NJDEP
Bureau of Freshwater & Biological Monitoring

Lake Monitoring Overview

Presented
December 1, 2011

NJ Water
Monitoring
Summit

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Water Monitoring and Standards

NJDEP
Lake Monitoring Overview

Topics Covered

- Ambient Lake Monitoring Network
- Volunteer Lake Monitoring Network

Ambient Lake Monitoring Network

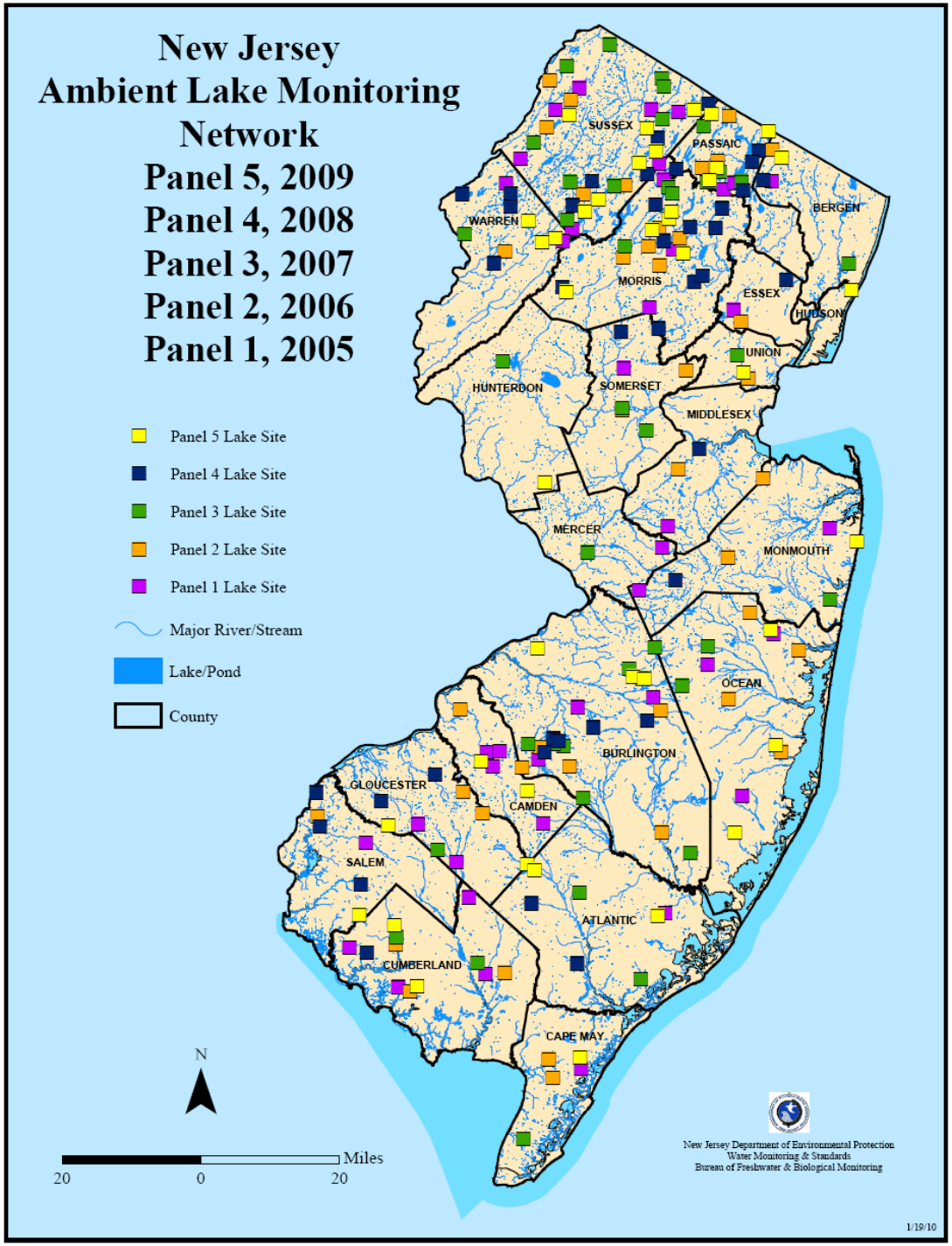
- **The primary purpose of the Lakes Monitoring Network is to provide a statistically valid estimate of overall lake water quality in the State.**
- **Data collected from the 220 probabilistically selected lakes statistically represents all lakes in NJ meeting the design criteria.**
- **Estimates can be made on the Statewide condition of all lakes meeting design criteria.**

