Hydrilla Management for Protection of the Delaware & Raritan Canal

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NEW JERSEY
EST. 1981
WATER SUPPLY AUTHORITY

May 24, 2018

DRBC Regulated Flow Advisory Committee

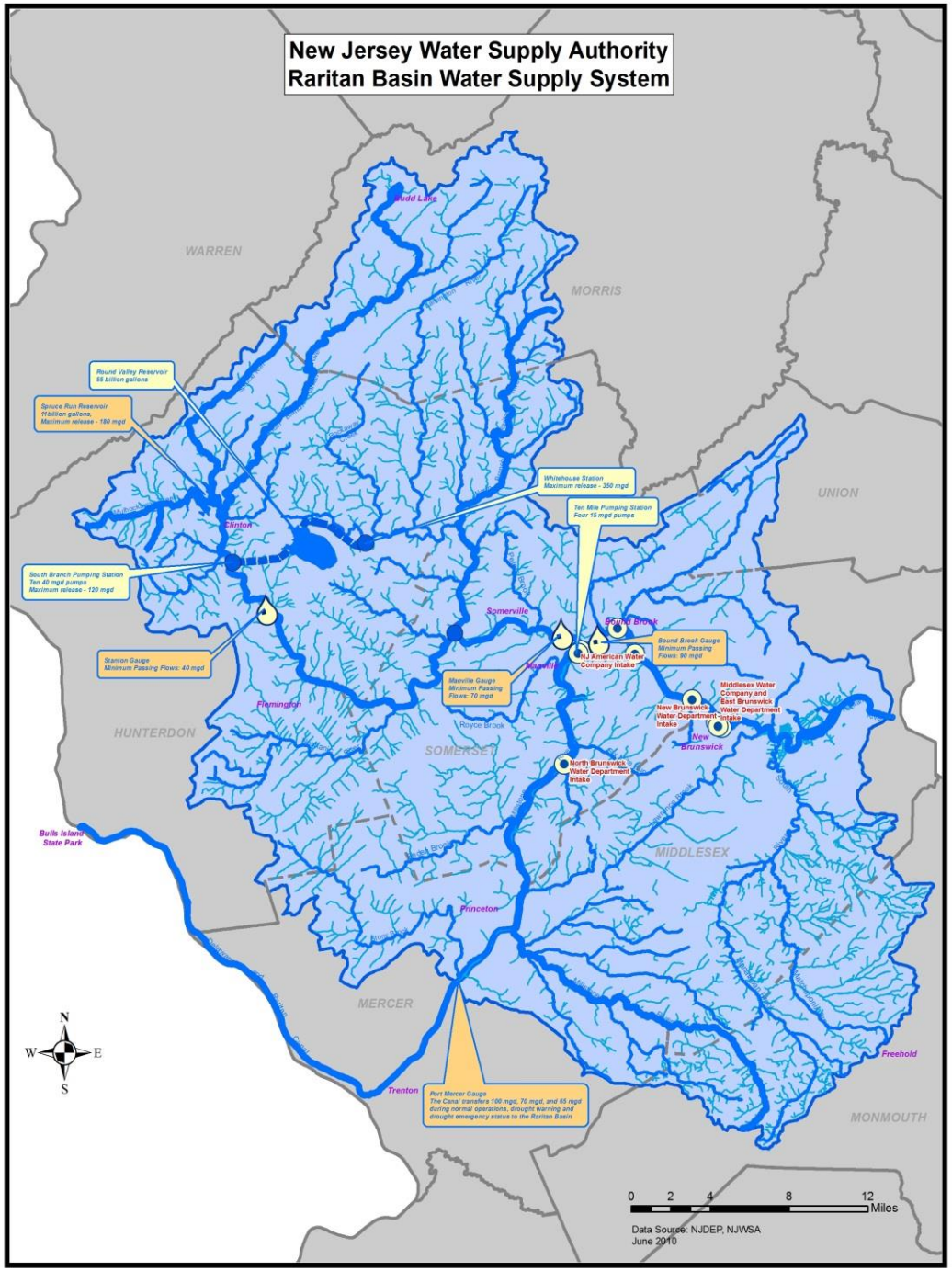
Raritan Basin Surface Water Supply Complex

Safe yield of 256 MGD

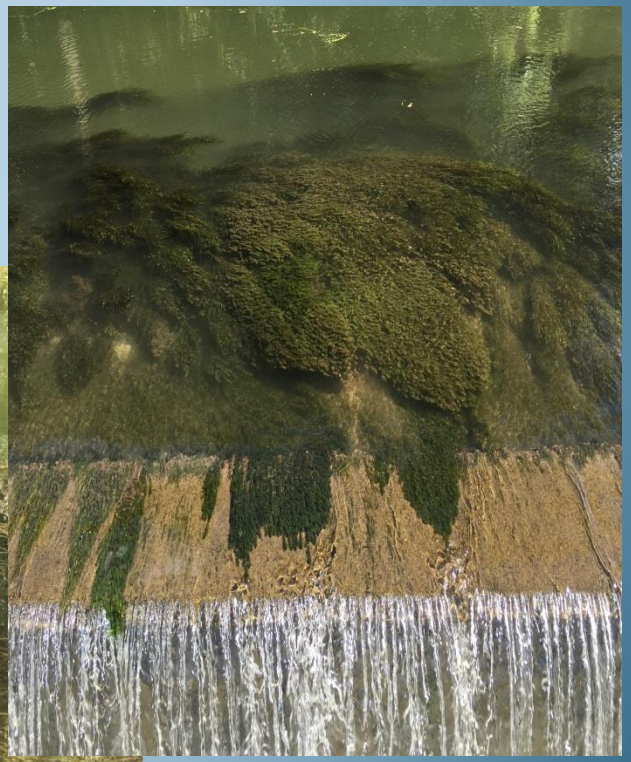
Round Valley Reservoir - 55BG
Spruce Run Reservoir -11BG

Canal transmission facility
Earthen dams, Pipelines,
South Branch Pumping Station – ten 40 mgd pumps

