

Sunrise Lake Milfoil Control

AMY P. SMAGULA

**LIMNOLOGIST/EXOTIC SPECIES PROGRAM
COORDINATOR**

NH DEPARTMENT OF ENVIRONMENTAL SERVICES

Overview



- Status of infestations in NH
- Exotic Species Program
- Milfoil in Sunrise Lake
- Management History
- 2019 Recommended Actions

Aquatic Invasive Species (AIS) Infestation in New Hampshire

Legend

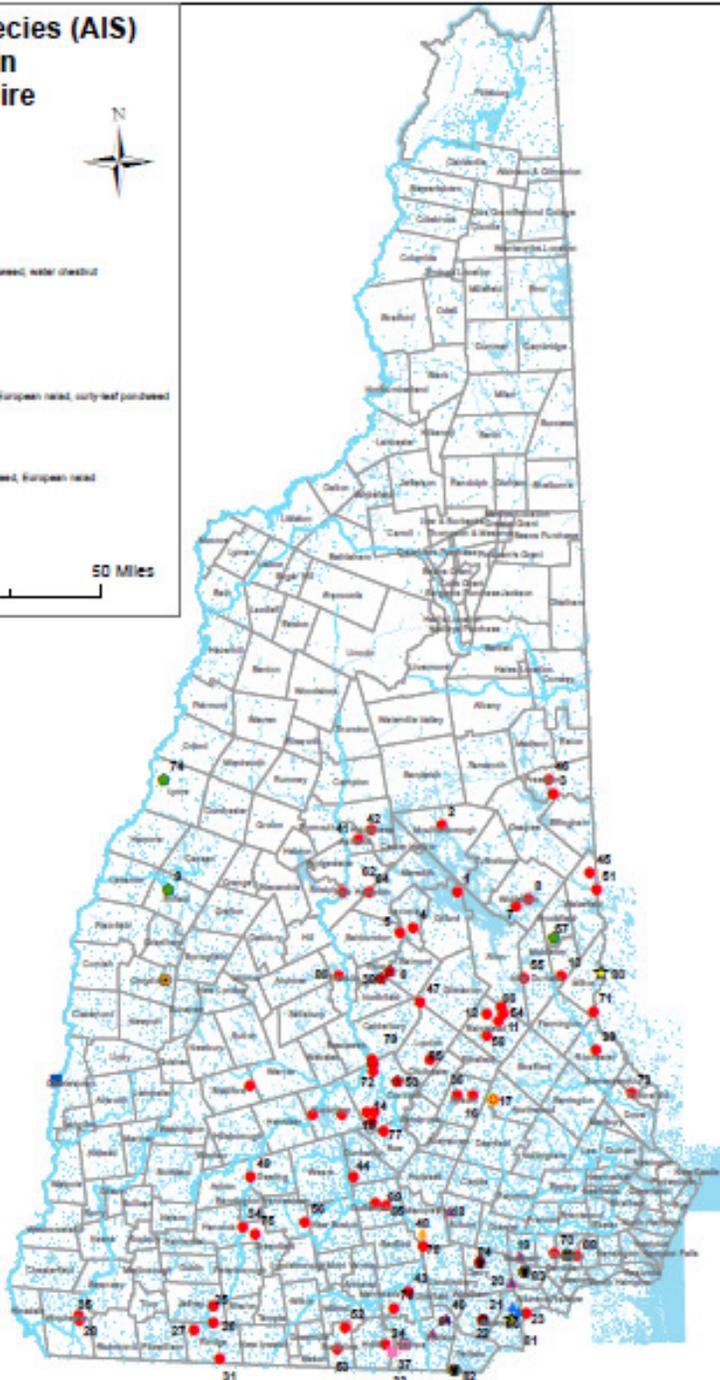
AIS Infestations

Type

- Asian clam
- Brazilian elodea
- Curly-leaf pondweed
- Eurasian naitid
- Eurasian naitid, European naitid, Clitello, curly-leaf pondweed, water chestnut
- ★ European naitid
- ▲ Fanwort
- Variable naitid
- Variable naitid, Asian clam
- Variable naitid, Curly-leaf pondweed
- Variable naitid, Eurasian naitid, fanwort, water chestnut, European naitid, curly-leaf pondweed
- Variable naitid, European naitid
- Variable naitid, curly-leaf pondweed
- Variable naitid, fanwort
- Variable naitid, fanwort, Eurasian naitid, curly-leaf pondweed, European naitid
- Town_Boundaries_polygons
- NH_Hydrography_polygons
- State_Boundary



0 12.5 25 50 Miles



Map prepared by NH DES
Exotic Species Program
Updated February 2019

Numbers correspond to separate
key which lists waterbody
name and town.

Status of Infestations

- 70+ variable milfoil infestations
- 5 Eurasian water milfoil infestations
- 9 fanwort infestations
- 2 water chestnut infestations
- 1 Brazilian elodea infestation
- 8 water naiad infestations
- 3 curly-leaf pondweed infestations
- 6 Asian clam infestations
- >80 Chinese mystern snail infestations

Invasive Species Mantra



- Prevention
- Early Detection
- Rapid Response
- Management

Prevention



- Lake Host Program
- Signs at all public access sites
- Information/pamphlets at kiosks
- New Clean, Drain, Dry card coming soon
- Newsletters/newspapers/town mailings, etc.

