

Lake Hopatcong – Past, Present and Future



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Lake Hopatcong, New Jersey

- **Past** – over the last 8 – 10 years
- **Present** – 2013 water quality report
- **Future** – 2014 and beyond





Lake Hopatcong's TMDL for total phosphorus

| Described Scenario | Associated Value |
|---|--------------------------|
| Annual TP Load (refined TMDL) | 8,097 kg (17,807 lbs) |
| Targeted TP Load | 4,800 kg (10,560 lbs) |
| Required Percent Reduction to Attain Targeted TP Load | 41 % |
| Required Reduction in the Existing TP Load | 3,297 kg (7,253 lbs) |



Municipal-based Phosphorus Loads for Lake Hopatcong

| Municipality | kg per yr | Percent Contribution | Required Reductions (kg / yr) |
|--------------------------|------------------|-----------------------------|--------------------------------------|
| Jefferson Township | 4,201 | 57.6 | 1,899 |
| Borough of Mt. Arlington | 322 | 4.4 | 145 |
| Roxbury Township | 235 | 3.2 | 106 |
| Borough of Hopatcong | 2,538 | 35 | 1,147 |
| Total | 7,296 | 100 | 3,297 |



| Implemented Stormwater or In-Lake Projects at Lake Hopatcong Morris / Sussex Counties, NJ | Total Phosphorus Removed (kgs) |
|--|---------------------------------------|
| Mechanical weed harvesting program (mean 2002-2012) | 162.4 |
| Partial sewerage of B. of Hopatcong (40% within SZI)* | 615.2 |
| Two Aqua-Swirl / Aqua-Filter MTDs in B. of Hopatcong and One Aqua-Filter MTD in T. of Jefferson (SFY 2005 319-grant) + One Filterra at T. of Jefferson | 7.3 |
| Three Nutrient Separating Baffle Boxes (two in Jefferson; one in Mt. Arlington; US EPA TWG) | 29.6 |
| One Nutrient Separating Baffle Box + Wetland Stormwater Basin (Roxbury; US EPA TWG) | 14.8 |
| Peat Biofilter retrofit to an existing community septic system (Jefferson; US EPA TWG) | 4.6 |
| Sub-TOTAL | 833.9 |



| Implemented Stormwater or In-Lake Projects at Lake Hopatcong Morris / Sussex Counties, NJ | Total Phosphorus Removed (kgs) |
|--|---------------------------------------|
| Sub-TOTAL | 833.9 |
| Watershed-wide use of non-P fertilizers (US EPA TWG; based on 2008-09 study; only for residential lawns) | 199.0 |
| Mandatory pump-outs of existing septic systems (Jefferson; Water Quality 604(b)-grant)* | 52.0 |
| One Nutrient Separating Baffle Box in Roxbury and One Bioretention System at Lake Hopatcong State Park (SFY2010 319-grant) | 1.0 |
| Installation of two Floating Wetland Islands; scheduled for installation in 2014 (SFY2010 319-grant) | 9.1 |
| GRAND TOTAL | 1,095.0 (2,409 lbs) |



Lake Hopatcong

| Described Scenario | Associated Value |
|---|-------------------------|
| Required Reduction to attain compliance with the TMDL for total phosphorus | 3,297 kg (7,253 lbs) |
| Amount of total phosphorus removed at the end of 2014 | 1,095 kg (2,409 lbs) |
| Percent of the TP load targeted for reduction removed to date (end of 2014) | 33 % |
| Amount of total phosphorus still in need of removal for TMDL compliance | 2,202 kg (4,844 lbs) |







1st Aqua-Filter installed (B. of Hopatcong; December 2008)



2nd Aqua-Filter installed (B. of Hopatcong; June 2011)



Aqua-Filter installed (T. of Jefferson; August 2009)



Inside the Aqua-Swirl and Aqua-Filter Chambers



Filterra installed in Jefferson (August 2012)



Nutrient Separating Baffle Boxes (2 in Jefferson; 1 in Mt. Arlington)



East Shore (J) June 2009



Yacht Club (J) July 2009

Nutrient Separating Baffle Box (Singac Avenue; Roxbury; May 2009)



Retrofit existing basin to function as wetland BMP (Roxbury)