Delaware & Raritan Canal - 100MGD Inter-basin Transfer

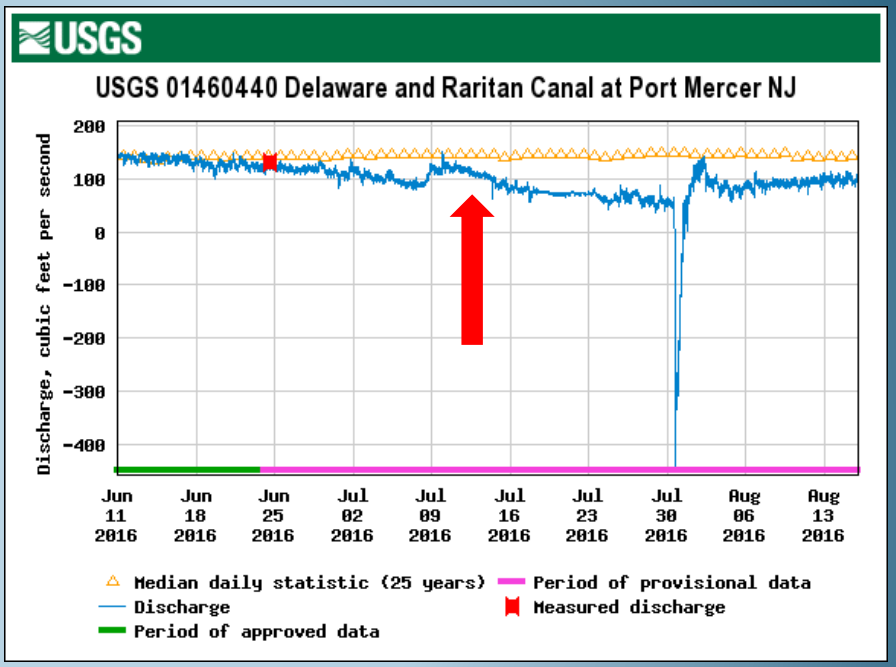


Maintaining Flows



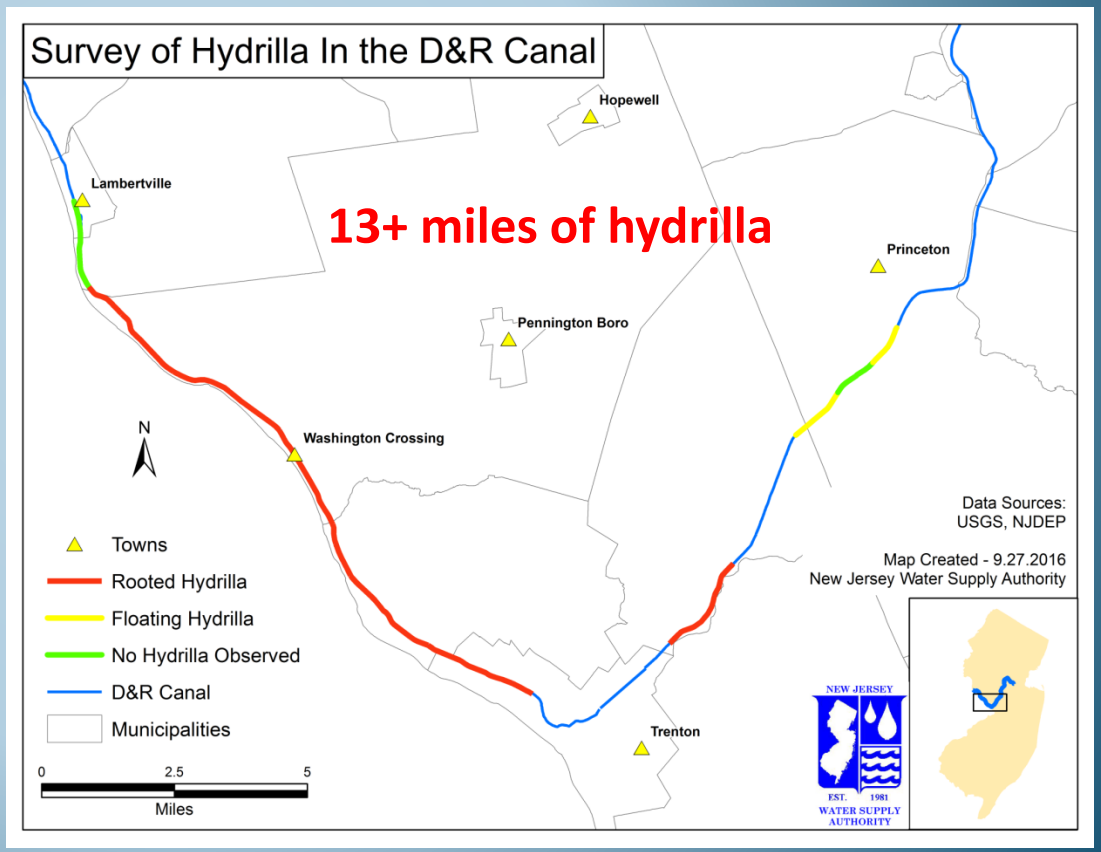
2016 Detection & Response

- Water flow restriction due to excessive plant growth
- Canal water level below intake
- Hydro-raking: July-August