Early Detection and Survey Work



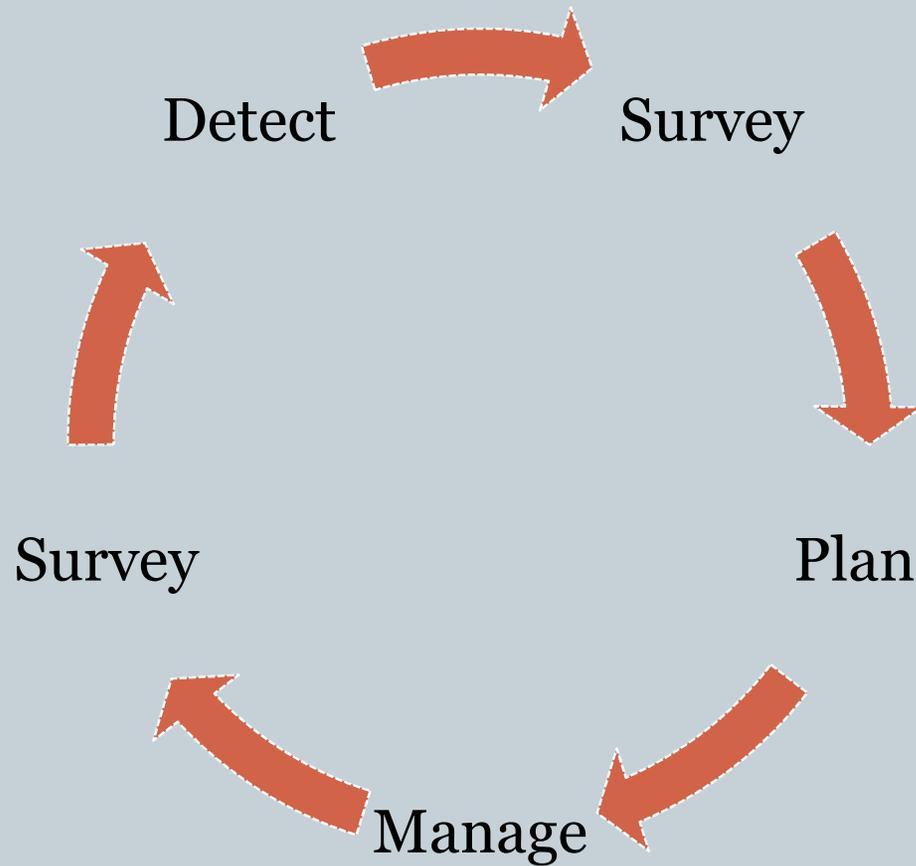
- Early detection with the Weed Watcher Program
- Survey Work
- Survey Methods
 - Invasive Aquatic Plants
 - ✦ Boat survey and GPS
 - ✦ Diver and GPS
 - Invasive Aquatic Animals
 - ✦ Visual
 - ✦ Sediment sample sieving
 - ✦ Vegetation/dock/hard surface surveys

Management Options



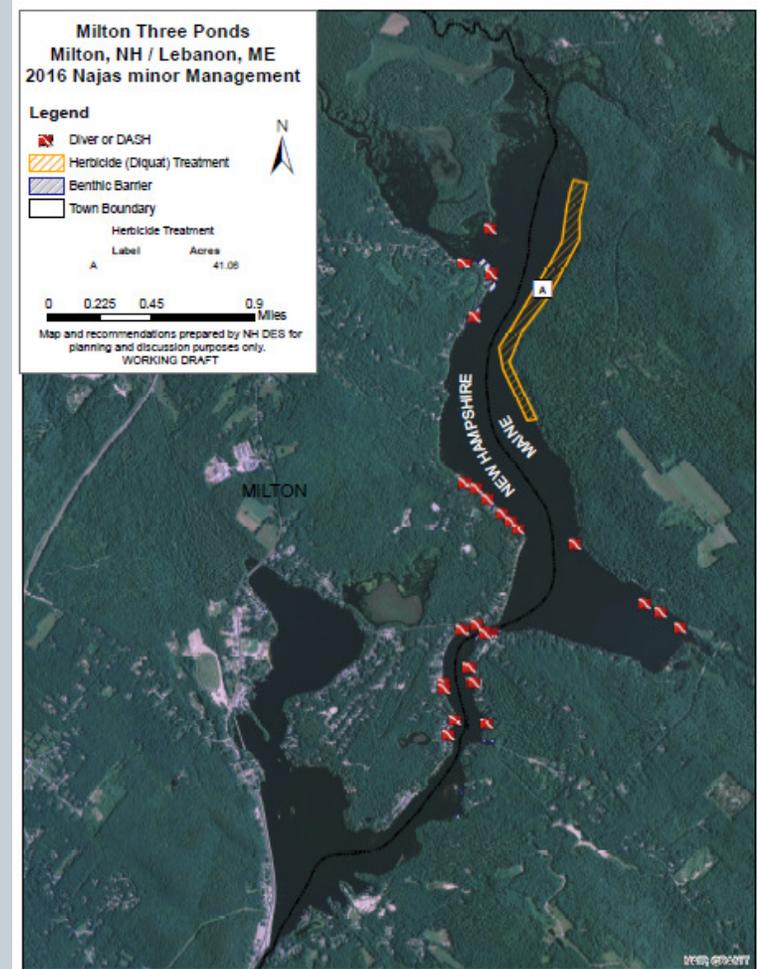
- **Physical control**
 - Hand removal
 - Diver-Assisted Suction Harvesting (DASH)
 - Drawdown
- **Mechanical control**
 - Dredging
 - Hydro-raking
 - Mowing/harvesting
- **Biological control**
 - Using an introduced species to control the milfoil (insect, fish, etc)
- **Chemical control**
 - Aquatic herbicide

