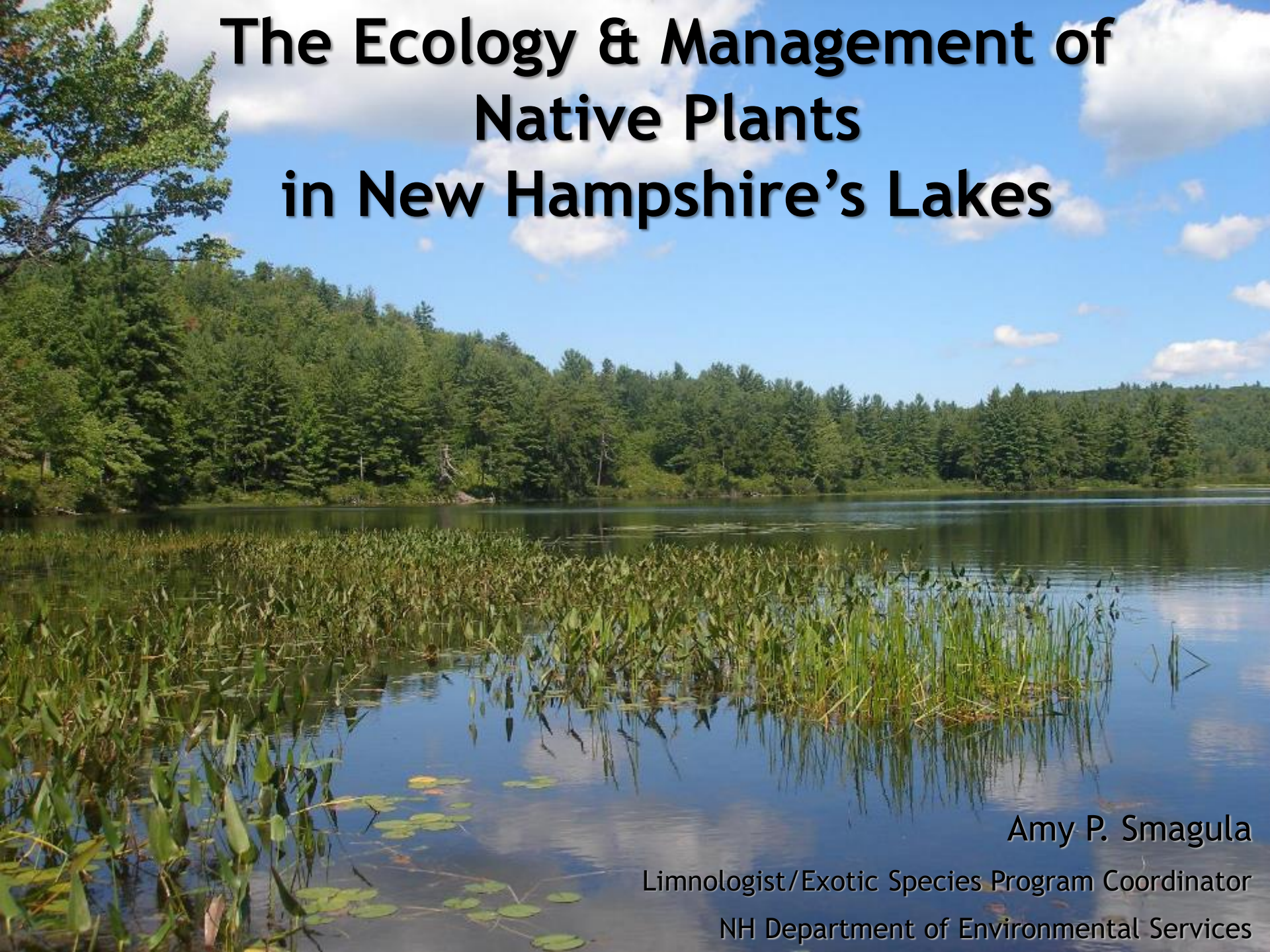
The Ecology & Management of Native Plants in New Hampshire's Lakes



Amy P. Smagula

Limnologist/Exotic Species Program Coordinator

NH Department of Environmental Services

Native vs. Invasive Aquatic Plants

- Native- A species that evolves or develops in one particular geographic area or region, usually marked as being present in an area prior to the advent of European colonization

Native water milfoil

- Invasive- A species that in non-native and that can cause economic and ecological harm, and harm to human health. To watch the webinar on invasive aquatic plants (and animals) in NH, click the link below.

Variable water milfoil (invasive)

https://www.youtube.com/watch?v=oD5xsjpC32Y&feature=youtu.be

On the Agenda

- Functions and values of aquatic plants
- Rare, threatened and endangered aquatic plants
- Lake basin and lake aging influences on plant growth
- Plant zonation and common plants by zone*
- To manage or not to manage native plants
- Management options and costs of management

- *This webinar is not intended as a full plant ID/taxonomy lesson, just an overview of the basics. References are provided at the end for further plant ID keys, etc.

Aquatic Plants Provide:

- Surfaces on which algae grow
- Refuge for zooplankton, fish
- Shade
- Oxygen
- Nutrient uptake/ recycling
- Erosion control
- Food for critters and people too
- Shelter-building materials
- Bottom sediment stabilization
- Aesthetic value
- Macroinvertebrate habitat
- Fibers for weaving and thatching

The “Secret Life” of Plants

- Carnivores
  - Pitcher plant
  - Sundew
  - Bladderwort
- Exploding plants
  - Jewelweed
- Medicinal plants
  - Jewelweed (rash)
  - Bur-reed (snake bite)
  - Hedge-hyssop (gout/stomach)
  - St. John’s wort (mood)
- Smallest flowering plant
  - Watermeal (*Wolffia*)

Pitcher plant

Jewelweed

St. Johns wort

Bladderwort

Wikipedia

Watermeal on fingertips

Tasty Plants!

Cranberry

Watercress

Wild rice

State Endangered Aquatic Plants

horned pondweed (*Zannichellia palustris*)
sago pondweed (*Stuckenia pectinata*)
northern slender pondweed (*Stuckenia filiformis*)
sclerolepis (*Sclerolepis uniflora*)
quill-leaved sagittaria (*Sagittaria teres*)
wapato (*Sagittaria cuneata*)
water-plantain spearwort (*Ranunculus ambigens*)
flatstem pondweed (*Potamogeton zosteriformis*)
Vasey's pondweed (*Potamogeton vaseyi*)
small slender pondweed (*Potamogeton pusillus* ssp. *pusillus*)
white-stem pondweed (*Potamogeton praelongus*)
knotty pondweed (*Potamogeton nodosus*)
leafy pondweed (*Potamogeton foliosus*)
thin-leaved alpine pondweed (*Potamogeton alpinus*)
tiny cowlily (*Nuphar microphylla*)
water marigold (*Bidens beckii*)
pale duckweed (*Lemna valdiviana*)
star duckweed (*Lemna trisulca*)
river bank quillwort (*Isoetes riparia* var. *canadensis*)
large-spored quillwort (*Isoetes lacustris*)
Engelmann's quillwort (*Isoetes engelmannii*)
featherfoil (*Hottonia inflata*)
common mare's tail (*Hippuris vulgaris*)
water stargrass (*Heteranthera dubia*)
sharp-flowered mannagrass (*Glyceria acutiflora*)
pygmy weed (*Crassula aquatica*)

26 State Endangered Aquatic Plant Species

Featherfoil (*Hottonia inflata*)

State Threatened Aquatic Plants

- reversed bladderwort (*Utricularia resupinata*)
- awlwort (*Subularia aquatica* ssp. *americana*)
- large bur-reed (*Sparganium eurycarpum*)
- sessile-fruited arrowhead (*Sagittaria rigida*)
- bluntleaf pondweed (*Potamogeton obtusifolius*)

Reversed bladderwort

NH Natural Heritage Bureau (NHB)

Division of Forests and Lands
Department of Resources and Economic Development

NHB finds, tracks, and facilitates the protection of New Hampshire's rare plants and exemplary natural communities

Mission is mandated by the NH Native Plant Protection Act (1987) RSA 217-A

"…to protect and conserve native plants"

What's Rare in NH?

- To reduce these lists to a subset of species likely to be present in a given town, visit *https://www.nh.gov/nhdfl/documents/town-lists.pdf*

