Soak up the Rain

LANDSCAPING FOR WATER QUALITY

University of New Hampshire Cooperative Extension

Sea Grant New Hampshire

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

United States Environmental Protection Agency

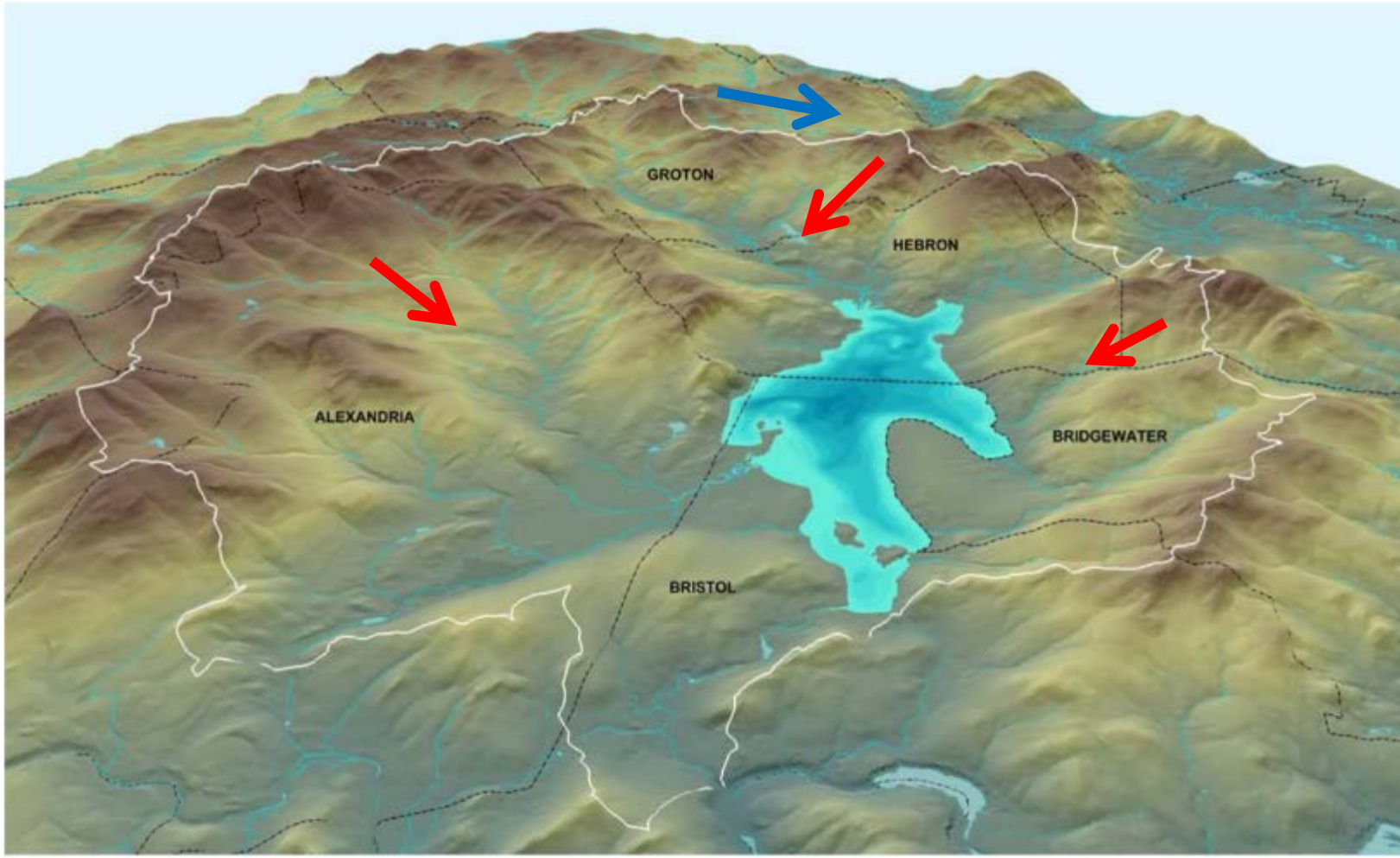
New Hampshire Department of Environmental Services

Hydrology and Water Quality Considerations in NH Lakes Region

Barbara McMillan

Watershed

Figure 1. Shaded Relief map of the Newfound Lake Watershed



Source: Society for the Protection of NH Forests

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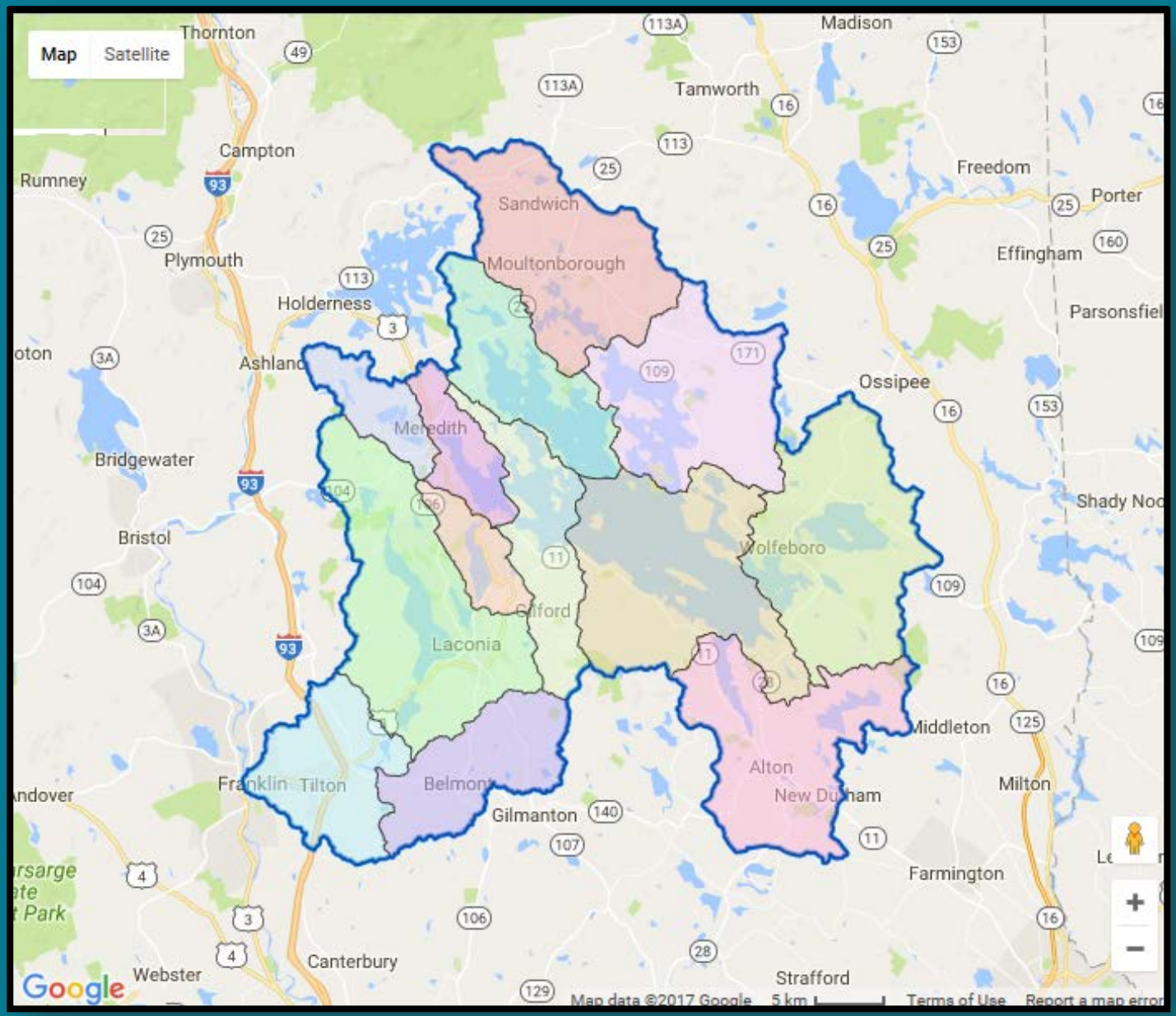
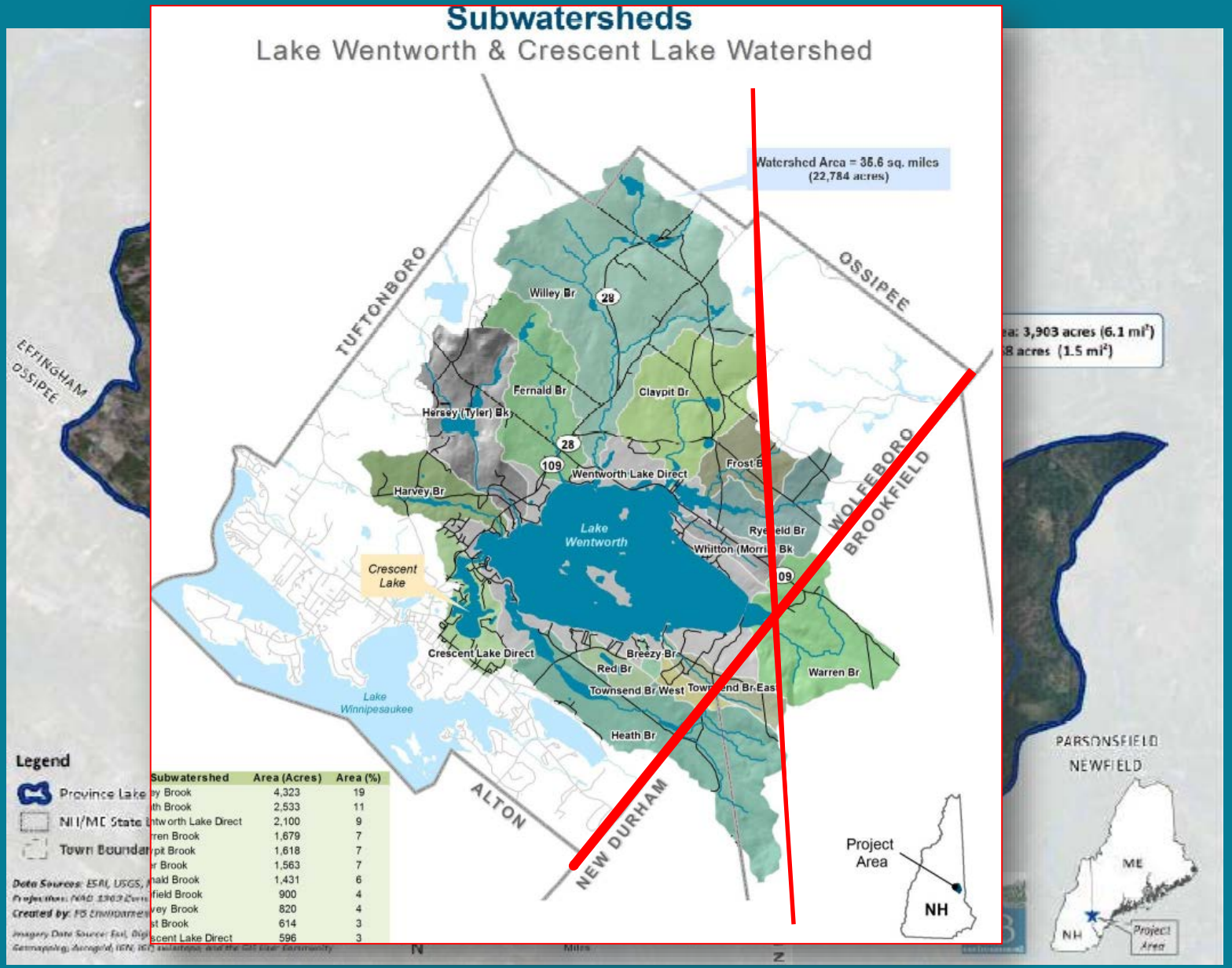
Watershed