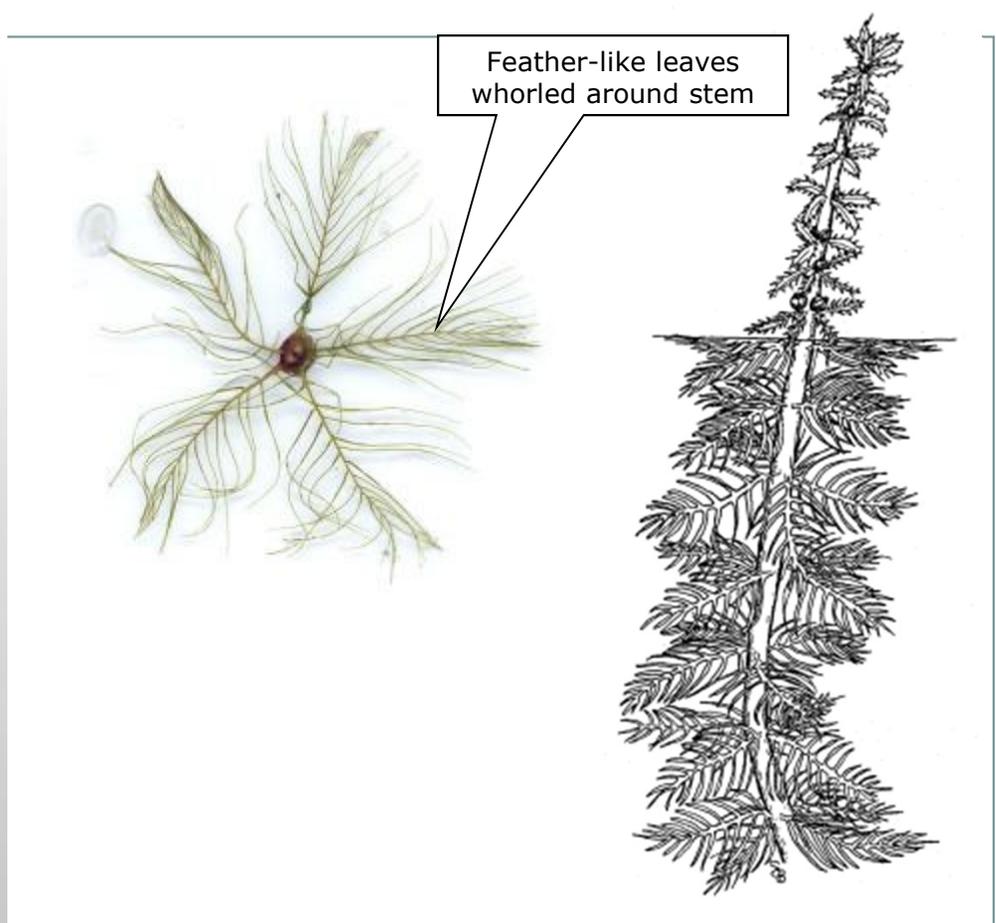
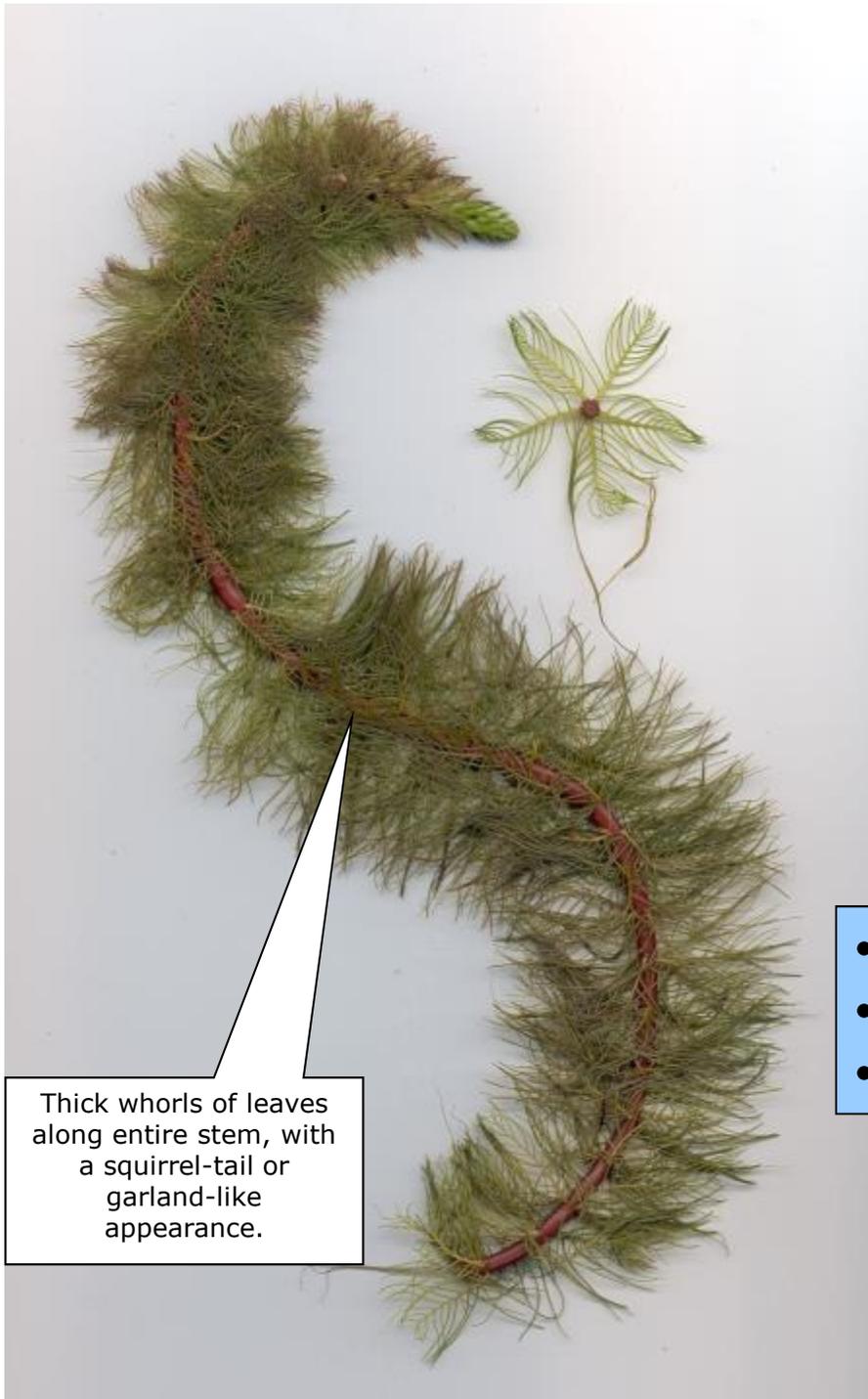
The Path of Management