2016 SAV survey

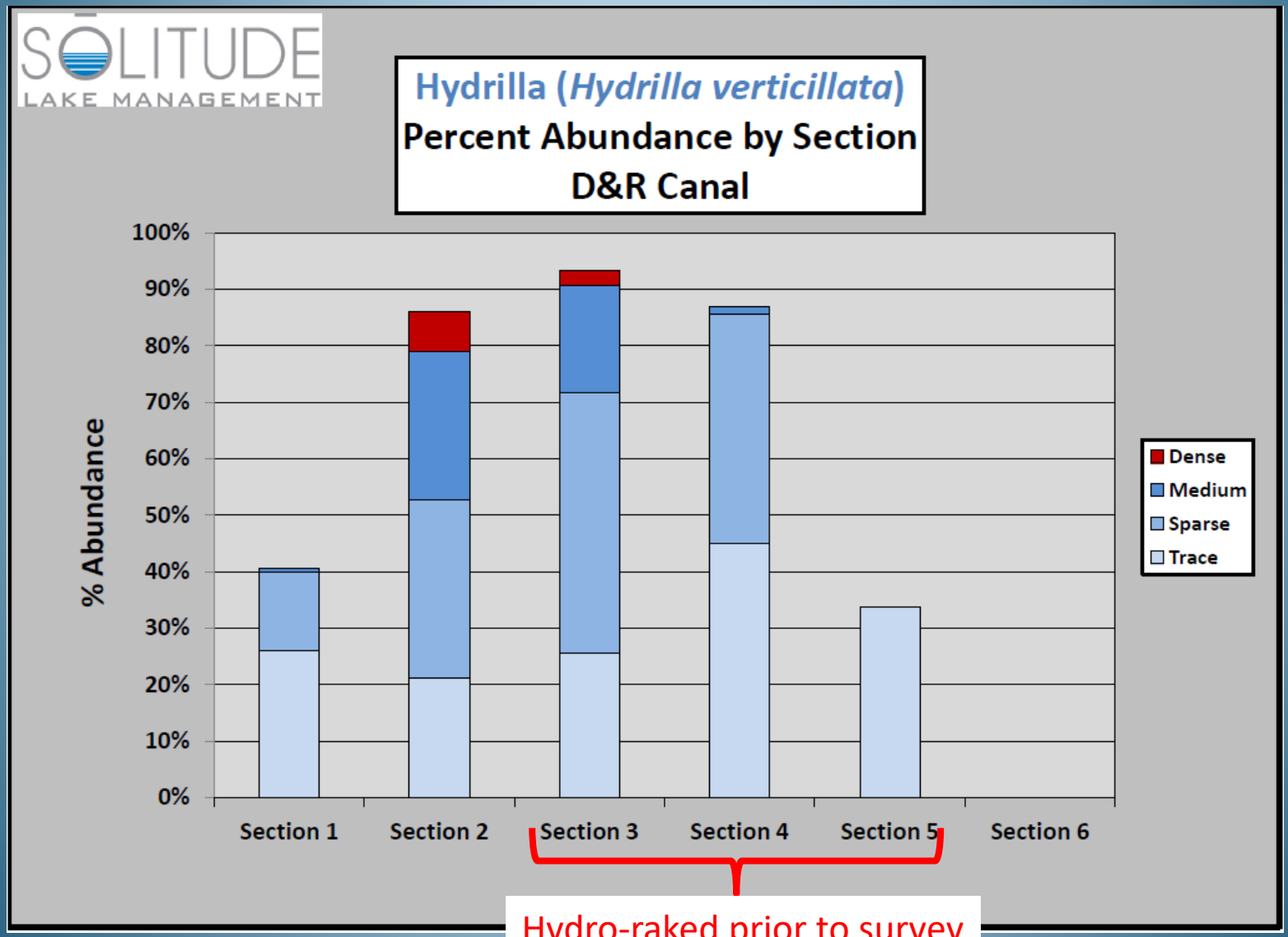
18.31 miles – 597 sites



2016 SAV Survey Results

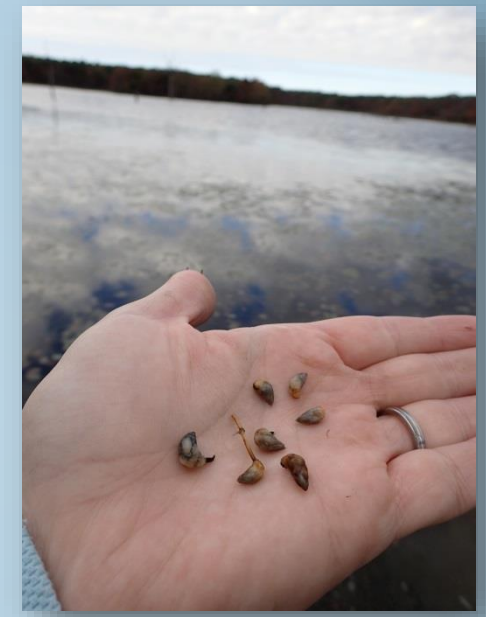
Common Name	Scientific Name	# Occurrences	% Occurrence
Overall SAV		**576**	**96.5%**
Small Duckweed	*Lemna minor*	536	89.8%
Coontail	*Ceratophyllum demersum*	507	84.9%
Water Stargrass	*Zosterella dubia*	399	66.8%
Hydrilla	*Hydrilla verticillata*	337	56.4%
Wild Celery	*Vallisneria americana*	313	52.4%
Common Waterweed	*Elodea canadensis*	196	32.8%
Benthic Filamentous Algae		189	31.7%
Brittle Naiad	*Najas minor*	143	24.0%
Eurasian Water Milfoil	*Myriophyllum spicatum*	60	10.1%
Water Starwort	*Callitriche palustris*	59	9.9%
Spatterdock	*Nuphar variegata*	55	9.2%
Watermoss	*Fontinalis* sp.	44	7.4%
Leafy Pondweed	*Potamogeton foliosus*	19	3.2%
Muskgrass	*Chara* sp.	11	1.8%
Curly-leaf Pondweed	*Potamogeton crispus*	9	1.5%
Long-leaf Pondweed	*Potamogeton nodosus*	7	1.2%
Pondweed species	*Potamogeton* sp.	6	1.0%
White Water Crowfoot	*Ranunculus longirostris*	3	0.5%
Great Duckweed	*Spirodela polyrhiza*	2	0.3%
Common Bladderwort	*Utricularia vulgaris*	2	0.3%
Arrowhead rosette	*Sagittaria* sp.	2	0.3%

2016 SAV Survey



Hydrilla verticillata

- Native to Asia
- Means of introduction: aquarium plant
- Recent invader to Mid-Atlantic (1980s)
- Can reach lengths of up to 25 feet
- Can grow up to 1 foot per day!
- Reproduces by fragmentation, tubers, & turions
  - Tubers can remain viable 6+ years



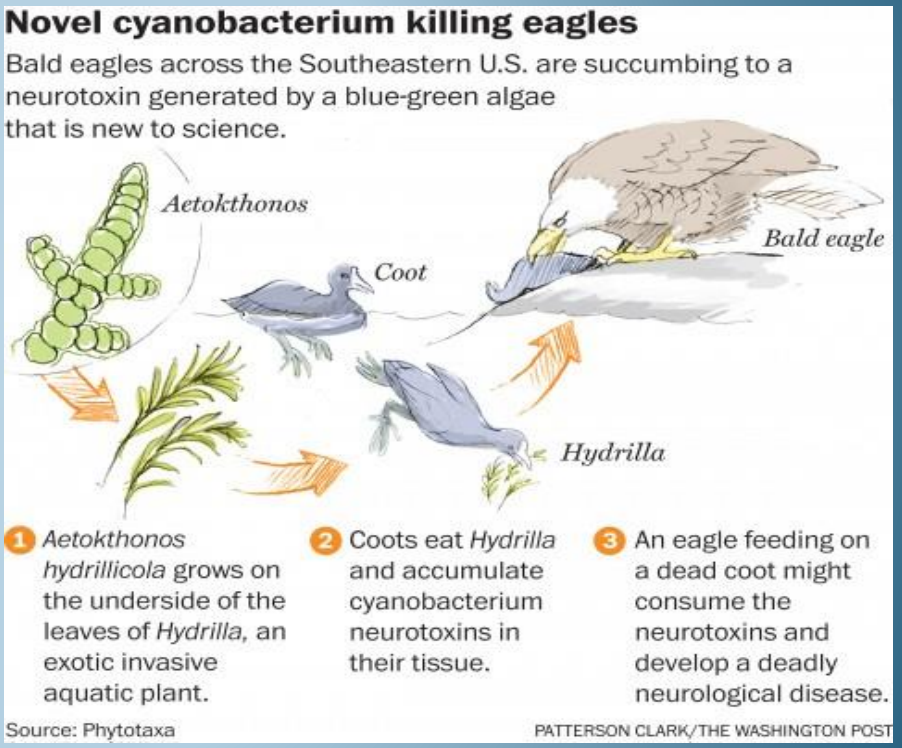
Hydrilla – "the perfect weed"