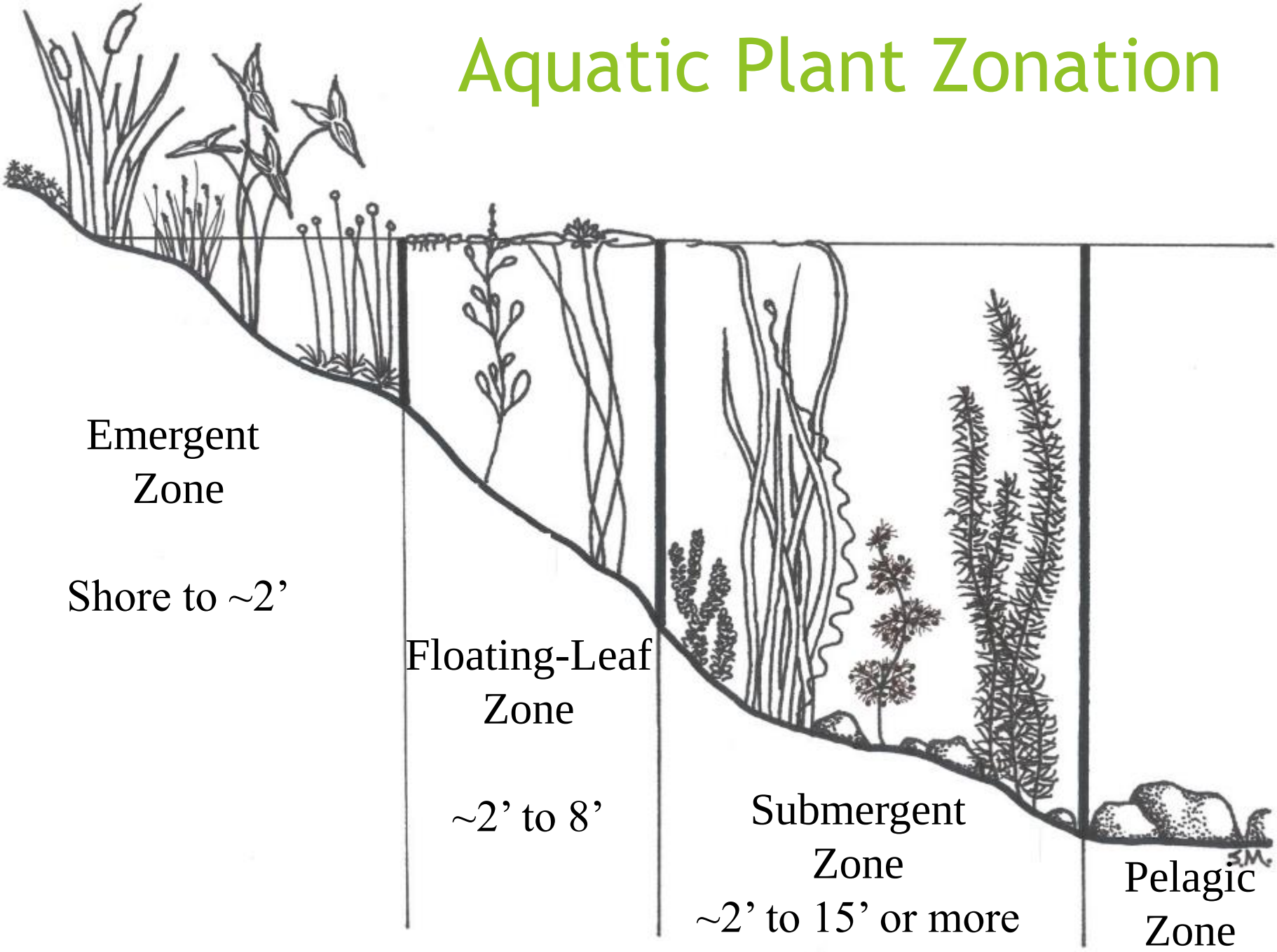
State Endangered: common mare's tail


Why plants grow where they do…

What Plants Need To Grow

- Water
- Nutrients (often derived from the sediments)
- Sunlight
- Substrate to root (if it's a rooting plant)

Aquatic Plant Zonation



Zonation in the lake

Common EMERGENT Plants


Bur-reed


Sedges


Pipewort


Arrowhead


Rushes


Cattails


White water-lily


Floating heart


Watershield

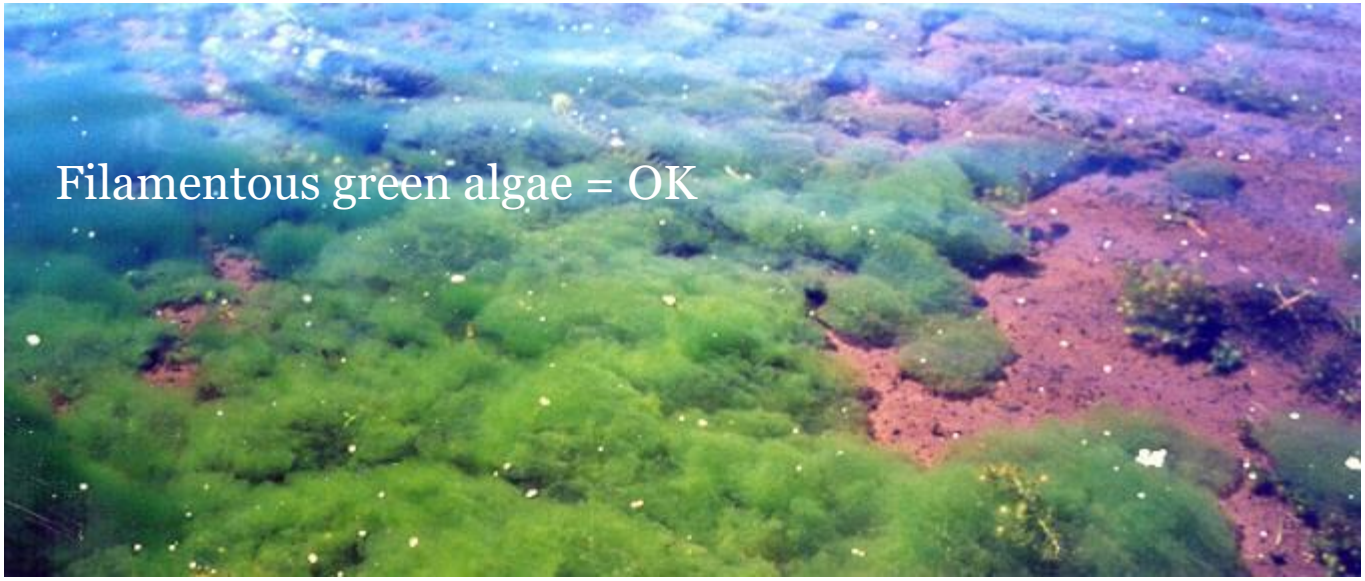
Common FLOATING-LEAVED Plants


Pondweeds
(appearance may vary by species)