Watershed


Subwatersheds
Lake Wentworth & Crescent Lake Watershed
Watershed Area = 35.6 sq. miles
(22,784 acres)
TUFTONBORO
OSSIPEE
EFFINGHAM
WOLFEBORO
BROOKFIELD
ALTON
NEW DURHAM
PARSONSFIELD
NEWFIELD
Willey Br
Fernald Br
Claypit Dr
Hersey (Tyler) Bk
Wentworth Lake Direct
Harvey Br
Lake Wentworth
Crescent Lake
Crescent Lake Direct
Breezy Br
Red Br
Townsend Br West
Warren Br
Heath Br
Lake Winnipesaukee
28
109
Legend
Province Lake
NH/ME State
Town Boundar
Subwatershed
Area (Acres)
Area (%)
4,323 19
2,533 11
2,100 9
1,679 7
1,618 7
1,563 7
1,431 6
900 4
820 4
614 3
596 3
Project Area
NH
ME

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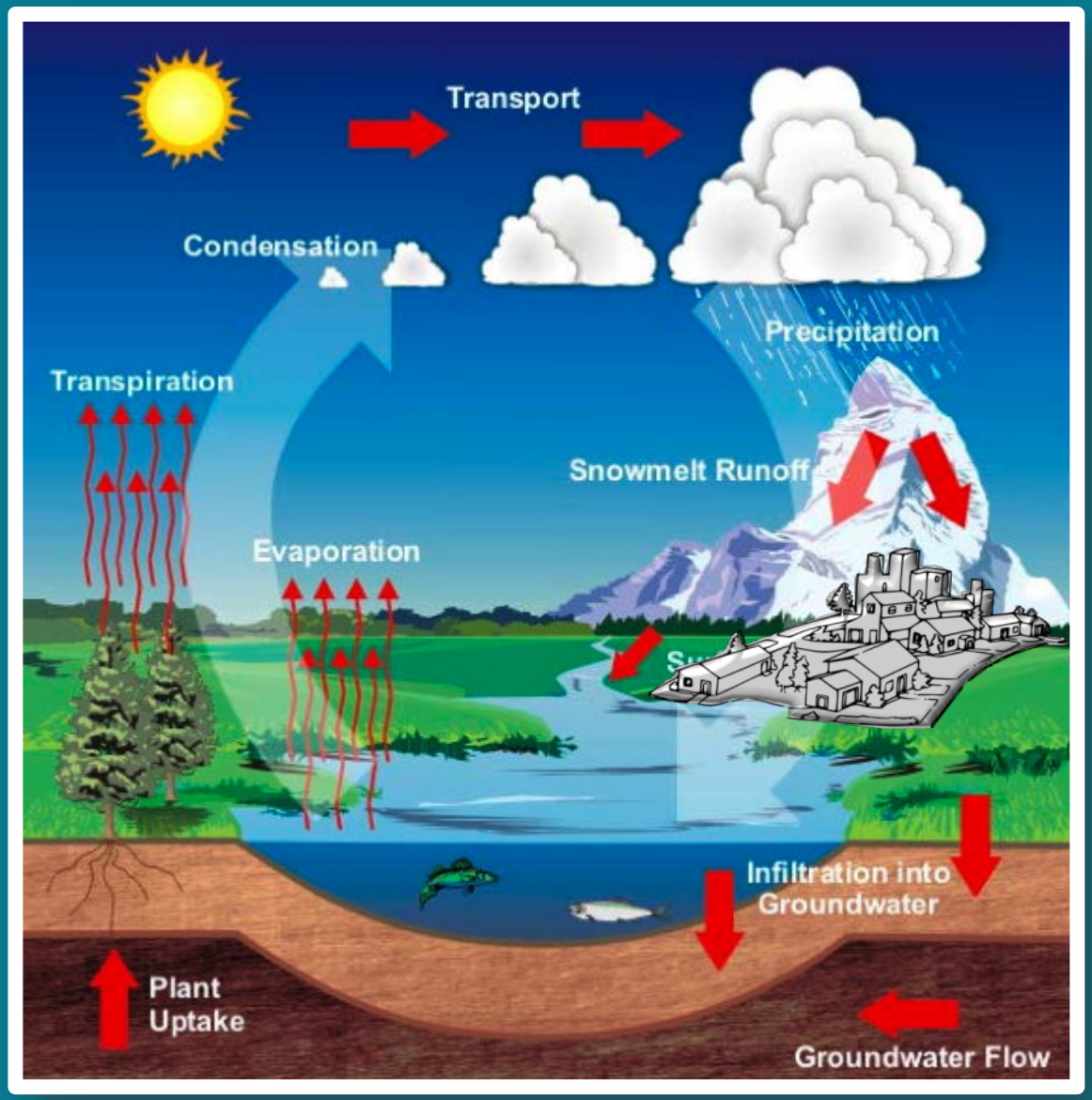
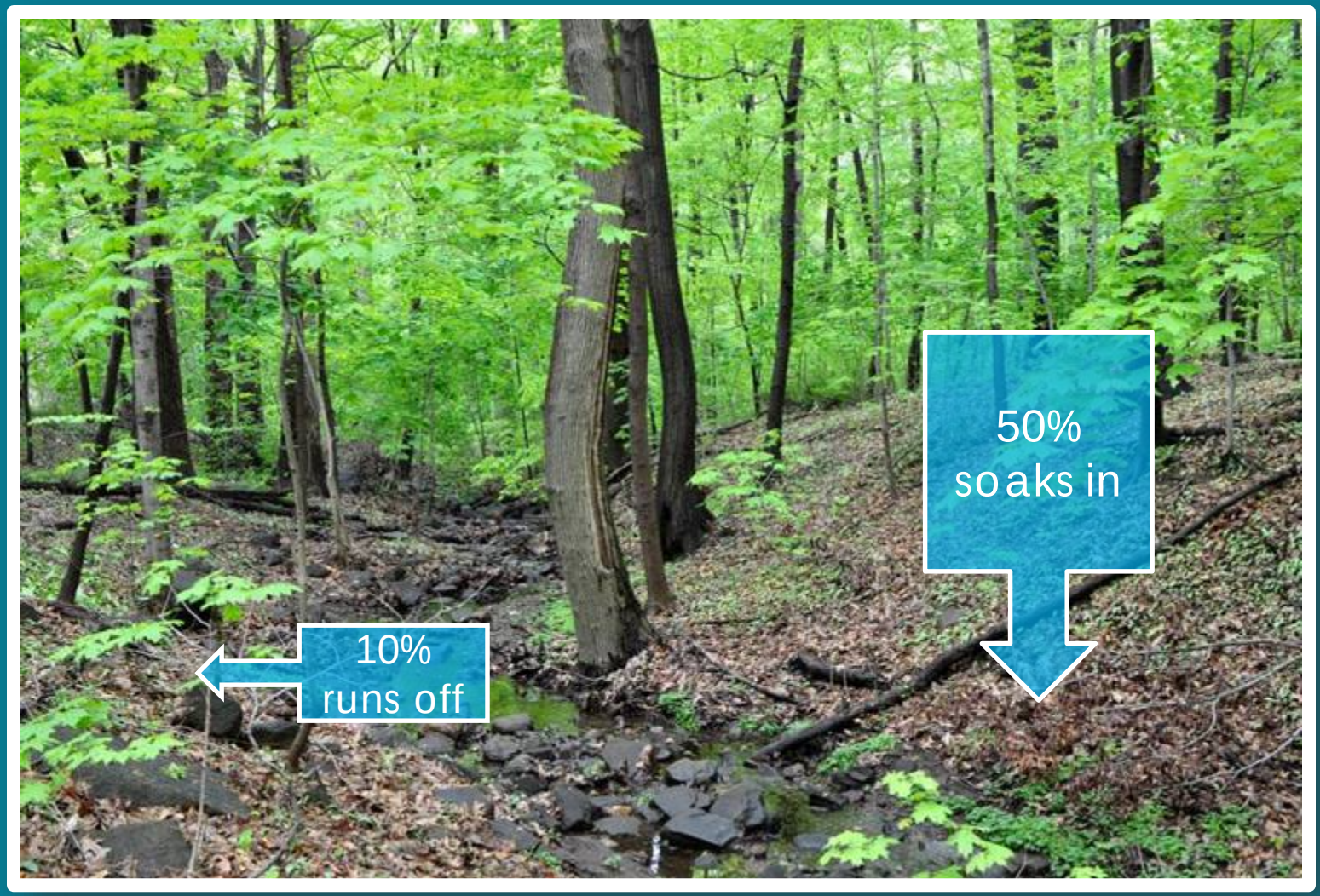
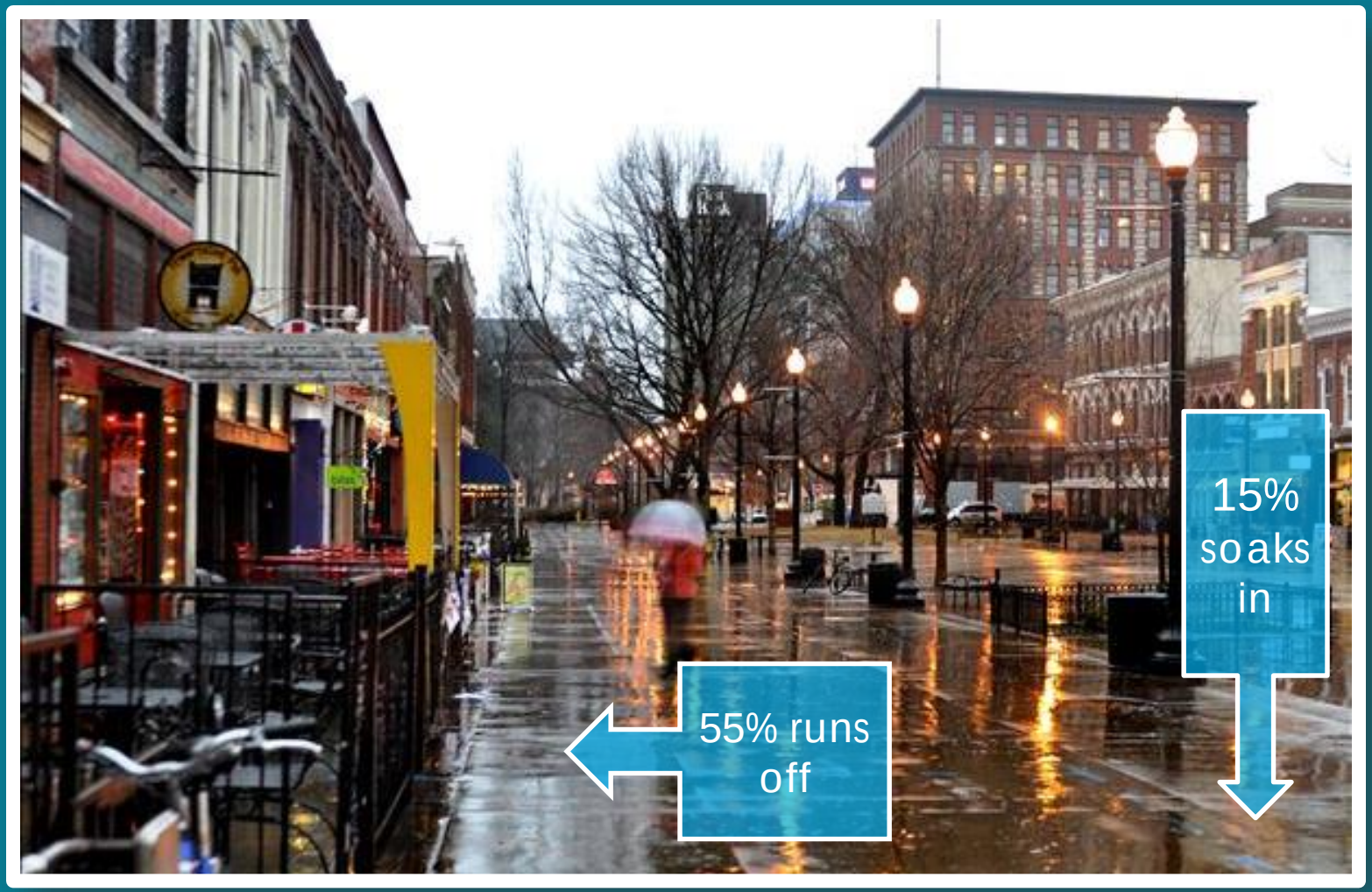
The Water Cycle



Undeveloped Area



Highly Developed Area



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Credit: Think Blue Maine

stormwater runoff

Water from rain or melting snow that doesn't soak into the ground.

"rain water"
"runoff"
"stormwater"

C:\barb\RainGarden.mp4

Why does it matter?

Stormwater runoff

causes or contributes to over

90%

of the water pollution problems in NH.