Elements of a Management Program

- Management must be planned, timely, feasible and not worse than the problem
- **Integrated Pest Management Strategies** should be employed
- Emphasis on “adaptive management”
 - Dealing with an invasive species that is adaptable
 - The best laid plans don't always work due to too many variables working with natural systems that are infested/invaded





- Variable milfoil- *Myriophyllum heterophyllum*
- Native to southern and central U.S., not to NH
- In over seventy waterbodies in NH

Variable milfoil ID tips

An underwater photograph showing a dense thicket of milfoil plants. The plants have long, thin, feathery stems that branch out. A central stem is highlighted with a callout box. The callout box is orange with a white border and contains text. The background is dark blue, suggesting an underwater environment.

Think of a “squirrel’s tail” when you look at the stems of growth. You will often see the stem and then the fluffy tubular growth around it. There may be a single stem, or a few in a clump.

Variable milfoil ID tips

The plants often have bright green tips, or whole stems



Variable milfoil ID tips

Scattered single stems and small clumps, indicative of a spreading population.



Don't be fooled by native bladderwort!



Large bladderwort
Utricularia vulgaris



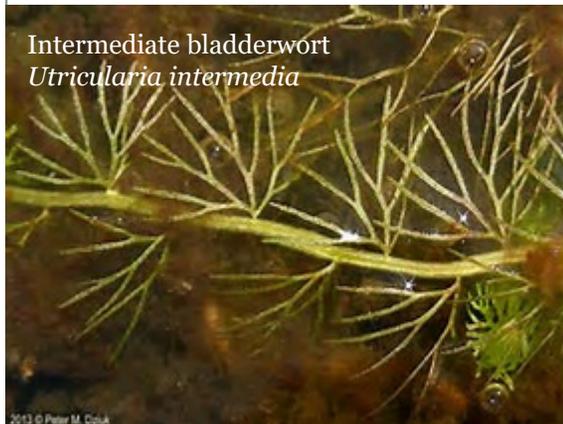
Large bladderwort
Utricularia vulgaris

Bladderwort is a very common native plant, most often confused for variable milfoil.



Intermediate bladderwort
Utricularia intermedia

You have all three of these in Pawtuckaway Lake!



Intermediate bladderwort
Utricularia intermedia

2013 © Peter M. Coluk



Whorled bladderwort
Utricularia purpurea

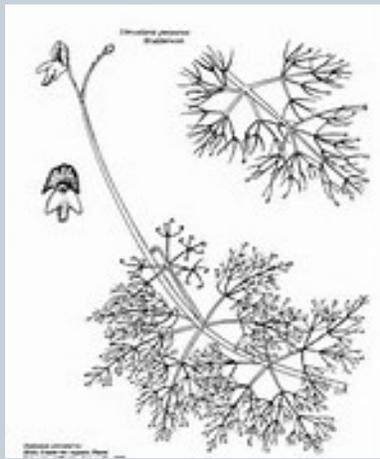
2014 © Peter M. Coluk



Intermediate bladderwort
Utricularia intermedia

To be sure, check the leaves!

- Bladderwort leaves are more branching or forking, and usually have green, black, or clear “bladders” on them. They alternate.
- Milfoil leaves look like a feather and have no bladders (but beware of the algae globs! Variable milfoil leaves are in whorls).
- *When in doubt, collect a voucher for DES.*



Whorled bladderwort leaves can whorl around the stem, but they are branching, not feather-like.