Yellow water-lily

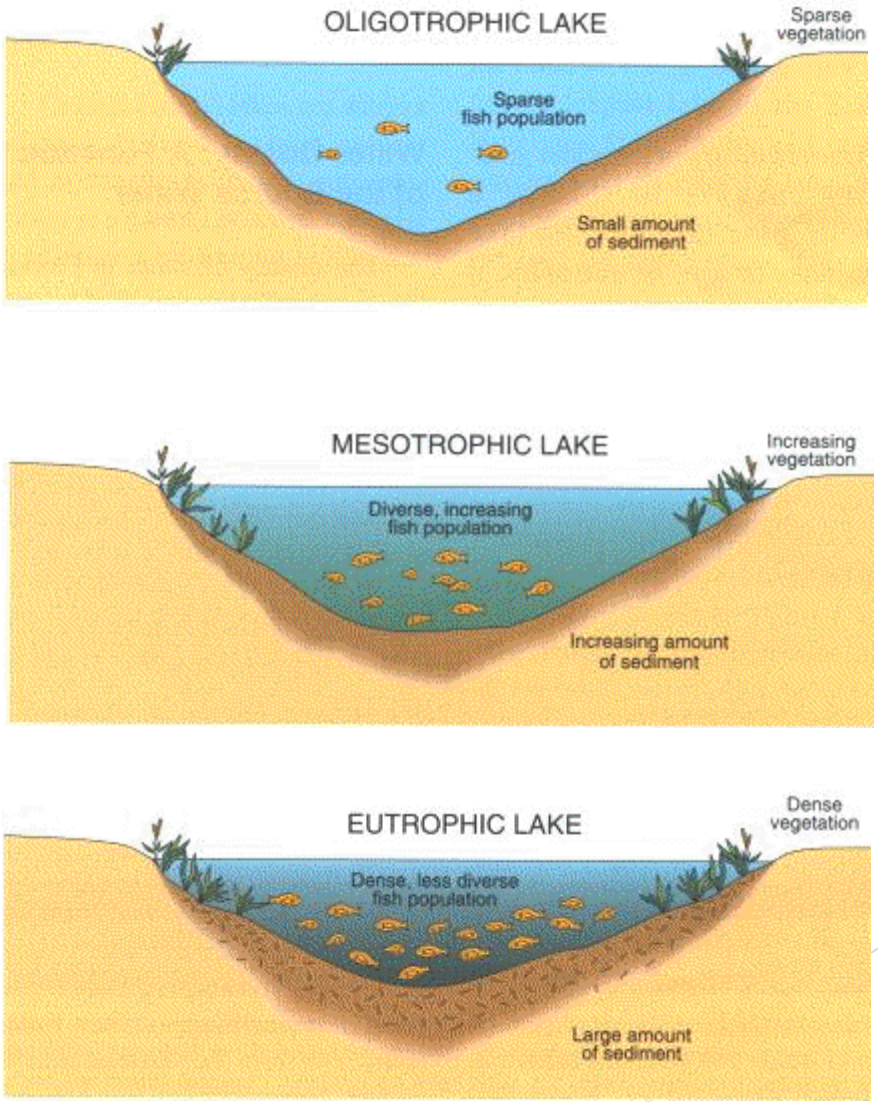
Common SUBMERGENT Plants

Algae

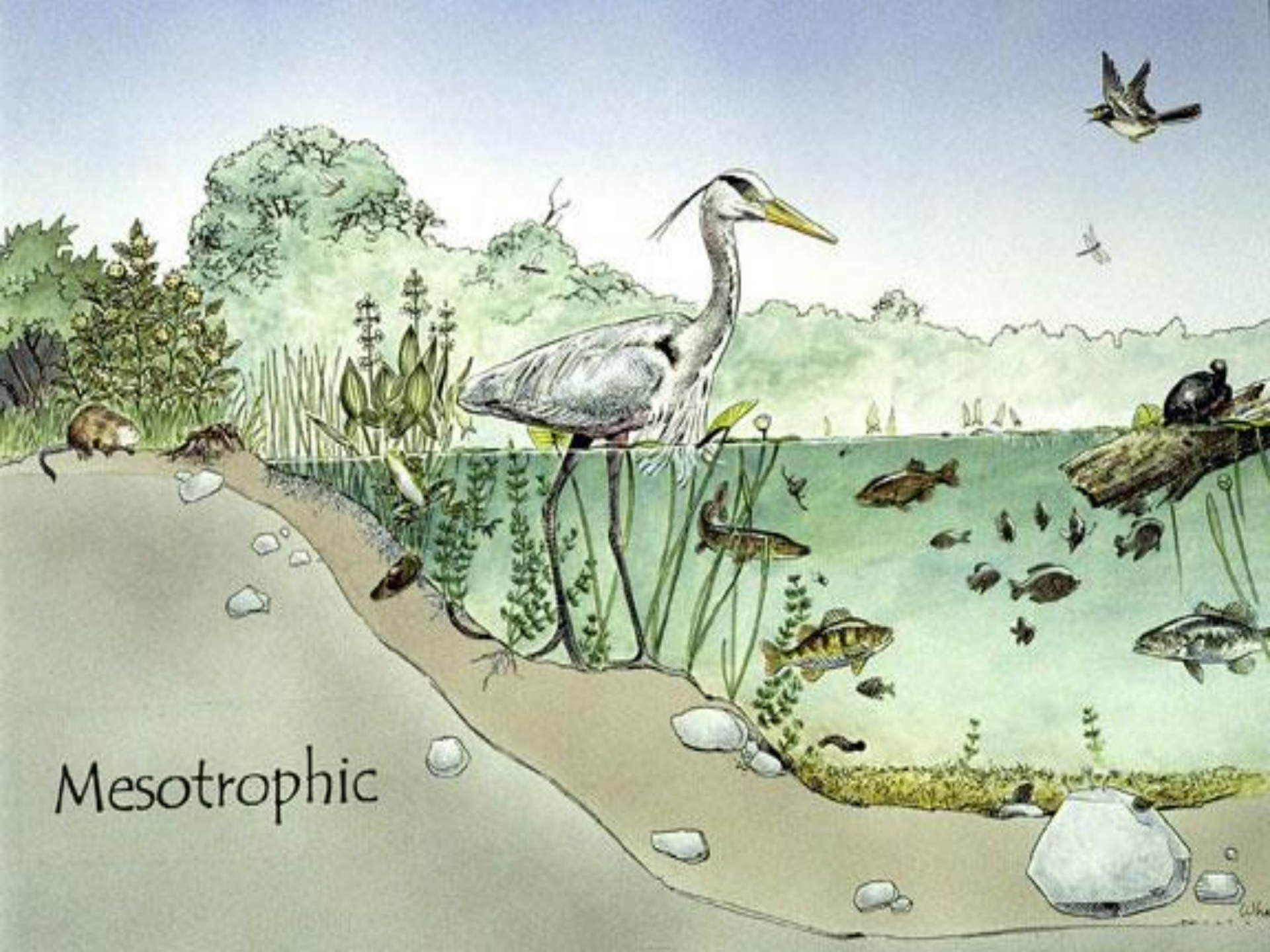


Cyanobacteria (bottom three photos) = concerns

Different Growth for *Different Stages*

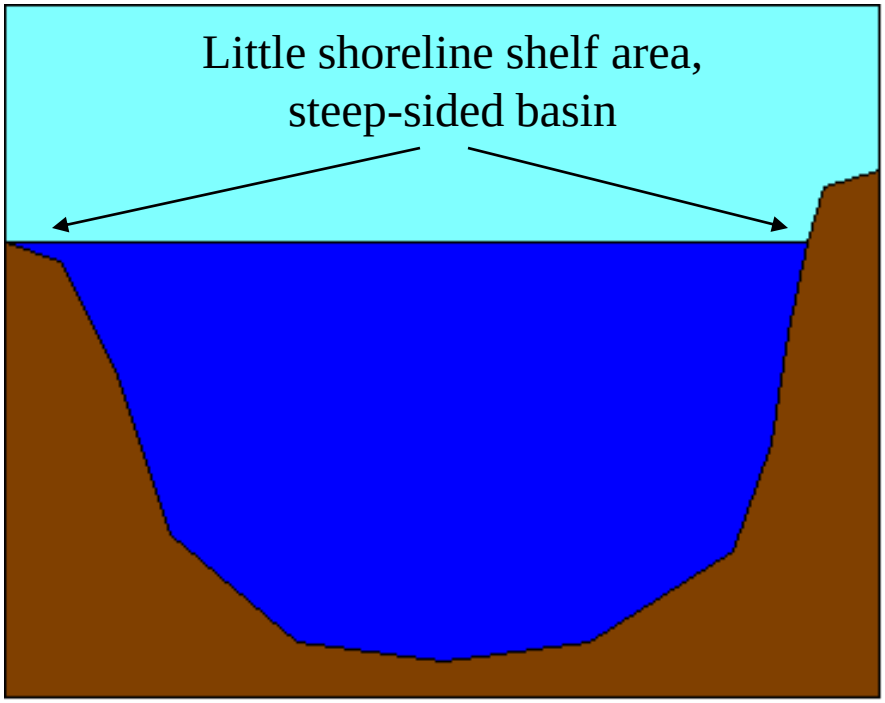


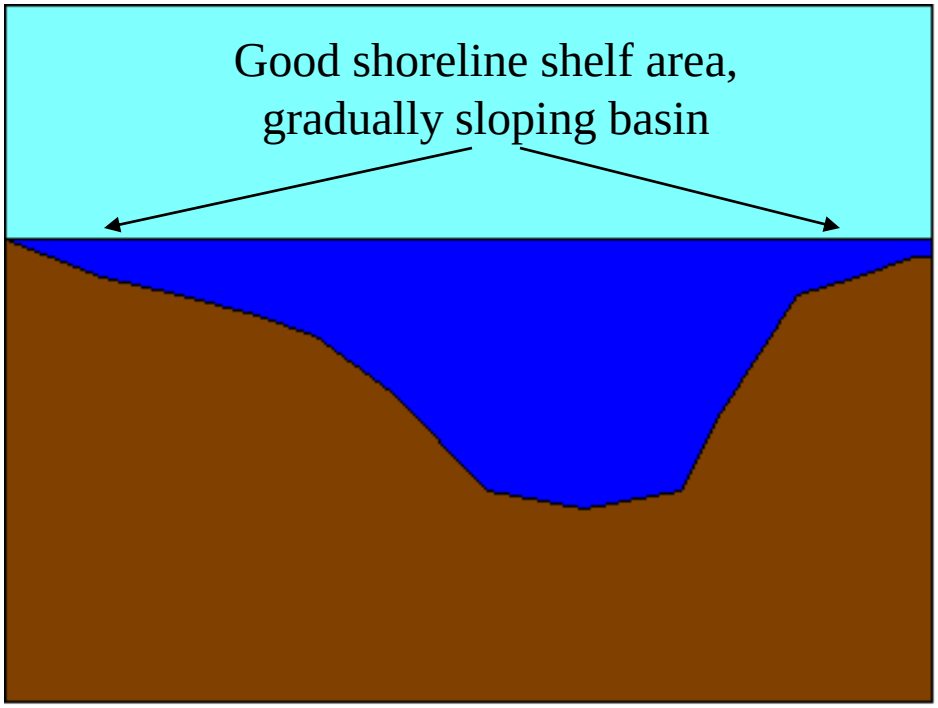

Oligotrophic


Mesotrophic