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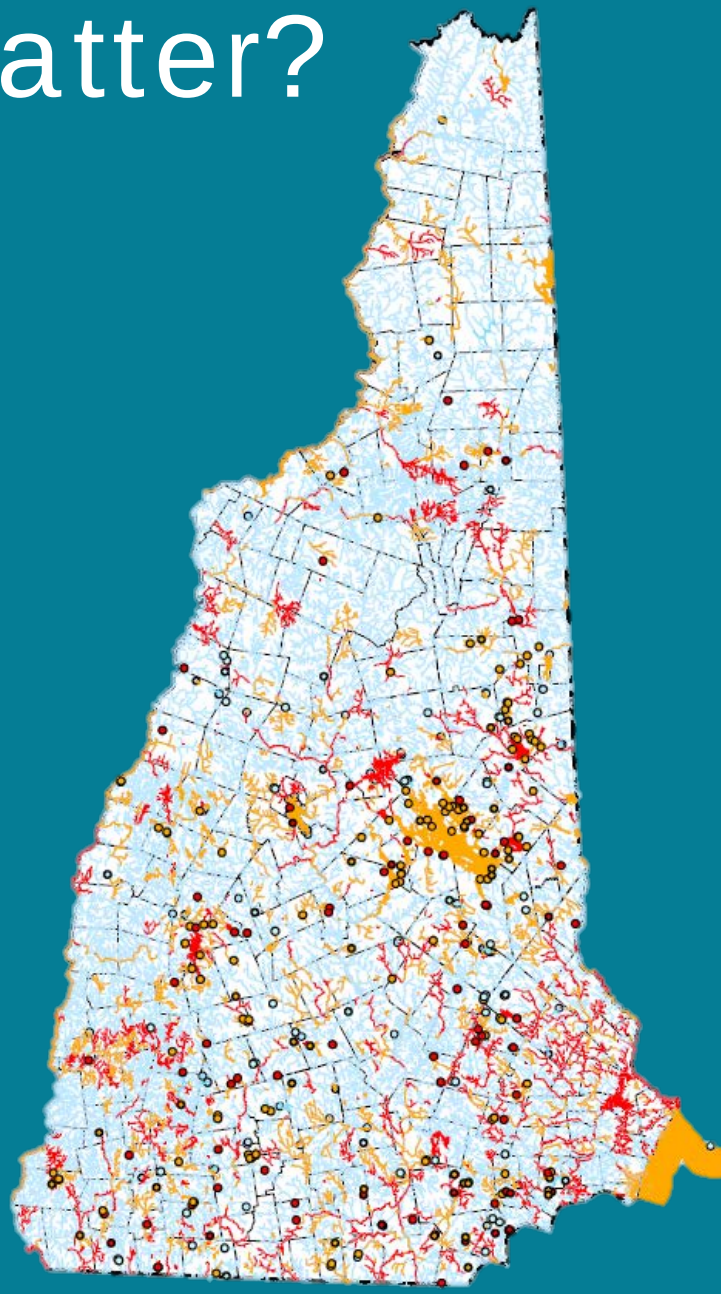
Why does it matter?

Aquatic Life Use

Primary Contact Recreation



Two Runoff Issues

1. CARRIES POLLUTION

2. TOO MUCH WATER

1. Carries Pollution

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Sediment

Nutrients

Pathogens


ADVISORY
High levels of BACTERIA have been detected in this WATER.
N.H. Dept. of Environmental Services
WATER CURRENTLY NOT SUITABLE FOR WADING OR SWIMMING!
Exposure to this water may cause nausea, vomiting, diarrhea, or fever.
Children, the elderly and others with sensitive immune systems are especially vulnerable.
All current advisories posted at www.des.nh.gov
Click "beach advisory" in left column
CONTACT INFORMATION:
NHDES Beach Program
29 Hazen Dr., Concord, NH
(603) 271-0698
beaches@des.nh.gov
Environmental Services

Toxic Contaminants

Chlorides
(Road Deicing Agents)

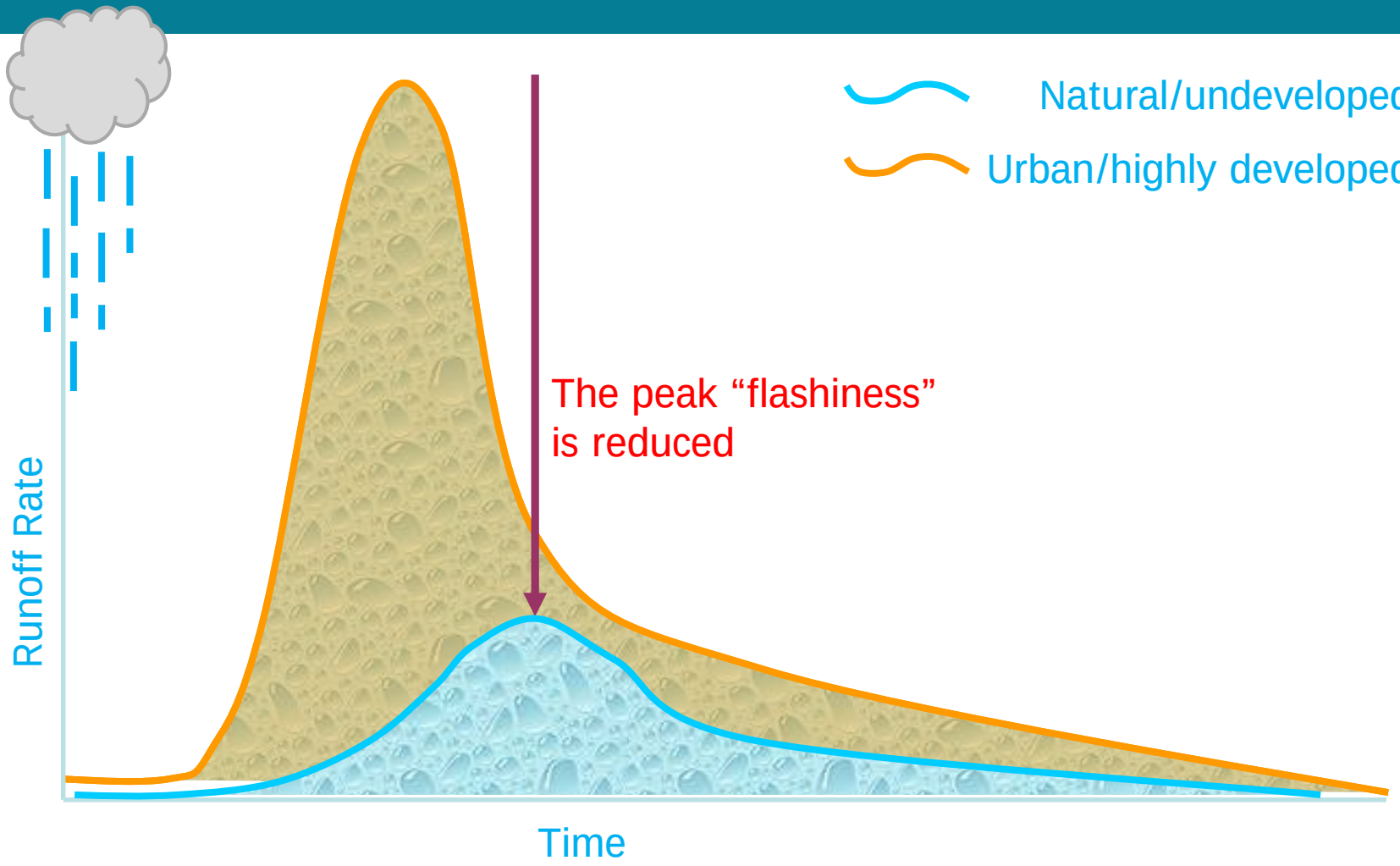
Sources of chloride in Policy Brook, Salem

Liability Protection

Walking on snow and ice is inherently dangerous

2. Effects of Too Much Water

Too Much Water



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Effects of Too Much Water

Impacts to Water

Adapted from Jeff Schloss, UNH CE and Wisconsin Dept. of Natural Resources and the Wisconsin Lakes Partnership using the Simple Method and the Residential Loading Models. Photo source: www.landvest.com.