June 2007

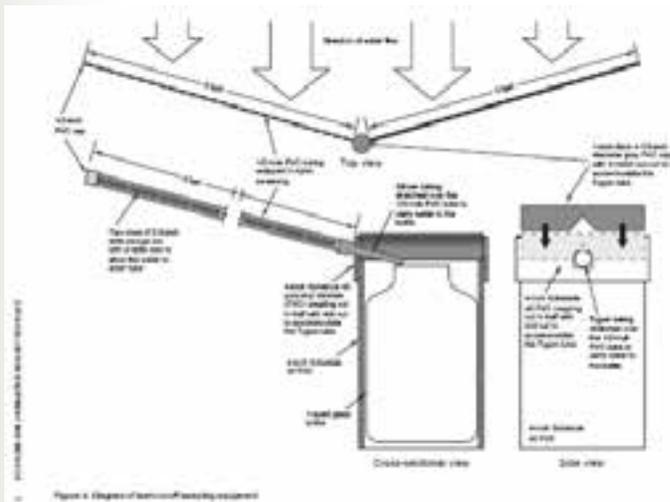


September 2011

Peat Biofilter retrofit for existing septic system (Jefferson; Aug – Oct 2012)



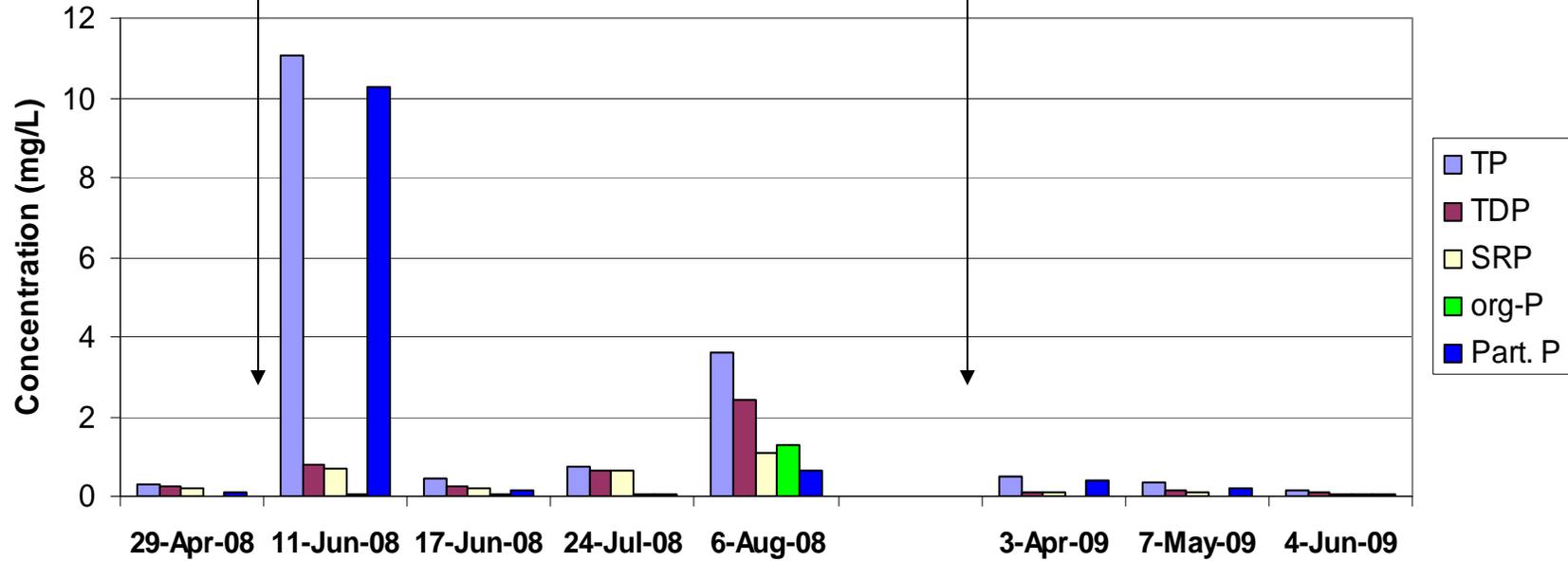
Quantifying the use of non-phosphorus fertilizers