Ambient Lake Monitoring Network Design Criteria/Target Population

- Man-made or natural
- Wholly or partially within NJ's political boundaries
- Water supply reservoirs with active draw downs and water exchanges not included.
- Lake size at least two hectares (5 acres) in area.
- Depth of approximately one meter at the deepest point measured.

Probabilistic Design

- Developed by EPA for National and Statewide assessments.
- Probability sample: produces design based estimators.
- 869 Lakes in NJ meet design criteria.
- 220 lakes targeted (200 for Statewide Status, 20 for Trends Analysis) in a stratified random manner.
- Targeted lakes eliminated for various reasons: not accessible, do not meet design, etc…
- Result of extent estimate on final lake selection: Network lakes statistically represent 635 lakes Statewide.


New Jersey
Ambient Lake Monitoring
Network
Panel 5, 2009
Panel 4, 2008
Panel 3, 2007
Panel 2, 2006
Panel 1, 2005
Panel 5 Lake Site
Panel 4 Lake Site
Panel 3 Lake Site
Panel 2 Lake Site
Panel 1 Lake Site
Major River/Stream
Lake/Pond
County
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
GLOUCESTER
CAMDEN
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
N
Miles
20
0
20
New Jersey Department of Environmental Protection
Water Monitoring & Standards
Bureau of Freshwater & Biological Monitoring
1/19/10

Sampling Frequency

- 40 lakes sampled per year (Panel 1-5)
- Up to 3 in-lake sample sites
- Sampled in Spring, Summer, Fall

Sample Parameters

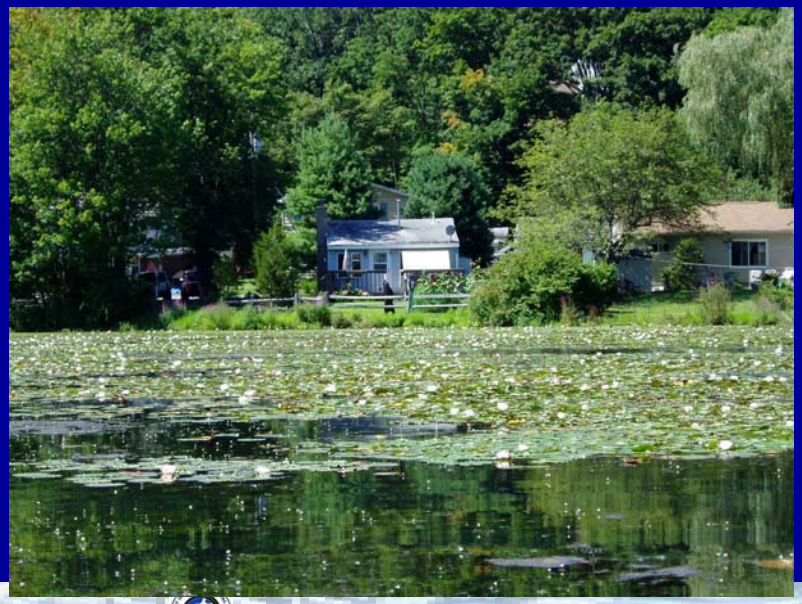
- **Total Phosphorus***
- Total Kjeldahl Nitrogen
- Nitrite+Nitrate Nitrogen
- Ammonia Nitrogen