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NH Lakes

Some Top Concerns About Our Lakes

- **Stormwater Runoff**
  - Overall Water Quality
  - Population Growth & Shoreland Development
  - Air-Borne Pollution (acid deposition, mercury)
- **Threats and Impairments from Invasive Species**

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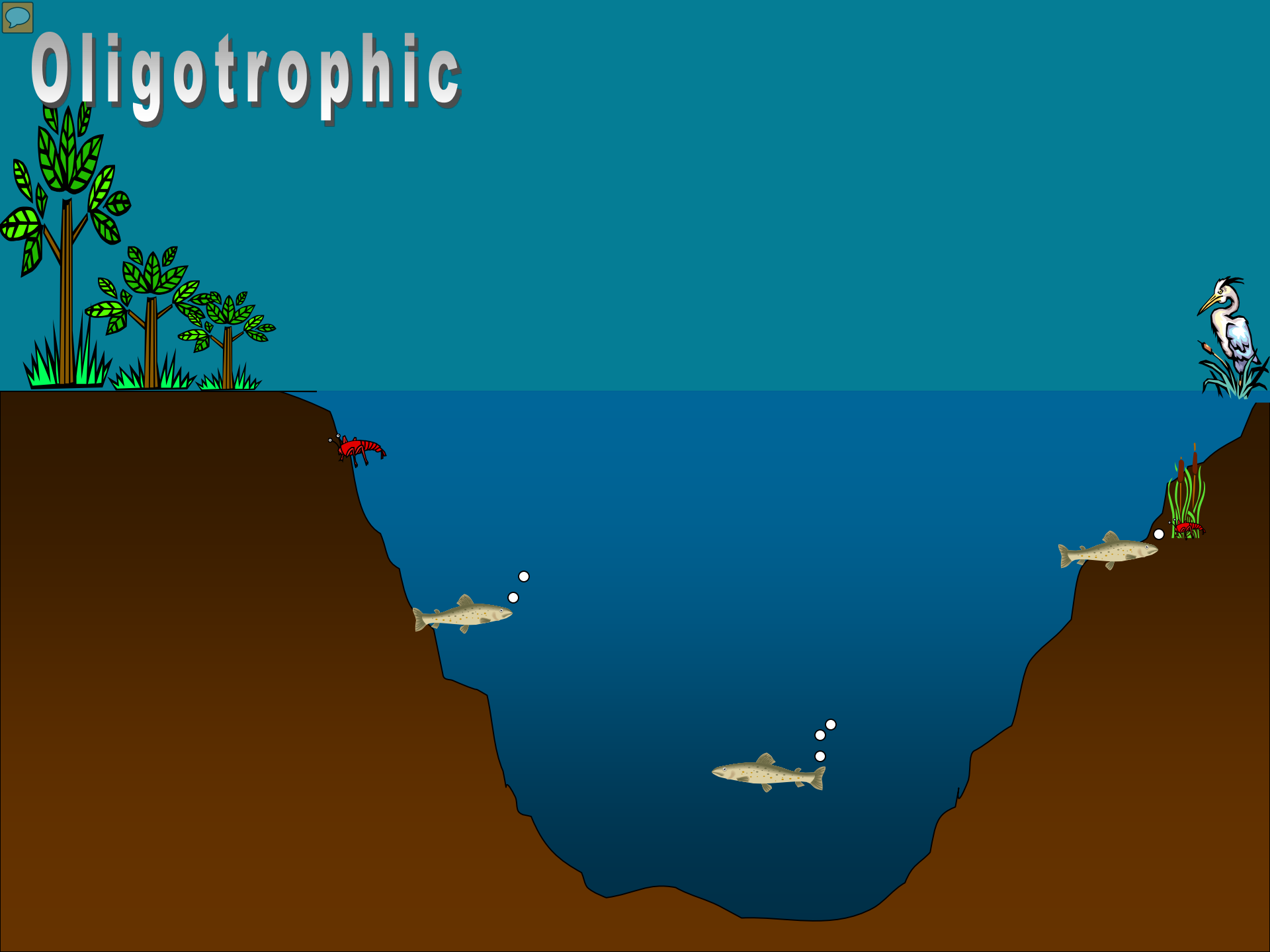
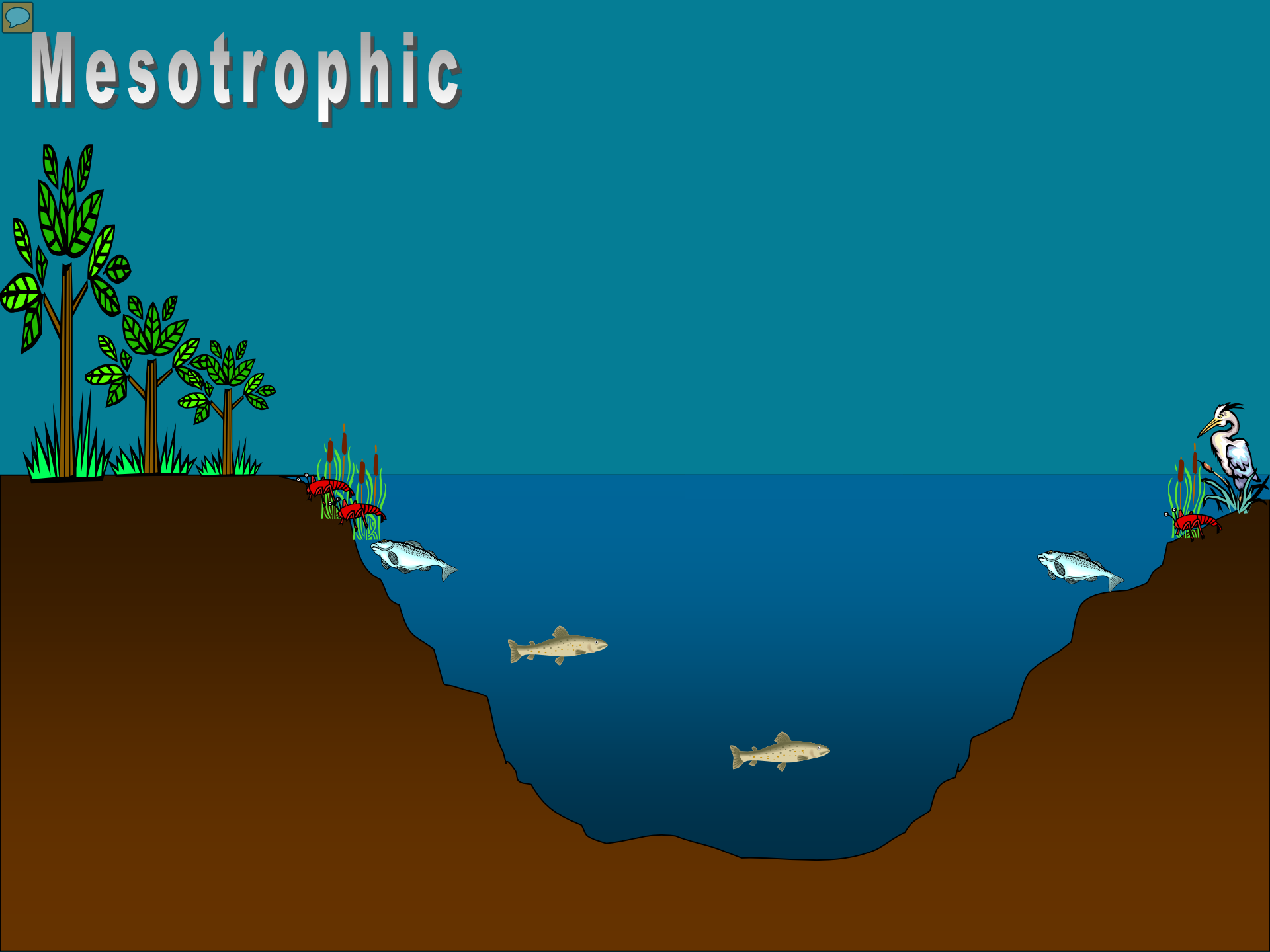
Oligotrophic