- Adapts to variety of conditions
  - Water depths – inches to 20+ ft
  - Lakes/ponds & rivers
  - Salinty 0-9ppt (possibly up to 13ppt)
  - Turbidity/water clarity
  - Low light tolerance
    - Even up to 10 weeks in total darkness!
- Impacts:
  - Native SAV & other biota
  - Water chemistry
  - Water flow
  - Recreation

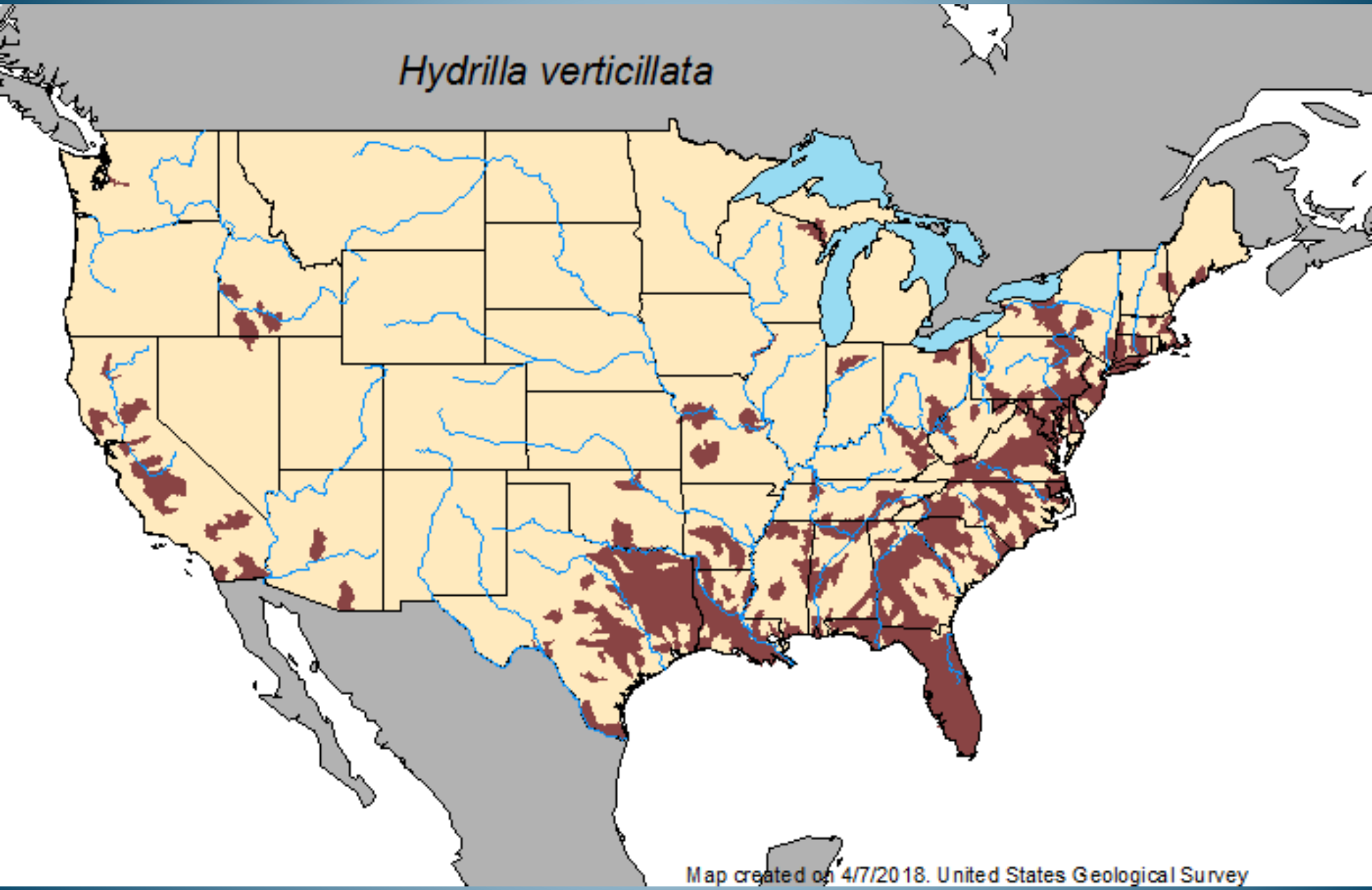
D&R Canal at Scudders Falls September 2016

Hydrilla & Cyanobacteria

- Toxic Cyanobacteria *Aetokthonos hydrillicola*
  (Eagle killer – grows on hydrilla)
- Grows on hydrilla stems only
- University of Georgia (S. Wilde) researchers discovered and study this
- NJWSA sent samples from the Canal in early September 2016:
  - *A. hydrillicola* was not found



For more information: https://www.warnell.uga.edu/research/dr-susan-wilde-avm-research



Hydrilla in the News

THE SPORTSMAN'S CHOICE FOR NEWS AND INFORMATION

PENNSYLVANIA

$2.50

Outdoor News

PF&BC is losing fight against hydrilla

Staff Report

Harrisburg — It may not look like plant," Morgan said. "It has highly evolved behaviors or strategies that can use fewer nutrients and it has a colder temperature range it will it either.

One big problem is that it can

CONTRIBUTED

ECO TALK

Eco Talk: Hydrilla is on New York state's least wanted list

Hydrilla: For this aquatic superweed prevention and early detection are essential

EPA awards $900,000 for New York invasive species removal including Cayuga Lake hydrilla

