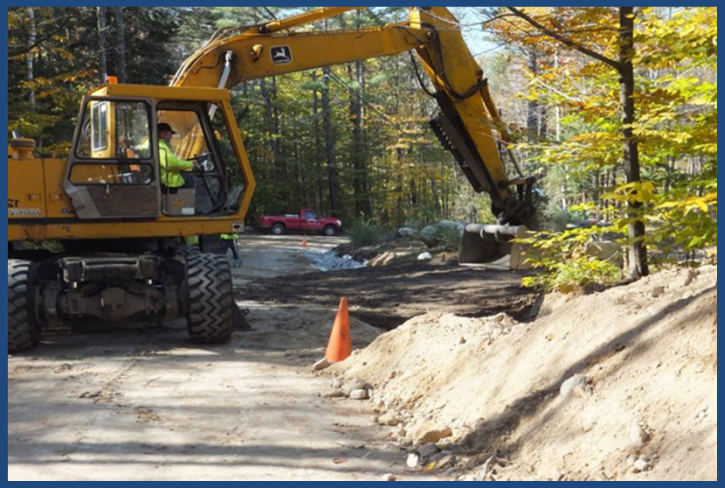
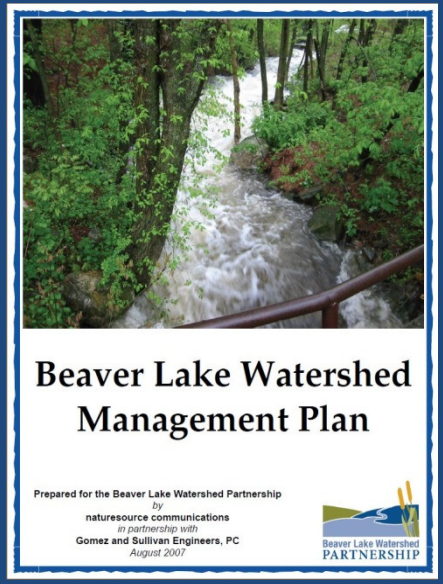
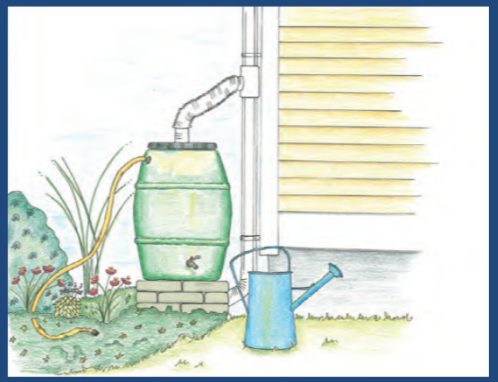
Watershed Management

It's a journey!