Mesotrophic



Eutrophic

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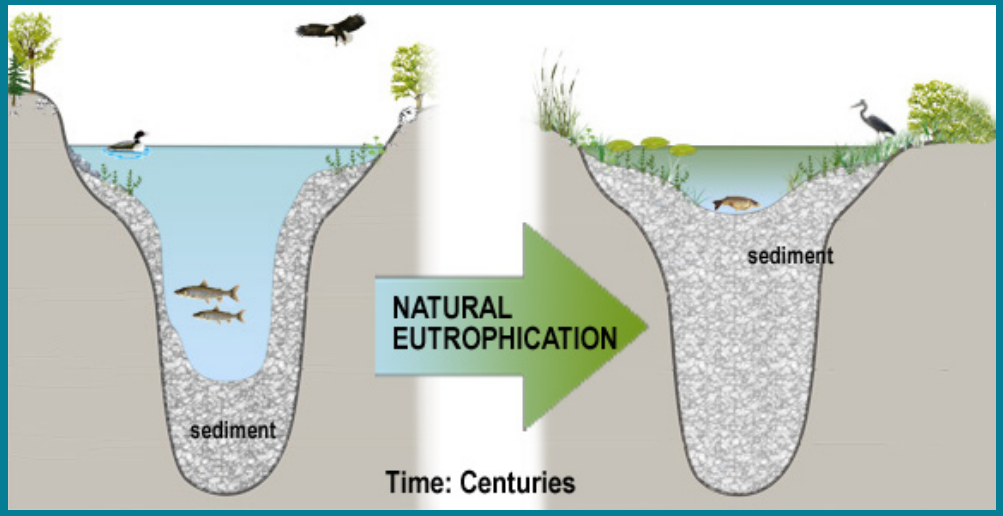
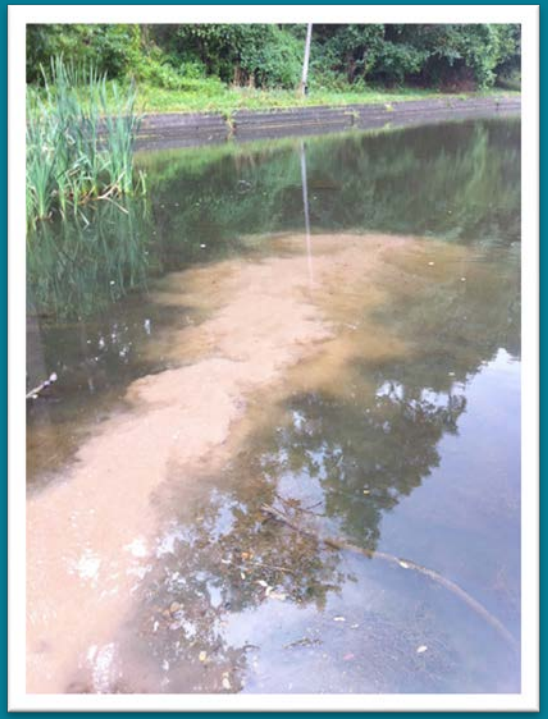
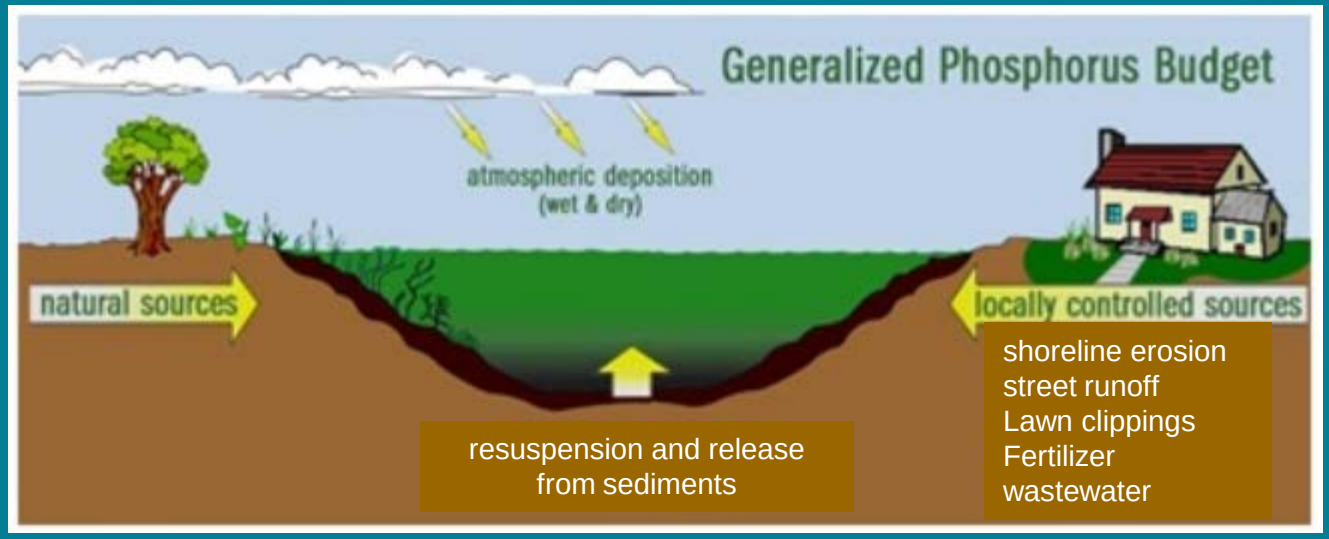




Phosphorus in NH Lakes



From Winnipesaukee Gateway

The Impact of Phosphorus

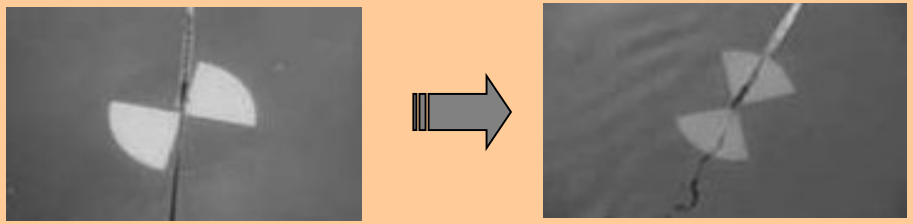
PHOSPHORUS

P

More Phosphorus Leads to:

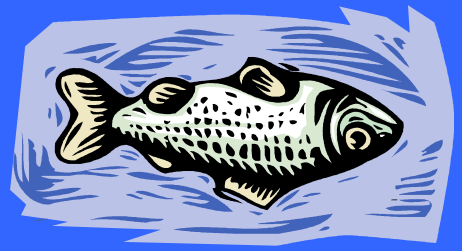
ALGAE

More Plant and Algae Growth



S
D

Lower Water Clarity



D.
O.

Lower Dissolved Oxygen

Algae

- Impacts water clarity
- Too many nutrients can increases in algae

. . . and possibly Cyanobacteria!

Another Big Problem…

Invasive Aquatic Species

- Impair designated uses of waterbodies
- Can cause declines in shorefront property values


Hydrilla (EXOTIC)


Fanwort (EXOTIC)
HIGH RISK!


Variable milfoil (EXOTIC)
HIGH RISK!


Brazilian elodea (EXOTIC)

What can we do to protect NH Lakes?

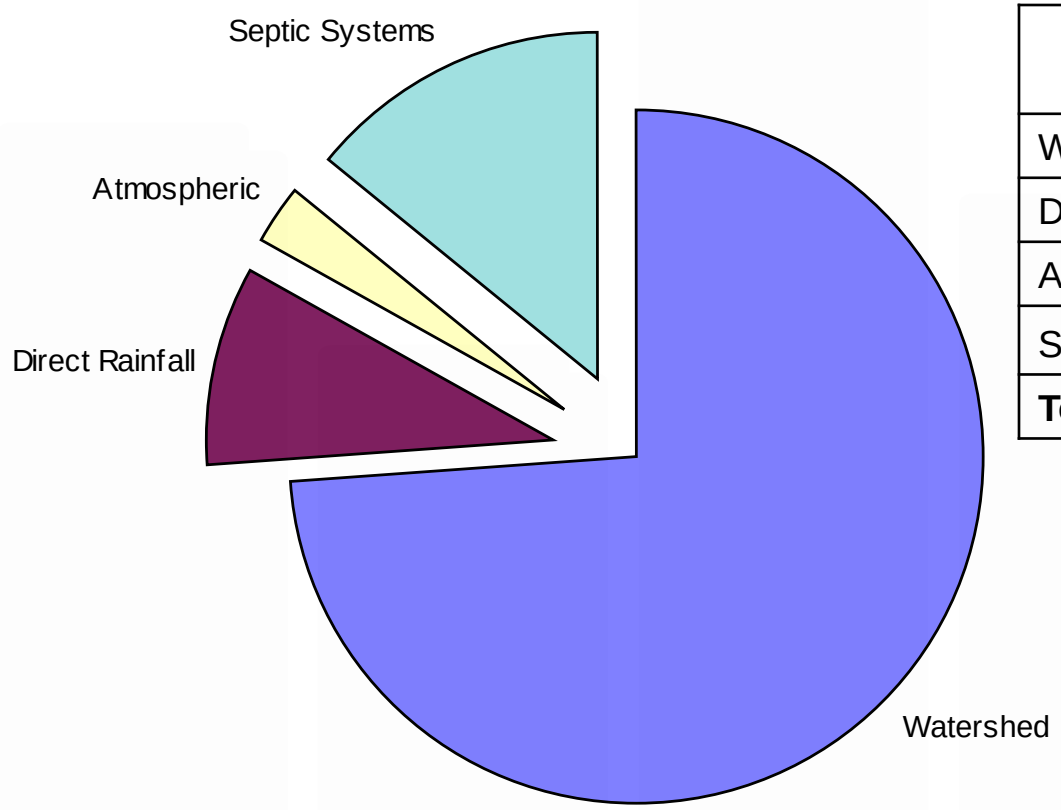
Questions or Comments?

