

The Messer Pond Watershed-Based Implementation Plan – More Science on a Lower Budget *NHDES VLAP Workshop*

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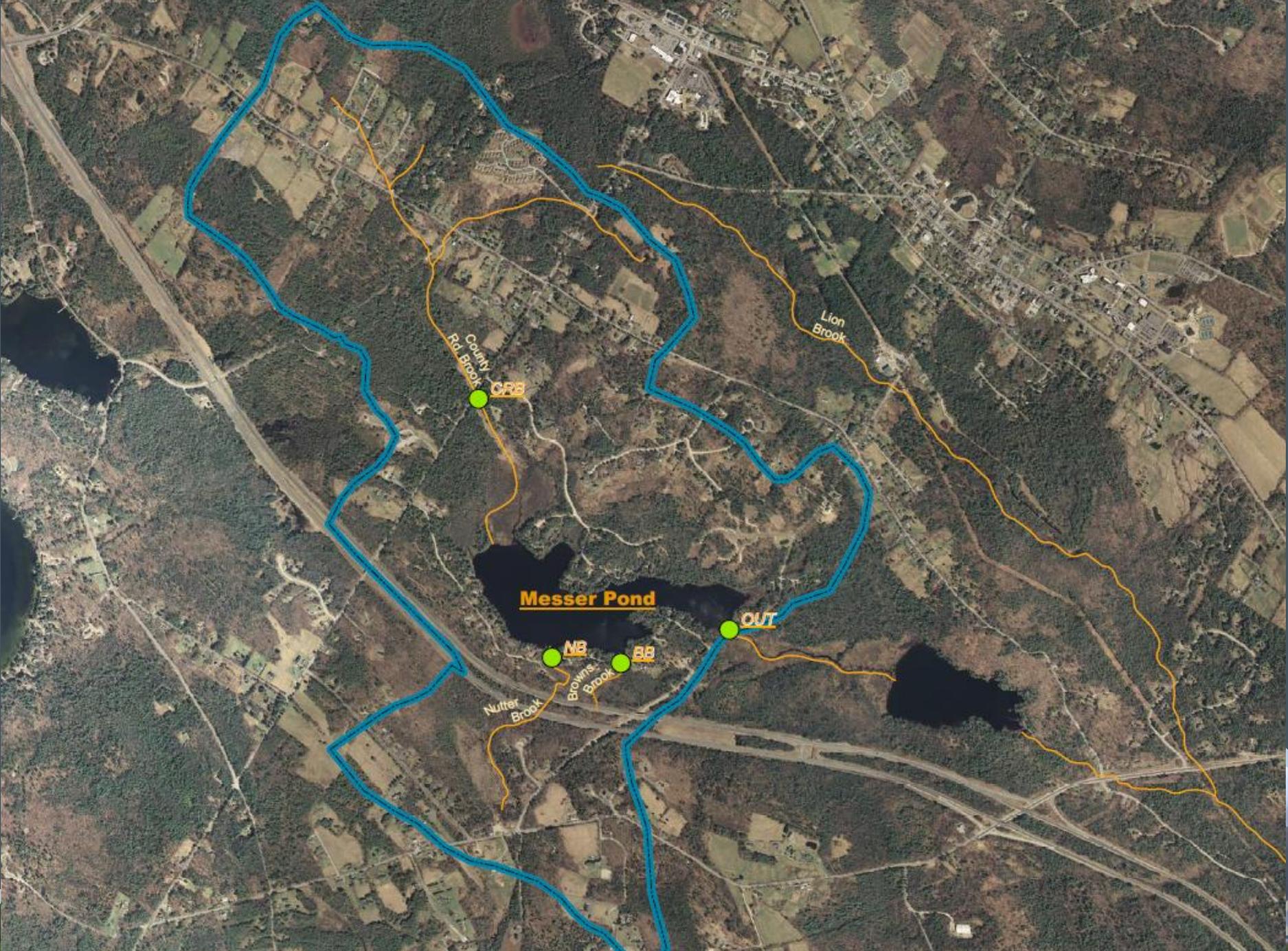
June 6, 2015