Hoagland Site

Spring application (P) - 17 May 08

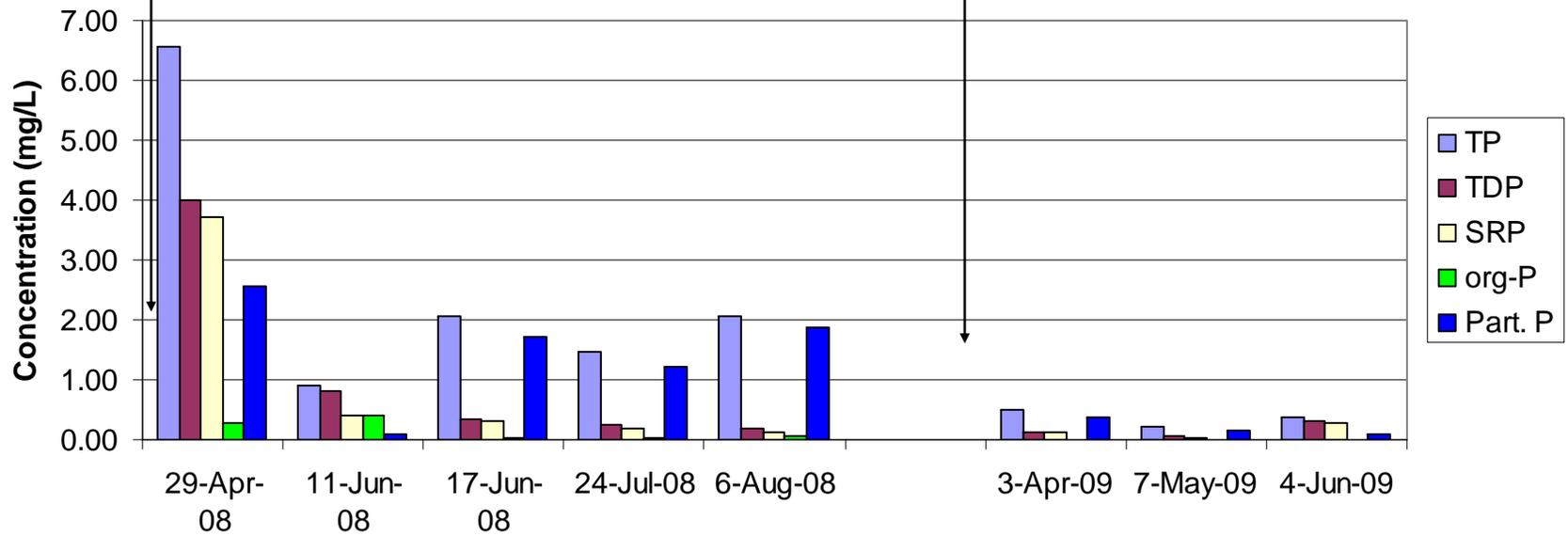
Spring application (non-P) - 27 March 09



K Mulch Site

Spring application (P) - 20 April 08

Spring application (non-P) - 30 March 09



Nutrient Separating Baffle Box (Roxbury; June 2013) and Bioretention Basin at the Hopatcong State Park



June 2012

Bioretention Basin (August 2013)