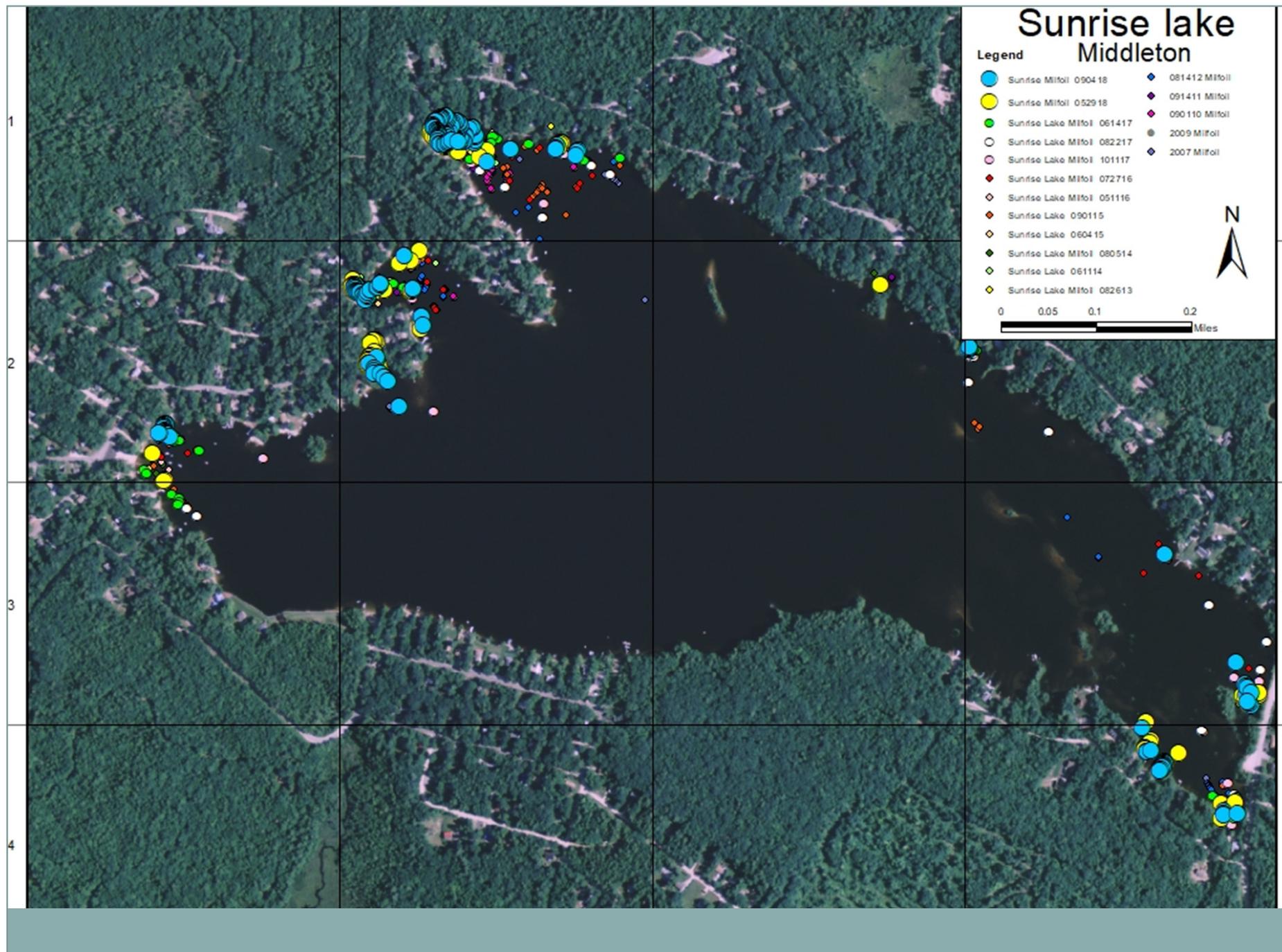
Large bladderwort leaf with black bladders. Notice it appears like a feather, but not a true feather. It is lacy and branching at the tip.



Large bladderwort leaf that lost bladders. Notice it appears like a feather, but not a true feather. It is lacy and branching at the tip.



Intermediate bladderwort leaves are alternate along stem. Bladders are on a separate stem.