Presentation Overview

- Messer Pond stats
- Pursing an implementation plan
- The Messer Pond Plan - Science
- The Messer Pond Plan - Volunteers
- Study Results

Messer Pond Stats

- Pond size = 67 acres
- Mean depth = 8.5 feet
- Max depth = 25 feet
- Watershed area = 1,410 acres (2.2 mi²)
- Trophic state = mesotrophic
- Land use = 52% forest, 11.5% hay/pasture, 10% wetlands, 7.3% developed



County Rd. Brook
CRB

Lion Brook

Messer Pond

OUT

NB

BB

Nutter Brook

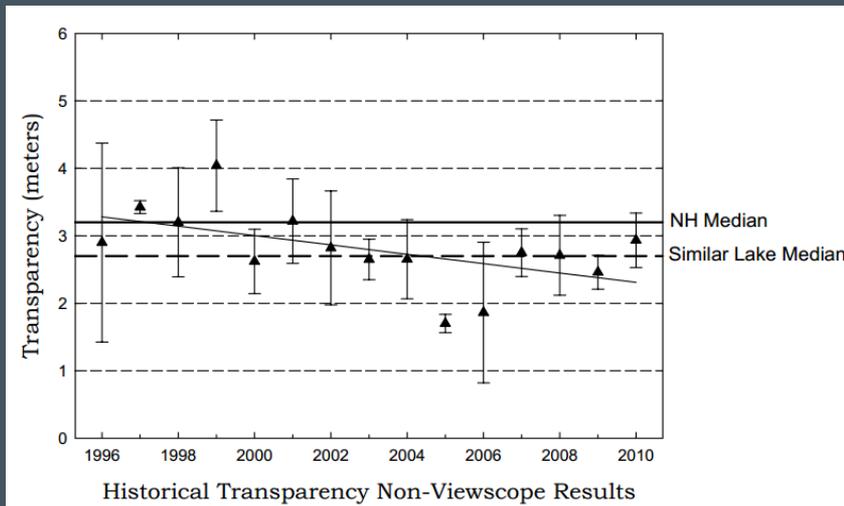
Browns Brook

Pursuing an Implementation Plan

- Why pursue a implementation plan?
 - DES 2010 and 2012 impaired waters listings for Messer Pond:
 - Phosphorous
 - Chlorophyll-a
 - pH

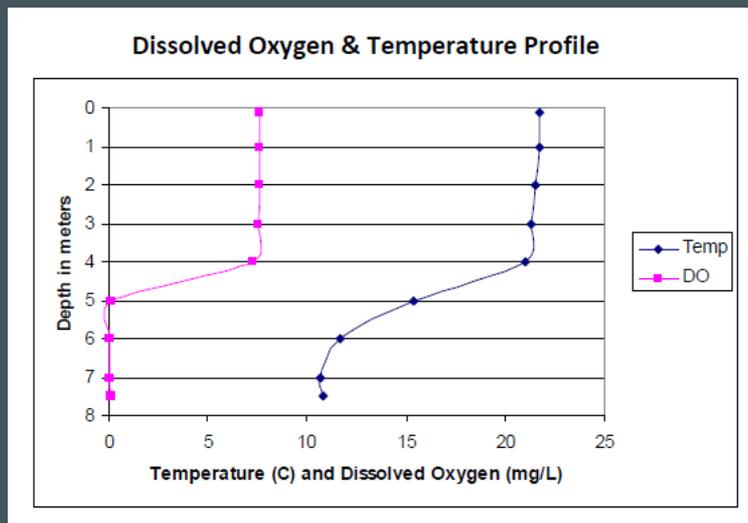
Pursuing an Implementation Plan

- Long-term water quality trends
 - Elevated conductivity levels
 - Decreasing transparency since VLAP sampling inception



Pursuing an Implementation Plan

- Long-term water quality trends
 - Elevated tributary phosphorous levels during wet weather
 - Potential for hypoxia in epilimnion



Pursuing an Implementation Plan

- Funding
 - NH Moose Plate grant
 - Some 319h funds to complete final tasks
 - Otherwise funded by MPPA