Have questions?
Want to get involved?

Barbara McMillan, NHDES Watershed Assistance Section

barbara.mcmillan@des.nh.gov 603-271-7889

Phosphorus in NH Lakes



Watershed P Loads (VHB, 2006)

Source	Mass (kg)	% of Total
Watershed	539.0	0.74
Direct Rainfall	68.1	0.09
Atmospheric	20.4	0.03
Septic Systems	103.0	0.14
Total	**730.5**	

Nutrients : Algae : Clarity Relationships

- Increases in nutrients (P)

=

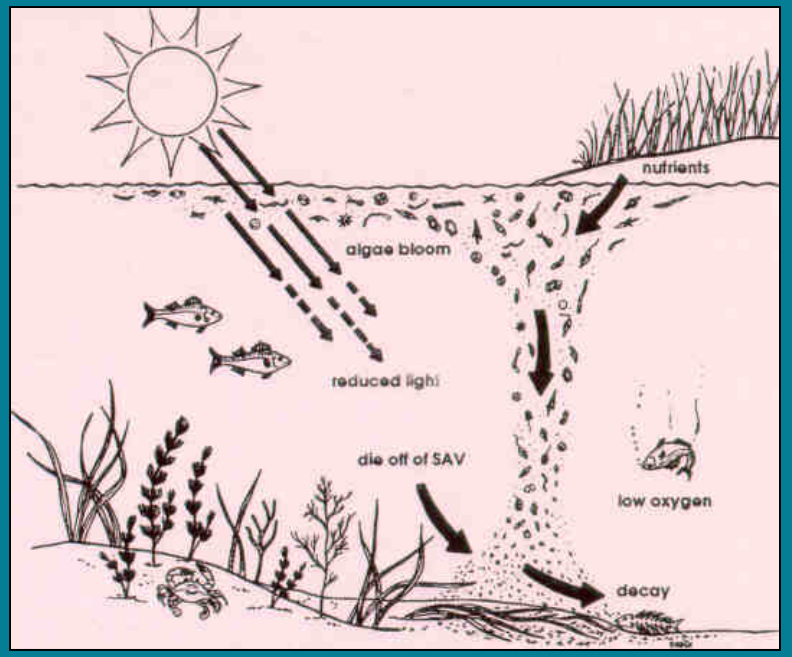
- Increases in algae (chl-a)

=

- Decreases in lake clarity (SD)

=

- Decreases in property values!

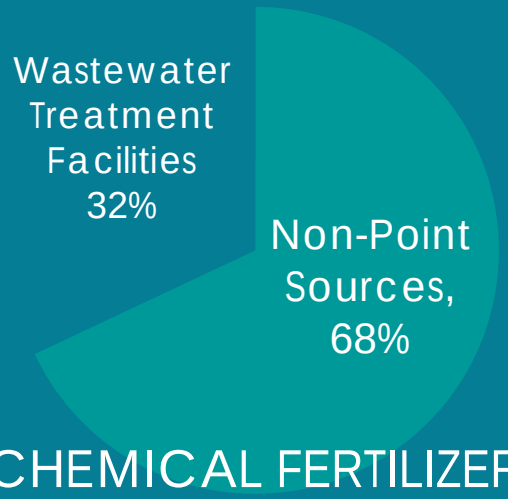


Activities and Factors in the Watershed that Can Affect Water Quality

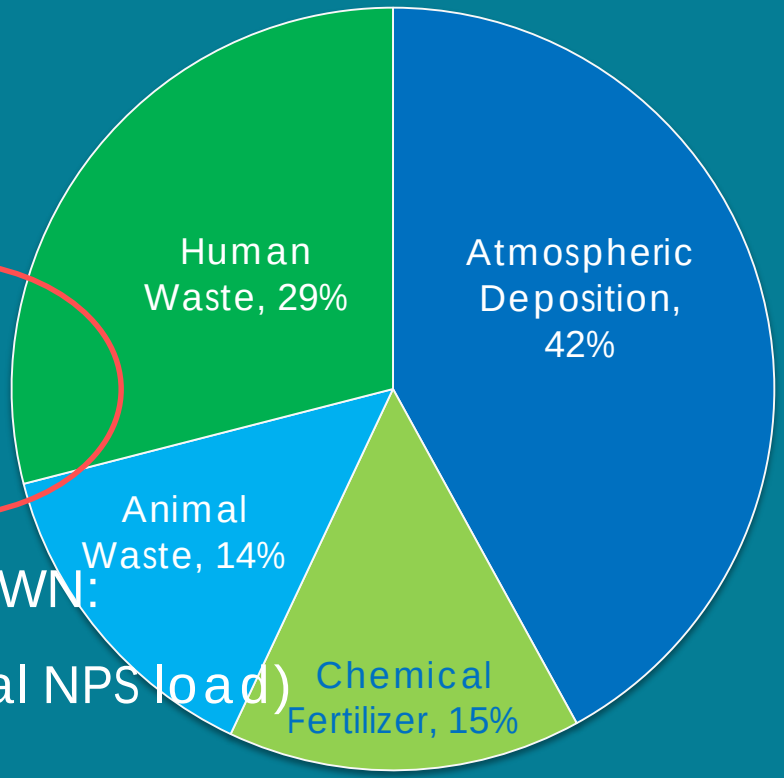
- Construction
- Road Runoff
- Shoreline Erosion
- Forestry Activities
- Fertilizing
- Washing Cars
- Septic System Failure/leaking
- Herbicide Application
- Sediment Disruption
- Farming/Animals
- Gasoline Spills
- Urban Development
- Commercial Development
- Improperly Constructed Beaches

Nitrogen in Great Bay

Total Nitrogen Load



NPS Nitrogen Load



CHEMICAL FERTILIZER BREAKDOWN:

- 70% from lawns (10.5% of total NPS load)
- 22% from agriculture
- 8% from recreational fields, including golf courses