Control Actions Over Time in Sunrise Lake



| DATE | ACTION | ACRES | TARGET SPECIES | CONTRACTOR |
|-----------------------|-----------------------|----------------------------------------------------------|------------------|----------------------------|
| 10-Jun-98 | 2,4-D | 5 | VARIABLE MILFOIL | AQUATIC CONTROL TECHNOLOGY |
| 11-Jun-01 | 2,4-D (G) | 5.2 | VARIABLE MILFOIL | LYCOTT |
| 10-Jun-02 | 2,4-D | 2.5 | VARIABLE MILFOIL | LYCOTT |
| 10-Jun-04 | DIQUAT | 10 | VARIABLE MILFOIL | LYCOTT |
| 05-Jun-06 | 2,4-D | 13 | VARIABLE MILFOIL | AQUATIC CONTROL TECHNOLOGY |
| 17-Jun-08 | 2,4-D | 12.5 | VARIABLE MILFOIL | LYCOTT |
| July/Aug 09 | DIVER HAND CONTROL | SPOTS | VARIABLE MILFOIL | DES |
| July/Aug 10 | DIVER HAND CONTROL | SPOTS | VARIABLE MILFOIL | DES |
| SUMMER 2011 | DASH | | VARIABLE MILFOIL | NEW ENGLAND MILFOIL |
| 13-Jun-12 | 2,4-D (G) | 2.9 | VARIABLE MILFOIL | AQUATIC CONTROL TECHNOLOGY |
| Aug-12 | DIVING/DASH | 3 DAYS OF DIVING IN COVES AT NORTH AND WEST ENDS OF LAKE | VARIABLE MILFOIL | NEW ENGLAND MILFOIL |
| WEEK ENDING 7/20/13 | DIVER HAND CONTROL | 410 GALLONS REMOVED | VARIABLE MILFOIL | AB AQUATICS |
| 9/28, 10/3, 10/7 2013 | DIVER HAND CONTROL | 540 GALLONS REMOVED | VARIABLE MILFOIL | AB AQUATICS |
| 6/14/2013 | 2,4-D & TRICLOPYR (G) | 18.43 ACRES | VARIABLE MILFOIL | ACT |

| | | | | |
|------------|-----------|----------------------------------------|------------------|---------------------|
| 6/21/2014 | DASH | 8 GALLONS REMOVED | VARIABLE MILFOIL | AB AQUATICS |
| 9/1/2014 | DASH | 165 GALLONS REMOVED | VARIABLE MILFOIL | AB AQUATICS |
| 9/7/2014 | HAND PULL | 1 GALLON - NE COVE LAUNCH AREA | VARIABLE MILFOIL | AB AQUATICS |
| 9/7/2014 | ABA DASH | 9 GALLONS- SE COVE LAUNCH AREA | VARIABLE MILFOIL | AB AQUATICS |
| 9/7/2014 | ABA DASH | 75 GALLONS - SW COVE LAUNCH AREA | VARIABLE MILFOIL | AB AQUATICS |
| 9/13/2014 | ABA DASH | 180 GALLONS - SW COVE LAUNCH AREA | VARIABLE MILFOIL | AB AQUATICS |
| 10/19/2014 | ABA DASH | 85 GALLONS -COVE W OF N COVE | VARIABLE MILFOIL | AB AQUATICS |
| 10/20/2014 | ABA DASH | 110 GALLONS-COVE W OF N COVE | VARIABLE MILFOIL | AB AQUATICS |
| 10/21/2014 | ABA DASH | 30 GALLONS- COVE W OF N COVE | VARIABLE MILFOIL | AB AQUATICS |
| 10/21/2014 | ABA DASH | 90 GALLONS- W COVE | VARIABLE MILFOIL | AB AQUATICS |
| 10/22/2014 | HAND PULL | 5 GALLONS-W COVE | VARIABLE MILFOIL | AB AQUATICS |
| 10/22/2014 | HAND PULL | 1 GALLON-SMALLEST COVE ON NW SHORELINE | VARIABLE MILFOIL | AB AQUATICS |
| 10/22/2014 | HAND PULL | 10 GALLONS-NORTH COVE | VARIABLE MILFOIL | AB AQUATICS |
| 7/27/2015 | DASH | 250 GAL | VARIABLE MILFOIL | NEW ENGLAND MILFOIL |
| 7/28/2015 | DASH | 320 GAL | VARIABLE MILFOIL | NEW ENGLAND MILFOIL |
| 7/29/2015 | DASH | 100 GAL | VARIABLE MILFOIL | NEW ENGLAND MILFOIL |
| 5/17/2016 | DASH | 40 GALLONS - NW COVE | VARIABLE MILFOIL | AQUALOGIC |
| 5/18/2016 | DASH | 40 GALLONS | VARIABLE MILFOIL | AQUALOGIC |
| 5/19/2016 | DASH | 30 GALLONS- W COVES | VARIABLE MILFOIL | AQUALOGIC |
| 8/12/2016 | DASH | 100 GALLONS - SW COVE | VARIABLE MILFOIL | AQUALOGIC |
| 8/13/2016 | DASH | 80 GALLONS - NW COVE | VARIABLE MILFOIL | AQUALOGIC |
| 8/15/2016 | DASH | 40 GALLONS - NE SHORES | VARIABLE MILFOIL | AQUALOGIC |