The Messer Pond Plan – Science

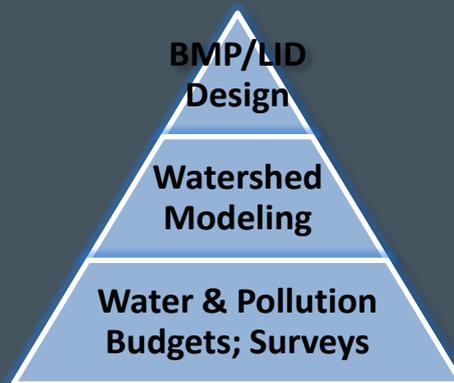
EPA's 9 Point Plan

- a. Identify pollutant causes and sources
- b. Pollutant load reduction estimates
- c. Describe NPS management measures
- d. Estimate technical and financial assistance
- e. Public information and education
- f. Implementation schedule
- g. Interim milestones
- h. Load reduction evaluation criteria
- i. Monitoring

The Messer Pond Plan – Science

EPA's 9 Point Plan

- a. Identify pollutant causes and sources
- b. Pollutant load reduction estimates
 - Proper ID and quantification of pollutant sources and loading is the basis for effective use of future 319h implementation funds
 - Especially when sources are diffuse/unknown!!!



The Messer Pond Plan – Science

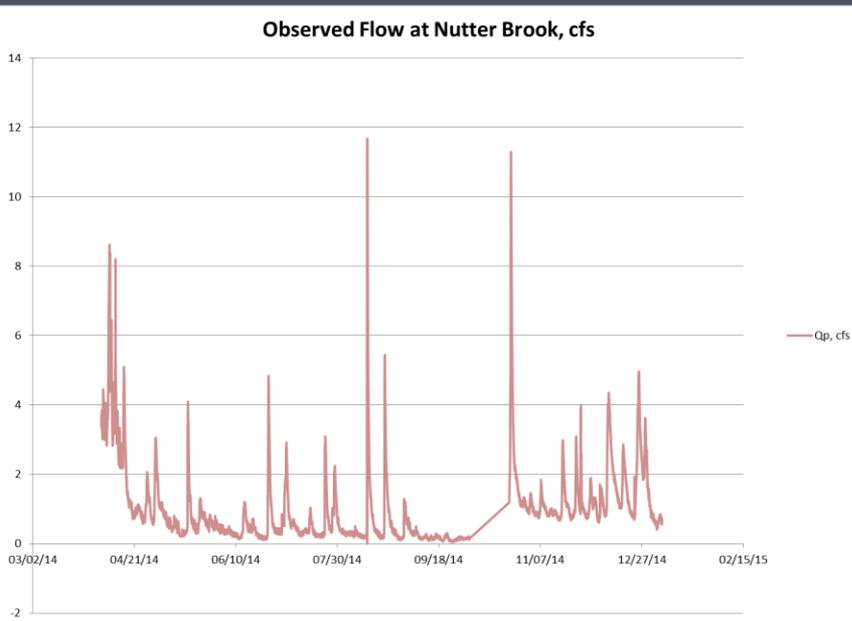
EPA's 9 Point Plan – Point a

- a. Identify pollutant causes and sources -
“data sources are accurate and verifiable, assumptions can be reasonably justified”
- Loadings = Flow x Concentration
 - Flow
 - Collected continuous flow data at all sampling stations
 - Water Quality
 - Dry weather sampling - 4 rounds (seasons)
 - Wet weather sampling - 3 storm events
 - Sediment
 - From deep spot