- Secchi depths
- Chlorophyll “a”
- **Dissolved Oxygen***
- Temperature
- Specific Conductance
- **pH***
- Alkalinity
- Hardness
- Turbidity

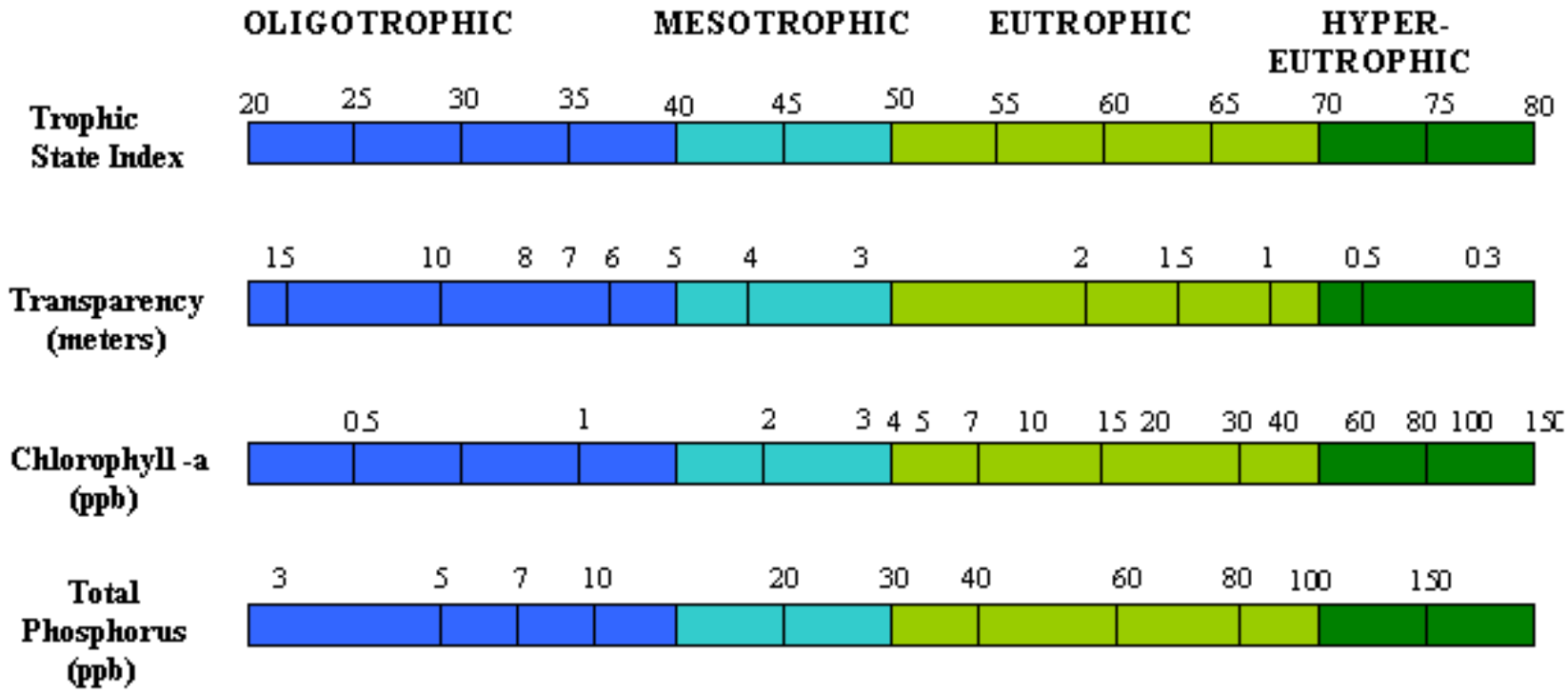
***Surface Water Quality Standard (SWQS)**

Trophic State Assessment

- **Eutrophication – Aging process of lakes moving toward increased algae & plant growth.**
- **Cultural eutrophication can rush lakes into eutrophic conditions in a matter of a human generation or two.**



Trophic Status Assessment
Carlson's Trophic State Index (TSI)



Trophic Status Assessment
TSI parameters converted to standard units*

- **Total Phosphorus**
  (TSIP) = 14.12 ln(TP) + 4.15

- **Chlorophyll "a"**
  (TSIC) = 9.81 ln (Chl a) + 30.6

- **Secchi Disk**
  (TSIS) = 60-14.41 ln(SD)

***Minnesota Lake Water Quality Assessment**

TSI Converted Values

- Oligotrophic. 0 to 40.
- Mesotrophic. 41-50.
- Eutrophic. 51-70.
- Hypereutrophic. >70.