The Citizen staff Sep 8, 2017

Austin

Swimmer blames hydrilla for near drowning at Lake Pflugerville

TAPinto New Brunswick

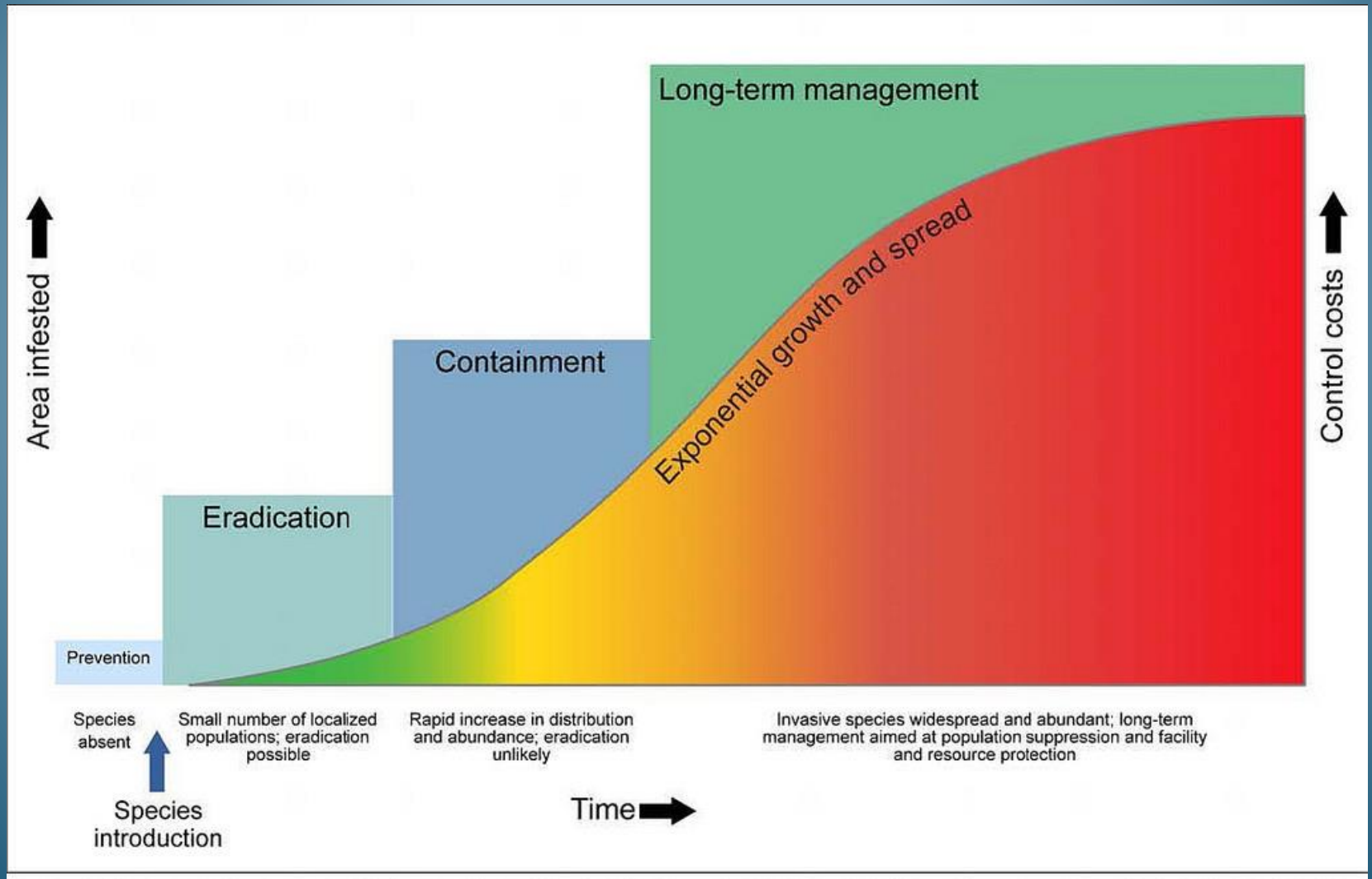
Serving New Brunswick and Rutgers University