The Messer Pond Plan – Science

EPA's 9 Point Plan – Point a

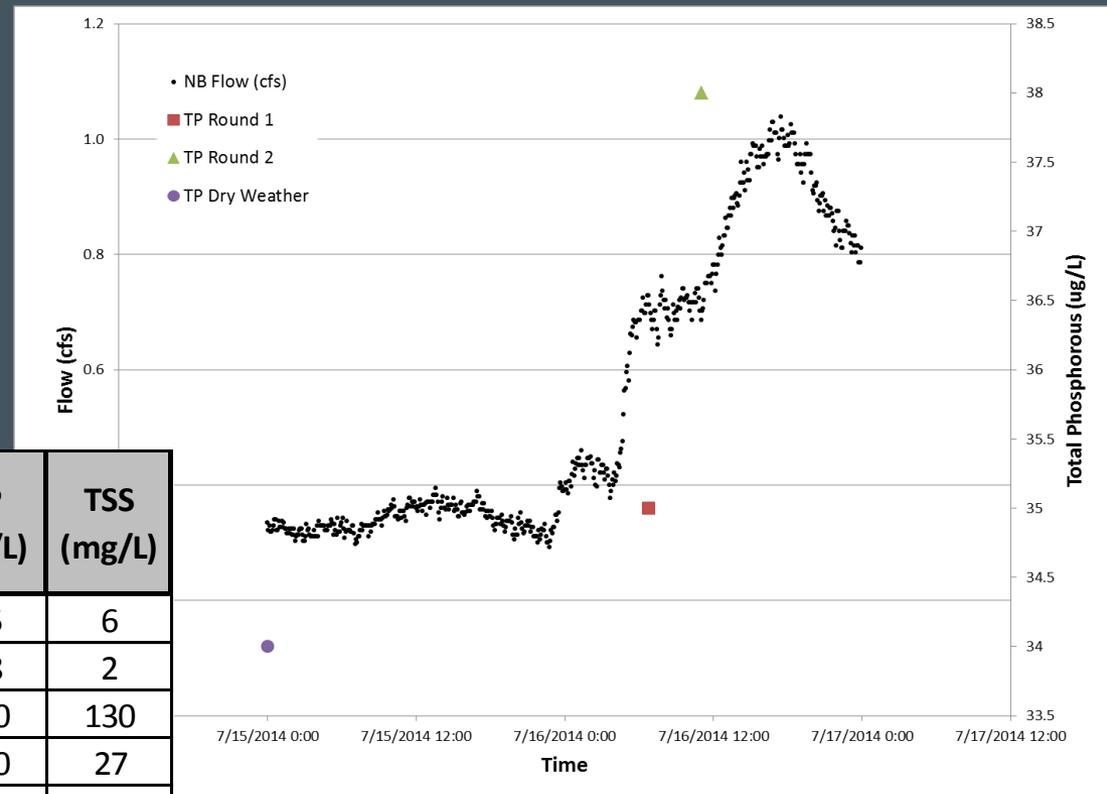
- Continuous 5 minute flow data, 4 stations



The Messer Pond Plan – Science

EPA's 9 Point Plan – Point a

- Water Quality



Station	Rainfall (in)/ Duration (hrs)	Avg. Storm Intensity (in/hr)	Sampling Round	TP (ug/L)	TSS (mg/L)
Nutter Brook	Storm 1 0.99", 7.75 hrs	0.13	1	35	6
			2	38	2
	Storm 2 1.76", 10.75	0.16	1	420	130
			2	170	27
	Storm 3 1.92", 13.25	0.14	1	270	11
			2	160	12