Season	TSIP	TSIC	TSIS	TSI
Spring Station 1	32.21	58.68	58.63	49.84 Mesotrophic
Summer Station 1	65	68.94	63.22	65.72 Eutrophic
Fall Station 1	61.67	53.76	51.53	55.65 Eutrophic

Surface Water Quality Standards (SWQS)

- Two Events Required For A Violation
- **Total Phosphorus (TP) > 0.05 mg/L**
- **Dissolved Oxygen (DO) < 4.0mg/l**

  (There is also a daily average criteria of 5mg/l, which is not applicable to the sampling methods used for this monitoring network)
- **pH 3.5 - 8.5 SU***

  *6.5 – 8.5 SU for lakes within waters designated as FW2 waters in the Upper Delaware, Upper Raritan, Passaic, and Wallkill River Basins.

  *4.5 - 7.5 SU for lakes within FW2 waters in the Atlantic, Lower Delaware, and Lower Raritan River basins.

  *3.5 - 5.5 SU for lakes designated as PL waters.

Probabilistic Estimate of Lakes Attaining SWQS

Indicator	Category	Number of Lakes	Estimate % Lakes
Total Phosphorus Impairment	Fail	30	15.5
Total Phosphorus Impairment	Pass	169	84.5
Dissolved Oxygen Impairment	Fail	5	2.6
Dissolved Oxygen Impairment	Pass	194	97.4
pH Impairment	Fail	28	14.0
pH Impairment	Pass	171	86.0
OVERALL ASSESSMENT	Not Support	57	29.0
OVERALL ASSESSMENT	Full Support	142	71.0

Potential Stressors

- **Impaired shoreline habitat.**
- **Storm water outfalls.**
- **Atmospheric precipitation and fallout from urban contaminants.**
- **Heavy fertilization in agricultural regions. The phosphorus content of precipitation is much higher during the active growing (summer) season.**
- **Release of sediment bound phosphorus due to changes is sediment-water interface.**

Additional information on the Ambient Lakes Monitoring Program can be obtained from:

WM&S/ Bureau of Freshwater & Biological Monitoring

609-292-0427

www.state.nj.us/dep/wms/bfbm.

Volunteer Lake Monitoring Network

Panel 6 of the New Jersey Ambient Lake Monitoring Network

Presented by: Sarah Helble

Volunteer Lake Monitoring Network

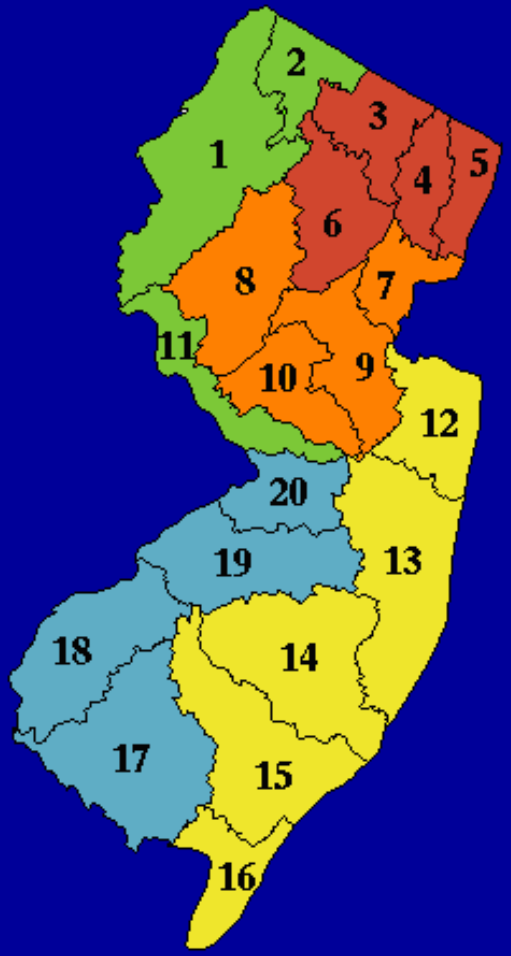
Panel 6 of the New Jersey Ambient Lake Monitoring Network

