

Rake Toss Aquatic Vegetation Surveys¹

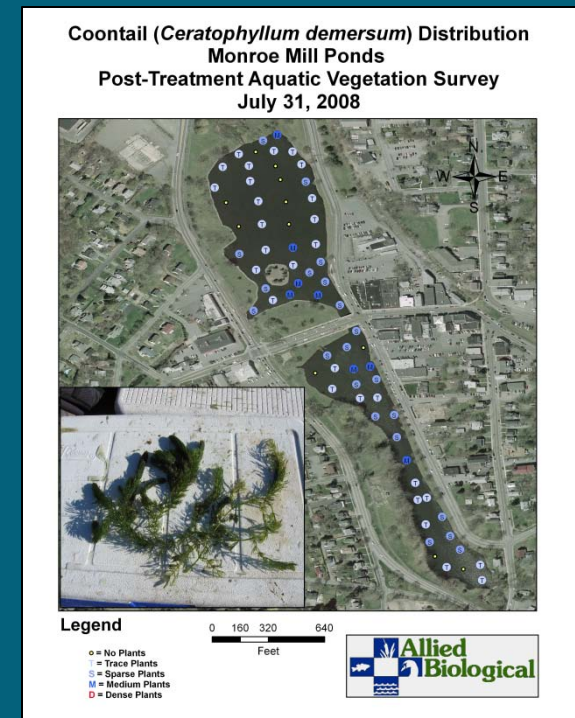
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1. Based on Point Intercept Methods developed by Madsen (ACOE, 1999) and Lord (Cornell, 2006).



Why Conduct a Rake Toss Survey?

- Check the Status of General Lake Ecosystem Health
 - Presence/absence invasive species
 - Increased diversity usually indicates healthy ecosystem
- Track Changes in Plant Community Over Time
- Presence of RTE Species
- Permit Requirements
 - NYDEC Priority Waterbody List
- Before Aquatic Plant Management
 - Determine the best method available
- After Aquatic Plant Management
 - Determine efficacy of methods employed



Equipment Needed



Equipment Needed: The Weed Anchor

- Two standard 13" long garden rakes
- Cut off wooden handles
- Secure back-to-back with hose clamps
- Tape handles together
- Attach 10 meters (approx. 35 feet) of thin rope (5/16") to the rake

Important Notes:

1. Tie the end of the rope securely to the boat! If you don't, see #2, below.
2. Always have a 2nd Weed Anchor on the boat!



Aquatic Plant Densities

Abundance	Code	Field Measure	Biomass (dry weight; g/m ²)
No Plants	“Z”	No plants	0.0000
Trace Plants	“T”	Fingerful (1-2 stems)	0.0001 to 2.000
Sparse Plants	“S”	Handful (3-6 stems)	2.001 to 140.000
Medium Plants	“M”	Rakeful (no tines visible)	140.001 to 230.000
Dense Plants	“D”	Difficult bringing weed mass into boat	230.001 to 450.000+