The Messer Pond Plan – Science

EPA's 9 Point Plan – Point a

- Sediment
 - Develop estimates of nutrient flux from deep spot sample



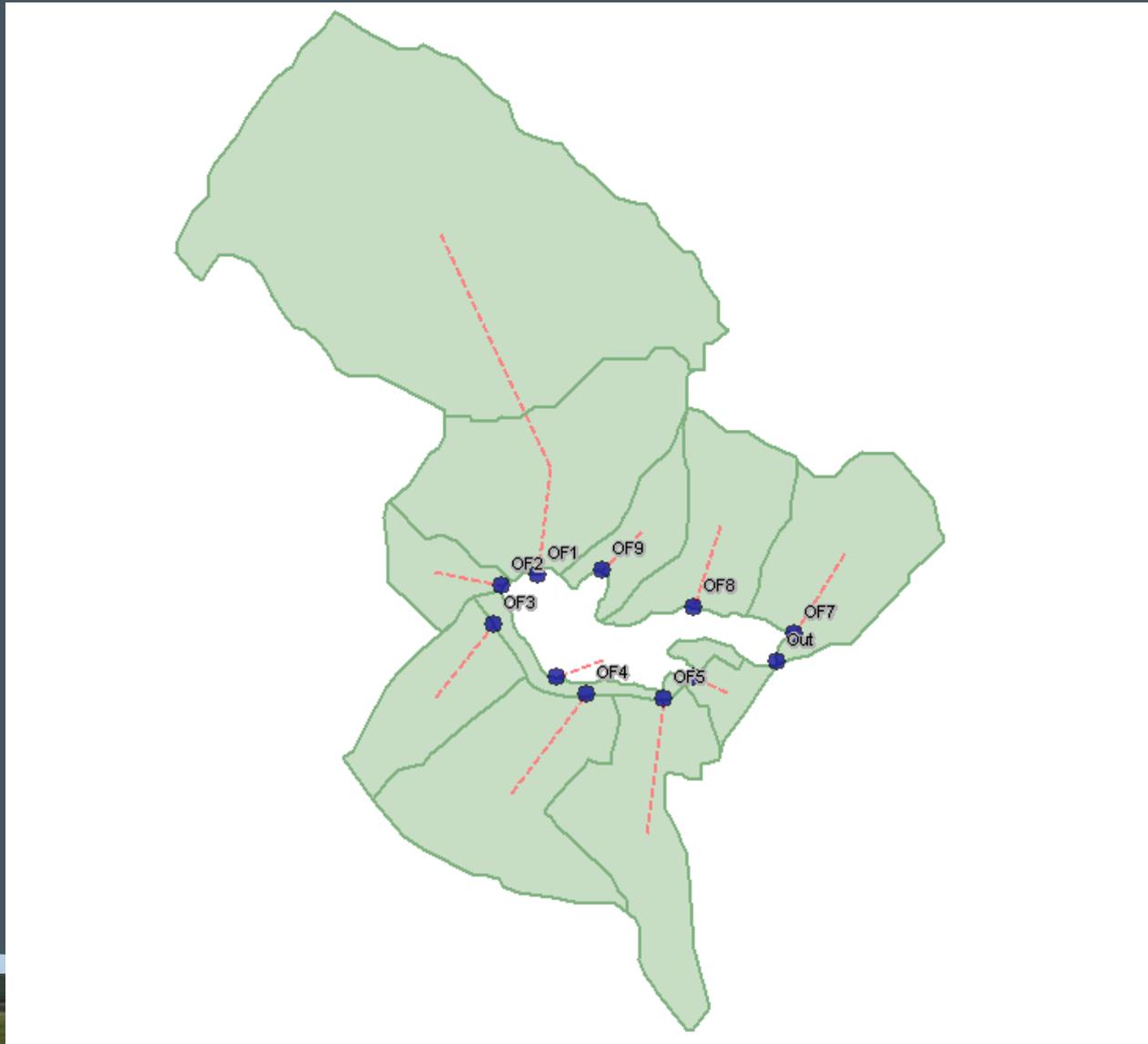
The Messer Pond Plan – Science

EPA's 9 Point Plan – Point b

- b. Pollutant load reduction estimates
 - “modeling processes are accurate and verifiable, assumptions can be reasonably justified”*
- Continuous rainfall/runoff model simulates:
 - Time varying rainfall, infiltration, runoff, evaporation, NPS runoff/loading
 - WQ - buildup/washoff of pollutants
 - LID/BMP simulation
 - Facilitation of calibration to field data