| | | | | |
|------------|-----------|-------------------------------------------------------------|------------------|-----------|
| 8/15/2017 | DASH | 75 GALLONS - NORTHERN SHORES | VARIABLE MILFOIL | AQUALOGIC |
| 8/16/2017 | DASH | 135 GALLONS - SOUTHERN AND WESTERN COVES | VARIABLE MILFOIL | AQUALOGIC |
| 8/17/2017 | DASH | 90 GALLONS - BOAT LAUNCH | VARIABLE MILFOIL | AQUALOGIC |
| 8/18/2017 | DASH | 75 GALLONS - SOUTH COVE OF THE BOAT LAUNCH | VARIABLE MILFOIL | AQUALOGIC |
| 8/21/2017 | DASH | 210 GALLONS - BETWEEN THE MIDDLE AND WESTERN COVES | VARIABLE MILFOIL | AQUALOGIC |
| 8/22/2017 | DASH | 240 GALLONS - MIDDLE COVE AND NORTH COVE ON THE WEST SIDE | VARIABLE MILFOIL | AQUALOGIC |
| 10/6/2017 | DASH | 60 GALLONS - NORTHERN COVE ON THE WESTERN SIDE | VARIABLE MILFOIL | AQUALOGIC |
| 10/9/2017 | DASH | 60 GALLONS - NORTHERN COVE ON THE WESTERN SIDE | VARIABLE MILFOIL | AQUALOGIC |
| 10/11/2017 | DASH | 135 GALLONS - NORTHERN COVE | VARIABLE MILFOIL | AQUALOGIC |
| 6/27/2018 | HAND PULL | 20 GALLONS-COVE BY PUBLIC LAUNCH/BEACH | VARIABLE MILFOIL | AQUALOGIC |
| 6/29/2018 | DASH | 80 GALLONS-AROUND 60 AUCLAIR RD | VARIABLE MILFOIL | AQUALOGIC |
| 7/2/2018 | DASH | 40 GALLONS-AROUND 60 AUCLAIR RD AND NEARBY COVE | VARIABLE MILFOIL | AQUALOGIC |
| 7/3/2018 | DASH | 40 GALLONS-BEACH AREA AND MIDDLE COVE | VARIABLE MILFOIL | AQUALOGIC |
| 7/5/2018 | DASH | 130 GALLONS-MIDDLE COVE AND COVE BY HAMPSHIRE SHORES LAUNCH | VARIABLE MILFOIL | AQUALOGIC |
| 7/6/2018 | DASH | 120 gallons-COVE BY THE LAUNCH | VARIABLE MILFOIL | AQUALOGIC |
| 7/10/2018 | DASH | 20 gallons-check east coves | VARIABLE MILFOIL | AQUALOGIC |
| 7/11/2018 | DASH | 40 gallons-northwest cove | VARIABLE MILFOIL | AQUALOGIC |
| 7/13/2018 | DASH | 100 gallons-north shore, new patch | VARIABLE MILFOIL | AQUALOGIC |
| 7/18/2018 | DASH | 20 gallons-check beach and west coves | VARIABLE MILFOIL | AQUALOGIC |
| 7/19/2018 | DASH | 20 gallons-check north shore and beach | VARIABLE MILFOIL | AQUALOGIC |

PROCELLACOR



- New novel aquatic herbicide manufactured by SePRO Corporation, major industry leader in product design for aquatic systems
- Not yet registered for use in aquatic systems (new herbicide going through EPA review and registration process, available in summer 2017)
- Can be applied at doses that are orders of magnitude lower to achieve effective dose
- Very clean toxicity
- Mode of action is partially a growth enhancer/stimulator, partially internal toxicity to plant