Workers Fight Invasive Weed Threatening City Water Supply

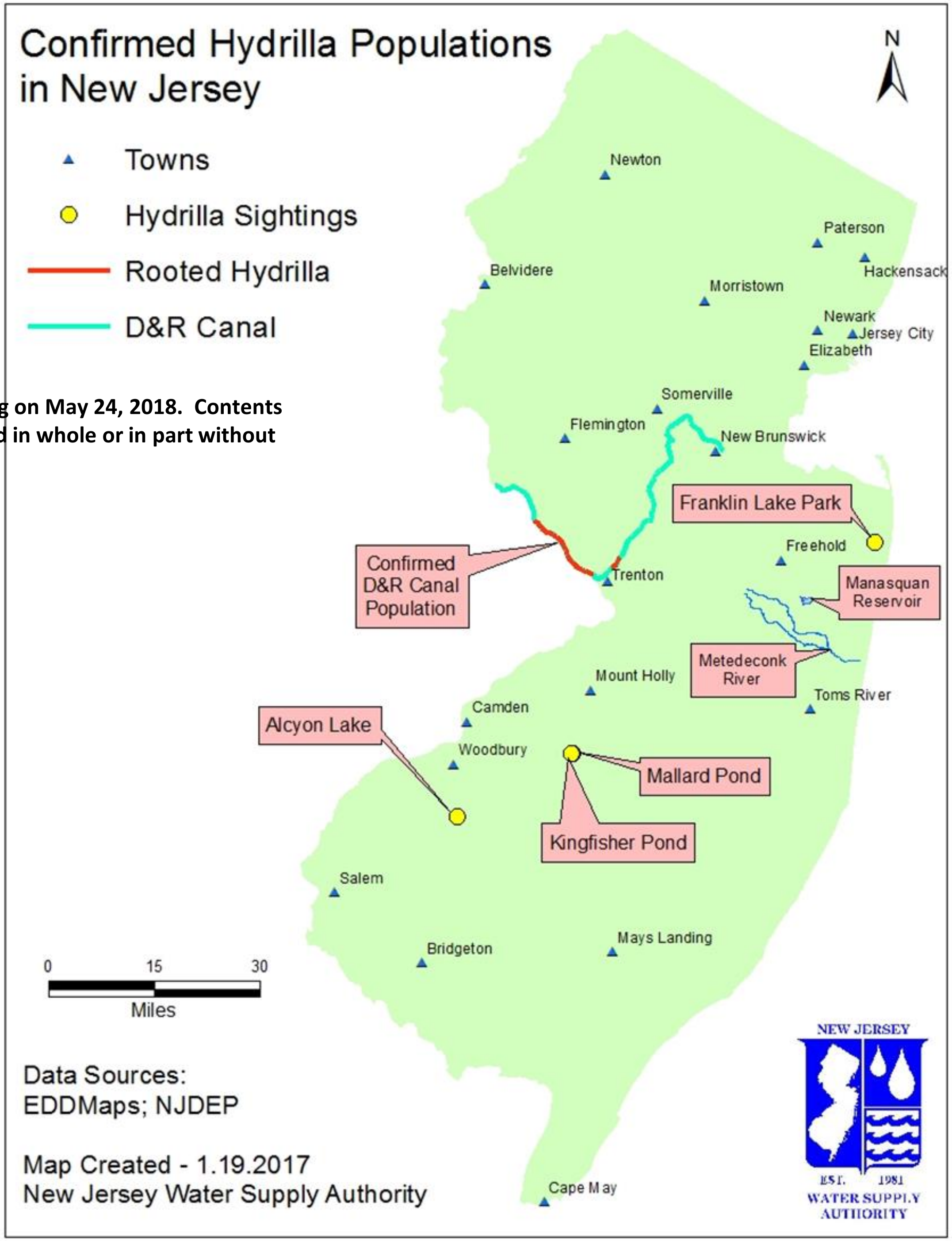
By JACK MURTHA

June 6, 2017 at 3:46 PM

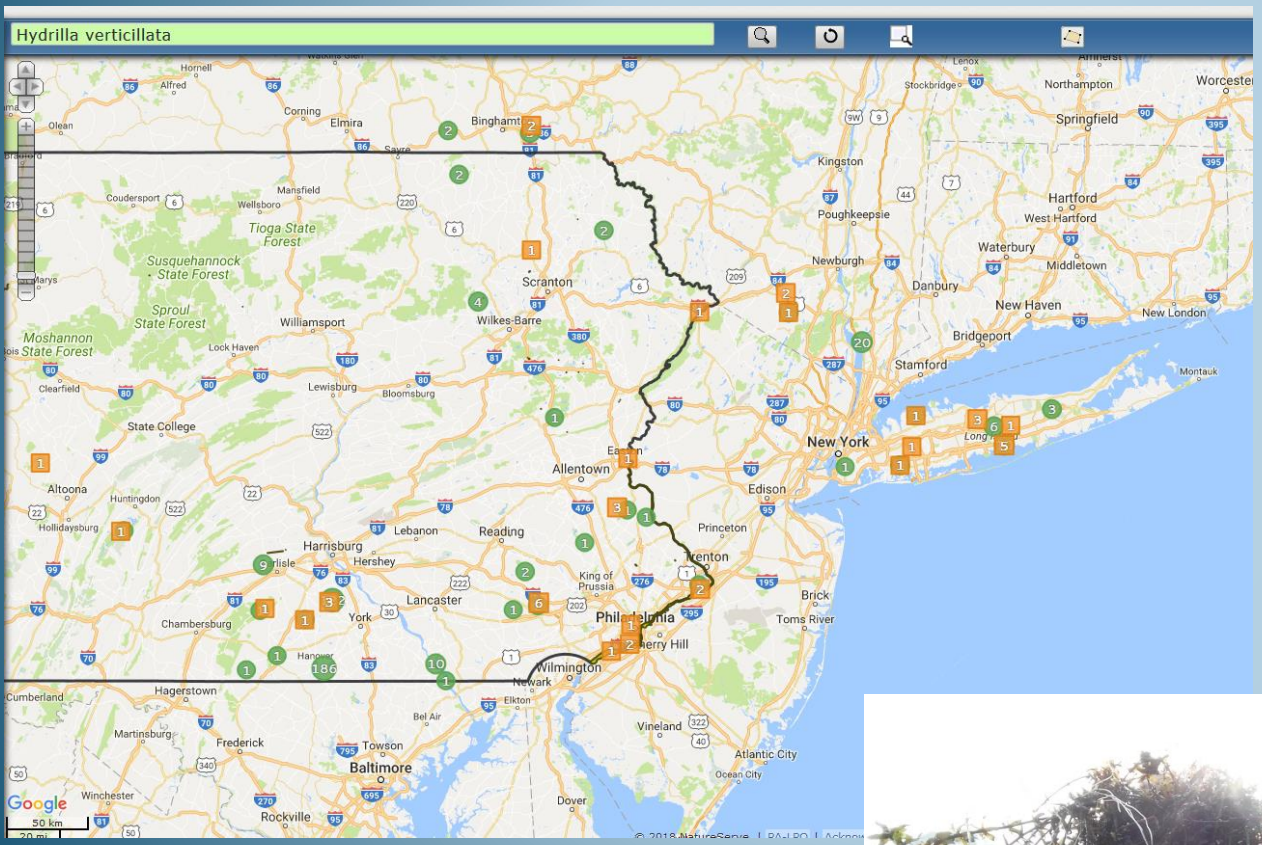
HYDRILLA
EARLY DETECTION/RAPID RESPONSE

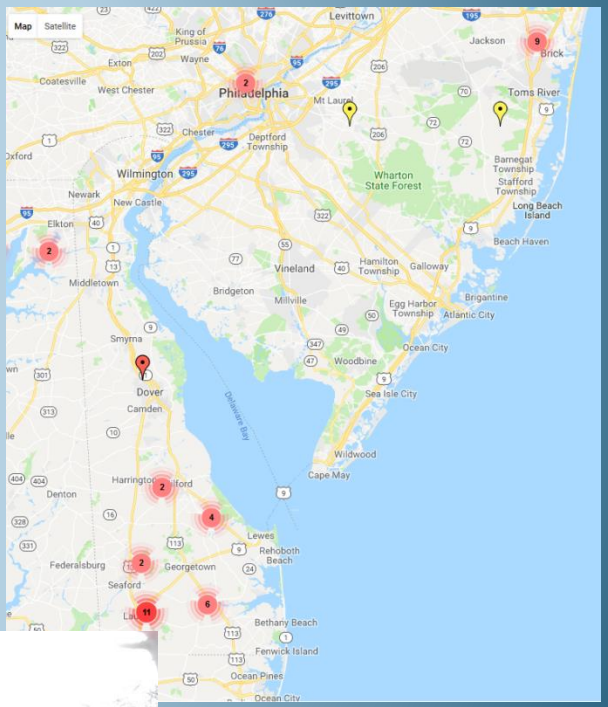


Sources: National Invasive Species Council; U.S. Department of Agriculture; National Park Service; U.S. Fish and Wildlife Service; Rodgers, L, South Florida Water Management District; Department of Primary Industries, State of Victoria, Australia; and GAO. | GAO-16-49



A Regional Concern





Hydrilla in the Delaware River at Washington Crossing

Prevention & Control

Hydrilla management

- Methods of control:
  - **Mechanical**: cutting, harvesting, dredging
  - **Biological**: Triploid grass carp
  - **Physical**: benthic mats
  - **Chemical**: selective/broad spectrum, systemic/contact herbicides

26 options evaluated in the
2017 Canal SAV Management Plan
Available at www.njwsa.org/hydrilla

Photo by: Mark Heilman, SePRO

Herbicide: fluridone

- Slow acting, systemic herbicide
- Requires long (90-120 day) contact time
- Low dose (2-4 ppb) reduce/eliminate water use restrictions
- At low concentrations, can be very selective in effects on other aquatic plants (hydrilla highly susceptible)