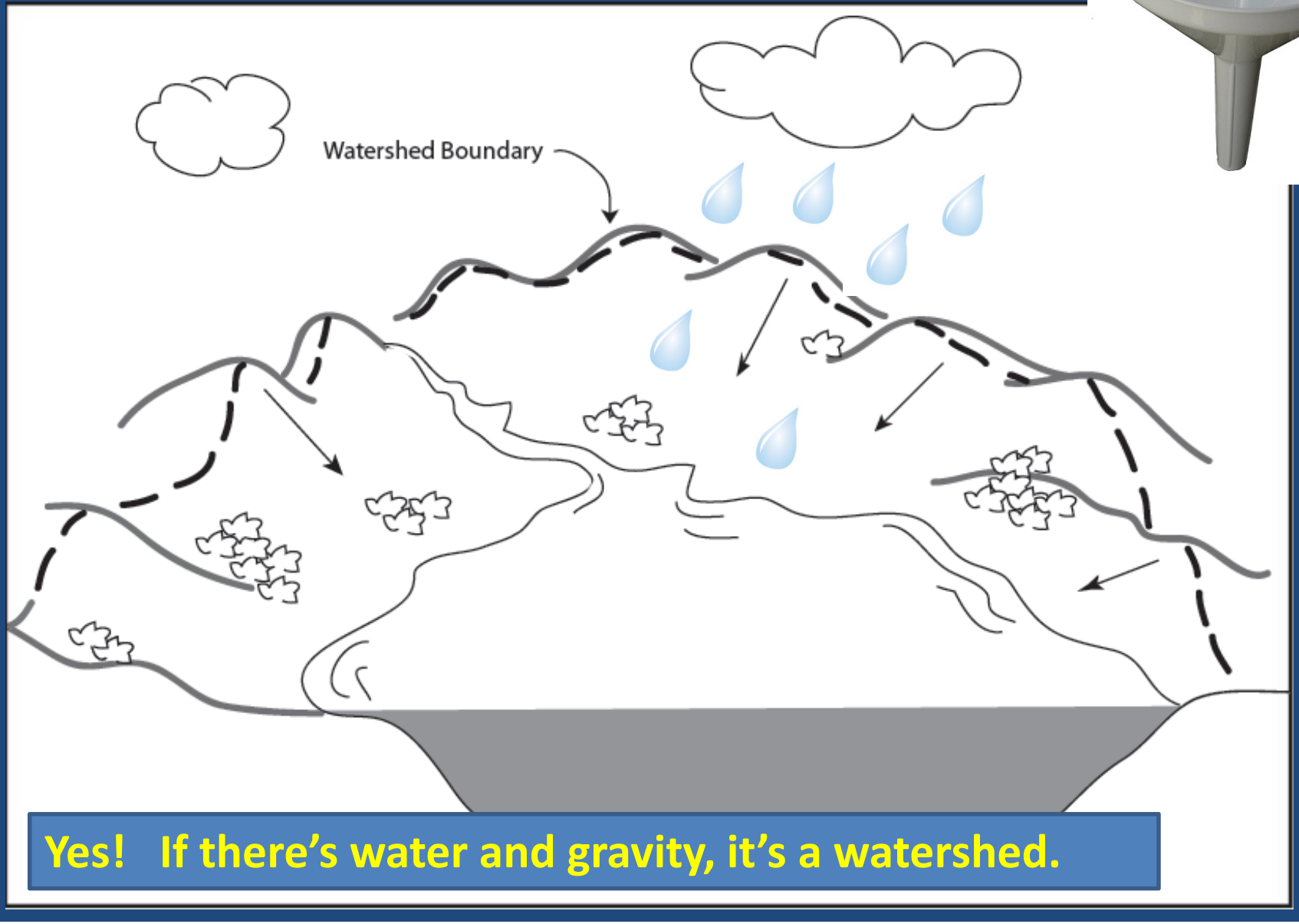


NHDES

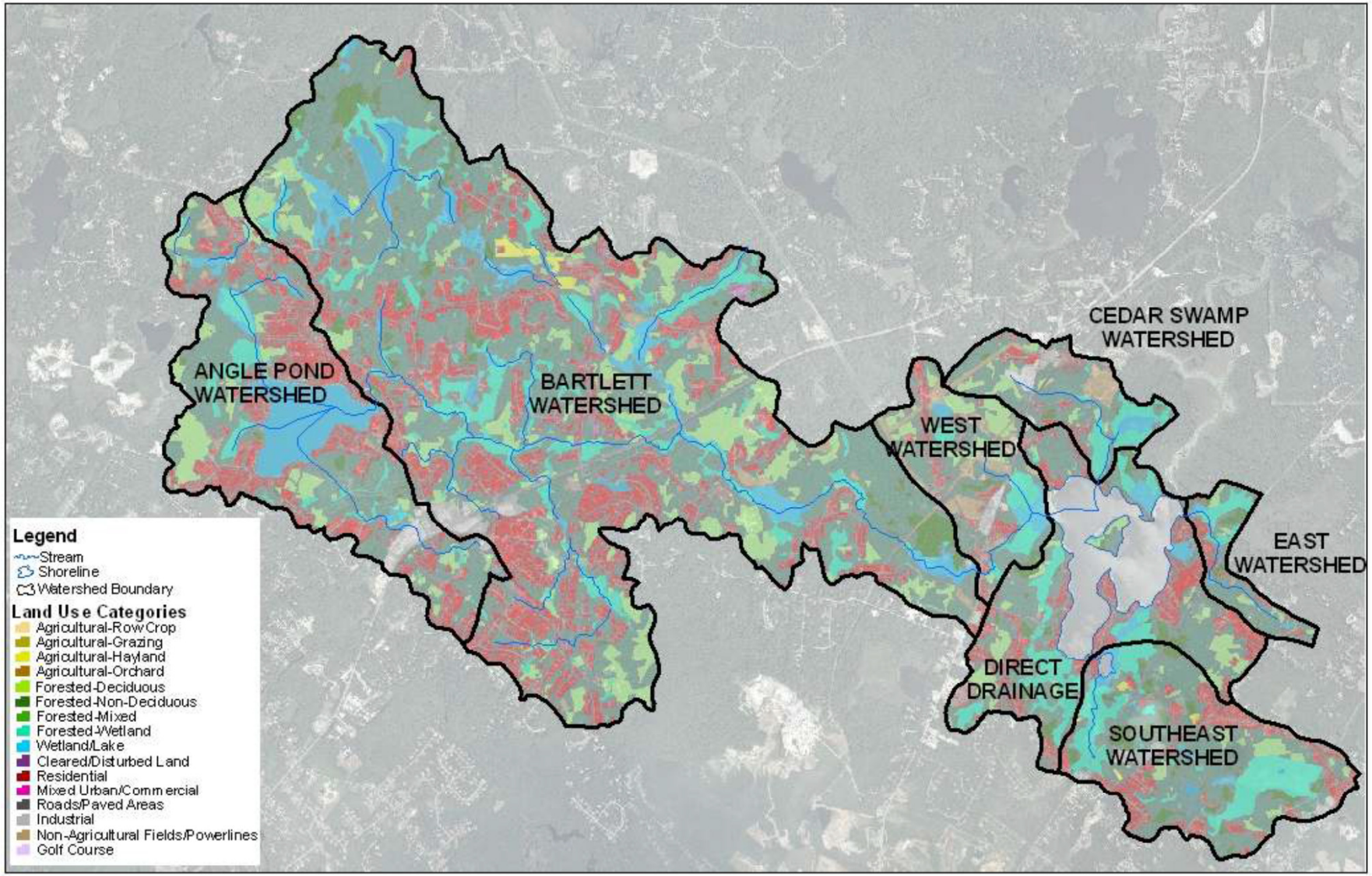
Sally Soule, Coastal Watershed Supervisor

NHDES Watershed Assistance Section

Do you live in a watershed?



Yes! If there's water and gravity, it's a watershed.



ENSR | AECOM

Proj# 09090-107

Notes:
1) Aerial photo base map from 2003 National Agricultural Imagery Program (NAIP); obtained from NHGRANIT.
2) Land use polygons were compiled by ENSR from Land Use polygon data, Land Cover raster data, and National Wetlands Inventory (NWI) data obtained from NHGRANIT, and from windshield survey information.

FIGURE 3-1
Land Use
Country Pond
Kingston, NH

Nonpoint Source Pollution (NPS)

- Diffuse sources
- Rainfall or snowmelt moving over and through the ground transports pollutants
- Runoff carries natural and human-made pollutants, deposits them into ponds, lakes, rivers, wetlands, coastal waters

Photo by Jon McKeon

NPS sources and pollutants

Source	Pollutants
Agricultural runoff	Nutrients , sediment, bacteria
Animal waste – pets, waterfowl, livestock …	Bacteria, nutrients
Atmospheric deposition	Nutrients
Erosion	Phosphorus and sediment
Hydromodification – dams, culverts, channelization…	Flooding, low DO, poor habitat
Fertilizers	Nutrients
Impervious cover (IC) – roads, parking lots, roofs, driveways…	Everything: bacteria, fertilizer, oil, gas, sand, salt, nutrients, hot water, high flows ……
Septic systems	Bacteria and nutrients
Stormwater runoff – from IC, gravel roads, lawns…	Everything!



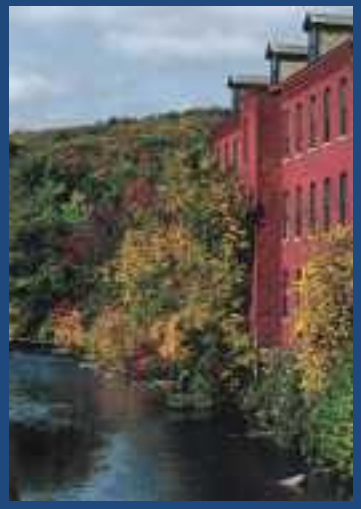



Why should you care about NPS?

NPS pollution can have serious impacts on economics, quality of life, and public health and safety