Data source: GBNNPSS, DES 2014

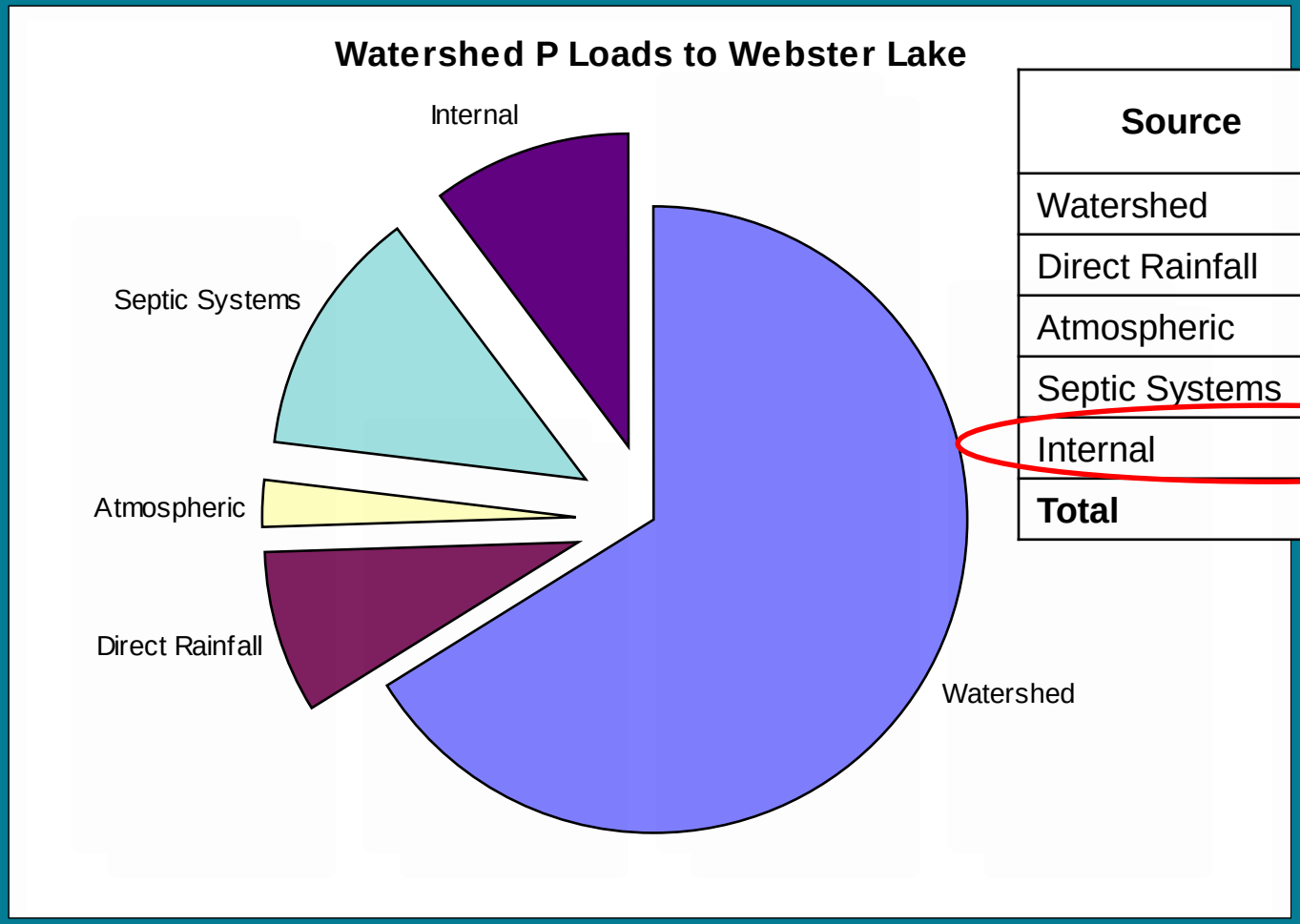
What can we do to protect Great Bay?

Photo: ©Jerry & Marcy Monkman

What is Internal P Loading?

- Sediments consist of solid particles separated by liquid-filled *interstitial spaces* containing pore water.
- The *sediment-water interface* is the barrier to free interchange of phosphorus between sediments and lake water.
- If the interface is *anoxic* phosphate ions can pass between the sediments and lake water.
- If the interface is *oxygenated*, phosphate ions are precipitated and do not pass freely to lake water.

Revised Watershed P Loads



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Direct Rainfall	68.1	0.08
Atmospheric	20.4	0.03
Septic Systems	103.0	0.13
Internal	84.4	0.10
Total	**814.9**	

NH Lakes that Experience Cyanobacteria Blooms

- Greenwood Pond, Kingston
- Country Pond, Newton
- French Pond, Henniker
- Monomonac Lake, Rindge
- Harvey Lake, Northwood
- Turtle Pond, Concord
- Baboosic Lake, Amherst
- Webster Lake, Franklin
- Bow Lake, Northwood
- Long Pond, Pelham
- Showell Pond, Sandown
- Phillips Pond, Sandown
- Robinson Pond, Hudson
- York Pond, Berlin
- Pawtuckaway Lake, Nottingham
- Harris Pond, Pennichuck Water Works, Nashua

Bow Lake, Northwood, 2006

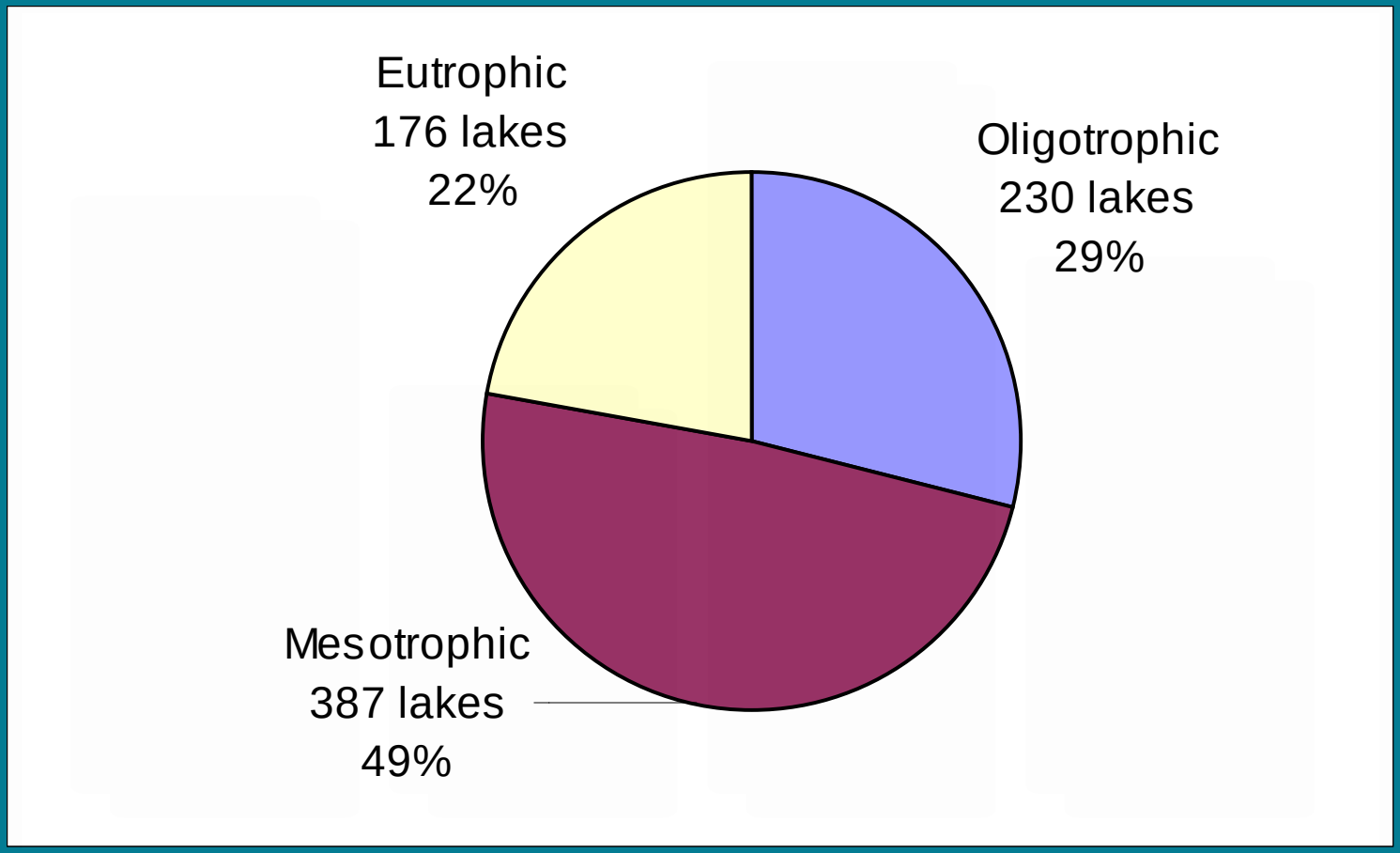

Merrell and Howe
2008


Merrell and Howe
2008

Top 10 Big Lakes in NH

Waterbody Name / Town	Area (acres)
Winnipesaukee / Wolfeboro	44,585.24
Umbagog / Errol	7,849.82
Squam Lake / Holderness	6,764.36
Winnisquam / Belmont	4,264.20
Newfound Lake / Bristol	4,105.91
Sunapee Lake / Sunapee	4,090.04
Moore Reservoir / Littleton	3,489.91
Ossipee Lake / Ossipee	3,091.83
Lake Wentworth / Wolfeboro	3,071.53
Massabesic Lake / Auburn	2,899.94

Trophic Status of NH Lakes



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