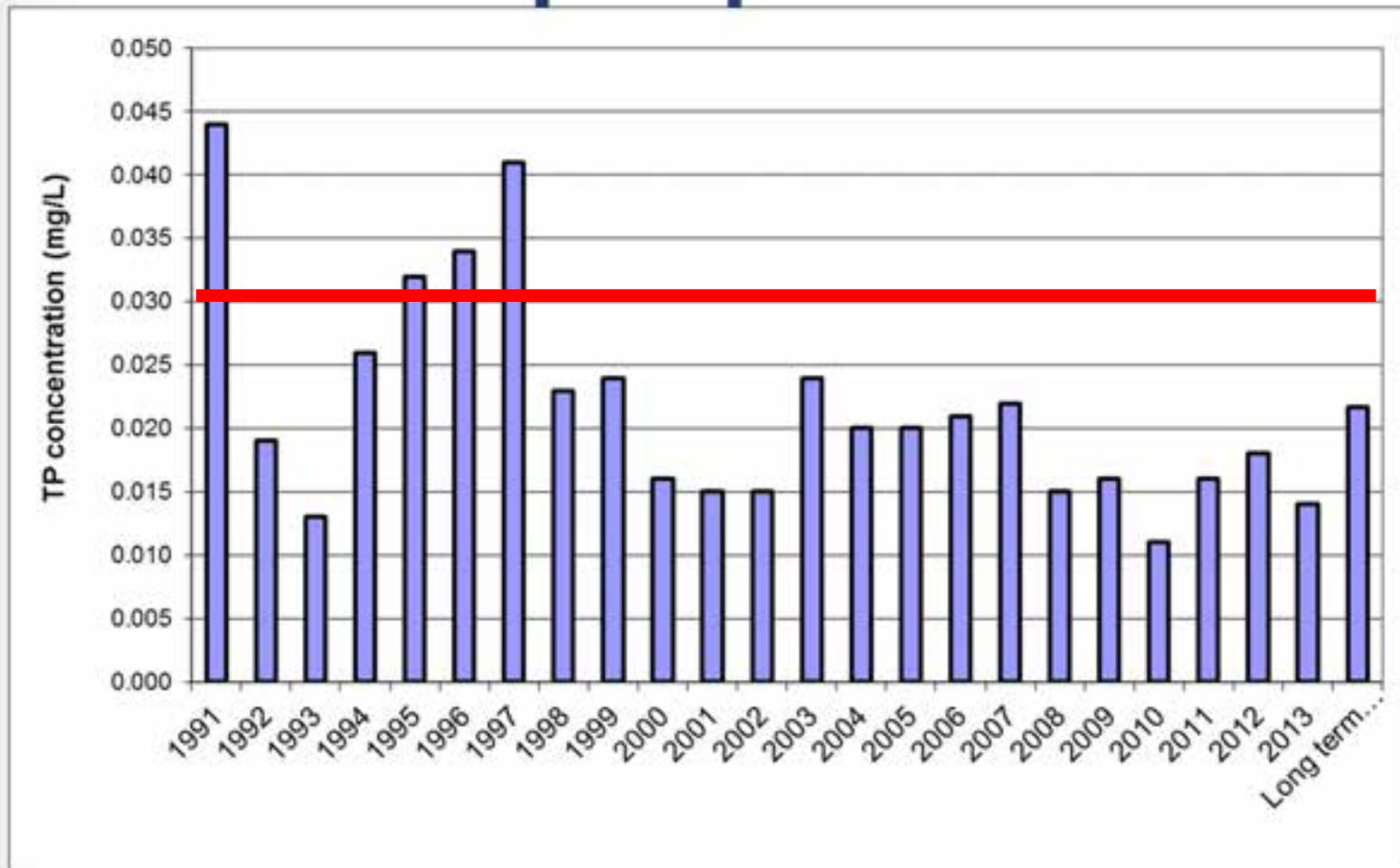
Bioretention Basin (August 2013)



