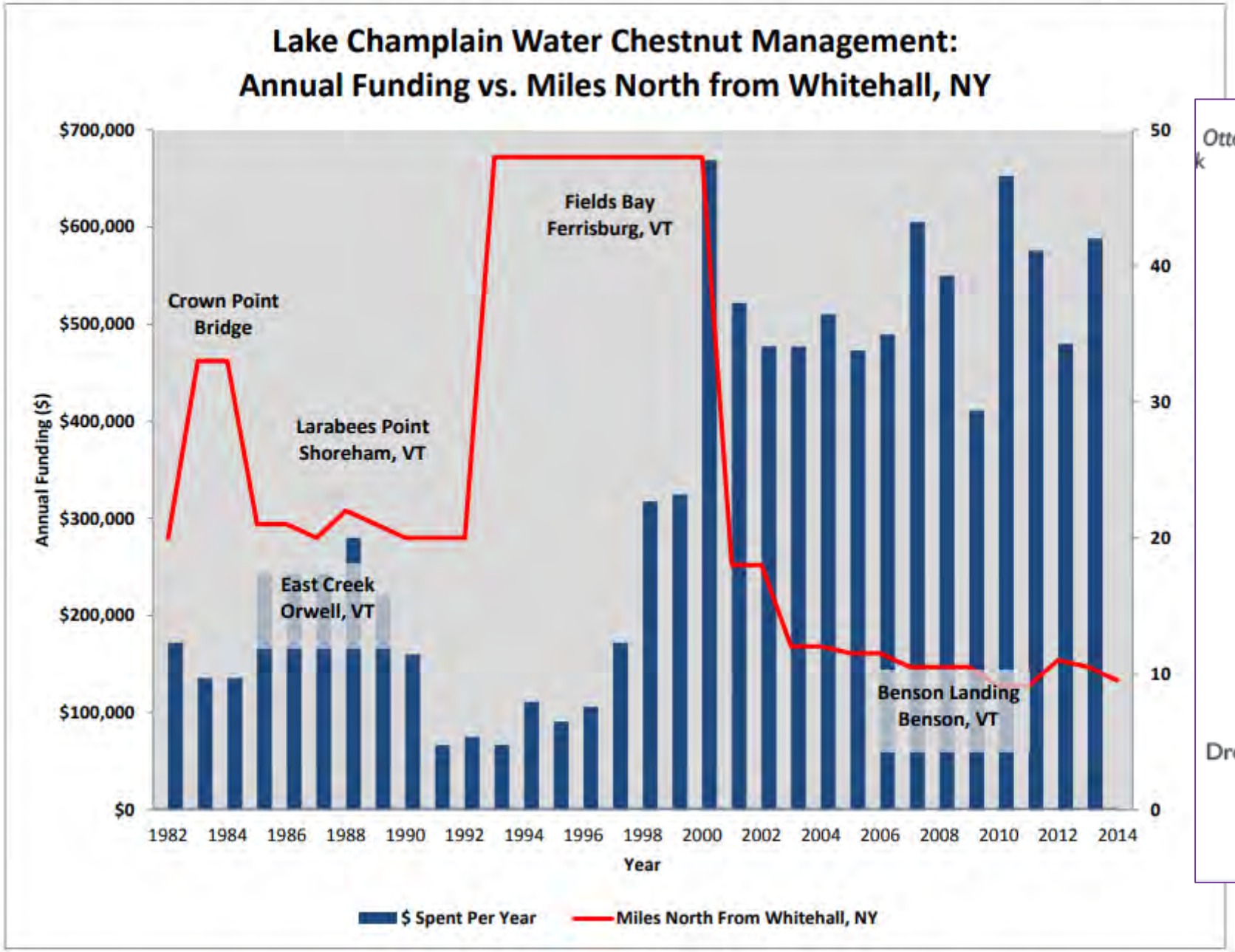

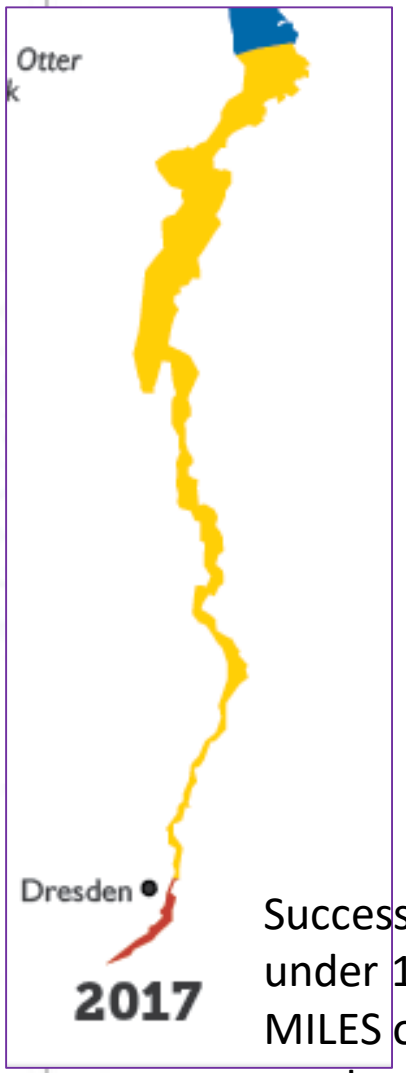

Successfully under 10 MILES of mechanical harvesting!

Questions?

RIDEM
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