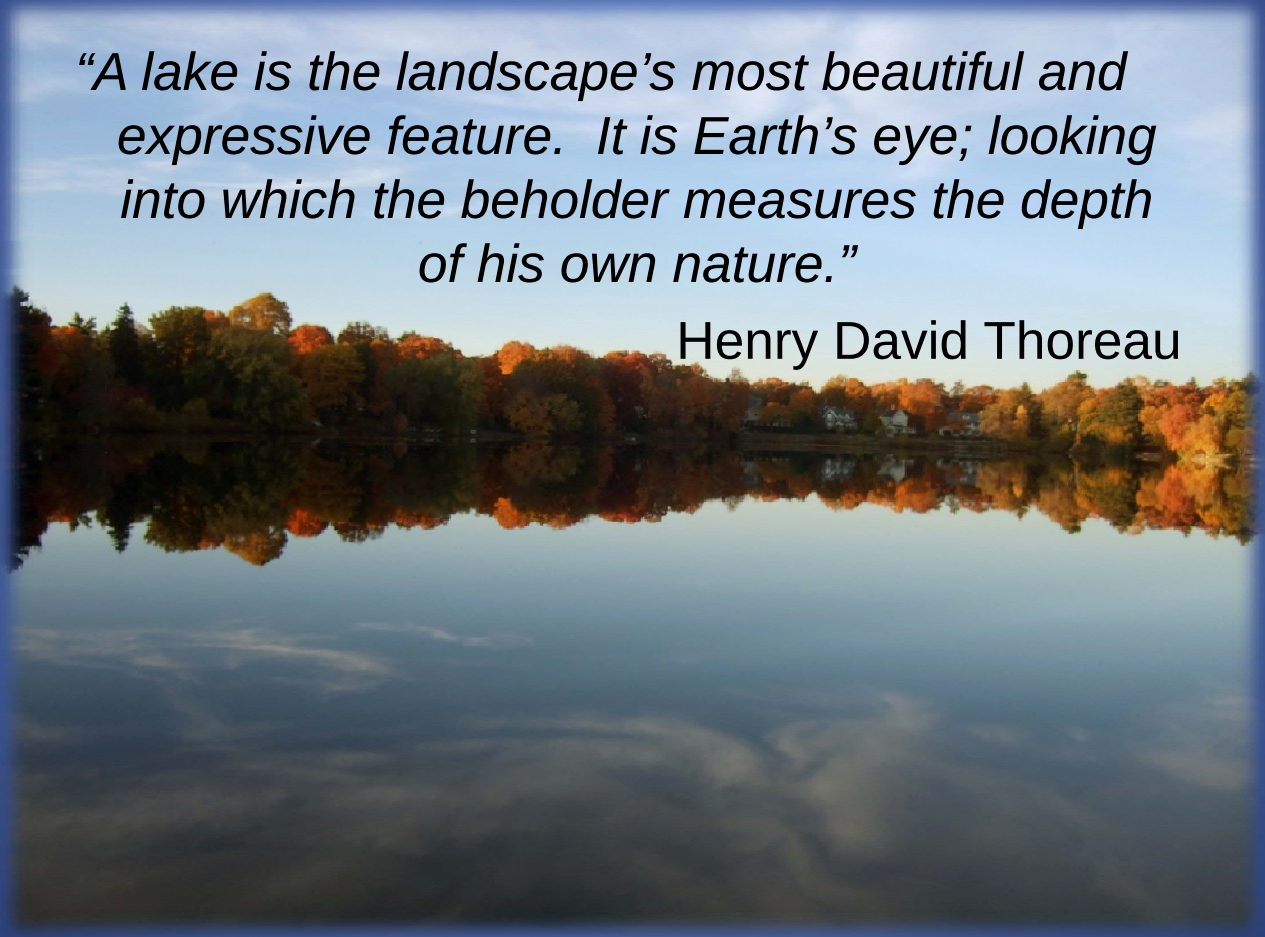
Crystal Lake Conservancy
Second Annual Forum



October 24, 2011

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What we hope to accomplish this evening regarding Crystal Lake

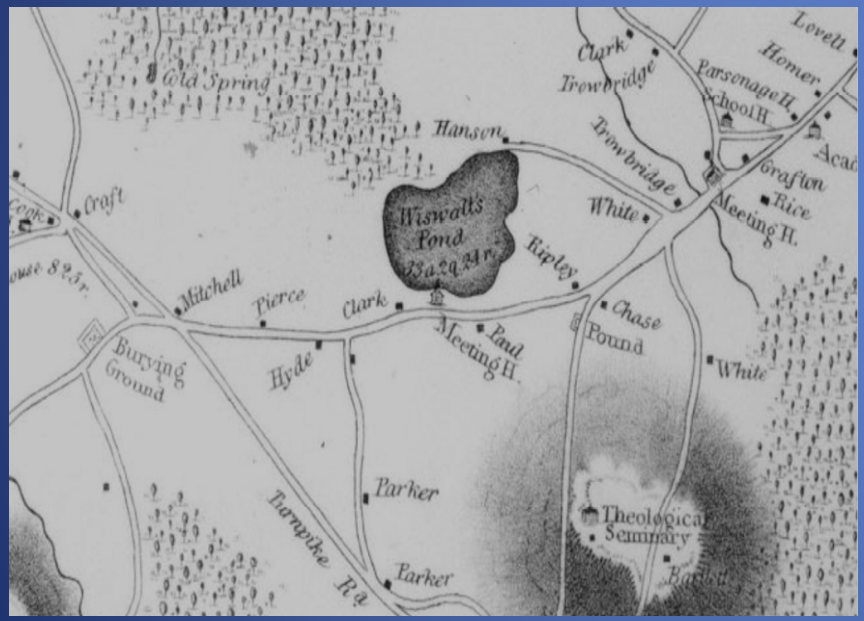
- A brief review of the natural systems of Crystal Lake
- A brief overview of the influence of the watershed surrounding Crystal Lake
- A review of 2010 and 2011Crystal Lake Data Collection efforts, and
- A review of the watershed land use survey

Crystal Lake Statistics

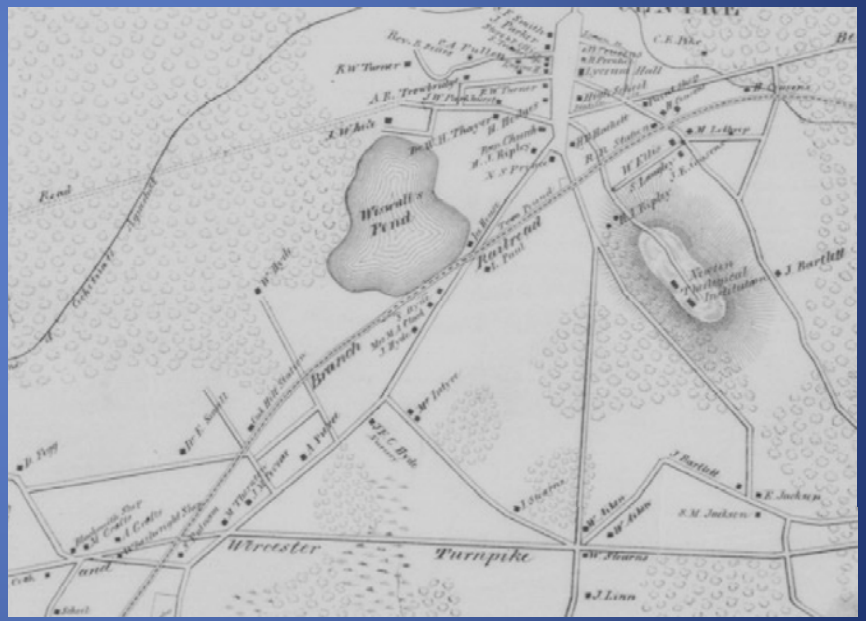
- 33 acres (13 ha)
- Classified as a Great Pond
- Drains into the Charles River
- Shoreline is about one mile
- Length is 1,200 ft (N/S)
- Width is 1,000 ft (E/W)
- Greatest Depth is about 31 ft