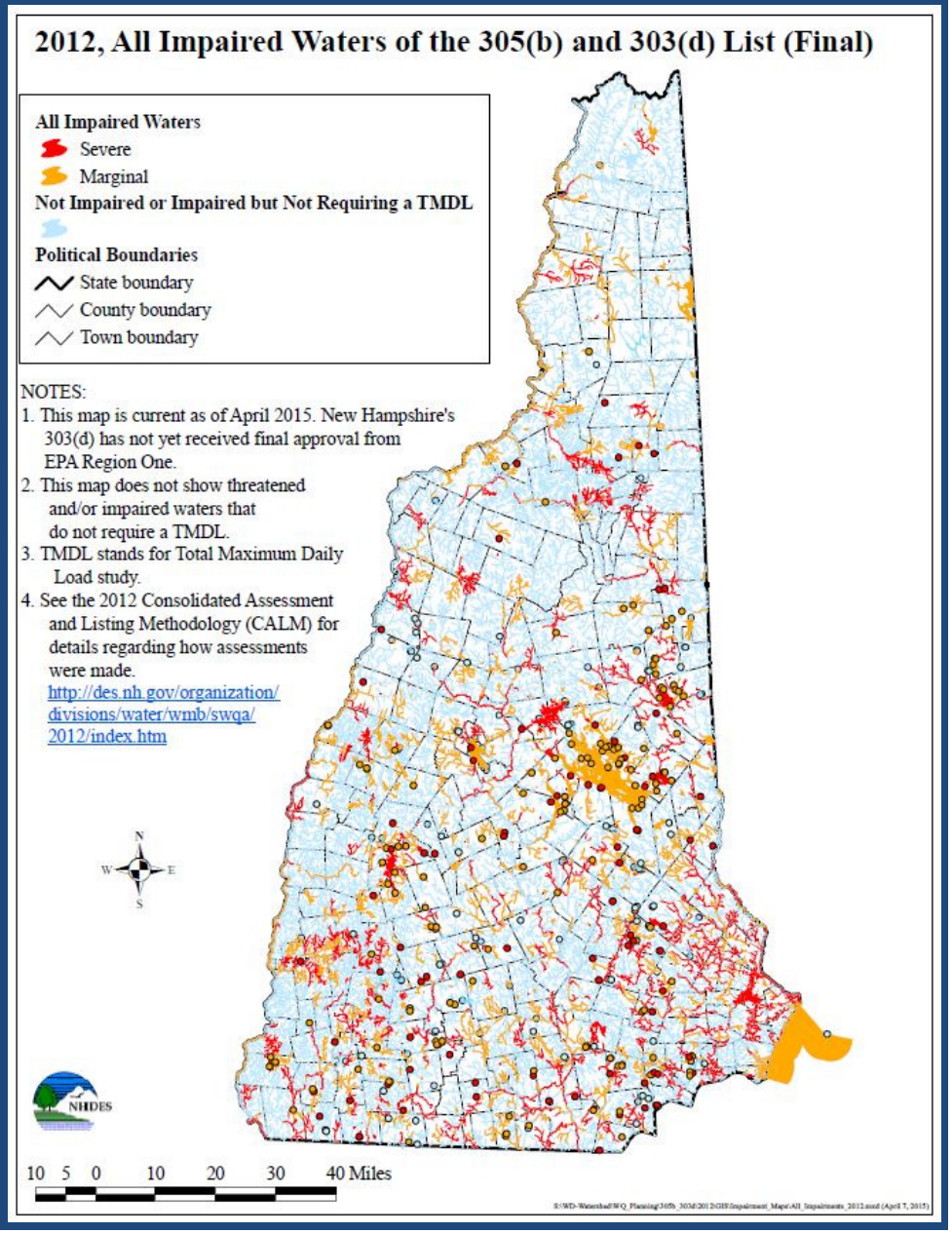
The **BIG** Picture

- Water quality has improved – Clean Water Act (fishable, swimmable)
- Challenges remain – Nonpoint Source Pollution
- Nearly 40 percent of assessed waters in the country remain too polluted for fishing, swimming, and other uses



The New Hampshire Picture

Nonpoint source pollution contributes to over 90% of the water pollution problems in NH

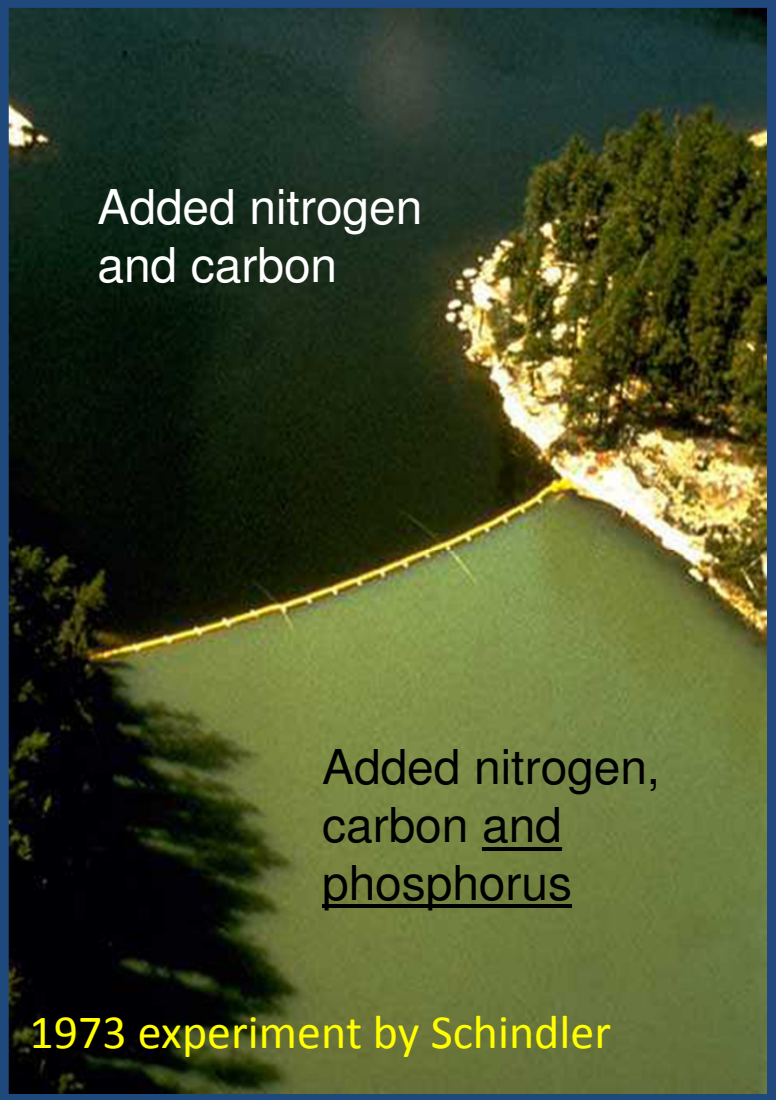


The Country Pond Picture

- Country Pond is impaired for Primary Contact Recreation due to the presence of cyanobacteria

- A TMDL (phosphorus “budget”) was completed in 2011 to provide guidance for reducing the frequency of cyano blooms (AECOM, 2011)

Too much phosphorus (P) grows algae



Eutrophication

eu·troph·i·ca·tion

[yo͞o ˌträfəˈkāSH(ə)n]