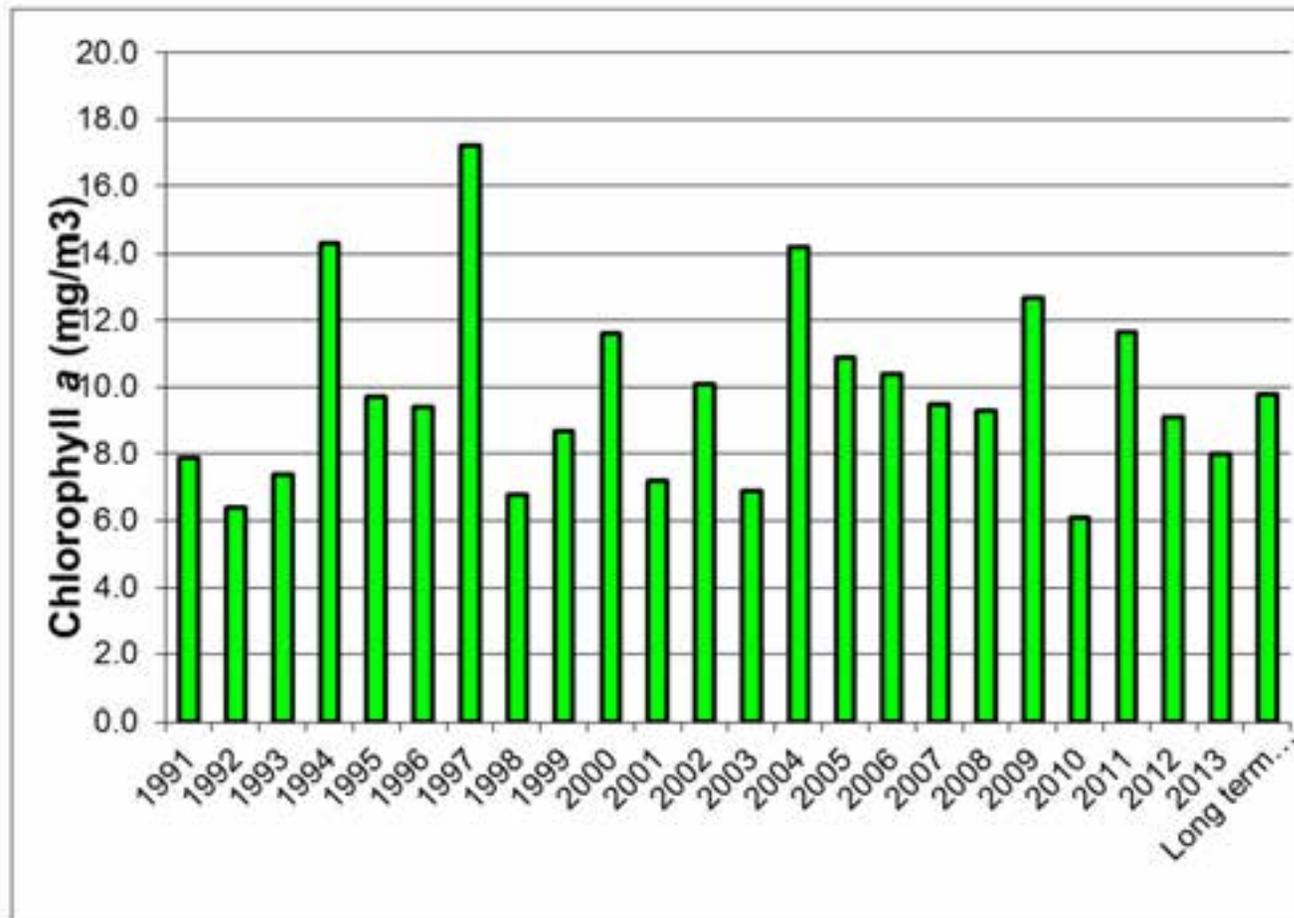
Install two, 250 sq. ft. Floating Wetland Islands in Ashley Cove (Jefferson; scheduled for 2014)



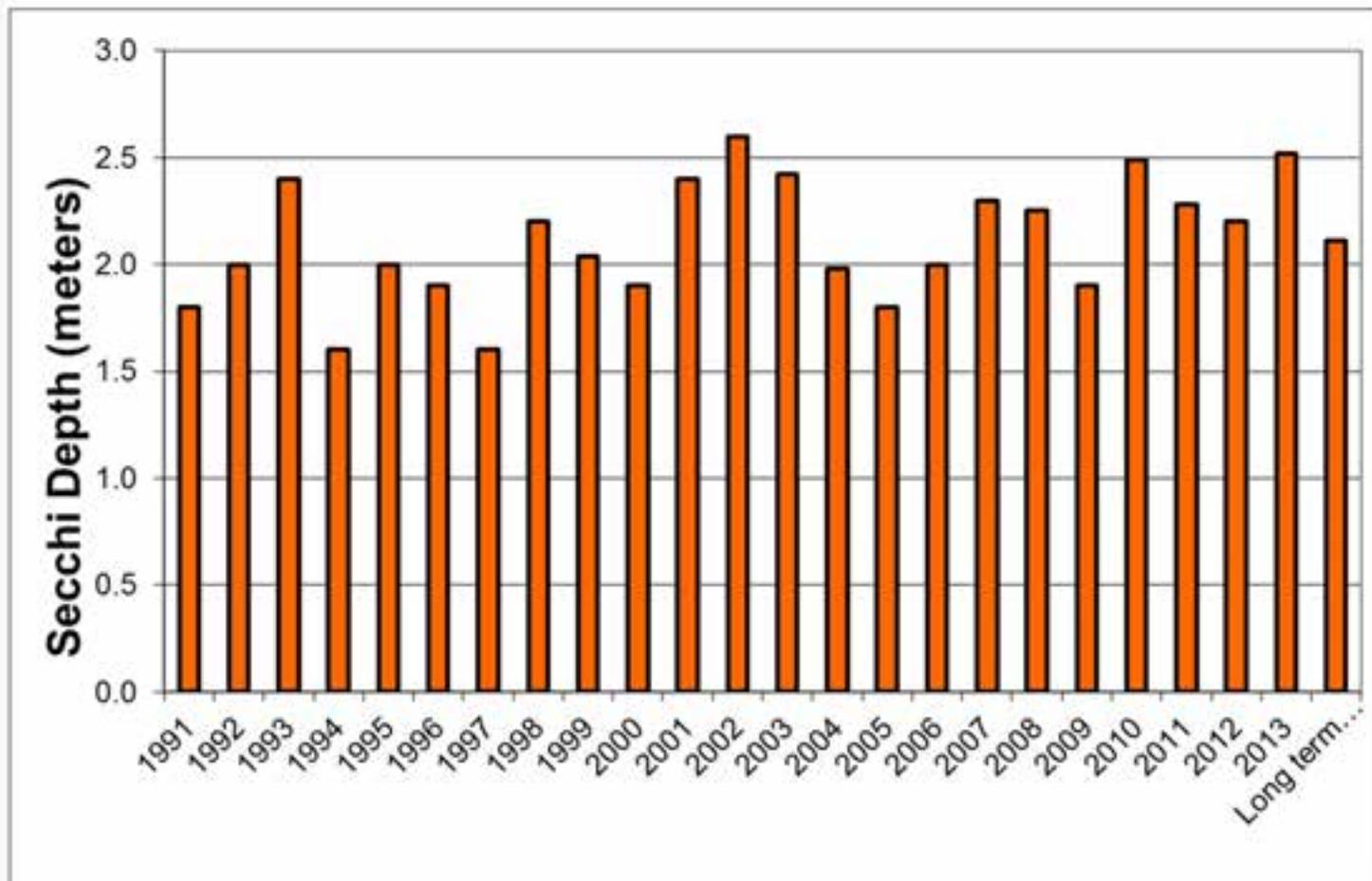
Lake Hopatcong mean, growing season total phosphorus