Crystal Lake Watershed Development

Wiswall's Pond - 1831



Wiswall's Pond - 1855



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Continued Development

Crystal Lake 1897

Crystal Lake Today

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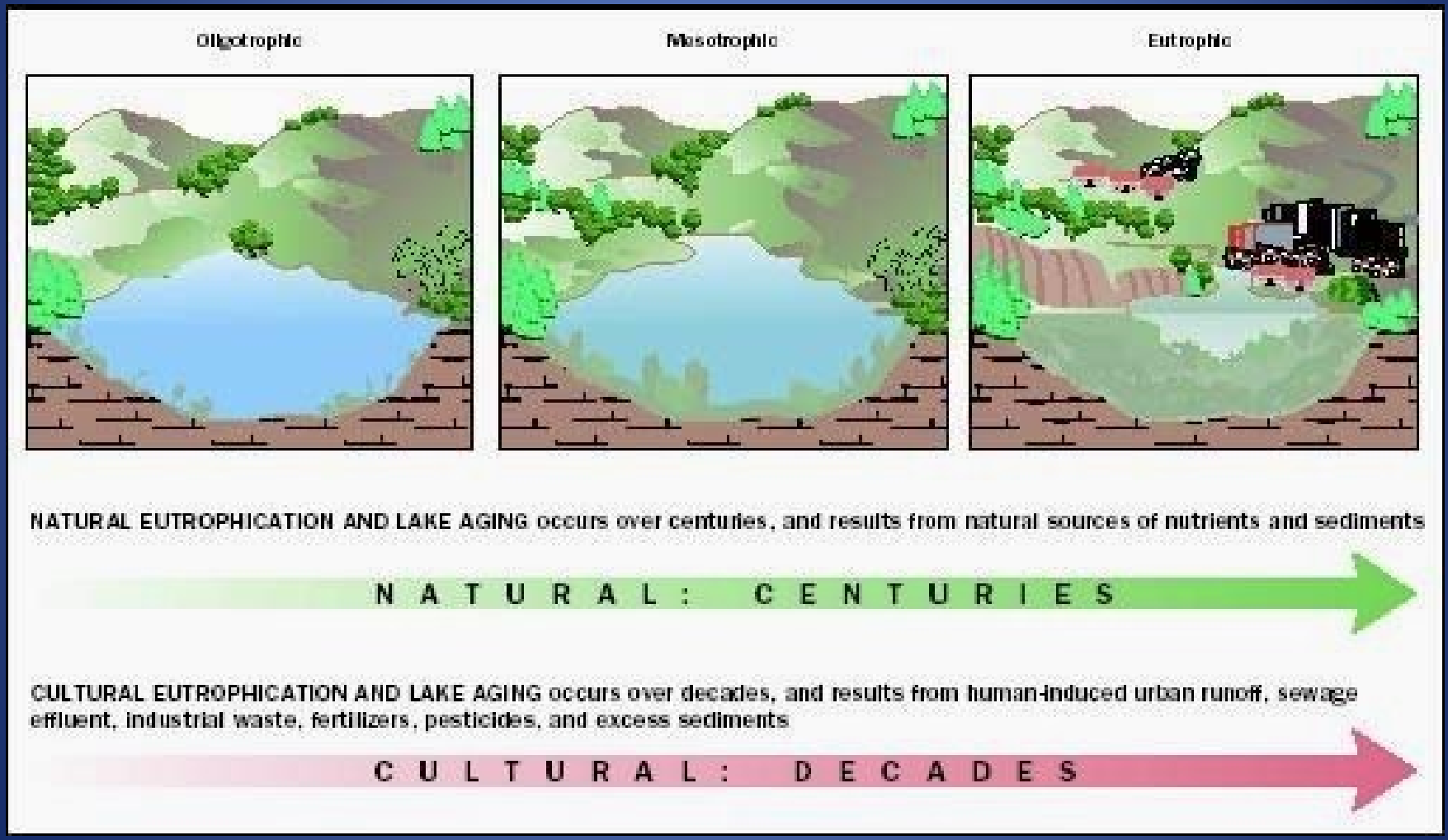
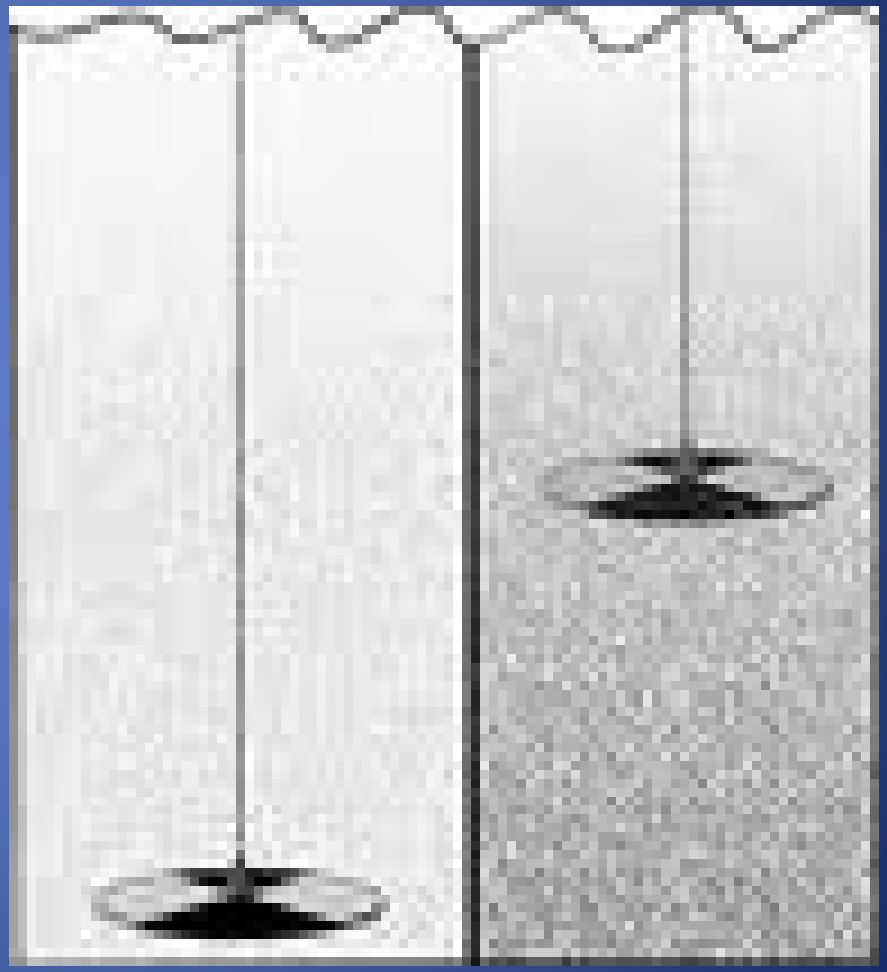
Characteristics of Crystal Lake and its Watershed