Submersed Aquatic Plant Density



Trace



Medium



Sparse



Dense

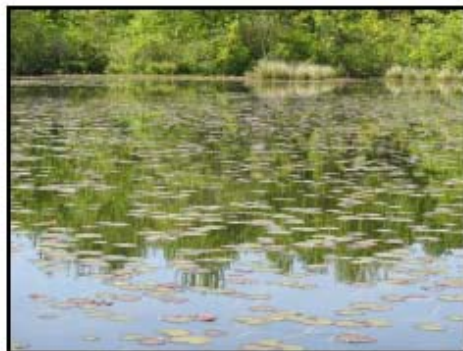
Floating Aquatic Plant Density



Trace



Medium



Sparse



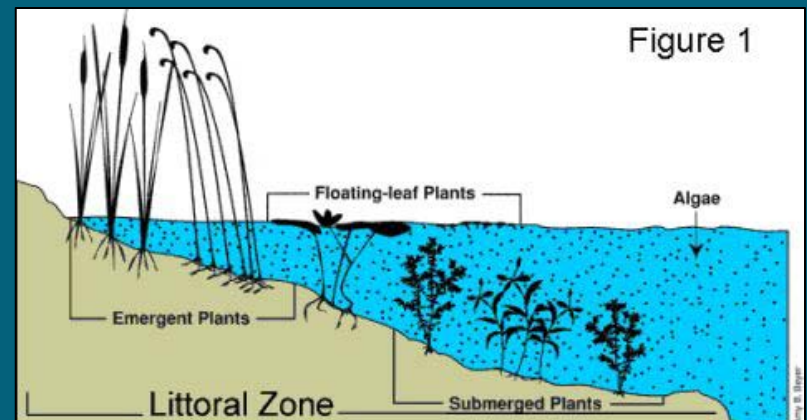
Dense



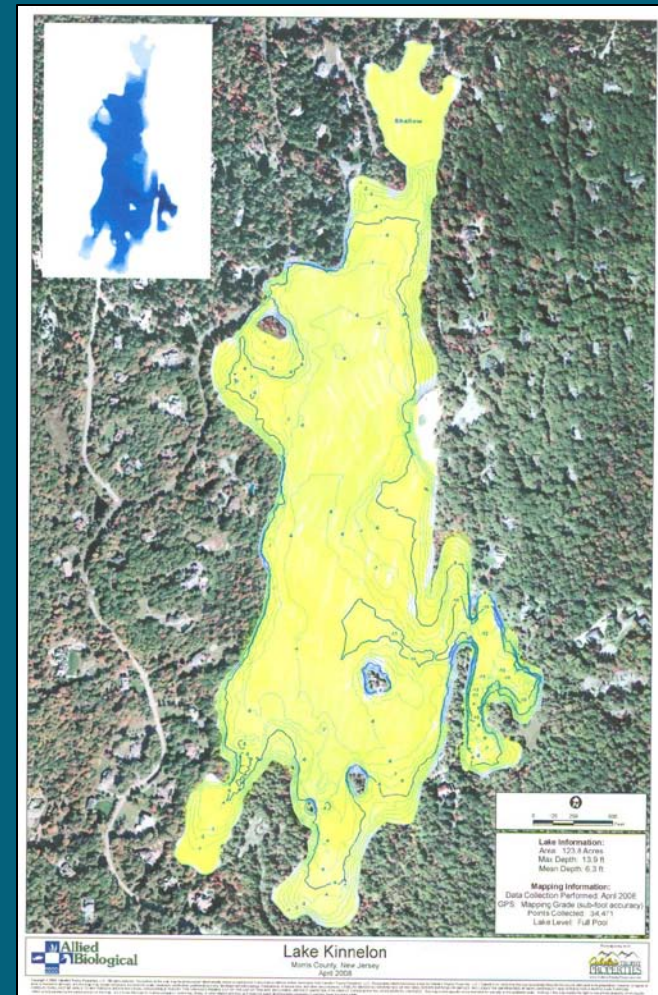
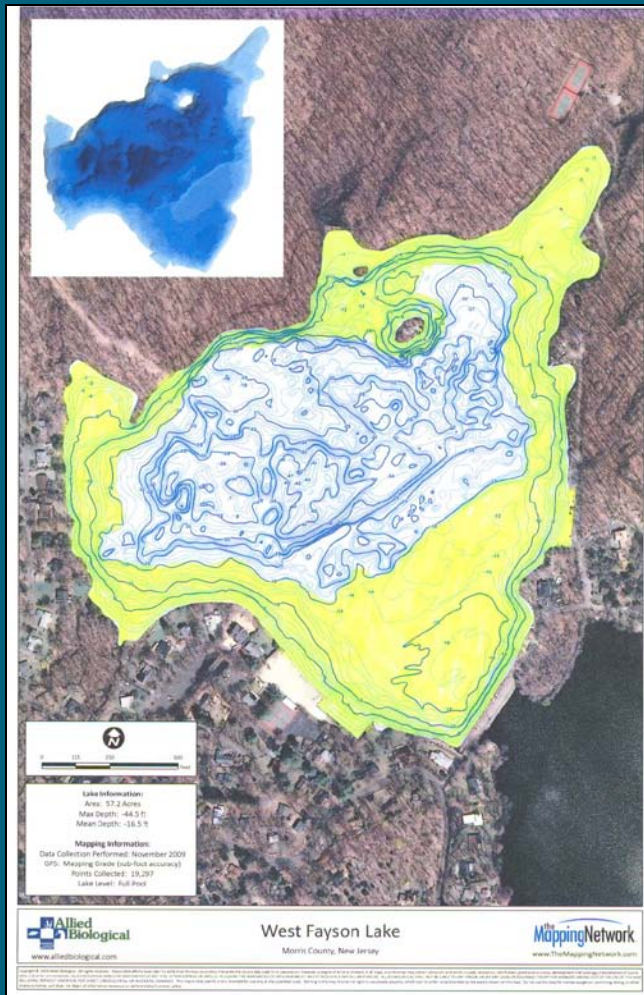
Sample Site Selection