Lake Hopatcong mean, growing season chlorophyll *a*



Lake Hopatcong mean, growing season Secchi Depth





Conclusions

- By the end of 2014, approximately 33% of the Lake Hopatcong TMDL for total phosphorus will be in compliance.
- A combination of in-lake and watershed-based restoration projects have been implemented with funding from two 319-grants and a US EPA Targeted Watershed Grant
- Long-term water quality improvements have been measured, however additional measures are necessary to continue to comply with the TMDL and protection the water quality of Lake Hopatcong.



Lake Hopatcong 2013 Water Quality Monitoring Program

- Assess the health of the lake; identify problems
- Track long-term changes or trends
- Determine the effectiveness of the watershed / in-lake management measures
- Determine if the lake can be taken off the NJDEP impairment list
- Increases changes to obtain funding



Lake Hopatcong 2013 Water Quality Monitoring Program

- Five monitoring events
- 11 in-lake monitoring stations; 5 near-shore stations
- Collect *in-situ* data (temp., DO, pH, conductivity, and water clarity)
- Chemical – phosphorus, nitrogen, suspended solids
- Biological – chl. *a*, plankton and aquatic macrophytes



In-situ Data

- **Temperature** – lake thermally stratifies over the summer season
- **Dissolved Oxygen** – Surface waters are well oxygenated, deep bottom waters are depleted of DO over the summer months
- No deep, bottom water fish habitat; increase release of TP from sediments
- Carry over brown trout habitat over entire year; optimal habitat over each month except for July



In-situ Data

- Most of the time pH was within the optimal range, however, at times pH exceeded the optimal upper value of 8.5
- Typically this occurred at Station #3 (River Styx); although it has also be observed at Station #6 (Henderson Cove) and #10 (Northern Woodport Bay)
- Lake Hopatcong is on the State's impairment list for pH



Phosphorus Data

- Phosphorus is the primary limited nutrient in Lake Hopatcong. One pound of phosphorus has the potential to generate up to 1,100 lbs of wet algae biomass
- TP was on the State's impaired list and a TMDL was developed by NJDEP; Restoration Plan completed in 2006
- NJDEP took the lake off the impaired list for total phosphorus (2010?)