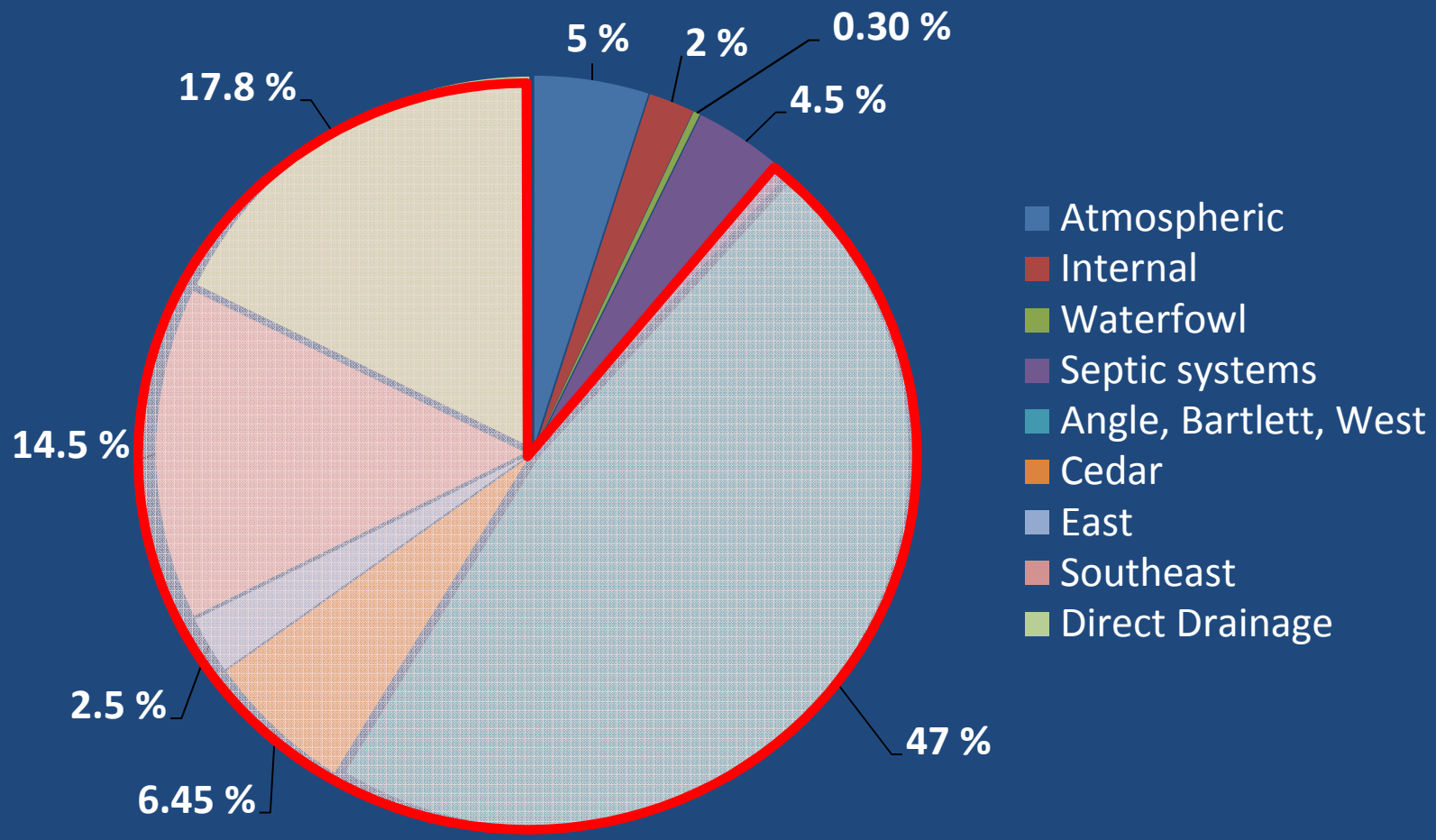
NOUN

Excessive richness of nutrients in a lake, frequently due to runoff from the land, which causes dense growth of plant life and death of animal life from lack of oxygen.

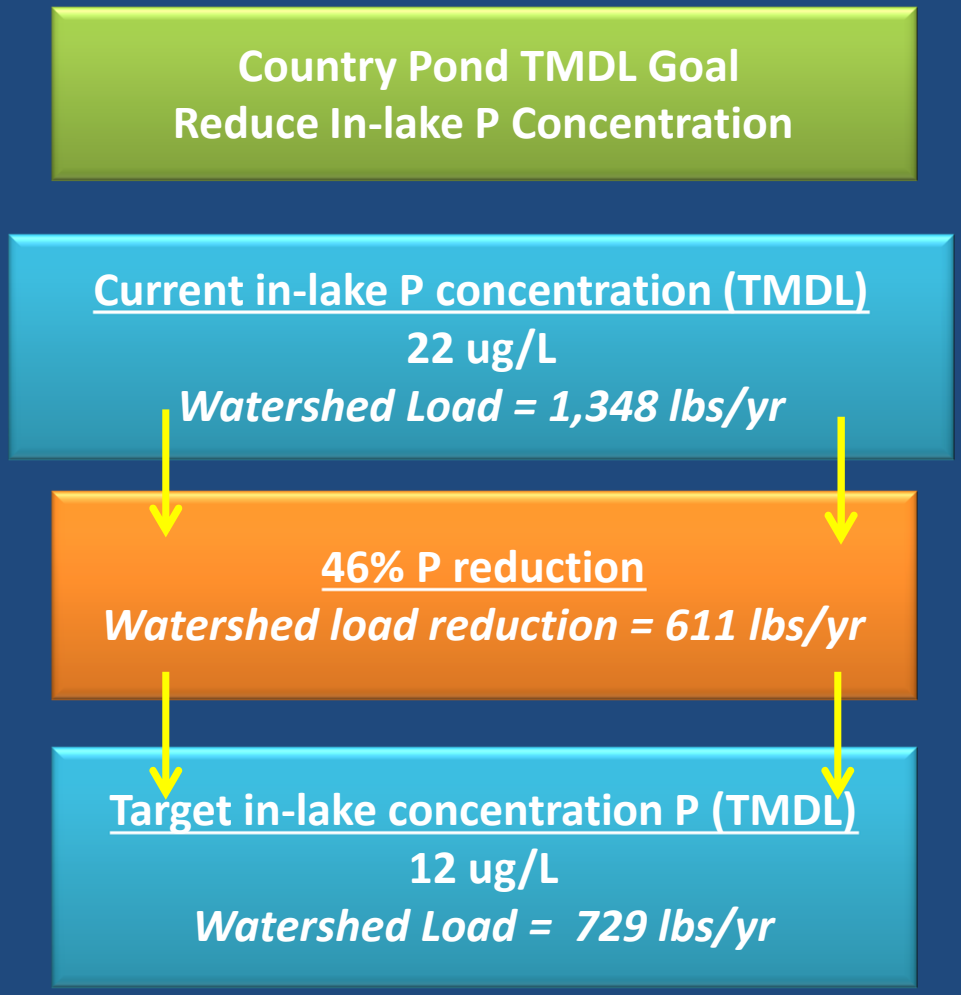
Where is the P coming from?!!

Country Pond P loads (TMDL)

Total load = 1348 lbs/yr



How much P do we need to reduce to have fewer cyanobacteria blooms?



What can we do about the P ?!

- ***Develop*** a watershed plan

- ***<u>Implement</u>*** your watershed plan – action!

Nine Element Plans

Attachment A: EPA Watershed Plan Elements "a" through "i"

a) *Identify pollution causes and sources: An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan), as discussed in item (b) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X number of storm drains that need retrofits; Y miles of gravel roads that need drainage BMPs; or Z linear miles of eroded streambank needing remediation).*

b) *Estimate pollution reductions needed: An estimate of the load reductions expected for the management measures described under (c). Estimates should be provided at the same level as in item (a) above (e.g., the total load reduction expected for storm drain retrofits, gravel road BMPs or eroded streambanks). First quantify the pollutant loads for the watershed. Based on these pollutant loads, determine the reductions needed to meet water quality standards (or other goals).*

c) *Actions needed to reduce pollution: A description of the NPS management measures that will need to be implemented to achieve the load reduction or habitat restoration scope estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.*

d) *Costs and authority: An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. Describe the types and sources of match that will be used to implement the project, keeping in mind that at least 40% of the project cost must be provided in non-federal match.*

e) *Outreach and education: An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing NPS management measures.*

f) *Schedule: A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.*

g) *Milestones: A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.*

h) *Success indicators and evaluation: A set of criteria that can be used to determine whether loading reductions or habitat restoration is being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised.*

i) *Monitoring plan: A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.*

Why develop an a – i watershed plan?

- Proactive and informed
- Locally driven
- Integrated and comprehensive
- Flexible and responsive
- A - i implementation projects are eligible for grant **FUNDING**

A watershed plan helps you make informed choices to maximize resources and achieve your water quality goals.