- Crystal Lake is a kettle pond with a small watershed
- Crystal Lake has a densely developed watershed
- Crystal Lake depends on run-off from this small, densely developed watershed and ground water sources for its supply of water

Lake Enrichment and Eutrophication



Evaluating Visibility (Secchi Disk)



Evaluating the Trophic Status of Crystal Lake

- Secchi Disk Comparison

- Recognizing Problems:
  - Algal Blooms
  - Nuisance aquatic plants
  - Poor drinking water
  - Disappearing fisheries
  - Low dissolved oxygen
  - Shoaling (sedimentation)

2010 Testing Program

Volunteers collected lots of Data

Crystal Lake Field Research - Testing Averages

Date	3/11/2010	3/18/2010	3/25/2010	4/6/2010	5/26/2010	5/29/2010
Week	1.00	2.00	3.00	4.00	5.00	6.00
Avg. Surface Temp. (°F)	42.00	45.50	47.94	54.23	76.60	73.60
Avg. 10' Temp. (°F)	41.75	44.33	47.17	49.28	68.40	69.75
Avg. 20' Temp. (°F)	41.38	43.67	45.58	45.32	63.00	62.00
Max. Depth Temp. (°F)	41.00	43.00	44.00	42.08	58.00	57.00
Avg. Secchi Depth (ft)	11.20	7.84	6.52	9.47	12.13	13.40

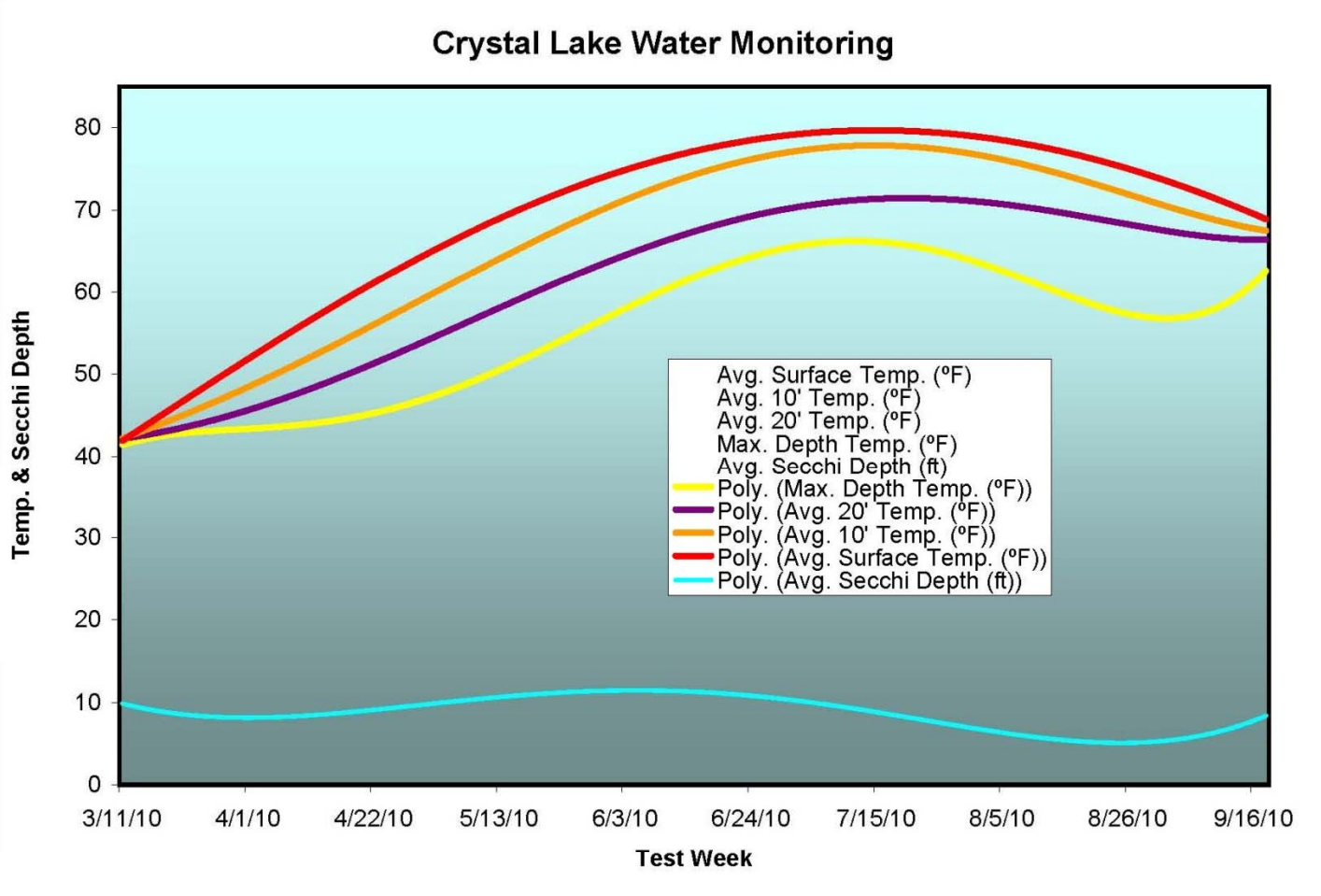
Date	6/2/2010	6/6/2010	6/9/2010	6/16/2010	6/26/2010	7/3/2010
Week	7.00	8.00	9.00	10.00	11.00	12.00
Avg. Surface Temp. (°F)	75.50	75.77	72.00	71.00	82.48	78.00
Avg. 10' Temp. (°F)	72.17	73.75	72.00	70.17	78.50	75.67
Avg. 20' Temp. (°F)	66.80	67.80	63.00	62.00	73.60	69.50
Max. Depth Temp. (°F)	58.00	59.00	59.00	56.00	68.00	62.00
Avg. Secchi Depth (ft)	12.95	11.30	11.20	7.58	6.93	8.00

Date	7/7/2010	7/24/2010	7/28/2010	8/4/2010	8/7/2010	8/11/2010
Week	13.00	14.00	15.00	16.00	17.00	18.00
Avg. Surface Temp. (°F)	84.40	81.50	80.00	74.67	78.62	77.17
Avg. 10' Temp. (°F)	81.60	77.33	78.00	72.60	76.96	75.17
Avg. 20' Temp. (°F)	73.20	69.50	75.33	72.33	65.44	70.50
Max. Depth Temp. (°F)	70.00	62.00	74.00	68.00	51.62	55.00
Avg. Secchi Depth (ft)	12.60	12.83	8.00	6.00	5.96	5.12