Eutrophic

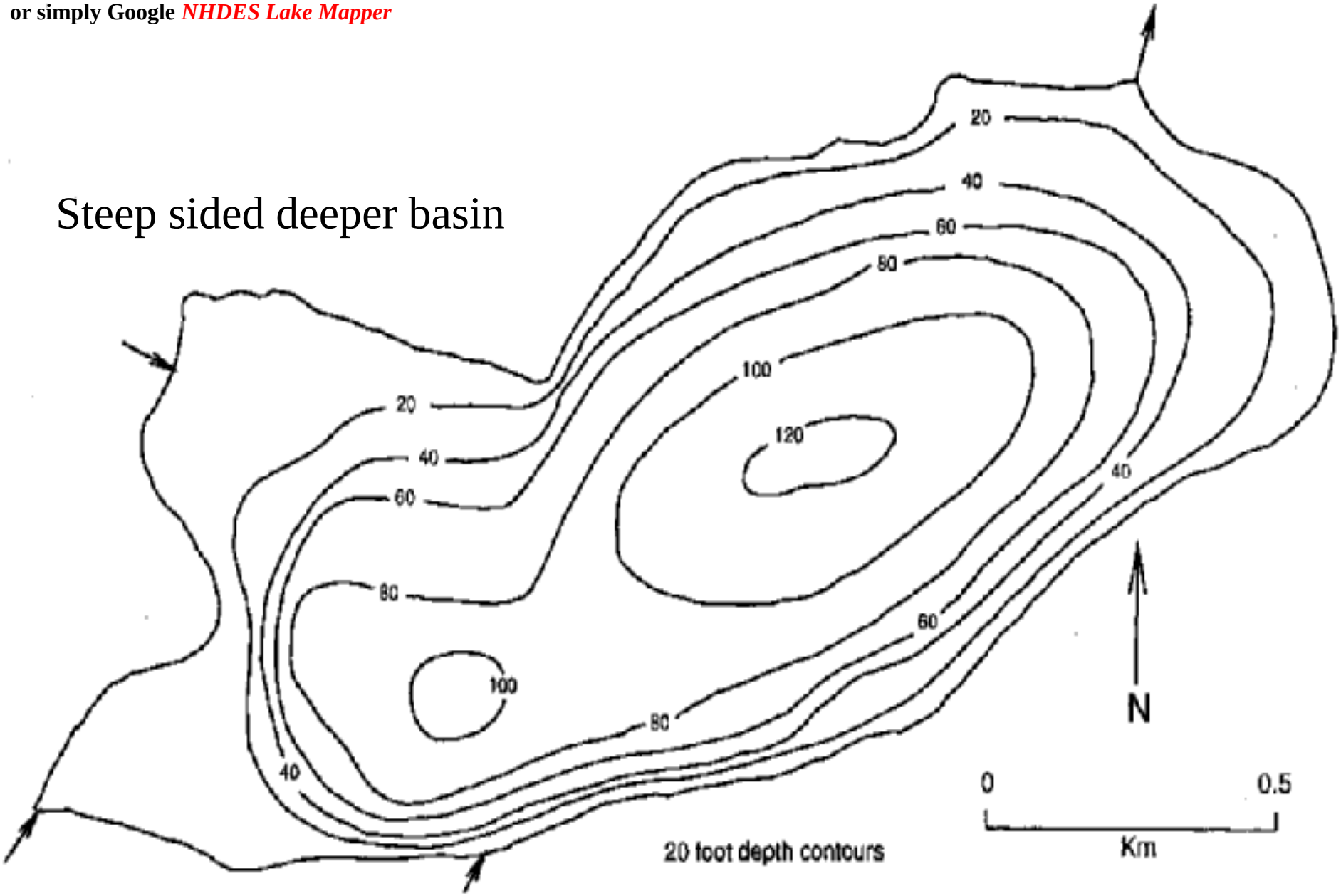
Different Growth for *Different Basins*



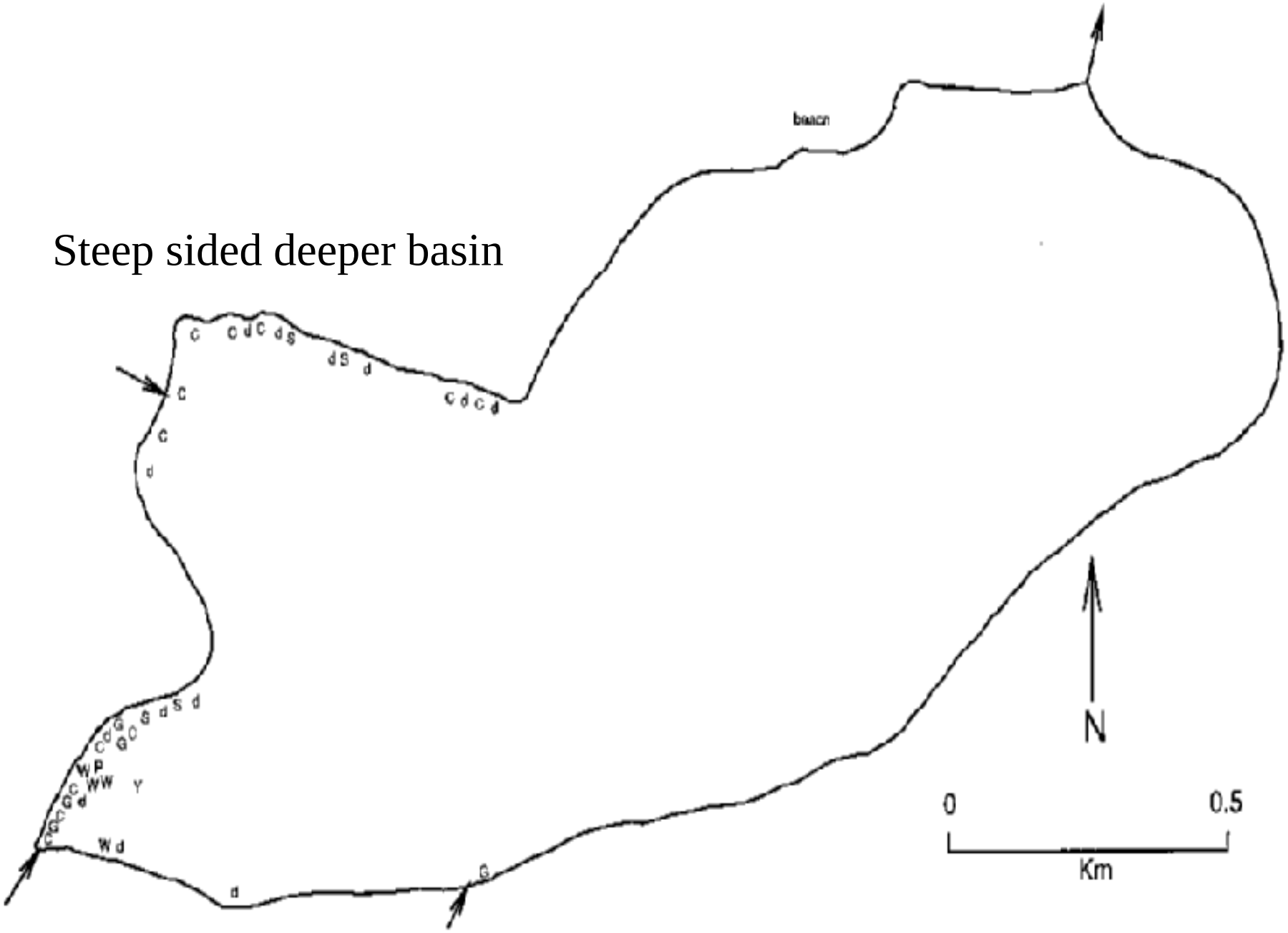


For historic plant surveys for your lake or pond visit
NHDES Lake Mapper App: http://nhdes.maps.arcgis.com/apps/webappviewer/index.html?id=1f45dc20877b4b959239b8a4a60ef540
or simply Google *NHDES Lake Mapper*