Phosphorus Data

- State standard for a freshwater lake or impoundment is 0.05 mg/L
- However, due to the sensitivity of the lake, the TMDL established a lake-specific threshold of 0.03 mg/L
- In 2013 TP concentrations generally varied between 0.01 and 0.04 mg/L, with concentrations as high as 0.06 mg/L



Phosphorus Data

- River Styx and Northern Woodport Bay had elevated TP concentrations
- In turn, the pH values are higher and these sections of the lake have higher concentrations of algae and aquatic macrophytes

Phytoplankton (free floating algae)



- **May** – green algae and diatoms
- **June** – blue-green algae, green algae, “brown” algae, diatoms
- **July – September** – mostly blue-greens and diatoms

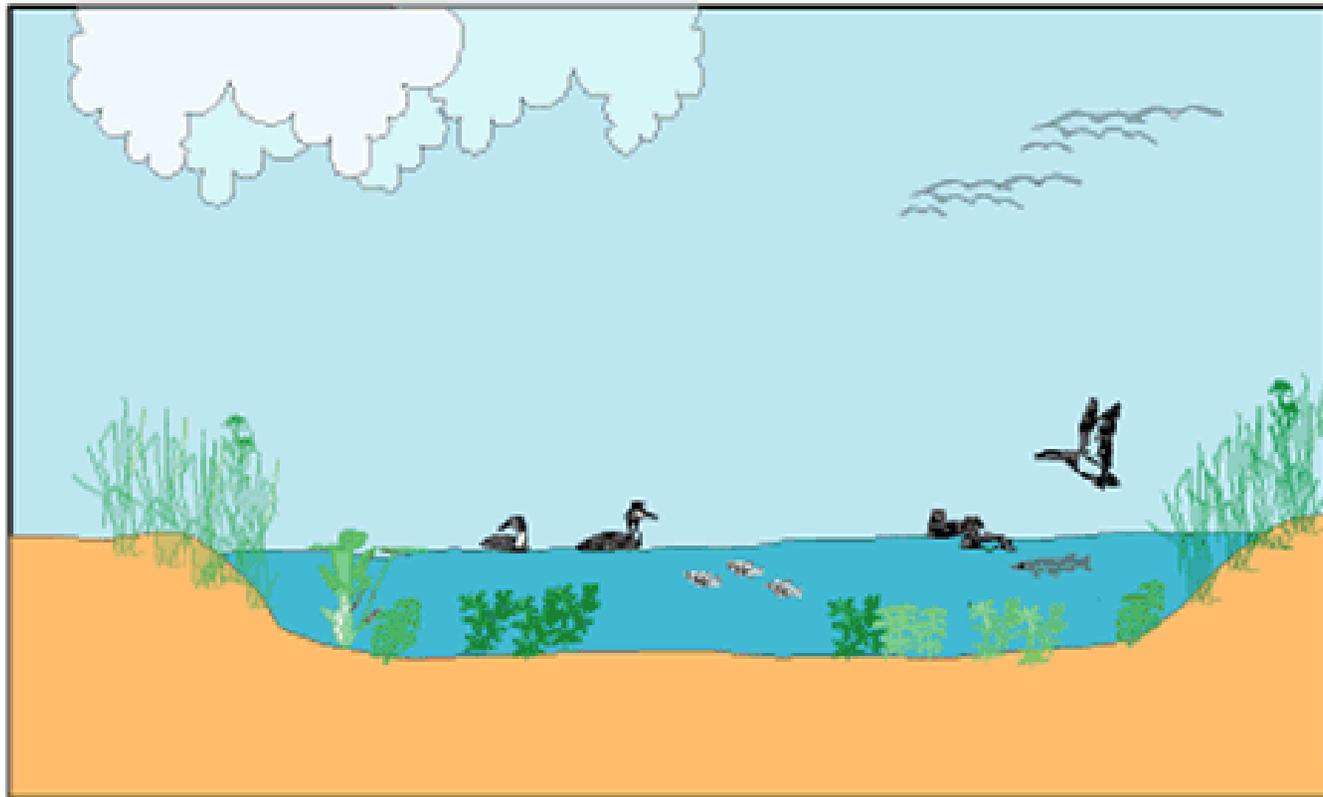




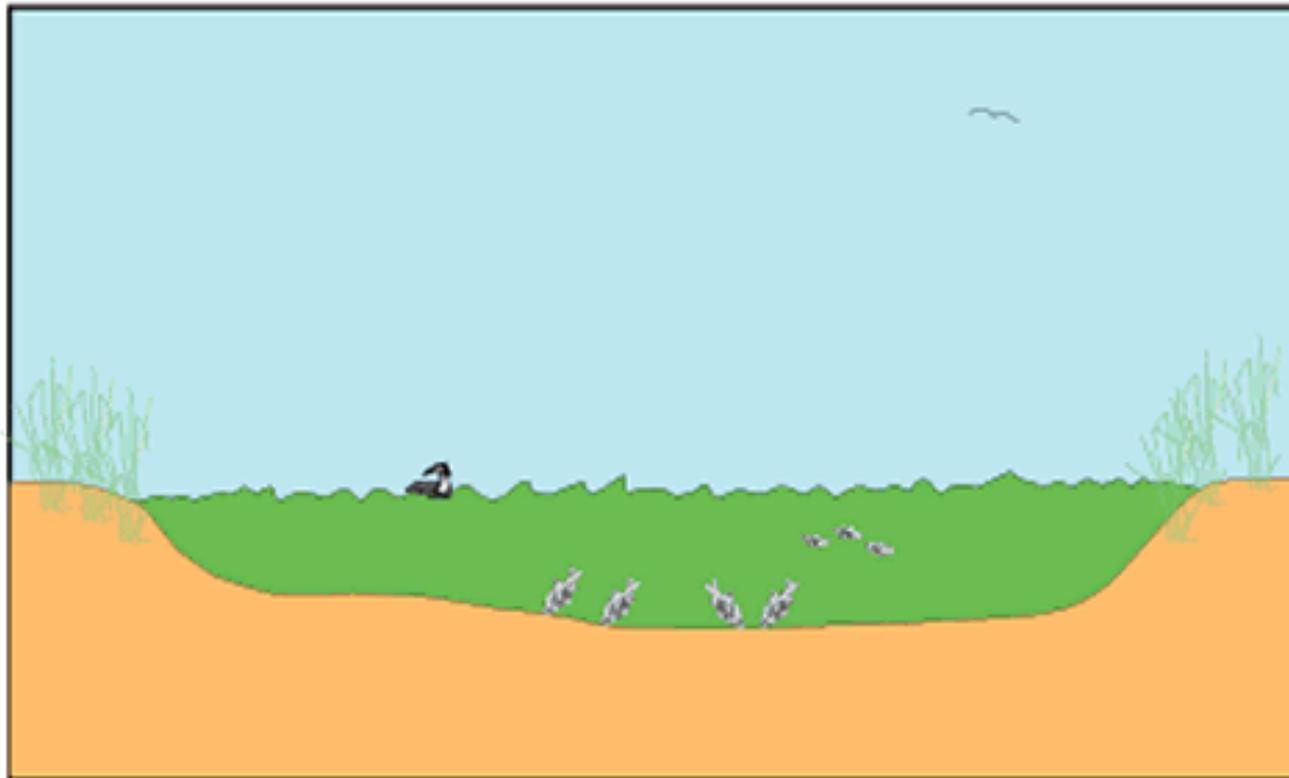
Aquatic Macrophytes

- **May** - Curly-leaved pondweed (I), EWM (I), Broad-leaf pondweed
- **June** – EWM (I), tapegrass, mat algae
- **July** – similar to June; some bladderwort
- **August** – similar to July; some thin-leaved pondweed as well
- **September** – overall plant biomass was low with some EWM, pondweeds and tapegrass in #6, #7 and #11
- Water lilies common in the Canals

Clear water, plant dominated State



Turbid, algal dominated state





2013 Mechanical Weed Harvesting Program

- Removed approximately 2,299 cubic yards of wet plant biomass
- This is approximately 49 lbs of TP (53,627 lbs of wet algae biomass); about 0.7% of the TP load targeted for removal under the TMDL (2011 was 0.3%; 2012 was 0.6%)
- In the past harvesting has accounted for up to 8% of the TP load targeted for removal under the TMDL

Future Actions - 2014

Another year of monitoring
under the existing 319(h)
grant

Installation of two Floating
Wetland Islands in Ashely
Cove, Jefferson Township





Beyond 2014

- Based on an 8-year analysis, TP concentrations exceeded the TMDL threshold (0.03 mg/L) 0 to 20% of the time for the mid-lake station, but 60 to 100% of the time for River Styx and 50 to 100% of the time for Northern Woodport Bay
- Some of these elevated TP concentrations were associated with elevated pH values; above the State standard



Beyond 2014

- The Restoration Plan was completed / approved in 2006
- However, the Plan does not include site-specific locations for watershed projects (typically needed for approved Watershed Implementation Plans)
- Thus, the Commission, working with the Foundation, would like to submit a grant application under the 604(b) program to fill in this “gap” in the Restoration Plan
- Increase changes funding for implementation

THANK YOU