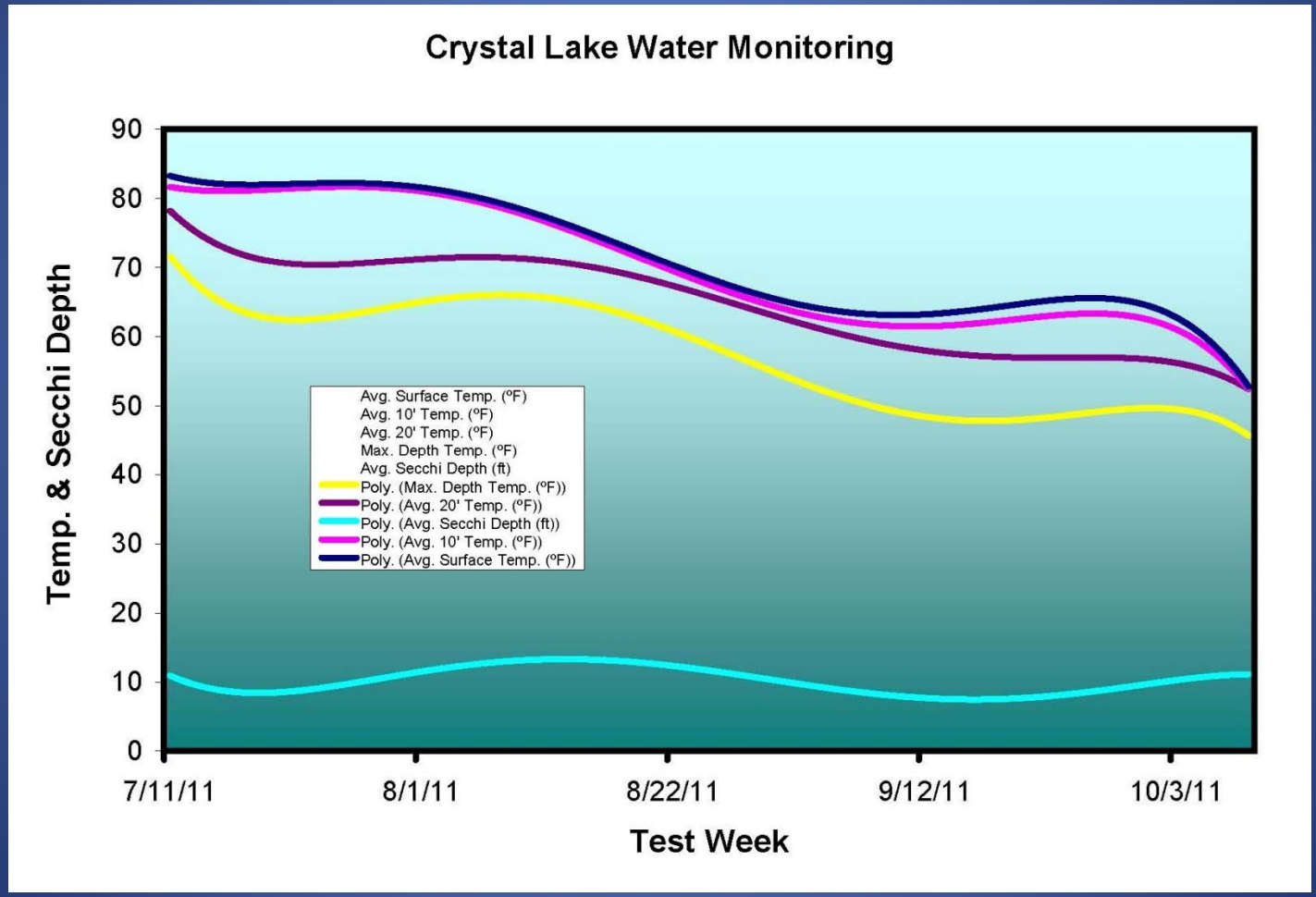
Date	8/18/2010	8/22/2010	8/26/2010	9/1/2010	9/18/2010
Week	19.00	20.00	21.00	22.00	23.00
Avg. Surface Temp. (°F)	76.00	74.17	72.14	79.83	67.83
Avg. 10' Temp. (°F)	72.00	73.83	70.70	73.33	66.83
Avg. 20' Temp. (°F)	66.00	68.67	68.45	71.67	65.33
Max. Depth Temp. (°F)	65.00	61.00	49.10	62.00	62.00
Avg. Secchi Depth (ft)	4.45	4.00	5.15	5.02	8.92

- Secchi Disk Visibility
- Temperature
- Dissolved Oxygen

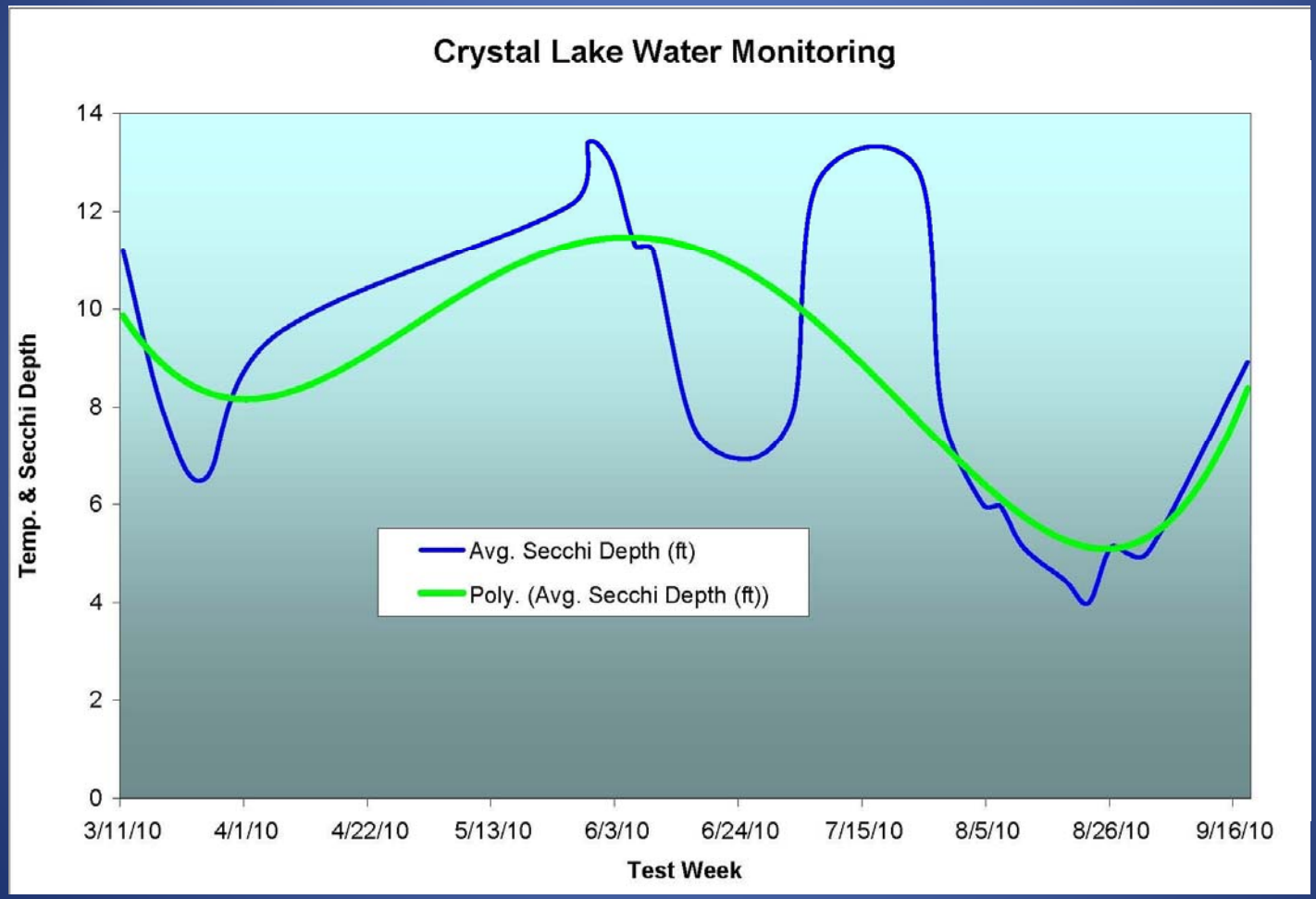
2010 Temperature and Secchi Disk versus Time