The Messer Pond Plan – Science

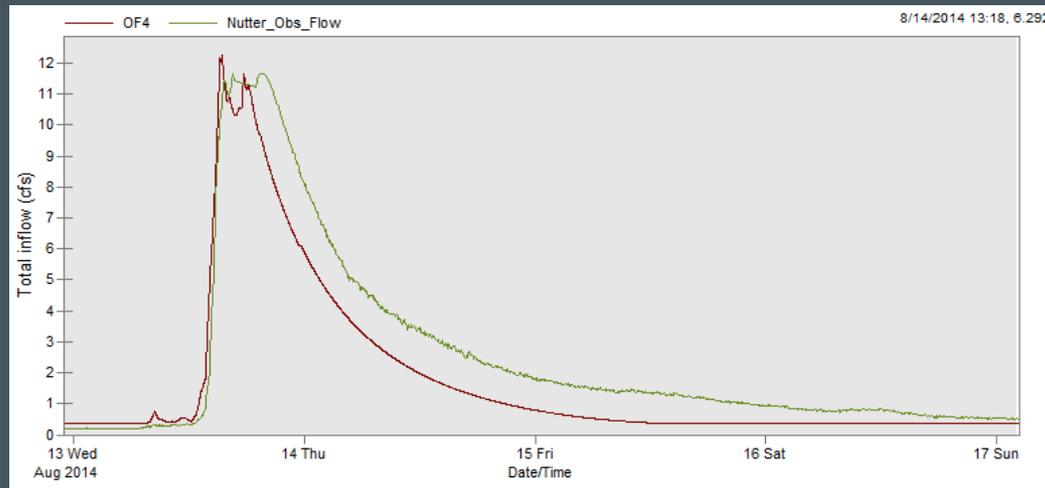
EPA's 9 Point Plan – Point b



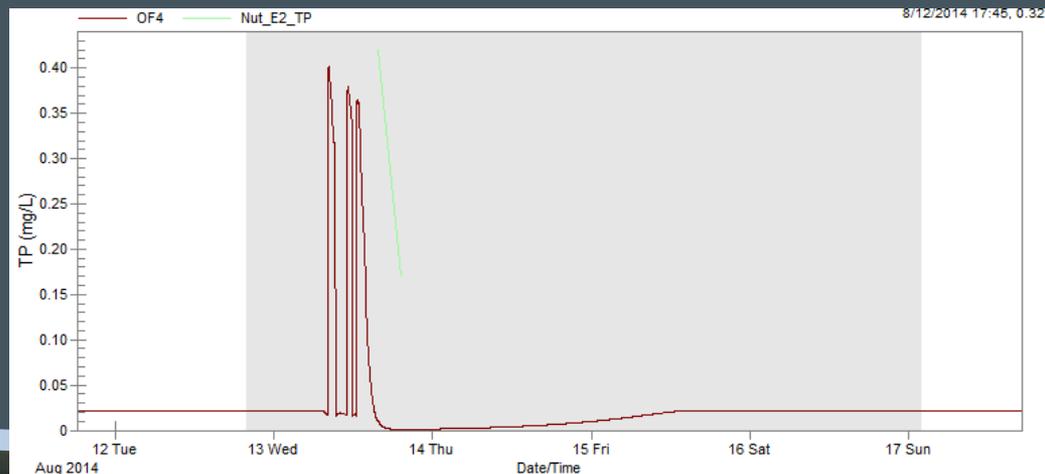
The Messer Pond Plan – Science

EPA's 9 Point Plan – Point b

Flow



WQ



The Messer Pond Plan – Science

EPA's 9 Point Plan – Point b

- Model is calibrated to site-specific hydrologic/WQ data
 - Flow inputs/outputs well characterized
 - ‘Calibrated’ pollutant export coefficients replace ‘regional’ export coefficients

Result = more accurate account of pollutant loadings, BMP/LID design and funding allocation



The Messer Pond Plan – Volunteers

Project Budget

- Budget set up allowing unlimited volunteer involvement
 - Volunteer hours applied against budget
 - Reduced total project cost
 - Motivation for volunteer involvement
 - MPPA PM ‘recruitment’ of volunteers
 - Unusual but appropriate for Associations that aren’t on the ‘grant radar’