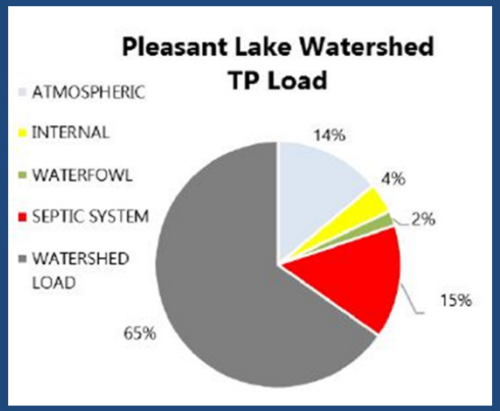
Element “a”

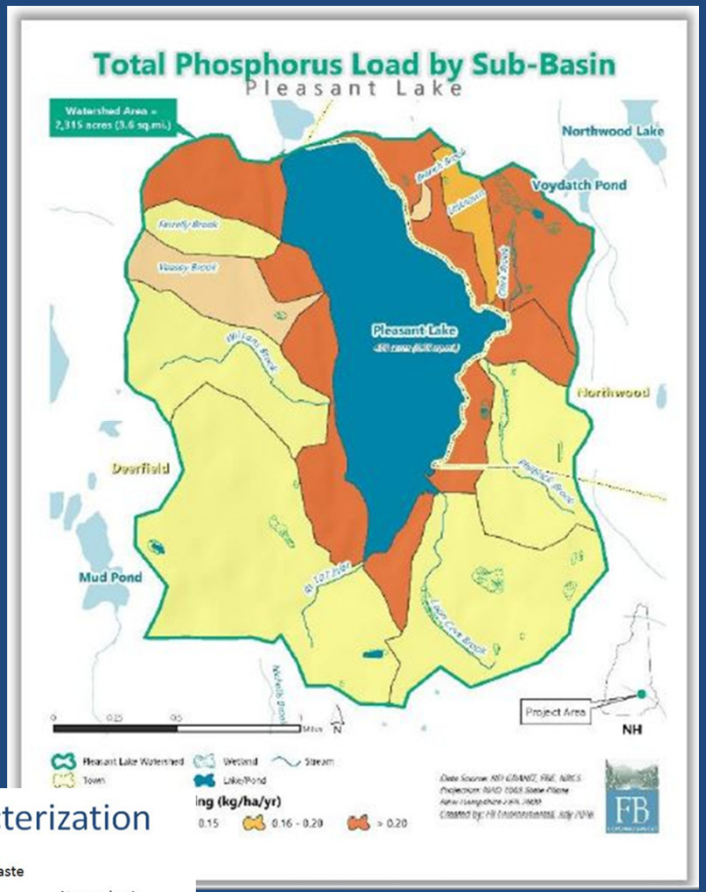
- Identify <u>pollution causes and sources</u> to be controlled

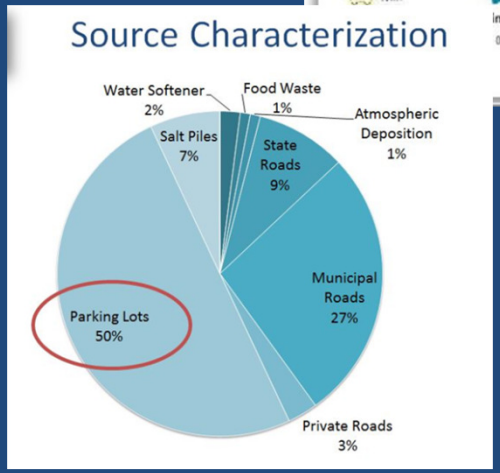
Study,

investigation,

and local knowledge.







Element “b”

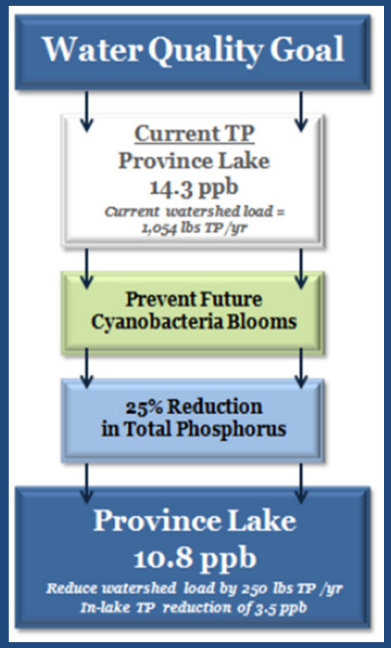
- Estimate <u>pollutant reductions</u> needed to meet water quality goals

Review WQ data,

quantify pollutant loads,

set your water quality goals,

model results and determine reductions.

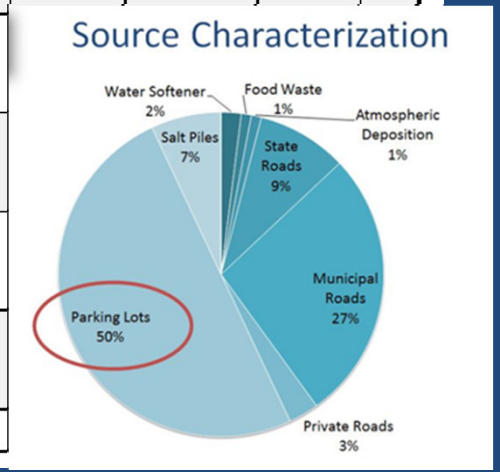


Element "c"

- Identify and prioritize actions needed to reduce pollutants
  - Structural and non-structural best management practices (BMPs)