- How Many Sites Should I Survey?
 - Depends on goals of the study
 - Rule of Thumb: 1 site per surface acre
 - NYDEC: 1 site per hectare (~2.2 acre) littoral zone.
 - If looking for invasive or RTE species, survey more sites (or throw 2-3 anchors per site).
 - If controlling plants, 50% to 75% of sites should be in treatment area (for spot treatments).
 - Focus on littoral zone
 - Depth of light penetration

In general, the more sites sampled, the more accurate the survey

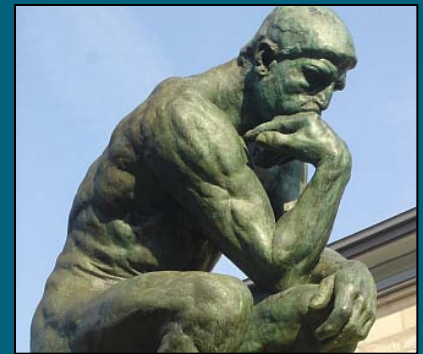


Sample Site Selection: Littoral Zone



To One Toss, or To Two Toss?

- Nope, it's not a dance, or a quote from a literary figure!
- How many rake tosses per site?
 - Again, depends on the goals of the survey.
 - One rake toss is fine in most circumstances, but...
 - Scientifically, two or three tosses is better.
 - However, adding rake tosses per site:
 - Increases the labor in the field
 - Tends to decrease the overall abundance calculations (see example)
 - Yet, increases the chance to discover smaller and/or less common plants
 - Use additional tosses when looking for invasive species and/or RTE species



Multiple Rake Toss Calculations

- Assign an Abundance Number to each density
 - No plants =0, Trace=1, Sparse=2, Medium=3, Dense=4
- To determine the plant density at a given site, sum and calculate the mean of the Abundance Numbers.
- Examples:

Rake Toss	Abundance	Abundance #
1	D	4
2	S	2
3	D	4
Mean	M	3.33

Rake Toss	Abundance	Abundance #
1	D	4
2	T	1
3	T	1
Mean	S	2.0

Rake Toss Plant Survey Techniques

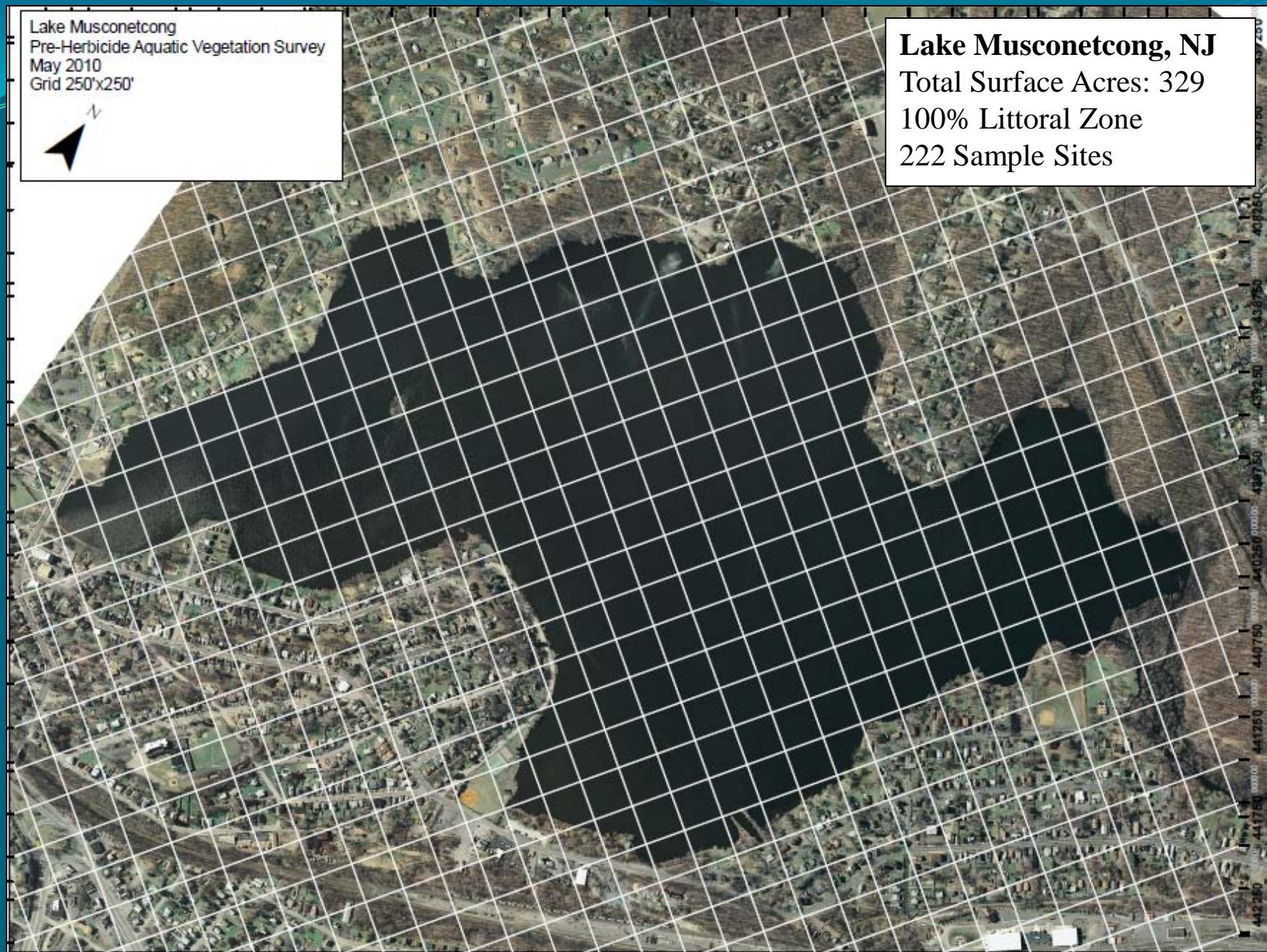
- **Before the survey:**

- Review historical information about the plant community
 - But beware of Bob! Have an open mind. Review Plants
 - Review water quality data
- Review bathymetry of the lake
 - Where is the littoral zone?
- Determine the number of sample locations
 - Depends on surface acreage, littoral zone, project goals
 - Plot sample points on a map (grid overlay)
- Determine the number of rake tosses per site
 - Don't alter after the survey begins
- Set up data logs/pack equipment

Lake Musconetcong
Pre-Herbicide Aquatic Vegetation Survey
May 2010
Grid 250'x250'



Lake Musconetcong, NJ
Total Surface Acres: 329
100% Littoral Zone
222 Sample Sites



Rake Toss Plant Survey Techniques

- **During the Survey:**

- Pilot boat to sample site (use transects)
- Anchor boat
- Log GPS data, water depth, shoreline plants, and notes
- Assign density to floating plants
- Toss Rake (full distance of the rope); let the rake settle on bottom, and slowly retrieve to the boat
 - Assign an overall density to the plant mass
 - Separate the plant mass into different species, and assign each a plant density
 - Archive any plant samples for positive identification
 - Remove all plant debris from work area (to avoid confusion during next site), pull anchor, and pilot to next sample site

Archiving Plant Samples

- Bottle with water (refrigerator)
 - Samples will keep for days to 1-3 weeks at 5°C
- Freezing
 - Place in Ziploc-type bag with little water
 - Will keep for several months, but become brittle
- Preservative
 - Place in sealed glass bottle with water-proof lid
 - Add 10% Formalin to achieve a 5% solution (dangerous solution)
 - Will keep for several years; can lose color
- Pressing
 - Takes practice; plants dried on paper and flattened
 - See procedure in handouts
 - Difficult with fine-leaved samples, but useful for all structures
- Digital Photography



Photographing Aquatic Plants

General Notes:

- Better if photographed indoors
 - More controlled lighting and backgrounds
- Use white or light background
- Close-ups of important identifying characteristics
 - Ex. Seeds, flowers, leaf structures (whorls), roots, stipules
- Label plant (lake name, date collected)



Photographing Aquatic Plants

- For Fine-leaved Plants
 - Ex. Milfoils, fine-leaved pondweeds, fanwort, coontail
 - Place in glass dish with clean water (tap water OK)
 - Use a white background
 - Do not use a flash