The Messer Pond Plan – Volunteers

Volunteer Completed Projects

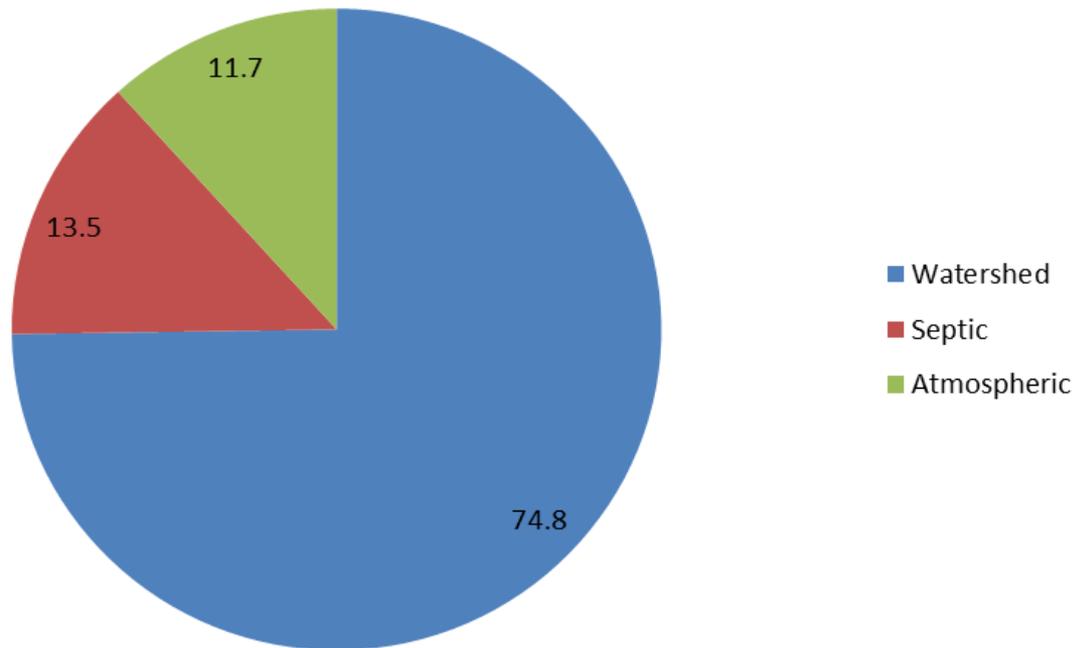
- Documentation of pond history
- Complete septic system survey
- WQ sampling
 - Dry weather
 - Wet weather
- Sediment samples
- Watershed surveys
- Build-out analysis trend research
- Public outreach



Study Results

Annual External P Load, %

Annual External Phosphorous Loadings (%)



Study Results

Annual Water Balance

Lake Inputs = Lake Outputs

SW Runoff + baseflows + precip + GW = evaporation + outflow



Study Results

Estimated Annual P Load

Sub-Basin	Size (ac)	Estimated Annual P Load		% of Watershed
		Total (lbs)	Per Acre (lbs)	Total P Load
CRB_Upper	522.8	35.7	0.07	42.2
CRB_Lower	159.7	5.5	0.03	6.5
Unnamed_Trib	31.2	3.3	0.10	3.9
Haas_Brook	63.9	6.3	0.10	7.5
Nutter_Brook	133.4	9.2	0.07	10.9
Browns_Brook	110.6	11.0	0.10	13.0
Beaver_Point	15.9	1.4	0.09	1.7
North_1	103.8	4.9	0.05	5.8
North_2	81.7	3.0	0.04	3.5
North_3	39.8	1.7	0.04	2.1
Direct_Drainage	23.1	2.4	0.11	2.9
Messer Pond Watershed (total)	1285.9	84.50	0.07	100.00

Study Results

Estimated Annual TSS Load

Sub-Basin	Size (ac)	Estimated Annual TSS Load		% of Watershed
		Total (lbs)	Per Acre (lbs)	Total TSS Load
CRB_Upper	522.8	1,448	2.8	42.4
CRB_Lower	159.7	144	0.9	4.2
Unnamed_Trib	31.2	80	2.6	2.3
Haas_Brook	63.9	119	1.9	3.5
Nutter_Brook	133.4	371	2.8	10.9
Browns_Brook	110.6	1,029	9.3	30.1
Beaver_Point	15.9	24	1.5	0.7
North_1	103.8	89	0.9	2.6
North_2	81.7	51	0.6	1.5
North_3	39.8	28	0.7	0.8
Direct_Drainage	23.1	36	1.6	1.1
Messer Pond Watershed (total)	1285.9	3418.92	2.66	100.00

Study Results

Final Steps

- Calculate required P reduction to meet target lake concentration of 10 ug/L
- Select BMP/LID projects to meet reduction
- Top 3 projects:
 1. Browns Brook wetland restoration
 2. TBD - mostly like dirt road BMPs
 3. TBD - culverts/vegetative strips, etc.

Questions?

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