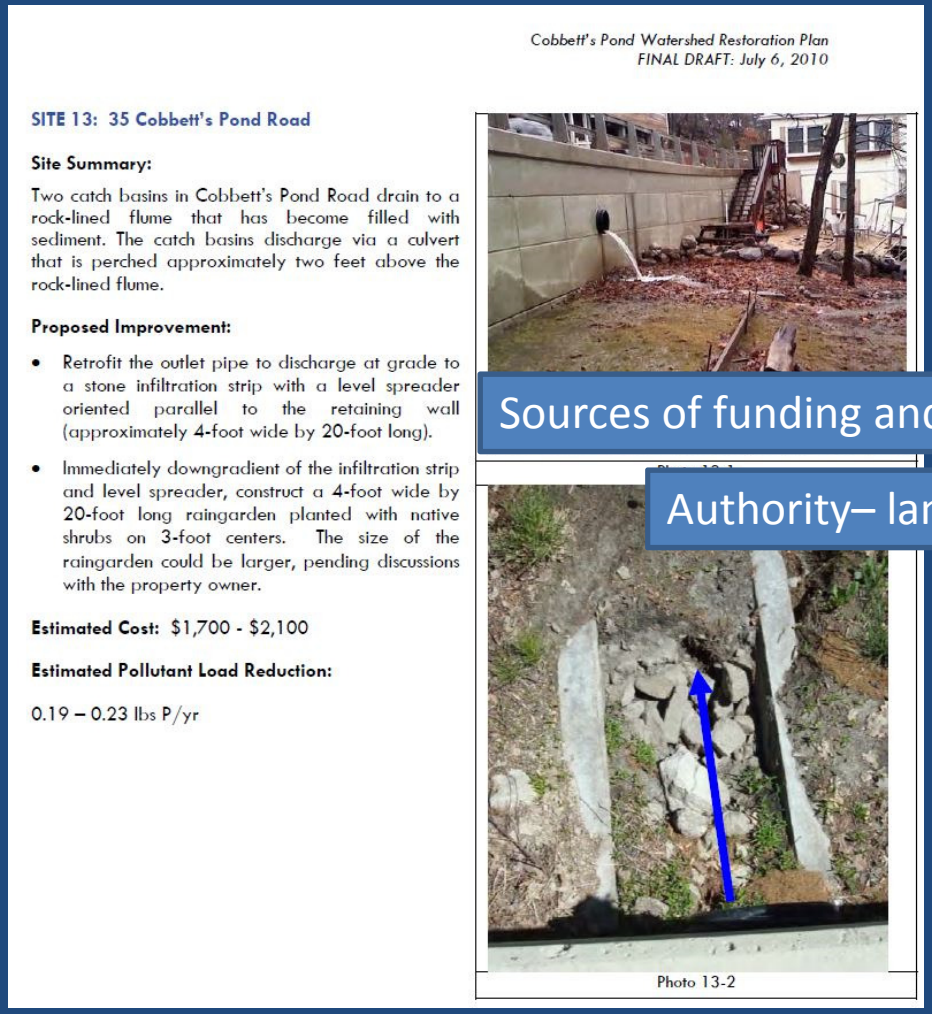
Appendix E.2 – Top 6 BMP Locations

Map ID	Top 30 ID	BMP Description	Tributary	BMP Drainage Area (acres)	BMP Impervious Drainage Area (acres)	BMP TP Loading (kg/year)	BMP Type	BMP Workable Area	BMP WQv Provided (cf)	BMP Sizing Factor	BMP TP Pollutant Removal Efficiency	BMP Annual TP Pollutant Removal (kg/year)	Conceptual BMP Cost Estimate	BMP Annual Maintenance Cost Estimate	10 yr Cost Per Pound TP Pollutant Removed ($/kg)	Rank
39	R-11	Wentworth State Park BMPs	Lake Wentworth	5.70	0.86	2.15	Stabilization & Infiltration BMPs	13,660	3,124	100%	60%	1.29	$19,607	$500	$1,908	1
67	R-13	Next to the Lake Motel - South Main Street Drainage Outlet	Crescent Lake	30.83	17.82	19.42	Detention Area / Gravel Wetlands	16,800	64,686	100%	55%	10.68	$203,197	$250	$1,926	2
40	R-4	Gov Went Hwy Shoulder & Pull-Off #2	Lake Wentworth	5.33	2.86	3.58	Infiltration BMPs	10,700	10,370	100%	60%	2.15				
70	R-6	Camp Bernadette Beach Area / Access	Lake Wentworth	14.78	6.31	7.31	Infiltration BMPs	7,800	9,360	41%	60%	1.79				
96	R-28	Crescent Lake Ave - Old Failed Level Lip Spreader	Crescent Lake	13.26	4.60	5.66	Treatment Swales	15,000	15,000	90%	25%	1.27				
79	R-25	Pleasant Valley Rd @ DeVyler Farm	Townsend Brook East	14.38	4.40	7.98	Bioretention Area	5,000	7,000	44%	65%	2.27				
TOTALS:				84.28	36.85	46.10						19.46				



Element “d”

- Implementation capacity: estimate costs, identify funding sources, and partners



Cobbett's Pond Watershed Restoration Plan
FINAL DRAFT: July 6, 2010

SITE 13: 35 Cobbett's Pond Road

Site Summary:

Two catch basins in Cobbett's Pond Road drain to a rock-lined flume that has become filled with sediment. The catch basins discharge via a culvert that is perched approximately two feet above the rock-lined flume.

Proposed Improvement:

- Retrofit the outlet pipe to discharge at grade to a stone infiltration strip with a level spreader oriented parallel to the retaining wall (approximately 4-foot wide by 20-foot long).
- Immediately downgradient of the infiltration strip and level spreader, construct a 4-foot wide by 20-foot long raingarden planted with native shrubs on 3-foot centers. The size of the raingarden could be larger, pending discussions with the property owner.

Estimated Cost: $1,700 - $2,100

Estimated Pollutant Load Reduction:

0.19 – 0.23 lbs P/yr

Conceptual plans - estimated costs

Sources of funding and support – Municipal, State, NGO, etc.

Authority– landowners, permitting agencies, etc.

Element “e”

- <u>Outreach and Education:</u> public information and participation

Raise awareness about what you’re doing and…

receive feedback to understand local needs, desires, and concerns.

Element "f"

- Schedule for implementing measures identified in your plan.

Table 5-1. McQuesten Brook Capital Improvement Plan & Schedule

Option	Partners	Capital Cost	Annual O&M Cost	Year 1 2013	Year 2 2014	Year 3 2015	Year 4 2016	Year 5 2017	Year 6 2018	Year 7 2019	Year 8 2020	Year 9 2021	Year 10 2022
#6. Dam Removal - Remove Dams McPD1, McPD2 and SMSD Along McQuesten Brook and Pond	NHRC, NHDES, City of Manchester, Town of Bedford, New Hampshire Fish and Game Department, River Network, Consultant, Volunteers	$110,000	$ -										
Obtain Funding				X									
Contract with Consultant Engineer				X									
Prepare Sediment Analysis and Hydraulic Modeling				X									
Prepare Final Dam Removal Designs and Secure Permits					X								
Remove Dams					X								
Conduct Pre and Post Monitoring					X	X	X	X	X	X			
#7. Streambank Restoration	NHRC, NHDES, City of Manchester, Town of Bedford, Private Business Owners, Volunteers												
Left Bank in Segment M02C		$ 5,500	$ -										
Contact Property Owners				X									
Seek Funding for Design and Construction					X								
Design, Permit and Construct Bank Stabilization and Erosion Controls					X	X							
Incorporate Improvements in Education Outreach							X						
Right Bank in Segment M02A		$ 1,925	$ -										
Contact Property Owners				X									
Seek Funding for Design and Construction					X								
Design, Permit and Construct Bank Stabilization and Erosion Controls					X	X							
Incorporate Improvements in Education Outreach							X						
Right Bank in Segment M01B		$ 3,575	$ -										
Contact Property Owners				X									
Seek Funding for Design and Construction					X								
Design, Permit and Construct Bank Stabilization and Erosion Controls					X	X							
Incorporate Improvements in Education Outreach							X						
#8. Long-Term Monitoring Program	NHRC, NHDES, New Hampshire Fish and Game Department, City of Manchester Urban Ponds Restoration Program, Volunteers												
Purchase Data Loggers - 3 DO, 3 conductivity, software & communications		$ 6,300			X								
#9. Encourage Stormwater Utility	NHRC, City of Manchester, Town of Bedford	$ -		X	X								
Total		**$3,093,300-$3,243,300**											
												Recharge Goal	

Notes:

1. Public education activities will be developed in consultation with the McQuesten Brook stakeholders committee.
2. For budgeting purposes, costs included under the "Design and Construct BMPs" recommendation are conceptual level and include design, permitting and construction for the highest cost alternative presented in Table 4-6 (with the exception of Sub-11, which uses the second highest priced alternative).
3. The cost to replace the undersized culver at I-293 assumes replacement with a 17' span x 6' rise x 210' long precast concrete box culvert with bed retention sills and stream simulation. The 17' span would meet the NH Stream Crossing Guidelines minimum span for the stream type. Costs include engineering, permitting and construction. A 12' span x 6' rise x 210' long precast concrete box culvert with bed retention sills and stream simulation to match bankfull channel width is estimated to cost $803,000.
4. The cost to replace the culverts at Wathen and Eastman Avenue include survey and engineering, permitting, construction and construction services. The Town of Bedford has included replacement of these culverts in its South River Road TIF project.
5. The streambank restoration work in segment M02A and M01B should be combined with other projects or performed by volunteers to reduce costs.