Injection unit

Eno River, NC
Photos: Mark Heilman, SePRO

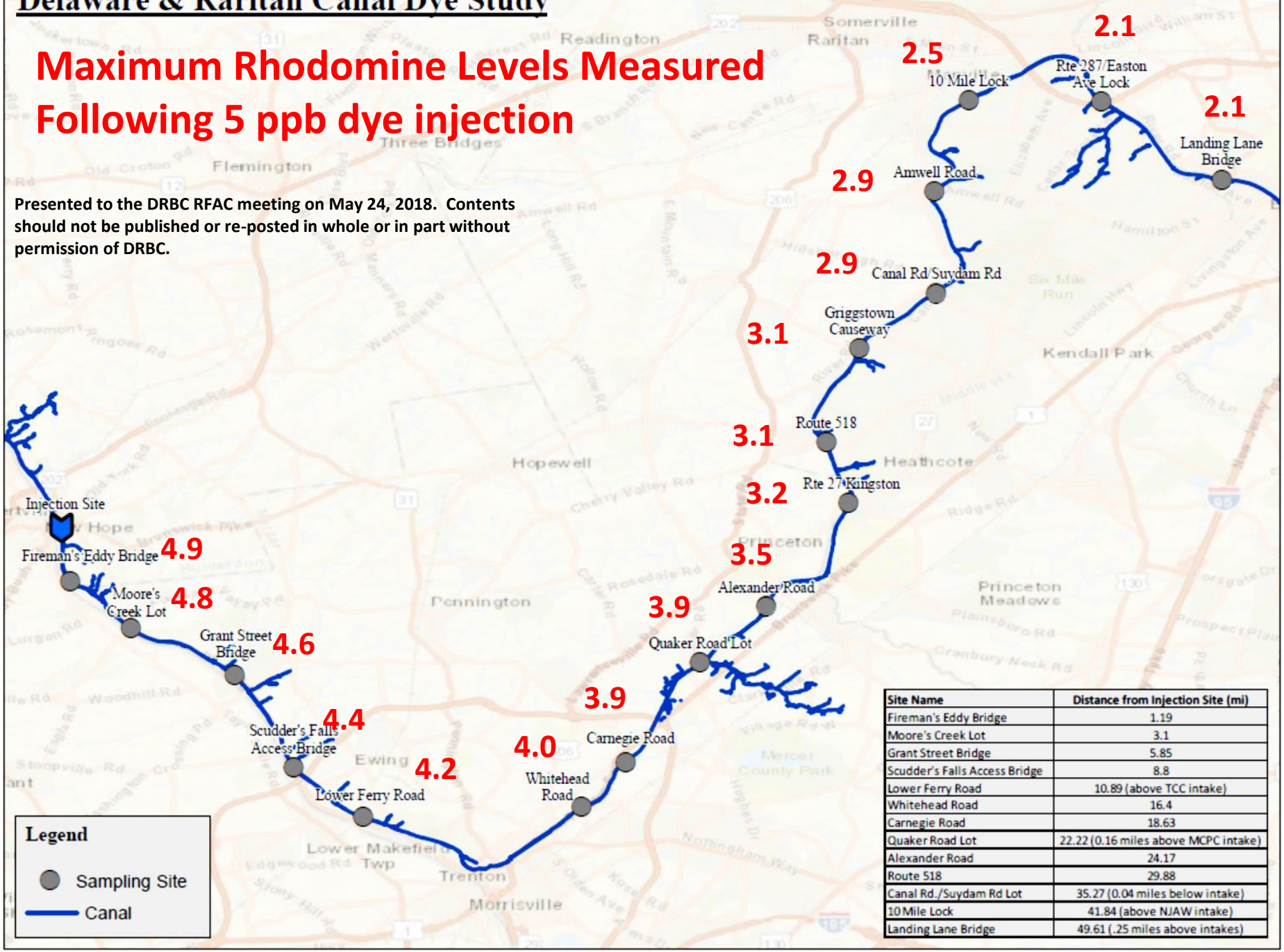
Getting It Right

Dye tracer study

- Rhodamine dye injected for 48 hours
- Dye concentrations measured real-time with fluorometer
- Dye simulates herbicide travel time
- Conservative estimate of herbicide concentrations

Delaware & Raritan Canal Dye Study

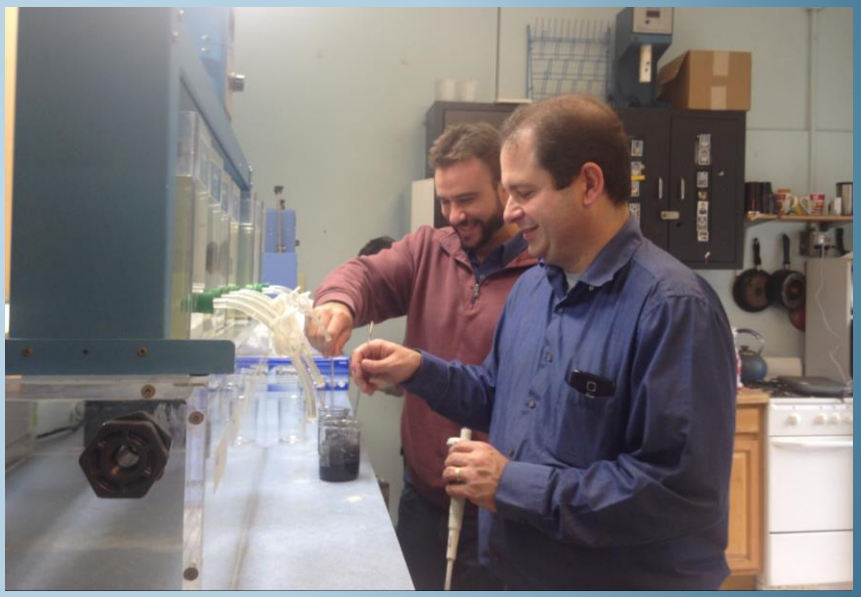
Maximum Rhodomine Levels Measured Following 5 ppb dye injection



Site Name	Distance from Injection Site (mi)
Fireman's Eddy Bridge	1.19
Moore's Creek Lot	3.1
Grant Street Bridge	5.85
Scudder's Falls Access Bridge	8.8
Lower Ferry Road	10.89 (above TCC intake)
Whitehead Road	16.4
Carnegie Road	18.63
Quaker Road Lot	22.22 (0.16 miles above MCPC intake)
Alexander Road	24.17
Route 518	29.88
Canal Rd./Suydam Rd Lot	35.27 (0.04 miles below intake)
10 Mile Lock	41.84 (above NJAW intake)
Landing Lane Bridge	49.61 (.25 miles above intakes)

Benchtop simulations

- Canal water with fluridone
- Simulated each treatment plant process
- Samples collected and analyzed for fluridone concentration
- Carbon very effective at removing fluridone