Initial Summary- Chemistry

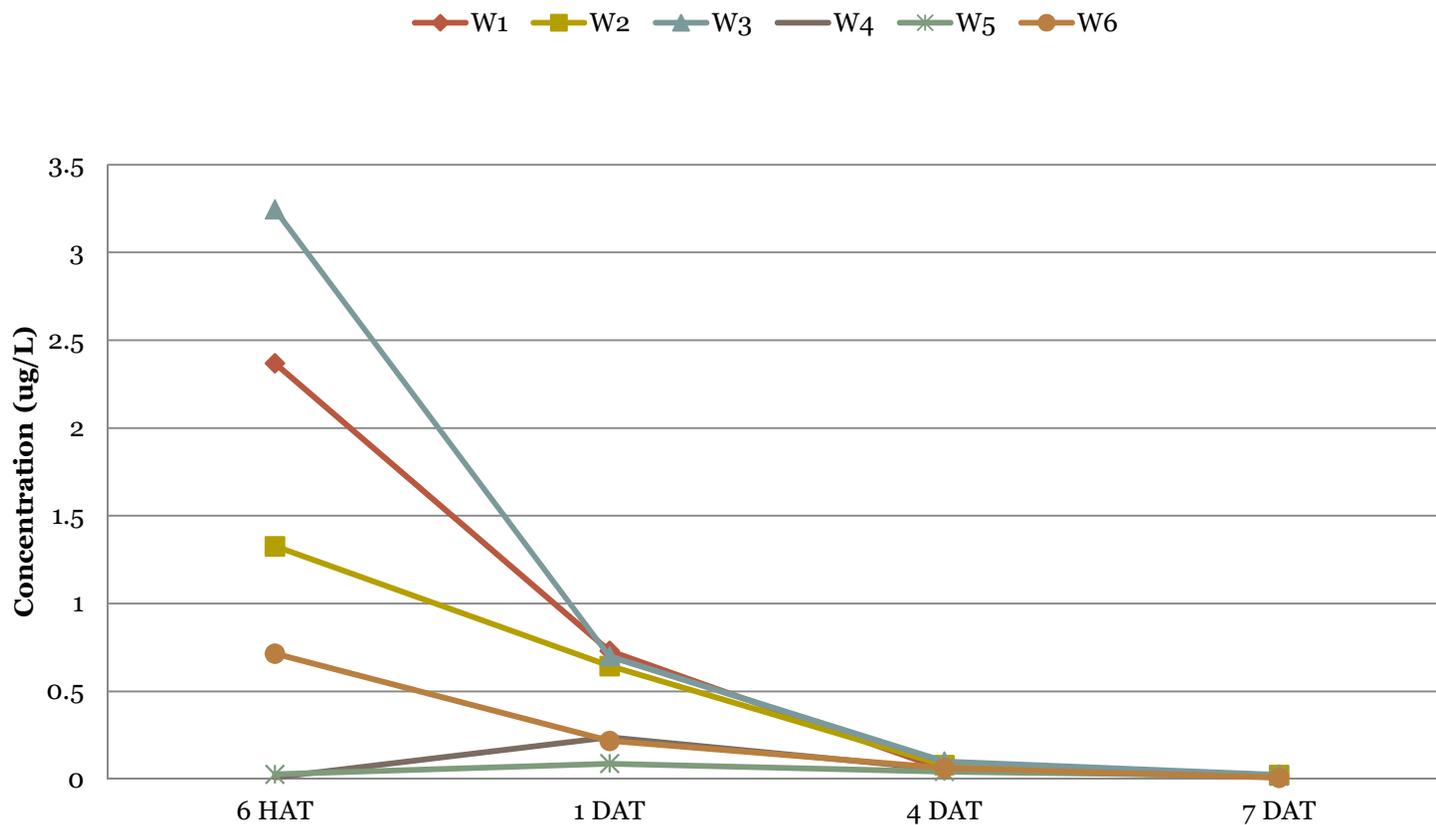


- ✓ Herbicide concentration declines rapidly post treatment, below use restriction threshold by 4 DAT
- ✓ No observed fish kills, insect kills, impacts to frogs/etc at the treatment site from direct toxicity
- ✓ Dissolved oxygen concentrations actually went up over the study period as plant density was reduced

ProcellaCOR Concentrations at a NH Study Site Following Treatment



Concentration of Active Ingredient Over Time



Sunrise Lake

Middleton



Legend

 Sunrise Lake 2019 Potential Treatment Areas_ 11.3 ACRES

0 0.075 0.15 0.3
 Miles

2019 HERBICIDE TREATMENT BID NOTE

PLEASE PROVIDE A BID FOR PERFORMING AN HERBICIDE TREATMENT IN 2019 AS OUTLINED BELOW:

TARGET SPECIES: VARIABLE MILFOIL
TREATMENT ACRES: UP TO 11.3 ACRES
PRODUCT: PROCELLACOR
MEAN DEPTH OF TREATMENT AREAS: 5 FEET
TREATMENT DETAIL: EARLY JUNE OR EARLY SEPTEMBER

TREATMENT AREAS MAY BE SMALLER THAN THE FOOTPRINT SHOWN, AND WILL BE FINALIZED BASED ON FIELD SURVEYS PRIOR TO TREATMENT. NOTE THAT BOTH KNOWN AND POTENTIAL TREATMENT AREAS MAY BE DELINEATED ON THIS MAP.

PLEASE PROVIDE PRODUCT OPTIONS AND APPLICATION RATES THAT YOU DEEM APPROPRIATE FOR THIS SITE, AS WELL AS A LINE-ITEM BUDGET SHOWING PROJECTED COSTS.

BIDS ARE DUE AT NHDES, CARE OF AMY SMAGULA AT AMY.SMAGULA@DES.NH.GOV BY FRIDAY NOVEMBER 9, 2018.



MAP GRANT

Sunrise Lake Middleton



Legend

- Sunrise Milfoil_052918
- Sunrise Milfoil_090418

0 0.075 0.15 0.3
Miles



2019 DIVER AND DASH BID NOTE

PLEASE PROVIDE A BID FOR PERFORMING DIVER AND/OR DIVER-ASSISTED SUCTION HARVESTING AS OUTLINED BELOW:

TARGET SPECIES: VARIABLE MILFOIL
TOTAL NUMBER OF DAYS: UP TO 10 DAYS
BREAKDOWN OF DAYS: PLEASE FACTOR IN A DAY OR TWO OF DIVE TIME EACH MONTH FROM MAY THROUGH SEPTEMBER, WITH EARLY SEASON WORK TO TARGET AREAS OF DENSER GROWTH.

THIS MAP SHOWS AREAS OF GROWTH DOCUMENTED IN 2018. GROWTH FOR 2019 IS INDETERMINATE AT THIS TIME.

DES WILL PROVIDE SHAPEFILES OR OTHER GEOGRAPHIC INFORMATION FOR DIVERS TO USE ON THIS PROJECT. THIS MAP IS INTENDED AS A REFERENCE FOR SITES FOR SPRING DIVING, AND ADDITIONAL SITES MAY BE ADDED AS NEEDED.

IT IS EXPECTED THAT DIVERS WILL BE USING GPS UNITS TO LOCATE WORK SITES WITHIN THE LAKE, FOR ENHANCED ACCURACY.

BIDS ARE DUE AT NHDES, CARE OF AMY SMAGULA AT AMY.SMAGULA@DES.NH.GOV BY FRIDAY NOVEMBER 9, 2018.

10/31/18 09:23:07

2019 Costs



- **Herbicide Cost**
 - Up to 11.3 acres with ProcellaCOR
 - ✦ \$16,182 total
 - ✦ \$4,046 grant award (25%)
- **DASH Cost**
 - 6 days
 - ✦ \$7,650
 - ✦ \$1,912 (25%)

Questions/Discussion



Amy P. Smagula – Amy.Smagula@des.nh.gov