2011 Temperature and Secchi Disk versus Time



Secchi Disk Visibility
Spring, Summer, and into the Fall 2010



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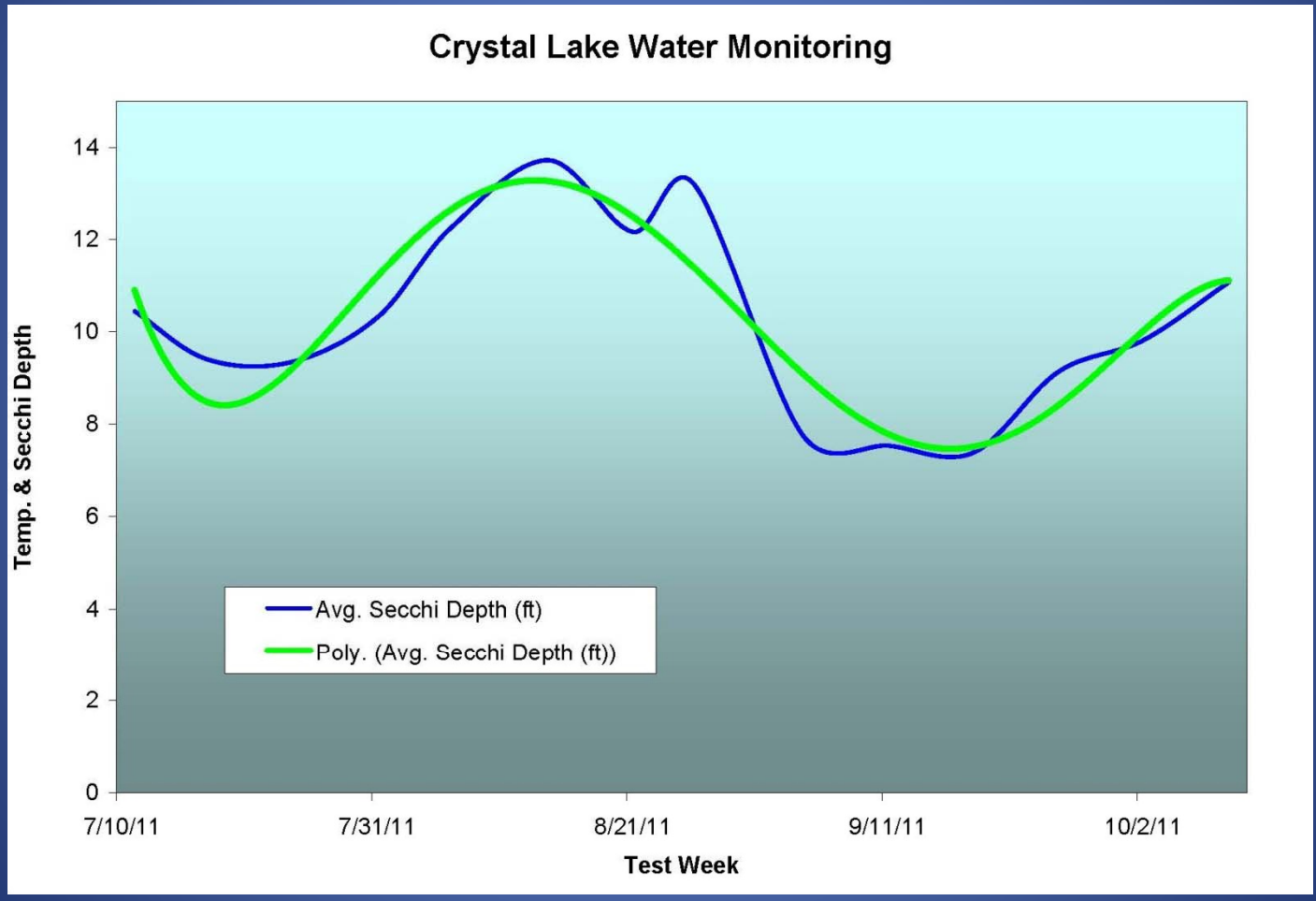
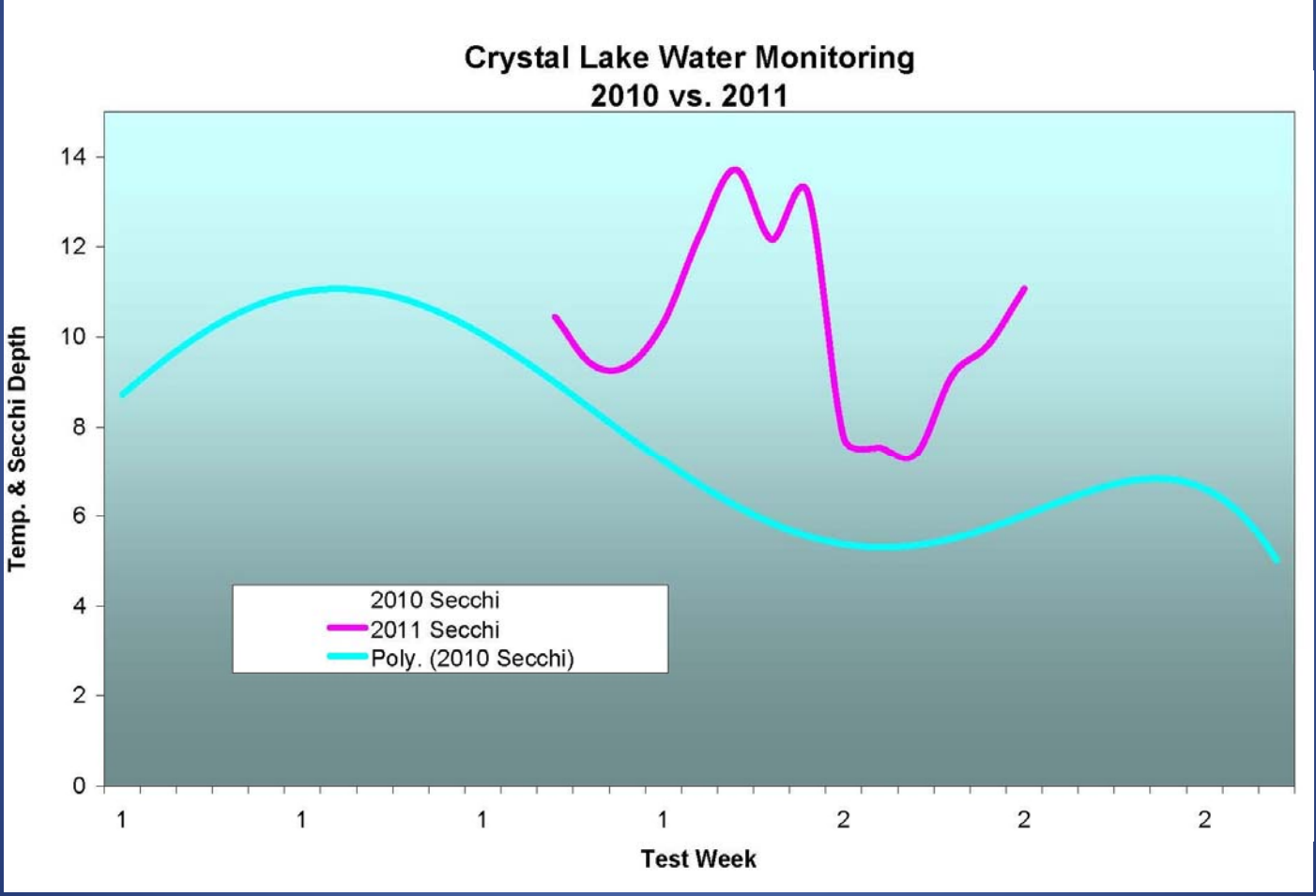
Secchi Disk Visibility
2011