- Panel 6 part of the New Jersey Ambient Lake Monitoring Network
- 20 lakes were probabilistically selected by EPA for a 5-10 year trend assessment
- These 20 lakes are to be monitored annually

Pilot Study Intro

Watershed Ambassador Program

- 20 members
- 5 lakes per member including the 20 lakes assigned by EPA mentioned above (panel 6 lakes)



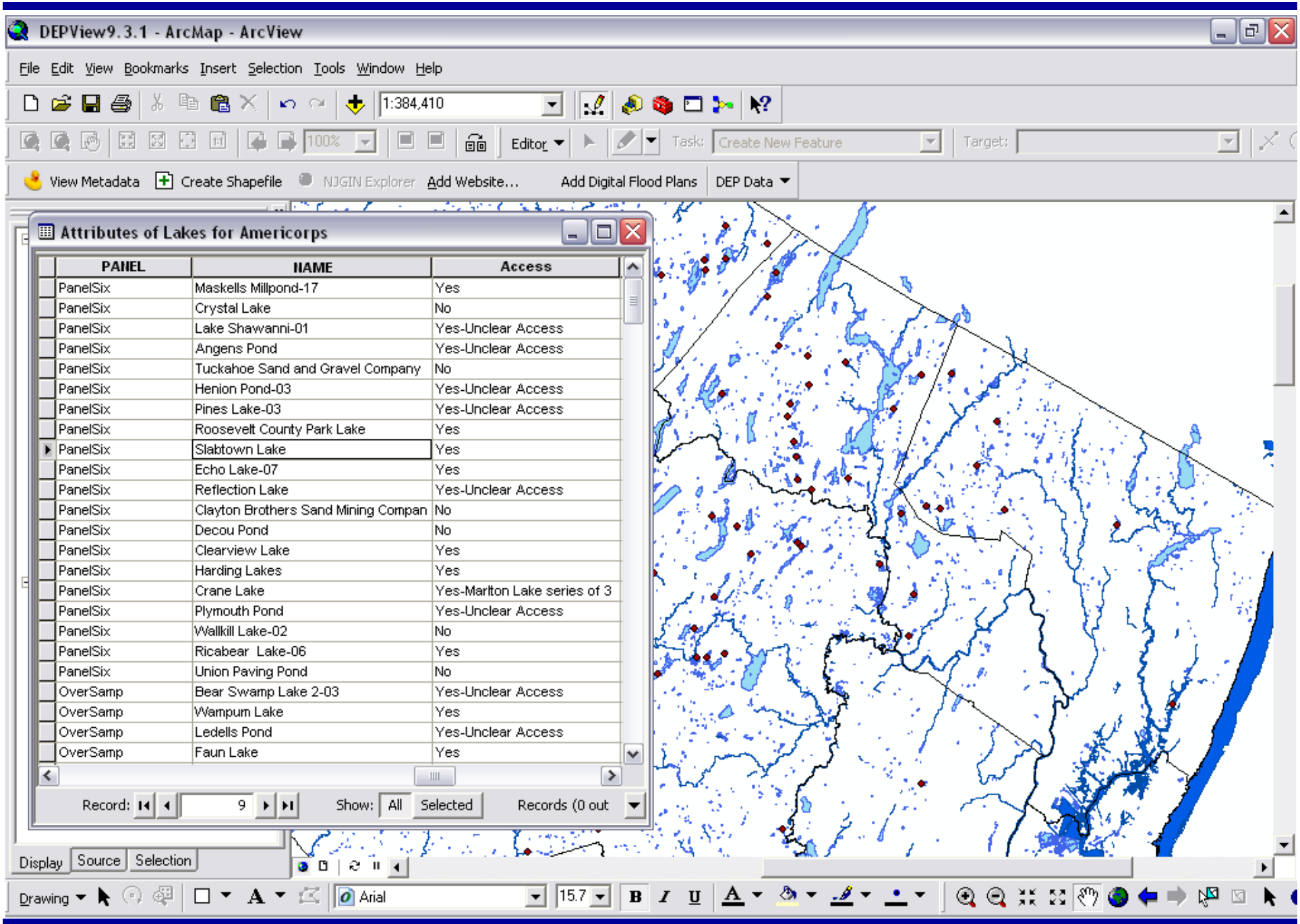
For a total of 100 lakes

Lakes Selection

1. Available Access
   - Determined accessibility based on GIS coverage of lakes and aerial photography.

2. Size of Lake

3. On or near public property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Editor
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Target:
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DEP Data
Attributes of Lakes for Americorps
PANEL | NAME | Access
PanelSix | Maskells Millpond-17 | Yes
PanelSix | Crystal Lake | No
PanelSix | Lake Shawanni-01 | Yes-Unclear Access