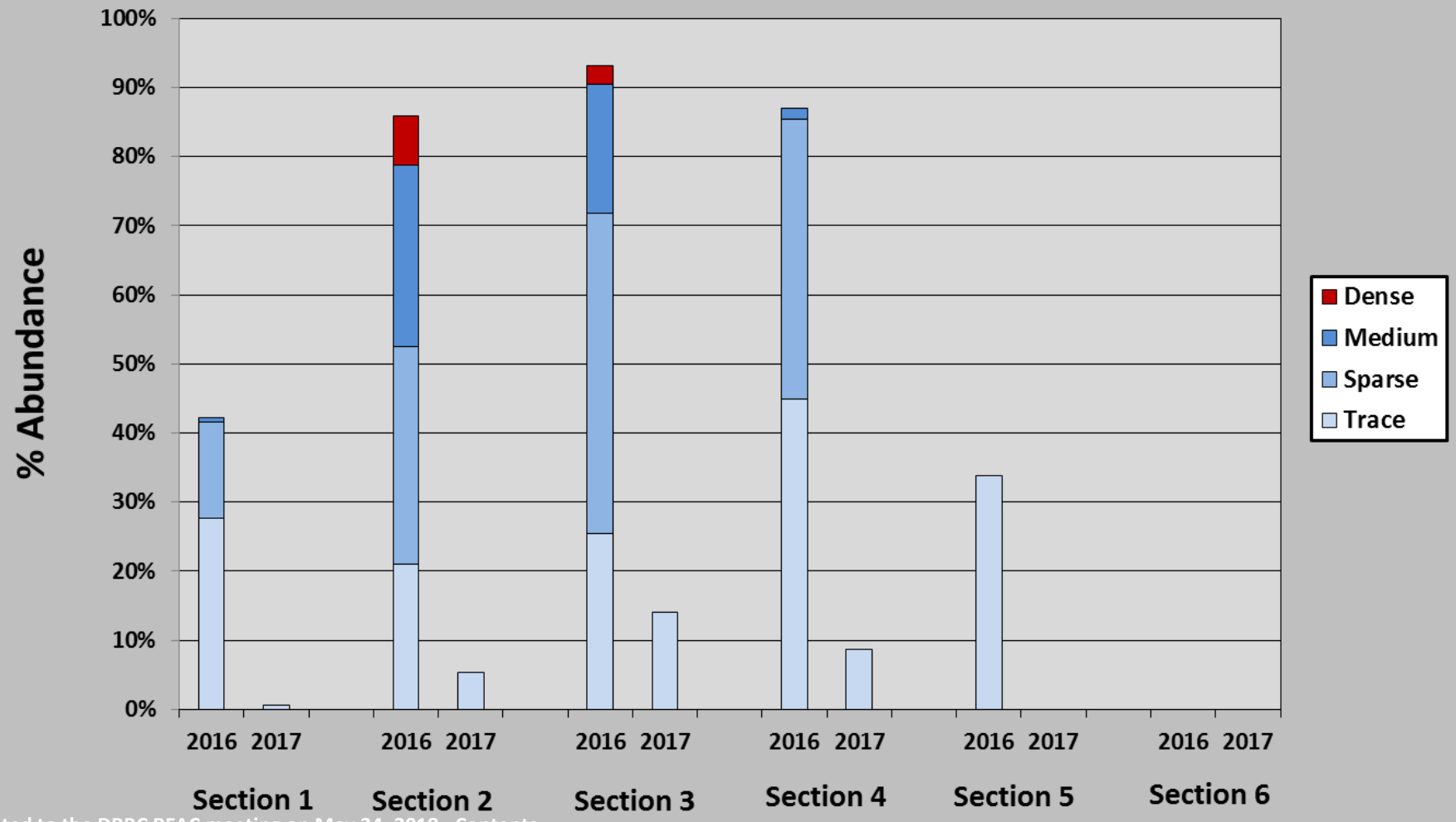


2017-2019 monitoring efforts

- **2017** – Complete submerged aquatic plant (SAV) survey of D&R Canal (40 miles)
- **2017-2019** – Annual SAV survey of management zone
- **2017-2019** – Annual tuber sampling
- **2017-2019** – Herbicide concentration monitoring

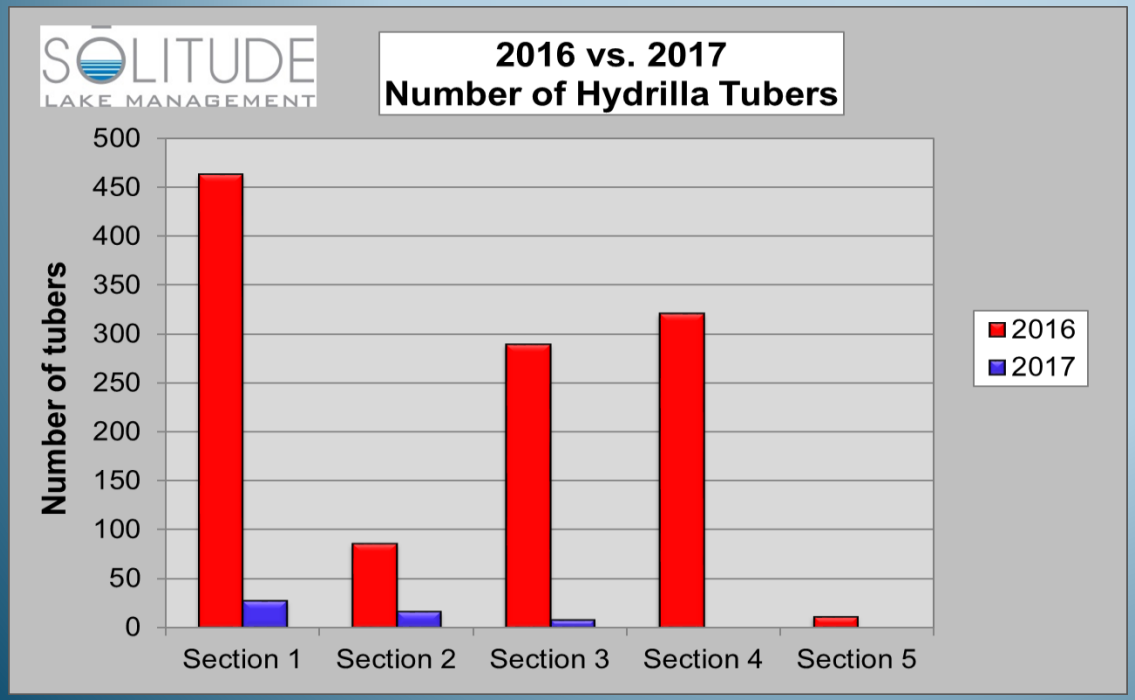
Hydrilla (*Hydrilla verticillata*)

2016 vs 2017 Percent Abundance by Section
D&R Canal



Tuber monitoring – 2016 vs. 2017

Tuber Sampling Stations	2016 (tubers/ m^2)	2017 (tubers/ m^2)	% Change
DR-1	462.8	26.5	94.27
DR-2	85.6	15.2	82.24
DR-3	288.9	7.6	97.36
DR-4	320.4	0	100.00
DR-5	10.7	0	100.00



Hydrilla at Scudders Falls

September 8, 2016

September 8, 2017

How you can help

- **Check, Clean, Dry** all equipment before leaving a waterway
- **Educate** others on aquatic invasive species and their impacts
- **Report** sightings of hydrilla and other AIS

Questions?

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www.njwsa.org/hydrilla