Secchi Disk Visibility 2010 vs. 2011



Crystal Lake Bathymetry

October 24, 2011

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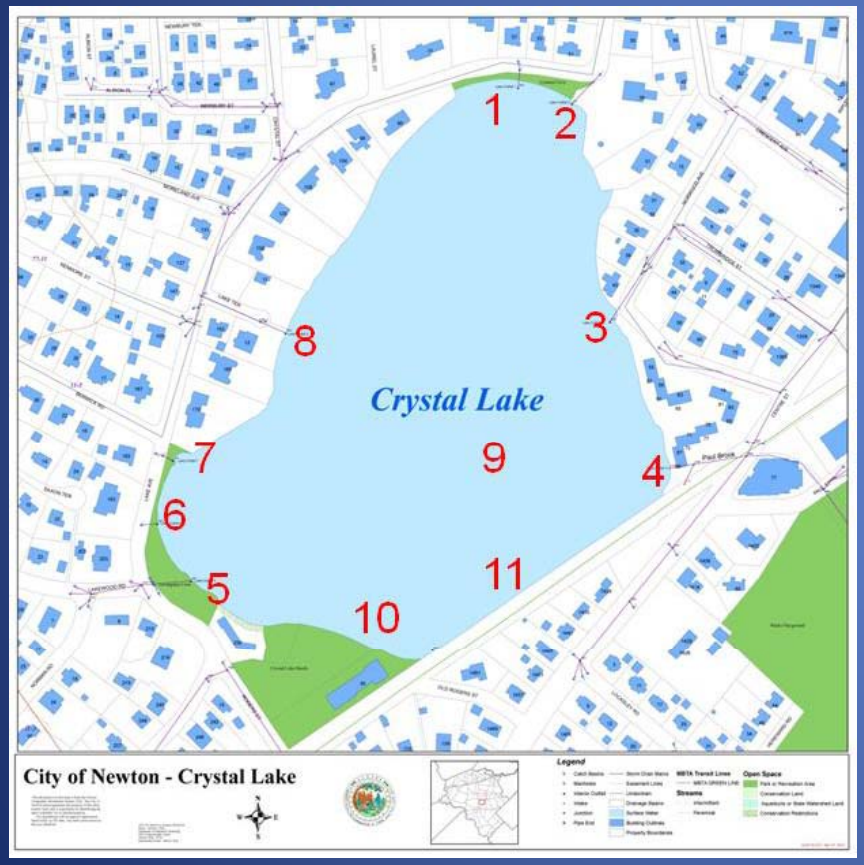
The Crystal Lake Watershed

Storm Water Discharge Point into Crystal Lake

2011 Testing Program and Data

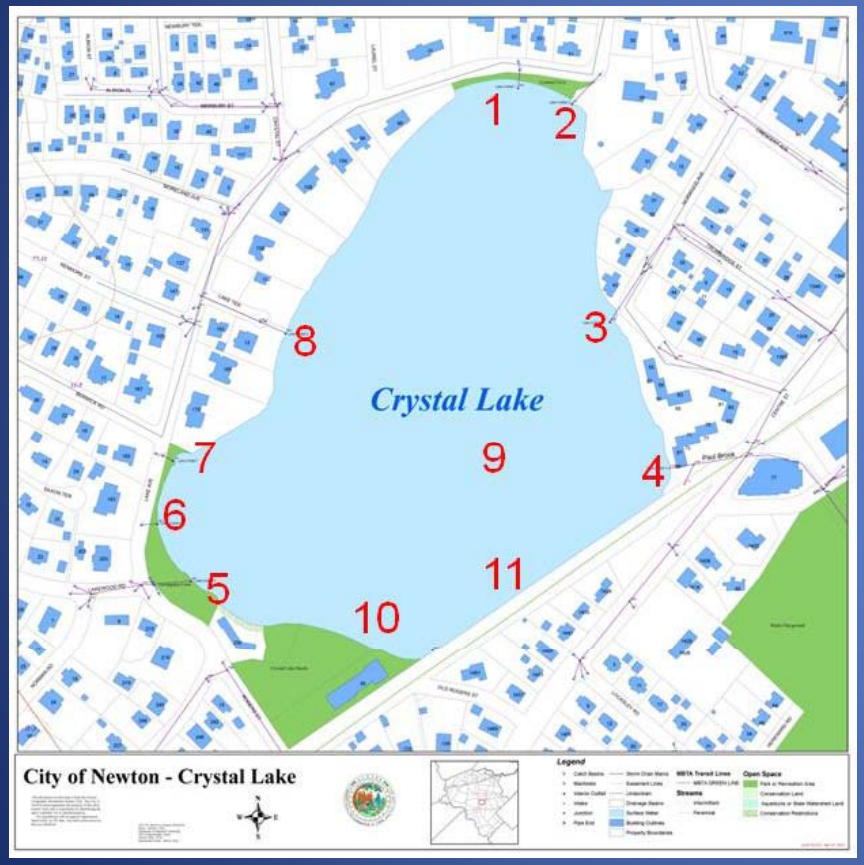
- Summary of results
  - Bacterial test results were variable
  - Nitrogen test results were comparatively low and typically below detection limits
  - Phosphorus test results were variable and were elevated in some areas
  - Pesticides and Herbicides were not detected
  - Arsenic was not detected

2011 Testing Locations



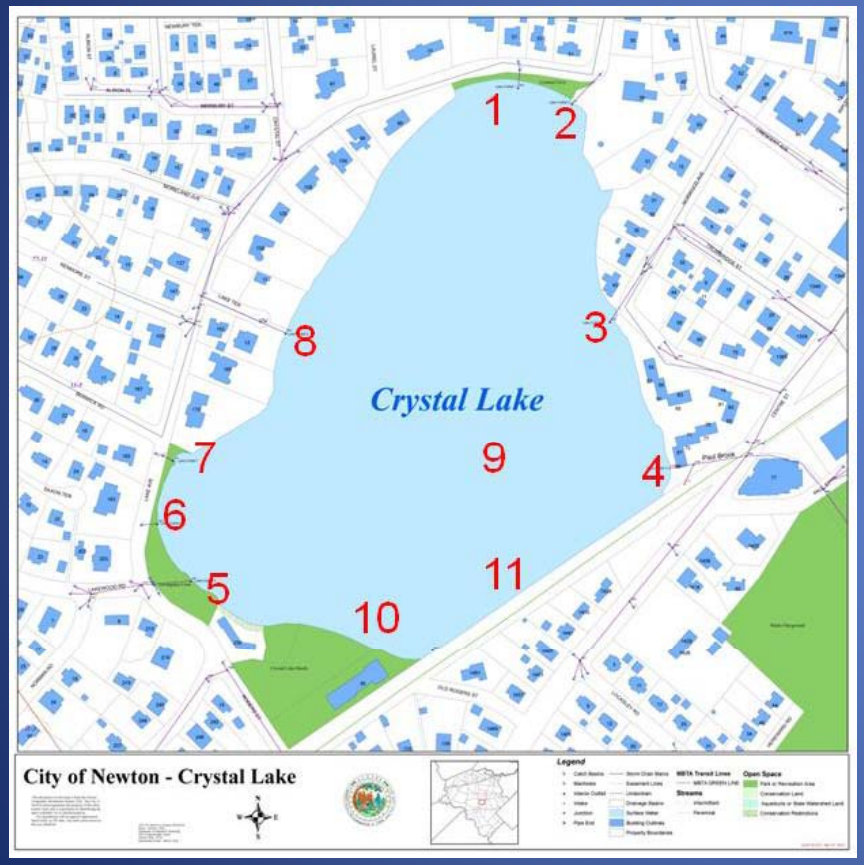
- Locations 1 – 8 are at stormwater drain outfalls
- Location 9 is at the deepest area of the lake
- Location 10 is at the Bath House
- Location 11 is adjacent to the railroad