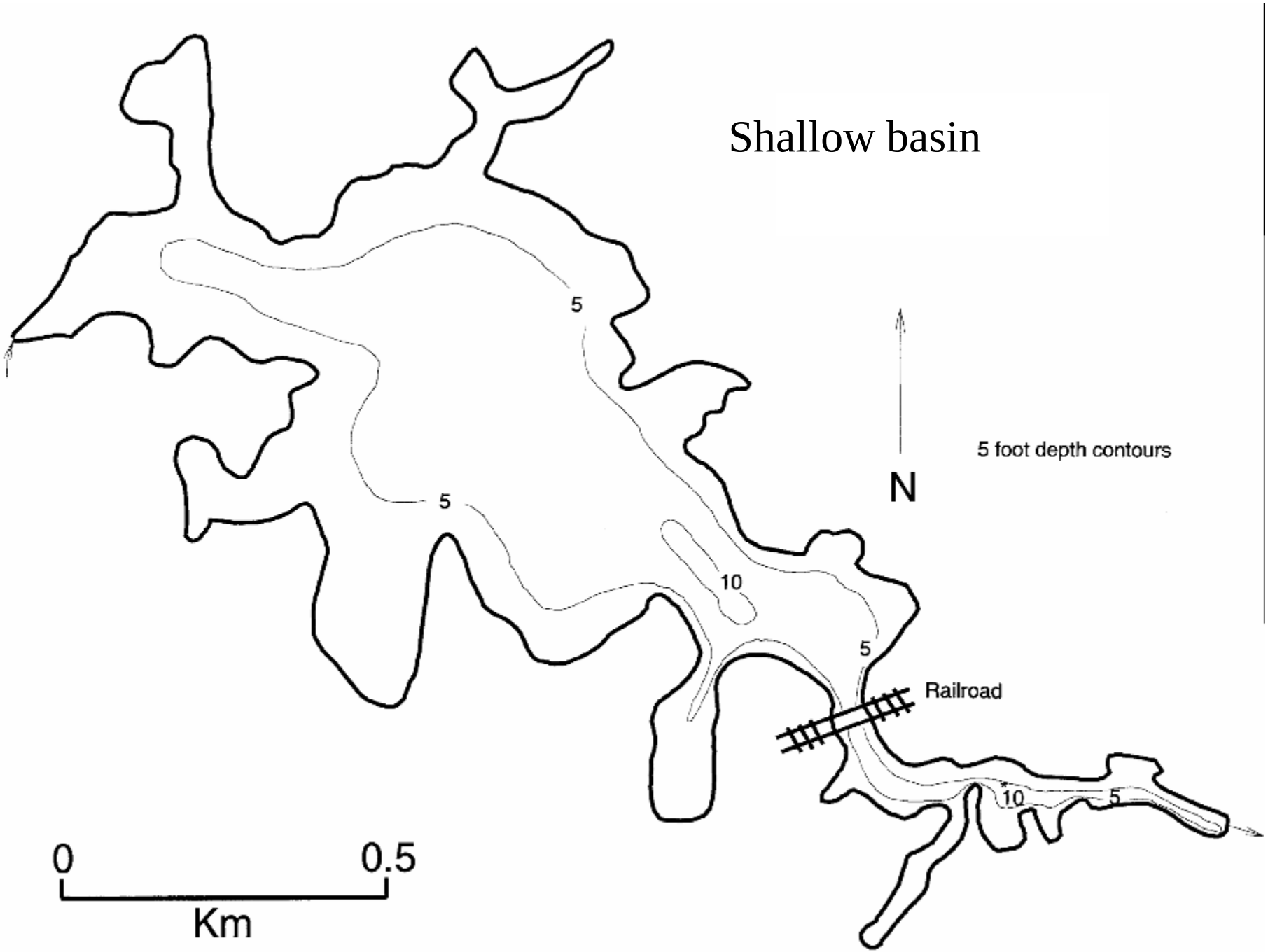
Steep sided deeper basin

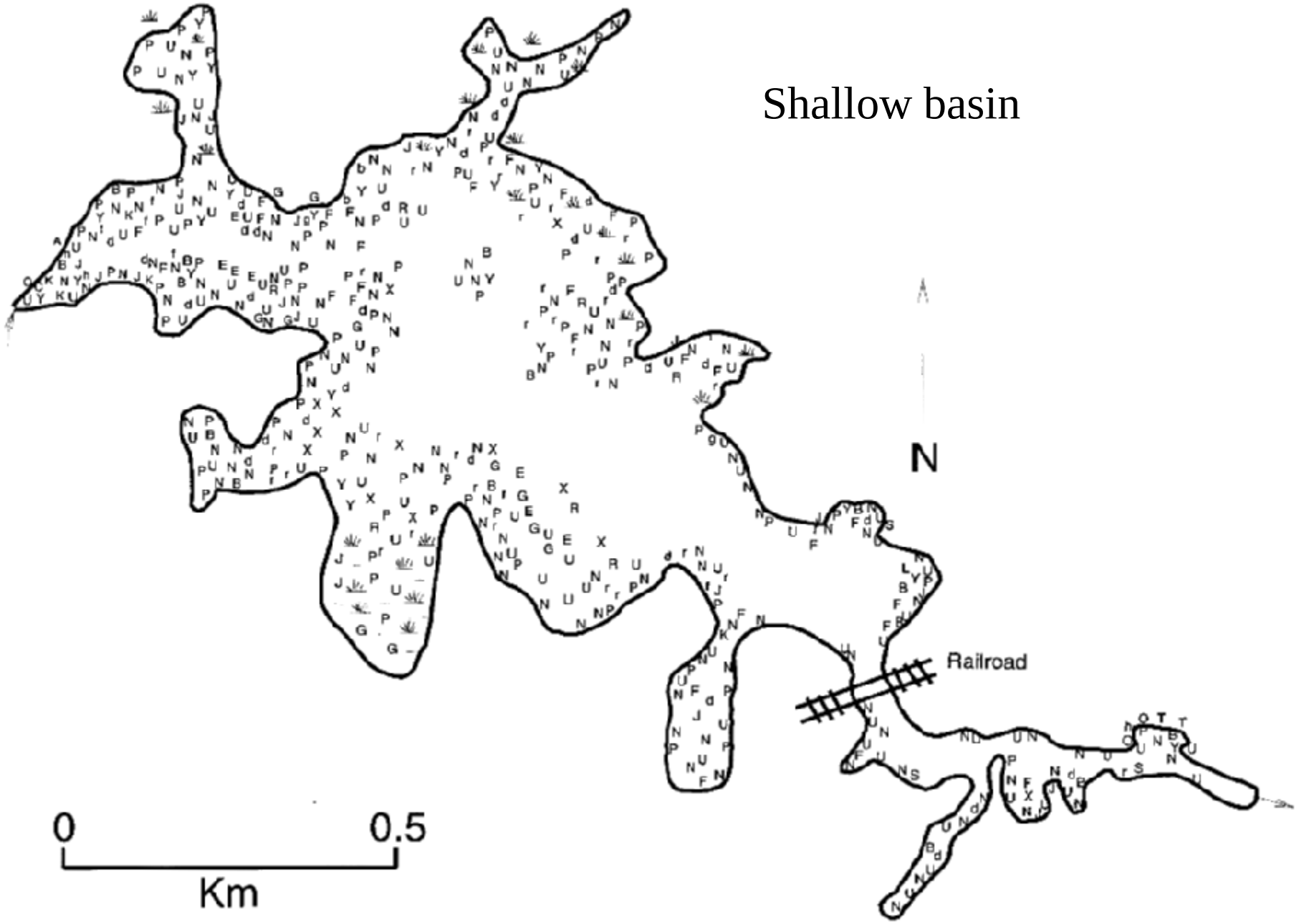


Steep sided deeper basin

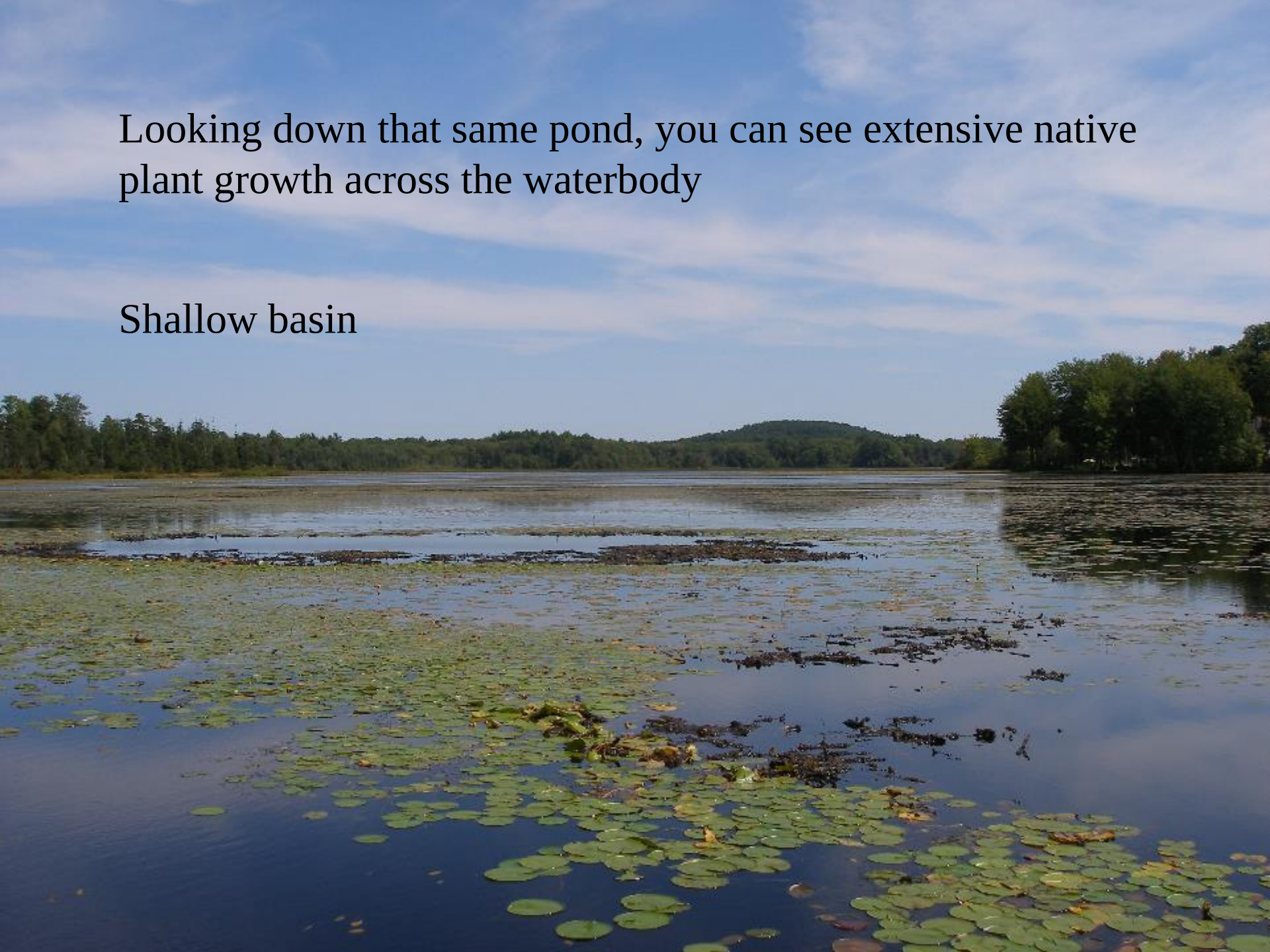



A band of vegetation near shore, but fading out with depth and distance from shore
Steep sided deeper basin