PanelSix | Angens Pond | Yes-Unclear Access
PanelSix | Tuckahoe Sand and Gravel Company | No
PanelSix | Henion Pond-03 | Yes-Unclear Access
PanelSix | Pines Lake-03 | Yes-Unclear Access
PanelSix | Roosevelt County Park Lake | Yes
PanelSix | Slabtown Lake | Yes
PanelSix | Echo Lake-07 | Yes
PanelSix | Reflection Lake | Yes-Unclear Access
PanelSix | Clayton Brothers Sand Mining Compan | No
PanelSix | Decou Pond | No
PanelSix | Clearview Lake | Yes
PanelSix | Harding Lakes | Yes
PanelSix | Crane Lake | Yes-Marlton Lake series of 3
PanelSix | Plymouth Pond | Yes-Unclear Access
PanelSix | Wallkill Lake-02 | No
PanelSix | Ricabear Lake-06 | Yes
PanelSix | Union Paving Pond | No
OverSamp | Bear Swamp Lake 2-03 | Yes-Unclear Access
OverSamp | Wampum Lake | Yes
OverSamp | Ledells Pond | Yes-Unclear Access
OverSamp | Faun Lake | Yes
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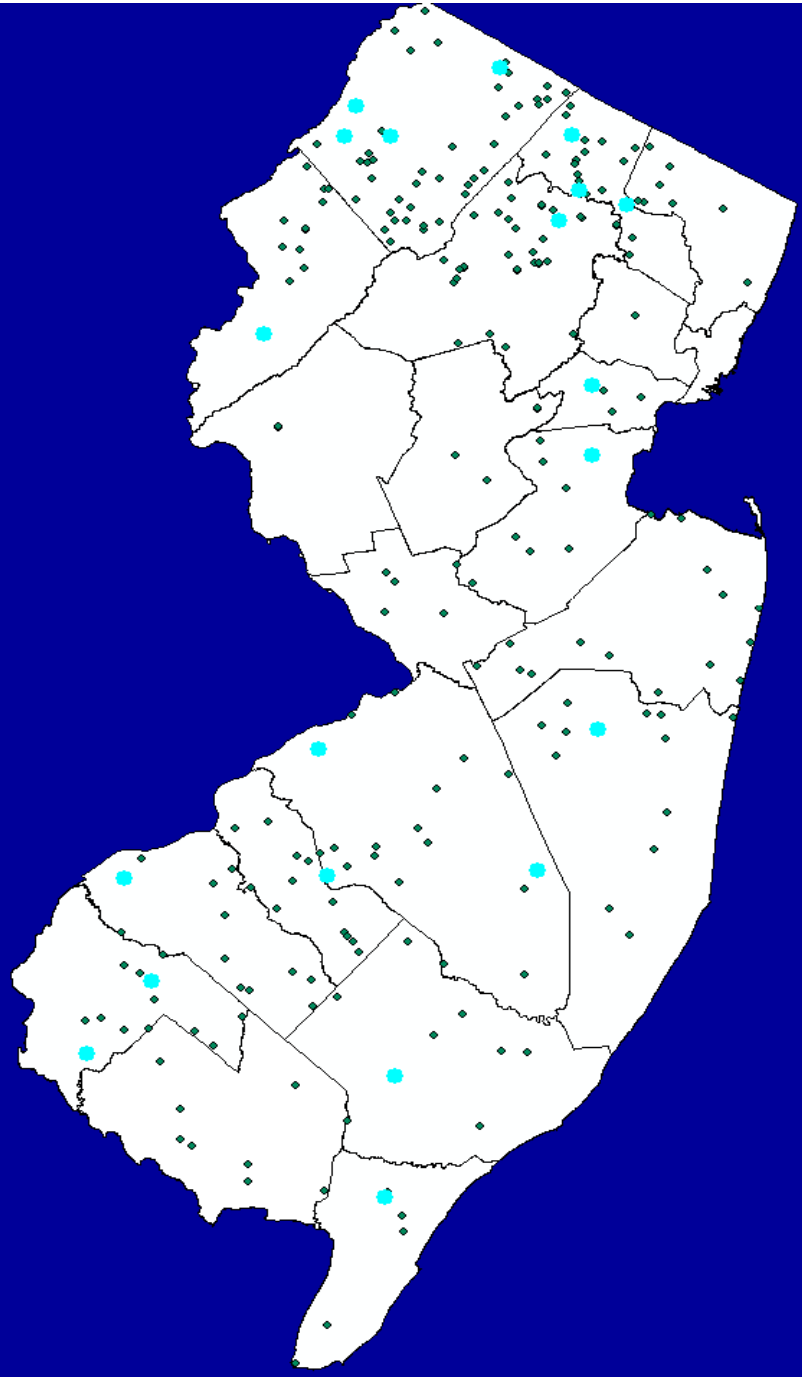
Lakes Selection