Bacteria Test Results
Early August, 2011



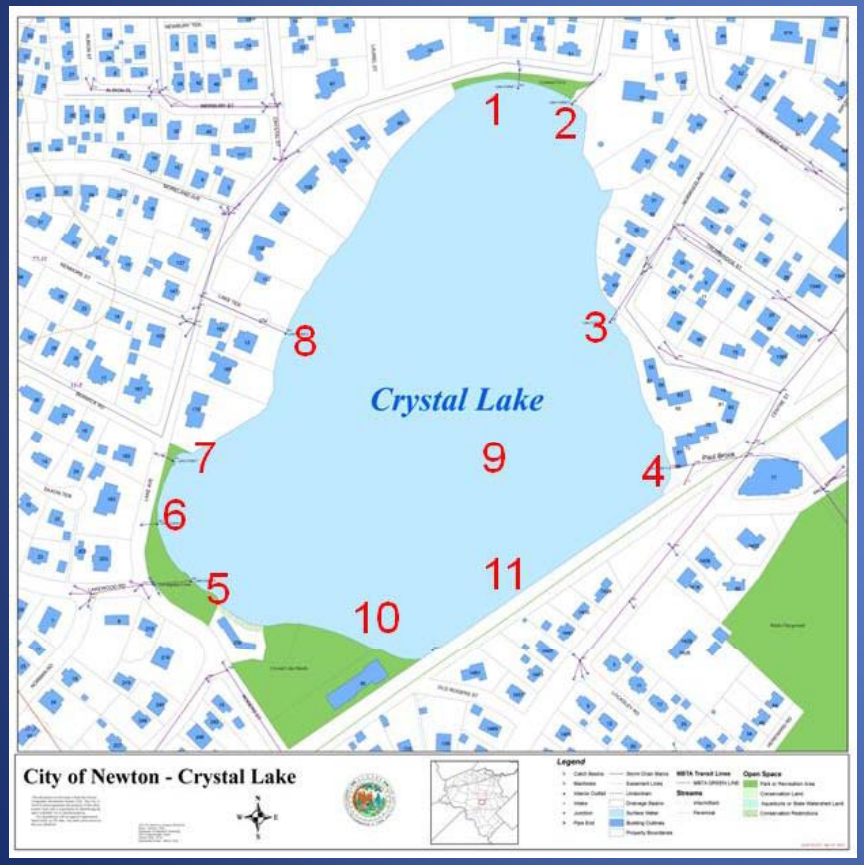
- E. coli levels were acceptable throughout the lake except at Outfalls 5 and 7
- Enterococci exceeded limits throughout the lake except at Outfall 4

Nitrate, Nitrite and Ammonia Test Results
Early August, 2011



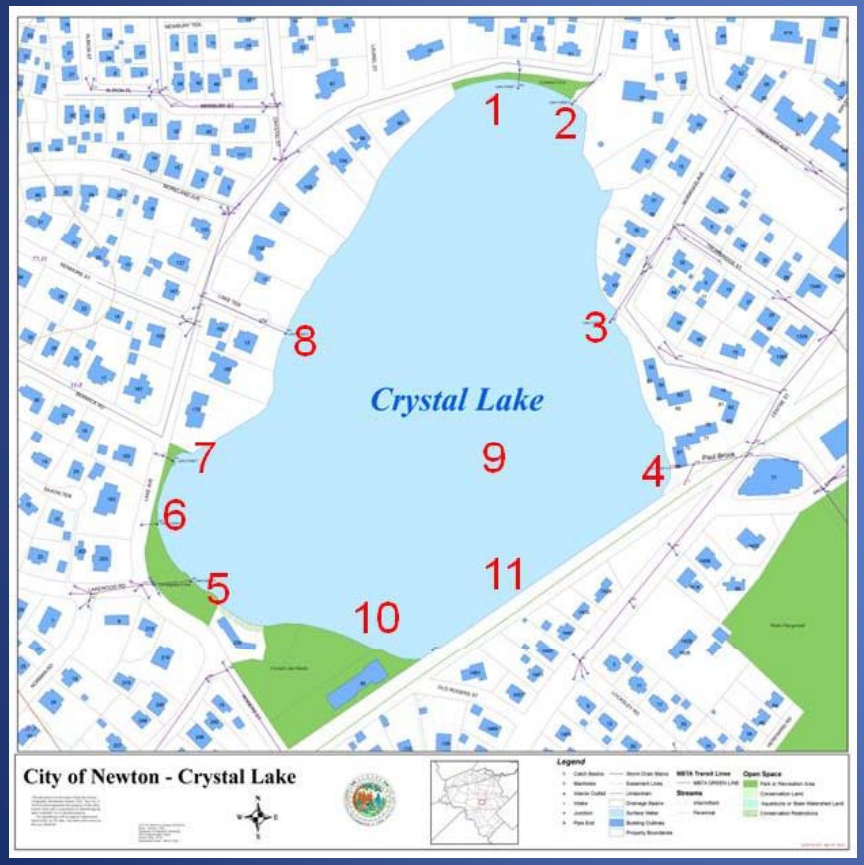
- A trace of Nitrate was detected at Outfall 3
- Nitrate, Nitrite, and Ammonia were not detected at any other location in the lake

Total Phosphorous Test Results
Early August, 2011



- Phosphorous was not detected throughout the lake except at Outfalls 6 and 7
- The levels that were detected were comparatively high (70 and 120 ppb)

Arsenic, Pesticides, Herbicides Test Results
Early August, 2011



- Arsenic was not detected
- Pesticides were not detected
- Herbicides were not detected