Shallow basin
5
5
10
5
10
5
N
5 foot depth contours
Railroad
0
0.5
Km

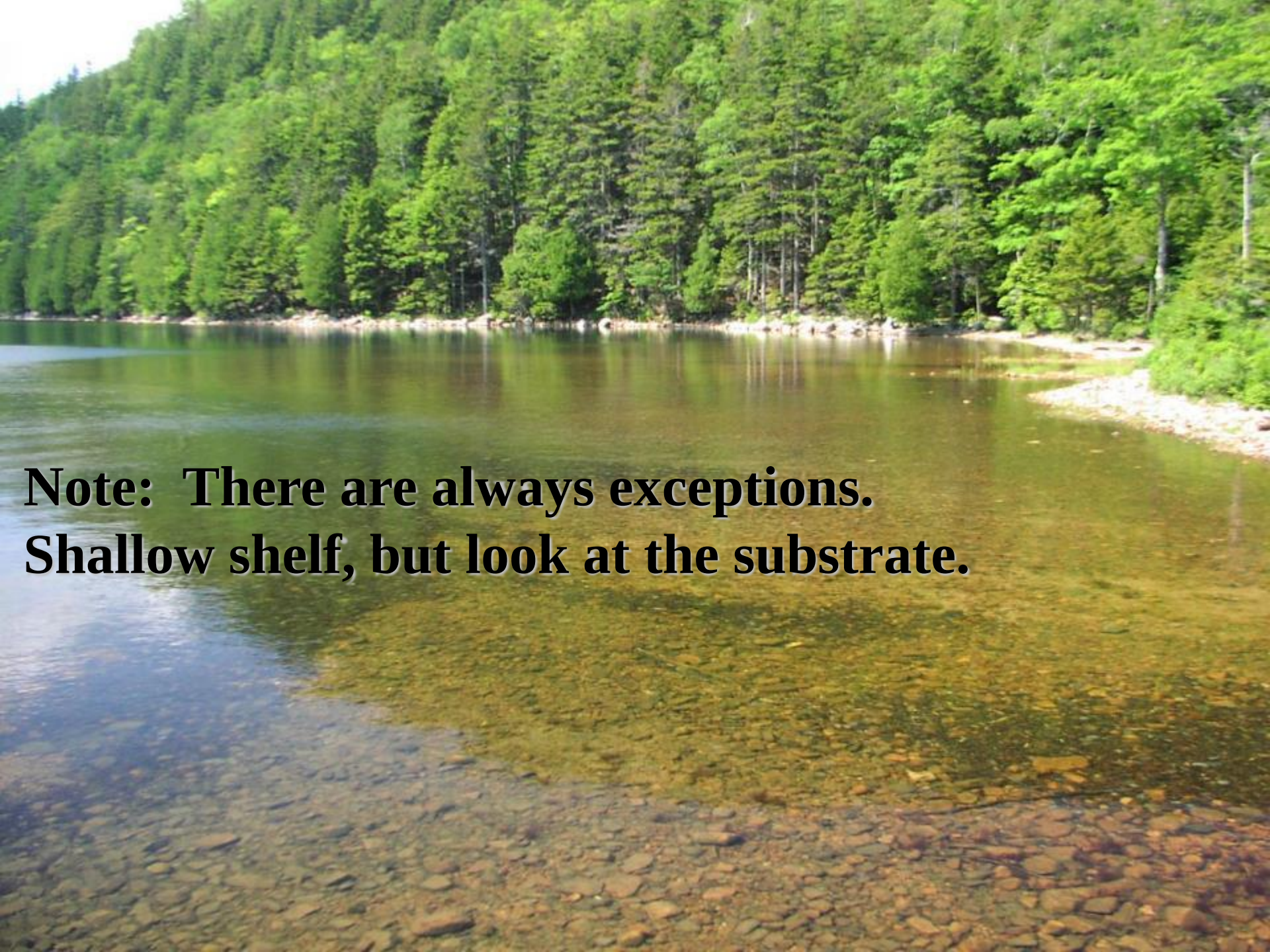

Shallow basin
N
Railroad
0
0.5
Km


A shallow lake with expansive growth off shore
Shallow basin

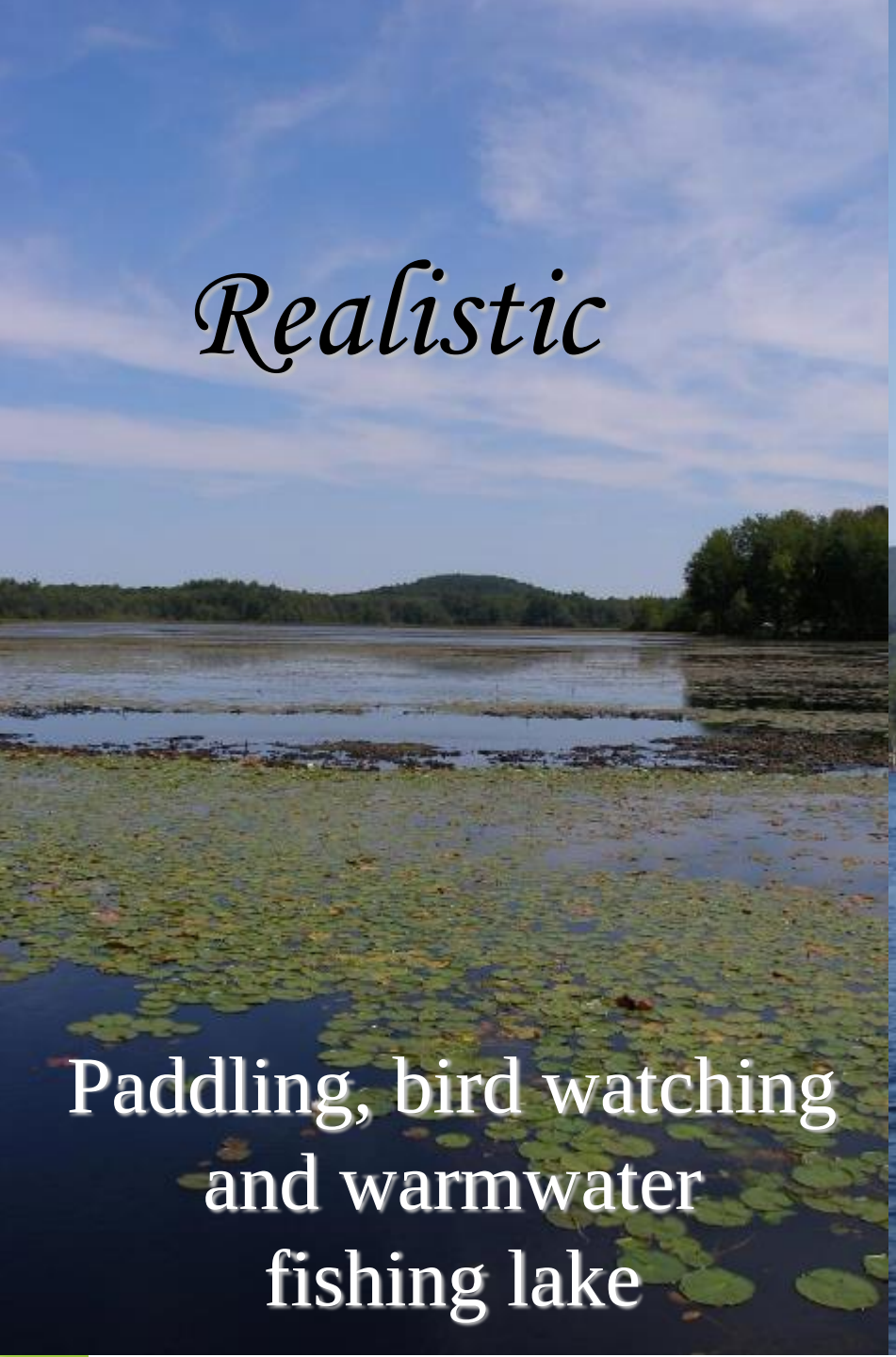


Looking down that same pond, you can see extensive native plant growth across the waterbody

Shallow basin

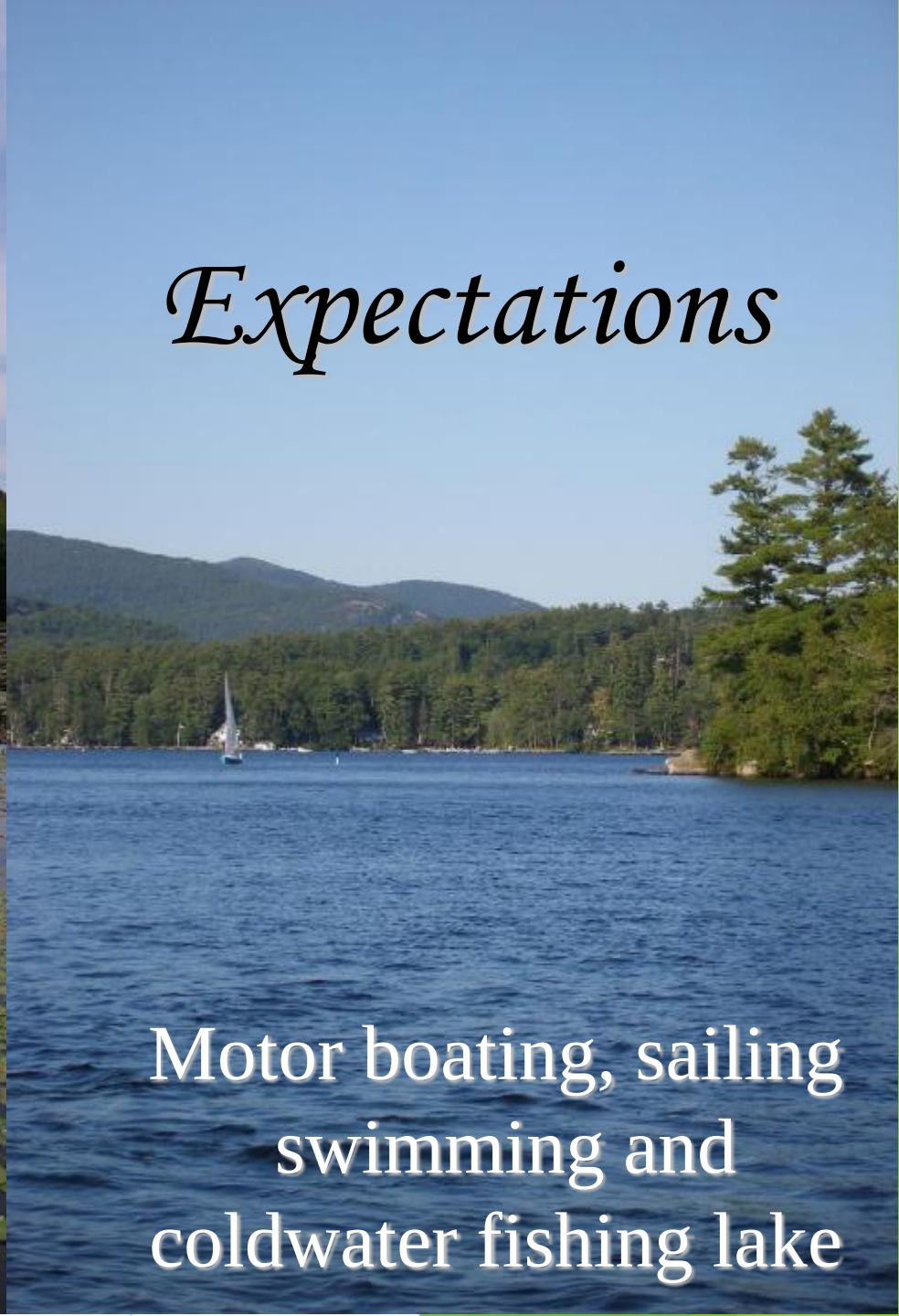


Note: There are always exceptions.
Shallow shelf, but look at the substrate.



Realistic

Paddling, bird watching and warmwater fishing lake



Expectations

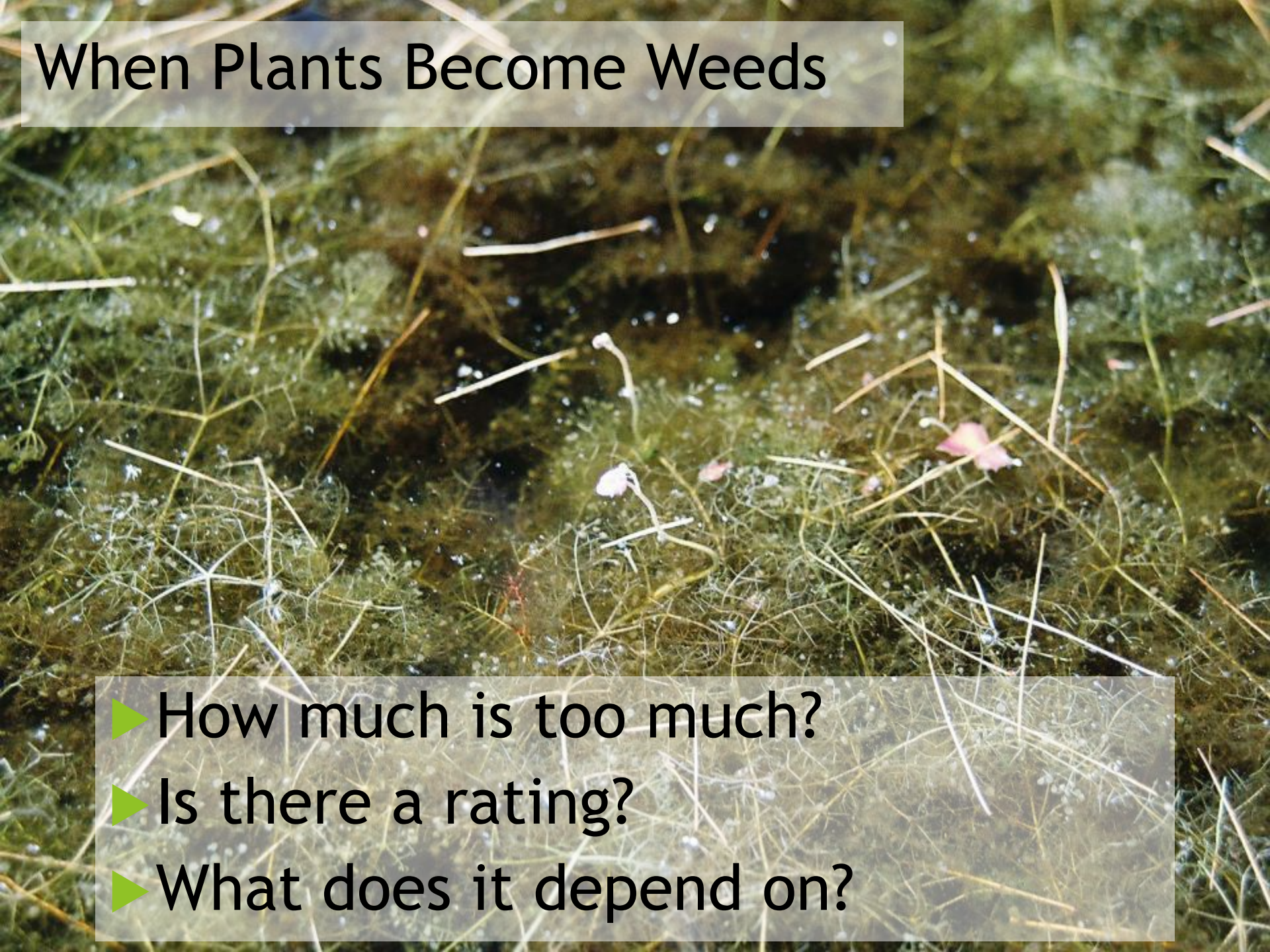
Motor boating, sailing swimming and coldwater fishing lake

Plants! Argh…
Why do we need them?!?!