Element "g"

- Identify <u>milestones</u> to determine whether NPS management measures are being implemented.

Lake Wentworth and Crescent Lake Watershed Management Plan

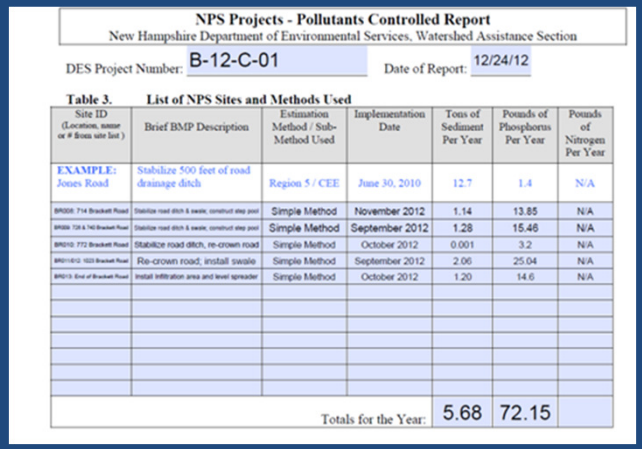
Appendix E.2 – Top 6 BMP Locations

Map ID	Top 30 ID	BMP Description	Tributary	BMP Drainage Area (acres)	BMP Impervious Drainage Area (acres)	BMP TP Loading (kg/year)	BMP Type	BMP Workable Area	BMP WQv Provided (cf)	BMP Sizing Factor	BMP TP Pollutant Removal Efficiency	BMP Annual TP Pollutant Removal (kg/year)	C… E…		($/kg)	
39	R-11	Wentworth State Park BMPs	Lake Wentworth	5.70	0.86	2.15	Stabilization & Infiltration BMPs	13,660	3,124	100%	60%	1.29	$19,607	$500	$1,908	1
67	R-13	Next to the Lake Motel - South Main Street Drainage Outlet	Crescent Lake	30.83	17.82	19.42	Detention Area / Gravel Wetlands	16,800	64,686	100%	55%	10.68	$203,197	$250	[illegible]	2
40	R-4	Gov Went Hwy Shoulder & Pull-Off #2	Lake Wentworth	5.33	2.86	3.58	Infiltration BMPs	10,700	10,370	100%	60%	2.15	$46,069	$500	$2,375	3
70	R-6	Camp Bernadette Beach Area / Access	Lake Wentworth	14.78	6.31	7.31	Infiltration BMPs	7,800	9,360	41%	60%	1.79	$38,285	$500	$2,416	4
96	R-28	Crescent Lake Ave - Old Failed Level Lip Spreader	Crescent Lake	13.26	4.60	5.66	Treatment Swales	15,000	15,000	90%	25%	1.27	$26,029	$500	$2,441	5
79	R-25	Pleasant Valley Rd @ DeVyler Farm	Townsend Brook East	14.38	4.40	7.98	Bioretention Area	5,000	7,000	44%	65%	2.27	$52,211	$500	$2,516	6
TOTALS:				84.28	36.85	46.10						19.46	$385,398	$2,750		

Element “h”

Success indicators – a set of criteria to determine whether you are making progress, or if the plan needs to be revised.

- **Quantifiable**: pollutant load reductions or measured in-lake concentration
- **Response**: fewer algal blooms or improved water clarity
- **Progress:** are we on schedule?



NPS Projects - Pollutants Controlled Report
New Hampshire Department of Environmental Services, Watershed Assistance Section

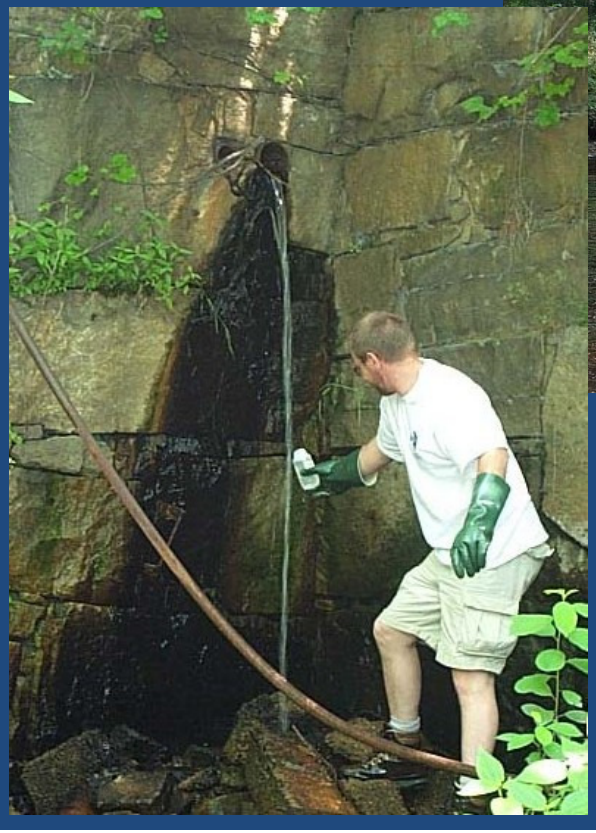
DES Project Number: B-12-C-01 Date of Report: 12/24/12

Table 3. List of NPS Sites and Methods Used

Site ID (Locations, name or # from site list)	Brief BMP Description	Estimation Method / Sub-Method Used	Implementation Date	Tons of Sediment Per Year	Pounds of Phosphorus Per Year	Pounds of Nitrogen Per Year
EXAMPLE: Jones Road	Stabilize 500 feet of road drainage ditch	Region 5 / CEE	June 30, 2010	12.7	1.4	N/A
BR008: 714 Brackett Road	Stabilize road ditch & swale; construct step pool	Simple Method	November 2012	1.14	13.85	N/A
BR009: 726 & 740 Brackett Road	Stabilize road ditch & swale; construct step pool	Simple Method	September 2012	1.28	15.46	N/A
BR010: 772 Brackett Road	Stabilize road ditch, re-crown road	Simple Method	October 2012	0.001	3.2	N/A
BR011/012: 1023 Brackett Road	Re-crown road; install swale	Simple Method	September 2012	2.06	25.04	N/A
BR013: End of Brackett Road	Install infiltration area and level spreader	Simple Method	October 2012	1.20	14.6	N/A
			Totals for the Year:	5.68	72.15	

Element “i”

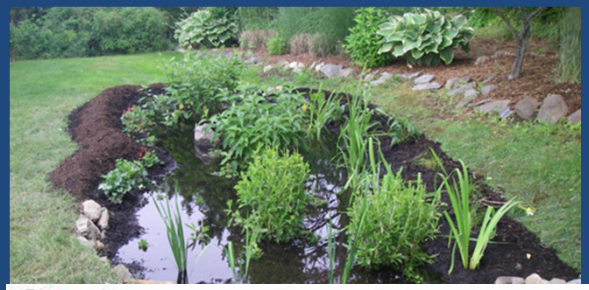
- **<u>Monitoring</u>** to evaluate effectiveness of management actions over time
- For Country Pond your monitoring = VLAP