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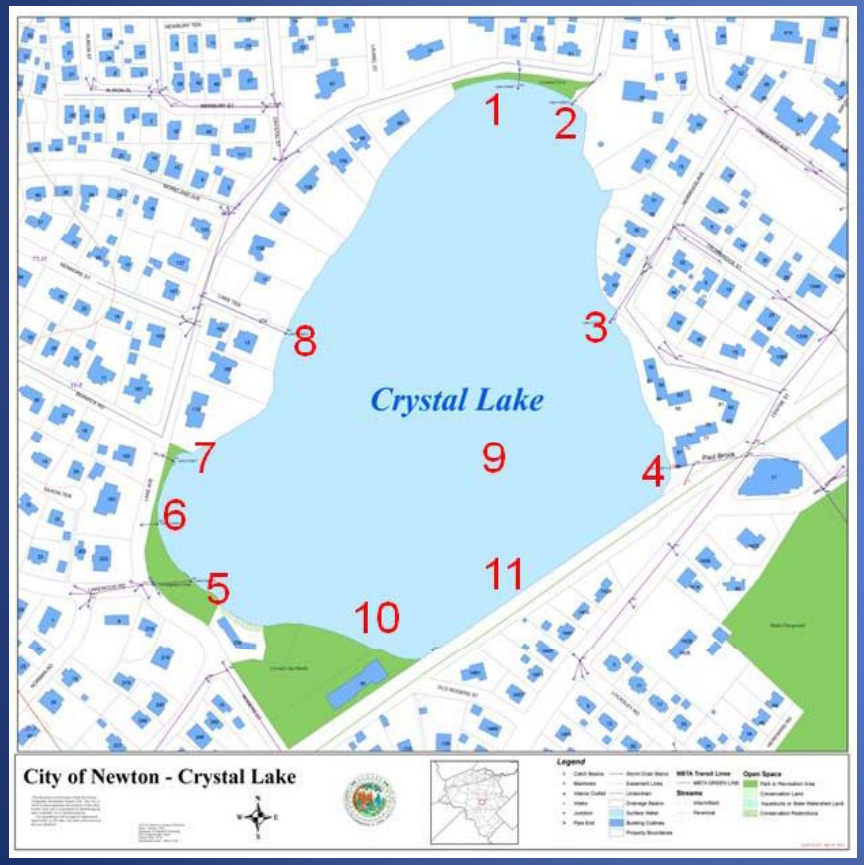
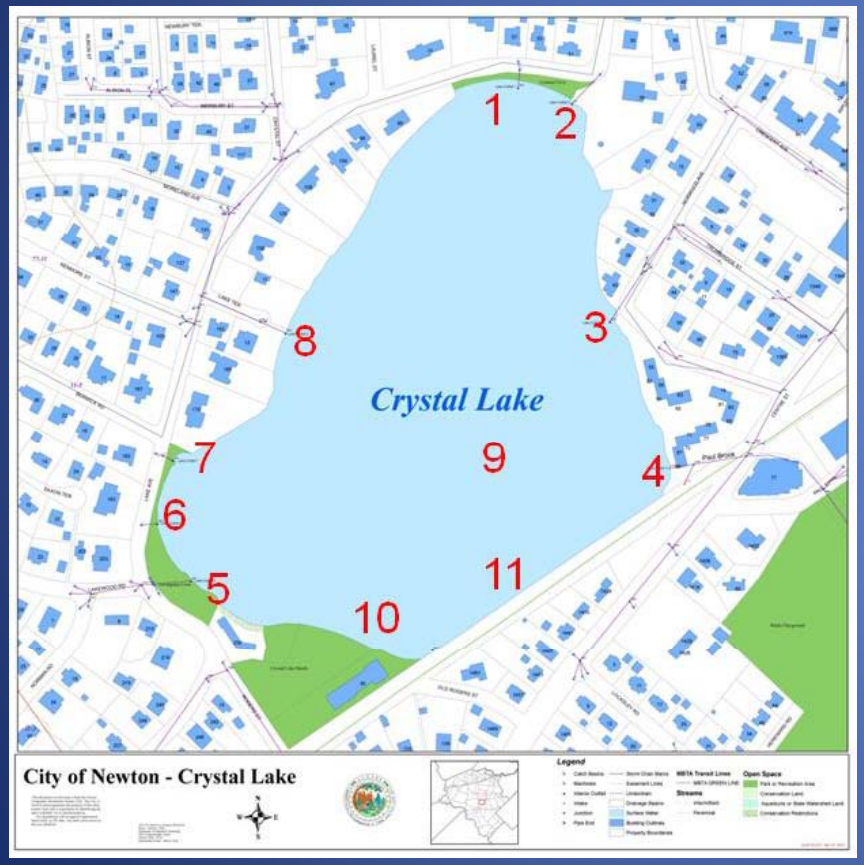
Test Results
Late August, 2011



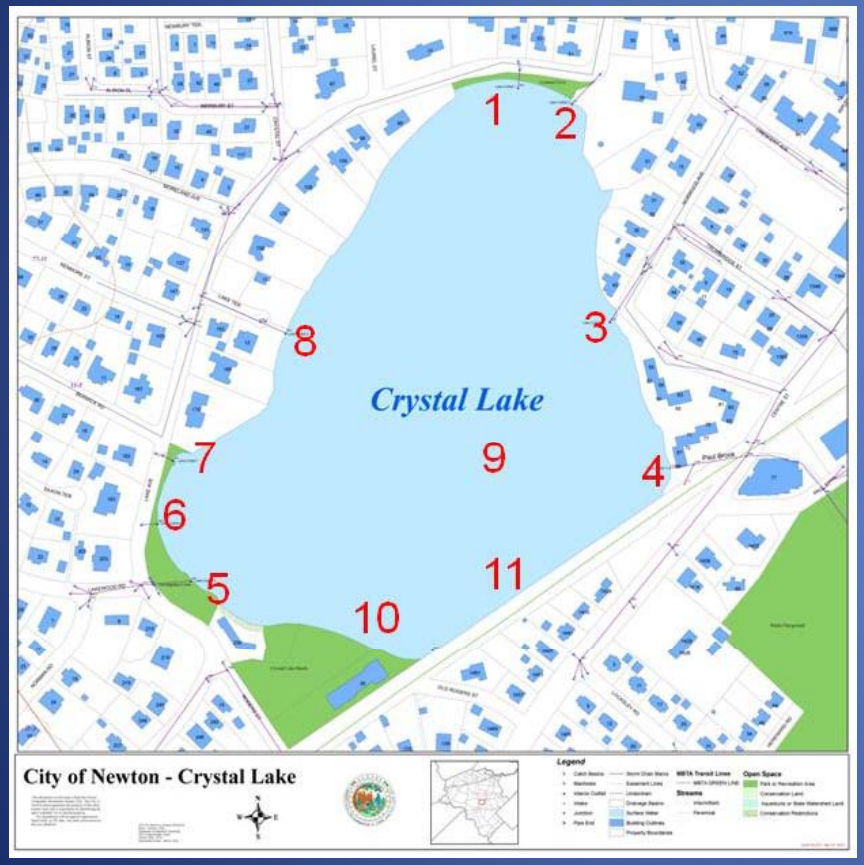
- E. coli levels were acceptable throughout the lake except at Outfall 5
- Enterococci exceeded limits at Outfalls 1, 2, 5, 6, and 8
- Nitrate was detected only at Outfall 1
- Phosphorus was detected at Outfall 1 and the Bathhouse (10)

Test Results
September, 2011 (twice)



- E. coli levels were acceptable throughout the entire lake
- Enterococci exceed limits at Outfalls 4 and 5 (once each)
- Nitrogen was not detected
- Phosphorus was detected at Outfalls 1 and 3

Test Results
October, 2011



- E. coli levels were acceptable throughout the entire lake
- Enterococci levels were acceptable throughout the lake except at Outfall 8 (70 vs. 61)

Watershed Land Use Survey Summary
July and August, 2011

- Other than a few findings of minor erosion, there is nothing visibly egregious occurring on properties in the watershed
- Lake-side observations did not reveal any visible water quality issues
- Invasive species appear to be under control with minor pockets observed
- Lawn fertilizers and pesticide use could not be accurately assessed via visual observations

Recommendations for the Future

In Crystal Lake

- Continue Monitoring the Lake
- Monitor storm events in addition to regular monitoring
- Monitor throughout the year

In the Watershed

- Begin an education program to help the residents understand ways to reduce impacts
- Develop programs to reduce pollutant loads entering the lake
- Search for grants and funding to implement recommendations