The concerns we hear:

- They grow all over the bottom of the pond!
- There are more every year!
- They are thick around the shoreline!
- They are slimy and get all over me when I swim!
- They get stuck around my propeller, paddles, and skis!
- There are bugs in them!
- They are everywhere!

When Plants Become Weeds



- How much is too much?
- Is there a rating?
- What does it depend on?

How do we assess problems in waterbodies?

- Surface Water Quality Standards (RSA 485-A:8) require that surface waters support designated uses, including both aquatic life and recreation

Designated Uses

- Aquatic Life Designated Use: Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.
- Primary Contact Recreation Designated Use: Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water (i.e., swimming).
- Secondary Contact Designated Use: Waters that support recreational uses that involve minor contact with the water.
- Wildlife Designated Use: Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.

There are currently no thresholds or numeric criteria for native aquatic plant density related to these designated uses, so there is no metric or "number" with which to make a determination.

So….

For native plants there is no threshold for management, and it is a subjective determination, usually driven by local entities.

A plant list and rating table for a lake- qualitative rankings

AQUATIC PLANT SURVEY

LAKE: WICWAS LAKE **TOWN:** MEREDITH **DATE:** 8/26/2009

KEY	PLANT NAME		ABUNDANCE
	GENERIC	COMMON	
P	Pontederia cordata	Pickerelweed	Common
N	Nymphaea	White water lily	Common/Abund
B	Brasenia schreberi	Water shield	Common/Abund
S	Sparganium	Bur reed	Common/Abund
e	Elodea	Waterweed	Sparse
C	Cyperaceae	Non-flowering sedge	Scattered
F	Nymphoides cordatum	Floating heart	Common/Abund
X		Bottom growth	Common/Abund
U	Utricularia	Bladderwort	Common/Abund
Y	Nuphar	Yellow water lily	Scattered
W	Potamogeton	Pondweed	Common
T	Typha	Cattail	Sparse
		OVERALL ABUNDANCE :	Common/Abund

Rating Categories

Abundance	Description
Sparse	Few emergent plants observed; submerged plants not obvious
Scattered	Several small patches or one to two large patches or much of the shoreline with a sparsely growing plant; submerged plants not obvious
Scattered/Common	Intermediate between Scattered and Common
Common	Plants around most of the shoreline but not a problem to navigation or several large patches of plants
Common/Abundant	Intermediate between Common and Abundant
Abundant	Plants around the entire shoreline and with large patches in several areas; submerged plants generally visible wherever bottom is visible
Very Abundant	At least ½ of the surface with emergent or floating leaf plants or submerged plants thick throughout the pond; navigation and swimming is impaired in areas due to physical presence of plants

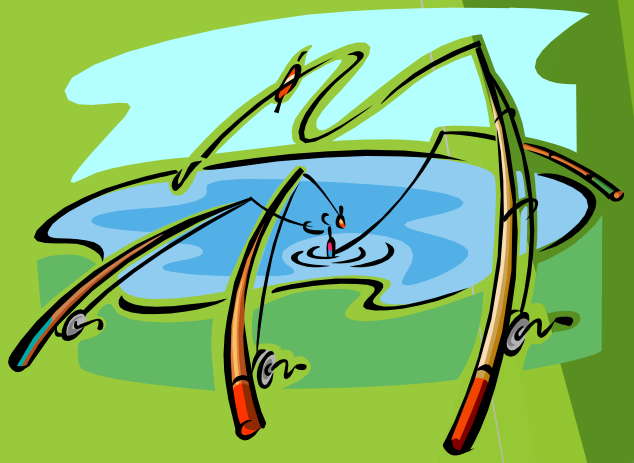
When, Why and How (and how not) to Manage

Arguments Against Management

- Native aquatic vegetation is part of a natural system and should be left in place
- Our lakes are not swimming pools, and rather are dynamic and evolving, and aging systems
- Native aquatic vegetation provides functional values to the system
- Management may cause negative impacts to aquatic ecology (alternate stable states, with shifts from plants to an algal dominated system with less clarity)
- Management may open up habitat for invasive species (disturbance)

If you fish….preserve the native plants

- Bluegill: 15-30% plant cover
- Yellow perch: 25-50% plant cover
- Bass: 40-60% plant cover
- Northern pike: >80% plant cover



If you bird (hunt, watch)….preserve the native plants for:

- Food
  - Either plant or tuber material or invertebrates living on plants
- Shelter
  - Nesting material, camouflage and protection

If you care about your lake water quality….preserve the native plants

- Oxygen production
- Erosion control
- Shoreline and bottom stabilization
- Filtration
- Nutrient utilization/uptake/ recycling
- Pollutant/contaminant uptake/binding

So….

- If you do opt to pursue management, there are several things to be aware of

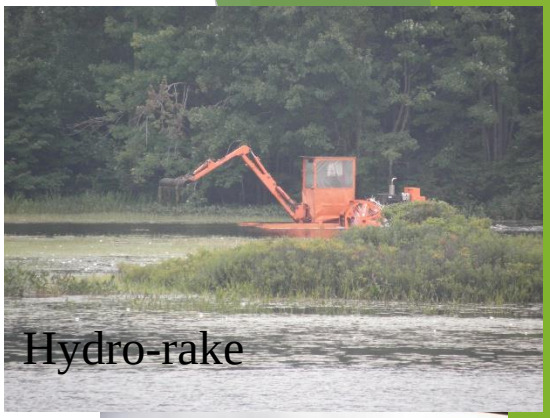
Permits (almost always) Required!

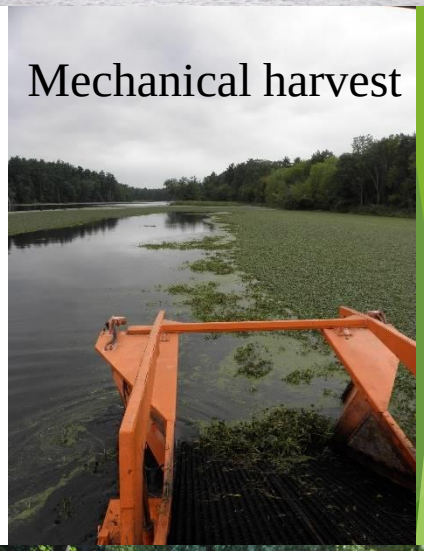
- For physical/mechanical removal Wetlands Bureau Permits are required (NH Department of Environmental Services)
  - *Call 603-271-2147 to inquire about if a permit is needed before you do any work*

- For herbicide/chemical control activities a Special Aquatic Permit is required (NH Department of Agriculture, Division of Pesticide Control) and state-licensed aquatic herbicide applicators must do the work.
  - *SOLitude Lake Management is the only firm in the region that does herbicide treatment or larger physical removal of aquatic plants in bigger lakes or ponds. Call them at 508-865-1000 for a site inspection, recommendations, and quotes.*

Management Methods

- Physical control
  - Physically removing by hand picking, raking, cutting, rolling, placement of benthic barriers, drawdown, etc.
- Mechanical control
  - Cutting, digging
  - Diver-assisted suction harvesting
- Chemical control
  - Herbicides


Hydro-rake


Mechanical harvest


Herbicide

Wetlands Rule Env-Wt 510.04- Approval Criteria for Native Aquatic Vegetation (NAV) Removal Project Criteria:

- Work to maintain access to existing legal beach, docking facility, public boat ramp or community swim area
- Project minimizes water quality impacts and sediment disturbance
- Protects critical habitats/nesting/spawning sites
- Does not remove root systems or substrate materials which would constitute a dredge
- Is less than 1,000 square feet in total, with a maximum width of 15 feet

These will require permits,
and based on scale they could be minimum,
minor and major impact projects.

https://www.des.nh.gov/organization/commissioner/legal/rulemaking/documents/env-wt500-adpt-pstd.pdf

What You Can Do Without a Permit

IMPORTANT:
When in doubt, ask!

There are a lot of nuances when it comes to state laws and rules, and this talk just includes a general outline of key factors.

DES Wetlands Bureau: 603-271-2147

Wetlands Rule Env-Wt 309.02

Projects Conditionally Authorized By Rule *(ie, no permit needed*, but there are still guidelines to be met)

(a) Mowing or other cutting of vegetation in a wet meadow, red maple swamp, hemlock swamp, or white pine swamp, subject to the following conditions:

(1) The roots of the vegetation shall not be disturbed;

(2) The ground shall be frozen or sufficiently dry to avoid making ruts; and

(3) The project shall not be located in a bog, designated prime wetland, duly-established 100-foot buffer, marsh, or tidal buffer zone;

(c) Temporary placement of a fabric barrier on the bottom of a lake or pond by or under the direction of the department for the control of exotic aquatic weeds as authorized by RSA 487:17, subject to the following conditions:

(1) The area shall not exceed 10,000 square feet (SF); and

(2) The project shall not be located in a marsh of any size or a PRA;

The use of the term "marsh" here, coupled with the definition on the next slide, rule out cutting as legal without a permit---you must also get a permit to cut vegetation.