Province Lake
atershed Management Plan
Environmental Services
Nutt Pond Watershed Restoration Plan
Final Report
January 19, 2009
Prepared for:
City of Manchester
300 Winston Street
Manchester, NH 03103
Mirror Lake Watershed Management Plan
May 2012
Prepared For:
Mirror Lake Protective Association
P.O. Box 311
Mirror Lake, NH 03853
Prepared By:
Geosyntec consultants
289 Great Road, Suite 105
Acton, MA 01720
www.geosyntec.com
You are not alone on this journey !
MESSER PO
WATERSHED-BASED IMPLEMENTATION PLAN
Prepared by
Base Flow, LLC
3 Brimstone Hill Road
Amherst, NH 03031
Prepared for
Messer Pond Protective Association
PO Box 103
New London, NH 03257
Submitted to
New Hampshire Department of Environmental Services
Watershed Assistance Section
29 Hazen Drive, PO Box 95
Concord, NH 03302
April 4, 2016
Environmental Services
NH SCC
Cobbett's Pond Watershed Restoration Plan
Final Draft: July 6, 2010
Prepared For:
Cobbett's Pond Improvement Association
20 Turtle Rock Road
Windham, NH 03087
Prepared By:
Geosyntec consultants
289 Great Road, Suite 105
Acton, MA 01720
www.geosyntec.com
ANT LAKE
WATERSHED RESTORATION PLAN
FINAL JANUARY 2017
PREPARED FOR
SOUTHERN NH PLANNING COMMISSION
438 Dubuque St
Manchester, NH 03102
SNHPC
PREPARED BY
FB ENVIRONMENTAL ASSOCIATES
170 West Rd, Suite 6
Portsmouth, NH 03801
FB

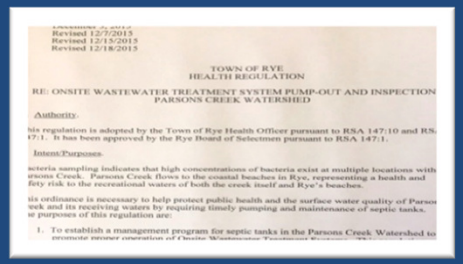
What does IMPLEMENTATION look like?

Residential and municipal stormwater ….



Outreach ….

Regulations….



Revised 12/7/2015
Revised 12/15/2015
Revised 12/18/2015

TOWN OF RYE
HEALTH REGULATION

RE: ONSITE WASTEWATER TREATMENT SYSTEM PUMP-OUT AND INSPECTION
PARSONS CREEK WATERSHED

Authority.

his regulation is adopted by the Town of Rye Health Officer pursuant to RSA 147:10 and RS
17:1. It has been approved by the Rye Board of Selectmen pursuant to RSA 147:1.

Intent/Purposes.

cteria sampling indicates that high concentrations of bacteria exist at multiple locations with
arsons Creek. Parsons Creek flows to the coastal beaches in Rye, representing a health and
fety risk to the recreational waters of both the creek itself and Rye's beaches.

is ordinance is necessary to help protect public health and the surface water quality of Parso
eek and its receiving waters by requiring timely pumping and maintenance of septic tanks.
e purposes of this regulation are:

1. To establish a management program for septic tanks in the Parsons Creek Watershed to

Septic systems ….

Culvert replacements ….

Gravel road fixes ….

RESULTS!

An a – i example from Province Lake

- Watershed plan completed 2014
- Two implementation grants
- 9 projects built
- Load reductions =

Phosphorus lbs/yr	Sediment tons/yr
100	105

Progress toward attaining watershed load reduction goal: 40%

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY

New Hampshire

Stakeholders Cooperate to Reduce Sediment Loading and Restore Recreational Uses in Cains Pond

Waterbody Improved

Sediment from stormwater runoff accumulated in Cains Pond, an old mill pond, and reduced its depth

Problem

Cains Pond, a three-acre impoundment on Cains Brook in the New Hampshire coastal town of Seabrook, was historically created for mill operation, ice harvesting, fire suppression and recreation. The pond is bounded by a residential area to the west and a major highway (U.S. Route 1) and urbanized commercial area to the east.

watershed experienced a commercial development boom around the year 2000. Construction activities are thought to have contributed much of the sediment that accumulated in the pond during this time. Increased development also resulted in a greater number of impervious surfaces. Additional stormwater infrastructure transported additional stormwater directly to the pond. Local residents used Cains Pond for fishing, boating, and other recreational pursuits; however, those uses became increasingly restricted as the pond filled

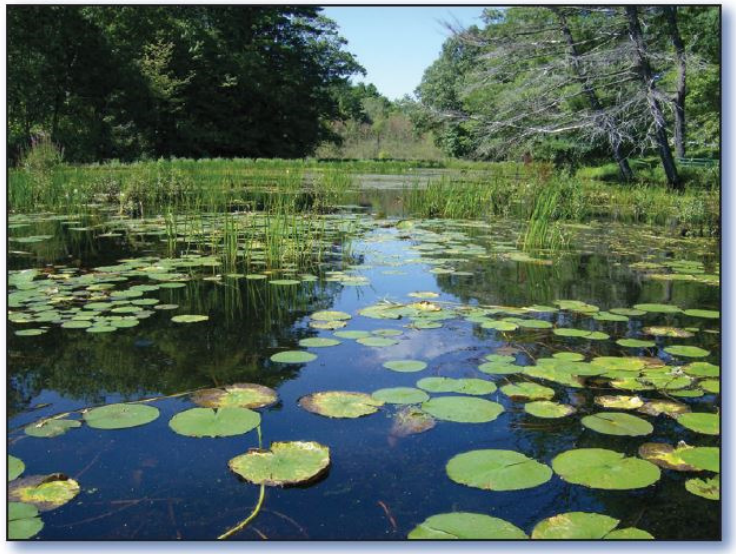
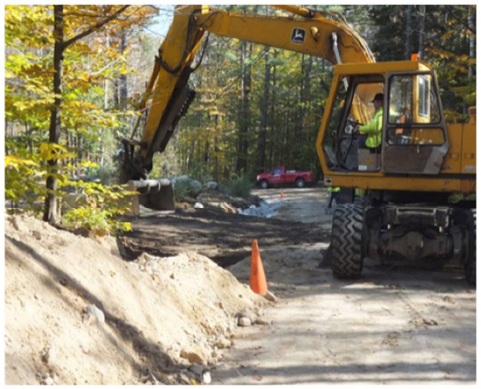
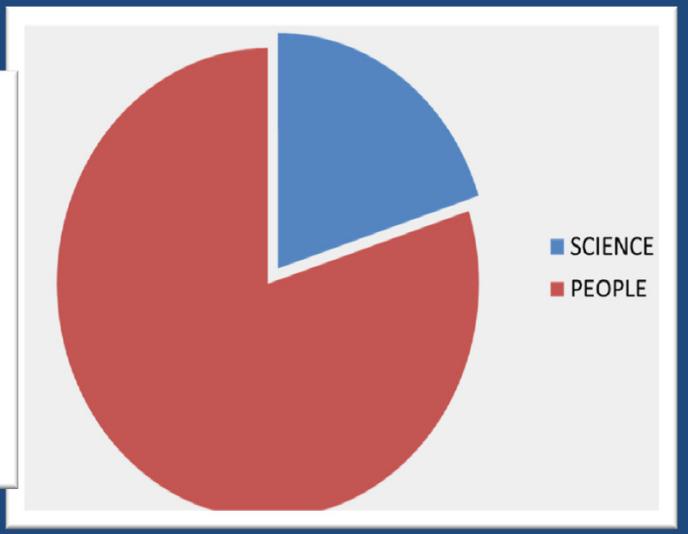


Figure 1. Before restoration efforts, Cains Pond was filled with

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