Shipping Aquatic Plants

- **General Notes:**

- Include a healthy sample with undamaged leaves
- Flowers and seeds are usually needed to identify to species
- Information on lake name, location, water depth located, abundance in the lake and water chemistry is helpful

- **Best Method** (use for RTE species, or on request)

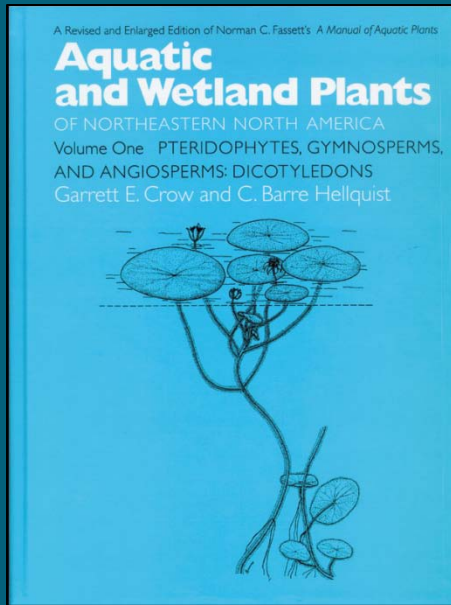
- Put plant sample in a bottle with site water
- Put bottle (tape lid!) in a cooler with blue ice packs
- Ship via overnight carrier

- **Suitable Method** (general use)

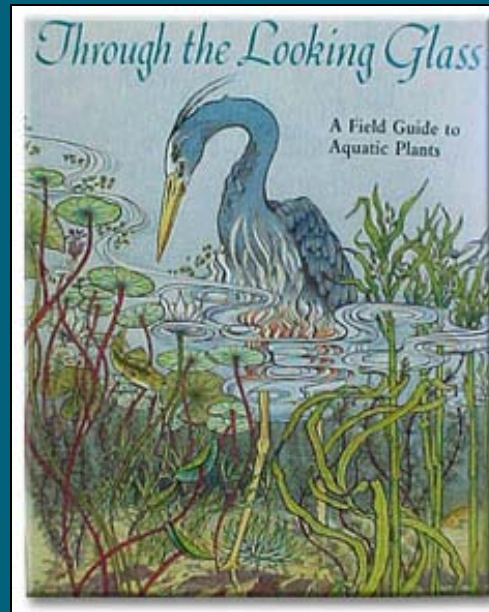
- Put plant sample in ziploc-type bag with moist paper towel
- Double (or triple) bag the sample and place in envelope
- Ship via first class mail
- Sample will last for a few days, but will smell!



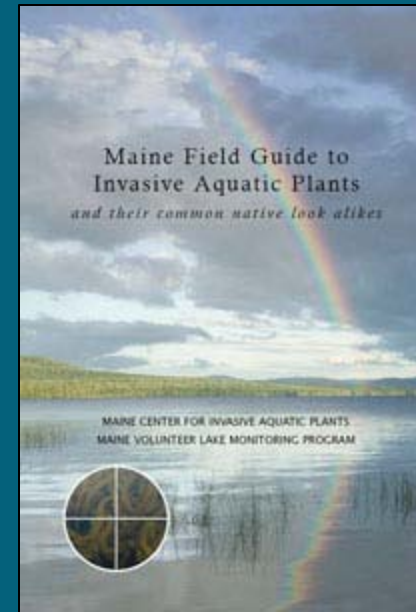
Taxonomic Keys for Aquatic Plants



Volume 1 and 2



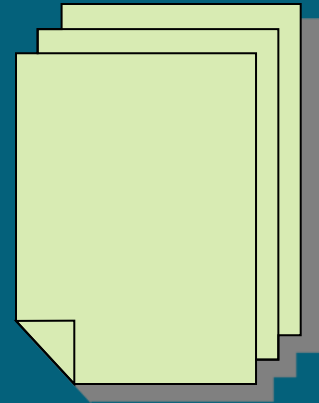
Not a Taxonomic Key,
but excellent resource on
plant ecology



Focuses on Invasive
Species and Look-
alikes

Handouts

- Identification of Plant Parts (one page)
- Potamogeton Cheat Sheets
 - S. Knight, 2005
- Key to the North American Potamogetonaceae
 - Hellquist, 2010
- Collecting/Pressing Aquatic Plants
 - S. Knight, 2005
- FQI Summary Sheet



Thank You!