Note this specifies "exotic" not "native" so permits are still needed for native plants

https://www.des.nh.gov/organization/commissioner/legal/rulemaking/documents/env-wt300-adpt-pstd.pdf

New definition: (Eff 12-19-19)

- Env-Wt 103.37 “Marsh” means a wetland that is distinguished by soft-stemmed herbaceous plants such as grasses, rushes, and sedges, where the water table is at or above the surface throughout the year but can fluctuate seasonally, as determined using the federal classification method. The term includes freshwater marshes and tidal marshes.

Wetlands Rule Env-Wt 309.02 Projects Conditionally Authorized By Rule (*ie, no permit needed, subject to meeting all provisions of the rules*), continued

(f) Hand raking of leaves or other organic debris from the shoreline or lake bed, subject to the following conditions:

(1) All raking shall be done in an area exposed by drawdown or other low-water conditions;

(2) The raking shall not disturb vegetative roots; and

(3) The raking shall be limited to an area no larger than 900 SF;

(g) The planting of non-invasive plants to enhance wetlands using hand-held, non-motorized tools;

https://www.des.nh.gov/organization/commissioner/legal/rulemaking/documents/env-wt300-adpt-pstd.pdf

It is worth repeating…

When in doubt, ask!

DES Wetlands Bureau: 603-271-2147

Types and Costs of Management

Management Method	Cost*
Hand harvesting by diver	$50-$100/hour
Diver-Assisted Suction Harvesting	$800-$1000/day
Benthic barrier/bottom screening	$2.00-$2.50/sq ft installed, $0.75-$1.50 sq fot materials only
Mechanical harvesting (not including disposal)	$900-$1800/acre, $1600-$1800/day plus mobilization costs
Hydro-raking (not including disposal)	$4500-$9000/acre, $1750-$2000/day plus mobilization costs
Herbicide Treatment	$650-$1100/acre

*Costs vary by site, project complexity, disposal costs, permit fees, and other factors

There are no state funds available for native plant management

It is never ok to….

- Rake or dig all of the plants out of your shorefront (beyond the location and size of the 900 sq ft set in Env-Wt 309.02)
- Cut plants and leave the cut pieces floating around the lake (marsh cutting is specifically disallowed under Env-Wt 309.02)
- Buy herbicide or algaecide at a store or online and self-dose the waterbody
- Prop- or fence- “dredge” plants from the lake bottom
- Dump/deposit sand or other material on the lake bottom or fill with rocks, sand or other material, or construct structures without a permit

Some Simple Things You Can Do to Help Limit Plant Growth

- Keep the trees on your shoreline
  - Overhanging canopies from trees will shade out shoreline areas and keep aquatic plant growth lower
- Avoid fertilizer on your shoreline
  - You are just fertilizing the lake, plus use is restricted
- Maintain your septic systems
  - 1st tier homes should have systems pumped every 1-3 years, 2nd and 3rd tiers every 3-5 years
- Take care of erosion problems
  - Sediment deposits in lakes provide nutrient rich substrates for plants to grow

Recommended Plant Ecology and Identification References

Aquatic Plants and Algae of New Hampshire's Lakes and Ponds
Amy P. Smagula and Jody Connor
Copyright 2009
Print copies available for $5 from NHDES, or free online at
https://www.des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-05-30.pdf

Biology and Control of Aquatic Plants
A Best Management Practices Handbook
Lyn A. Gettys, William T. Haller and David G. Petty, editors
http://www.aquatics.org/bmp.html

Pond and Brook
Michael J. Caduto
Copyright 1990
ISBN 0-87451-509-1

The Book of Swamp and Bog
John Eastman
Illustrated by Amelia Hansen
Copyright 1995
ISBN 0-8117-2518-9

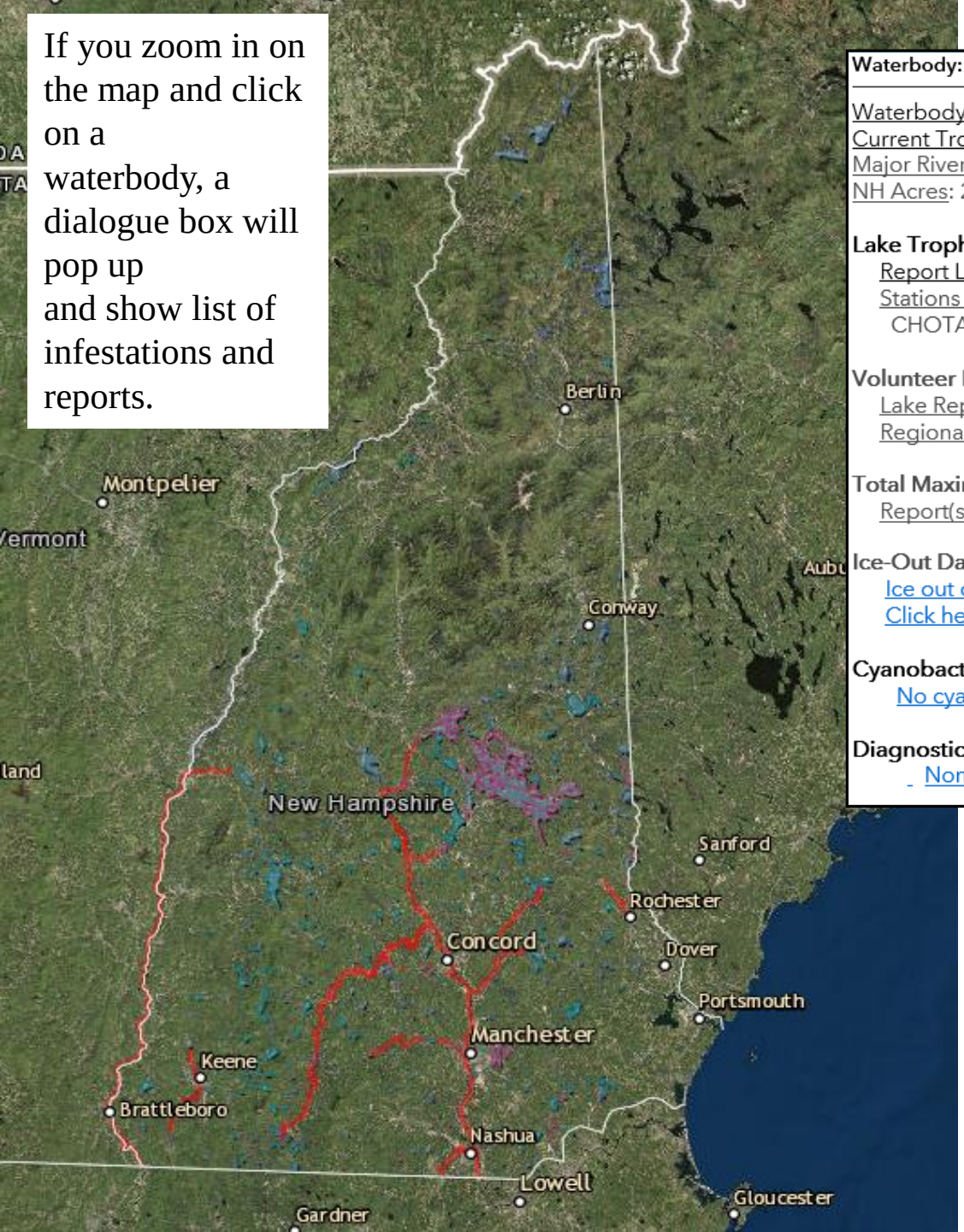
Through the Looking Glass
Susan Borman, Robert Korth, and Jo Temte
Illustrated by Carol Watkins
Copyright 1998
ISBN 0-932310-32-X

For historic plant surveys for your lake or pond visit
NHDES Lake Mapper App:
http://nhdes.maps.arcgis.com/apps/webappviewer/index.html?id=1f45dc20877b4b959239b8a4a60ef540
or simply Google *NHDES Lake Mapper*

If you are unsure of an aquatic plant identification simply email photos to Amy.Smagula@des.nh.gov for assistance.

Photos of the plants in the lake, or on a white paper towel or piece of paper are helpful. Remember to include a ruler or coin for scale.

If you zoom in on the map and click on a waterbody, a dialogue box will pop up and show list of infestations and reports.



Waterbody: LAKE CHOCORUA

Waterbody ID: NHLAK600020604-01-01
Current Trophic Class: Mesotrophic
Major River Basin: Saco
NH Acres: 232.27

Lake Trophic Survey Report (LTS)
Report Links: 1979 1991 2000
Stations Used in LTS Reports:
CHOTAMD CHOTAM-GEN

Plant and depth maps here

Volunteer Lake Assessment Program (VLAP)
Lake Report(s): This waterbody does not participate in VLAP.
Regional Report:

Total Maximum Daily Load (TMDL) Reports
Report(s): Mercury

Ice-Out Dates
Ice out data
Click here to learn more about ice out data submittal.

Cyanobacteria Bloom(s)
No cyanobacteria bloom history recorded.

Diagnostic Feasibility Study (DFS)
None available.

NHDES Lake Mapper App:
http://nhdes.maps.arcgis.com/apps/webappviewer/index.html?id=1f45dc20877b4b959239b8a4a60ef540

or simply Google *NHDES Lake Mapper*

Plant Mapping

- NHDES does very limited plant surveys these days, only for lake assessment lakes (~10/year)
- Find historic plant maps for your waterbody by visiting the DES Lake Mapper app (see previous slide)
- You can also hire a contractor to map the plants in your lake, once or on a schedule, to track growth over time
  - Simple plant survey with map
  - Sonar survey (looks at plant distribution, depth, and volume of plants in water column)
  - Point-intercept survey (more detailed grid map of waterbody)
- Try it yourself! Use historic maps and plant reference resources to check new growth compared to historic growth and update your plant map yourself or as a lake association.

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