Map 1: Twenty Panel 6 lakes + over flow list



Lake Assessment Protocol

- Cost effective for volunteers and Ambassadors
- Similar to National Survey
- Developed for
  - DEP (Panel 6)
  - EPA National Lake Assessment (NLA)
  - Lakes Communities
  - Volunteers

Lake Assessment Protocol

Quick Visual Assessment for:

1. Designated use (human uses of lake)

2. Nutrient Assessment (algal conditions)

Similarities between the National (NLA) and Volunteer Lake Assessments

- Land Use surrounding lake
- Shoreline Characteristics
- Algae Survey
- Recreational Appeal

Additions to the Volunteer Assessment

Presence/Absence of Invasives

Wildlife Observations

Recreational Aesthetics

Recreational Availability

Water Characteristics (Turbidity, Odor, Surface Coating)

Results

- 100 lakes were assigned to the Watershed Ambassadors to be assessed.
- Of these 100 lakes, 66 had a full assessment performed
- 26 were not able to be assessed due to lack of access

Lake Appeal

Of the 66 lakes assessed:

- 42 were considered to be recreationally appealing

Lake Appeal

Of the 66 lakes assessed:

- 23 were considered to not be recreationally appealing

Next Steps:

Do another round of visual assessments on the same 100 assigned lakes

- Which of the 100 assigned lakes were accessible?

- Which of the Panel 6 lakes were accessible?

- Data analysis

- Assign new lakes as needed (overflow list)

Coming to the Web spring 2012!

http://www.state.nj.us/dep/wms/bwqsa/vm/lake_monitoring.html

For more information on Volunteer Monitoring please contact:

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