



MARYLAND DEPARTMENT OF NATURAL RESOURCES

*The State of Deep Creek Lake, 2010 - 2011*

**Maryland's Environmental Monitoring Efforts  
in Deep Creek Lake, 2010 - 2011**

McHenry, Maryland 21341

**Presentation to:  
Garrett County Commissioners  
15 November 2011**

**John R. Griffin, Secretary  
Maryland Department of Natural Resources  
Annapolis**

Image USDA Farm Service Agency

Google

Imagery Date: Jun 6, 2007

39° 29.535' N 78° 20.029' W

Eye alt 19103 ft

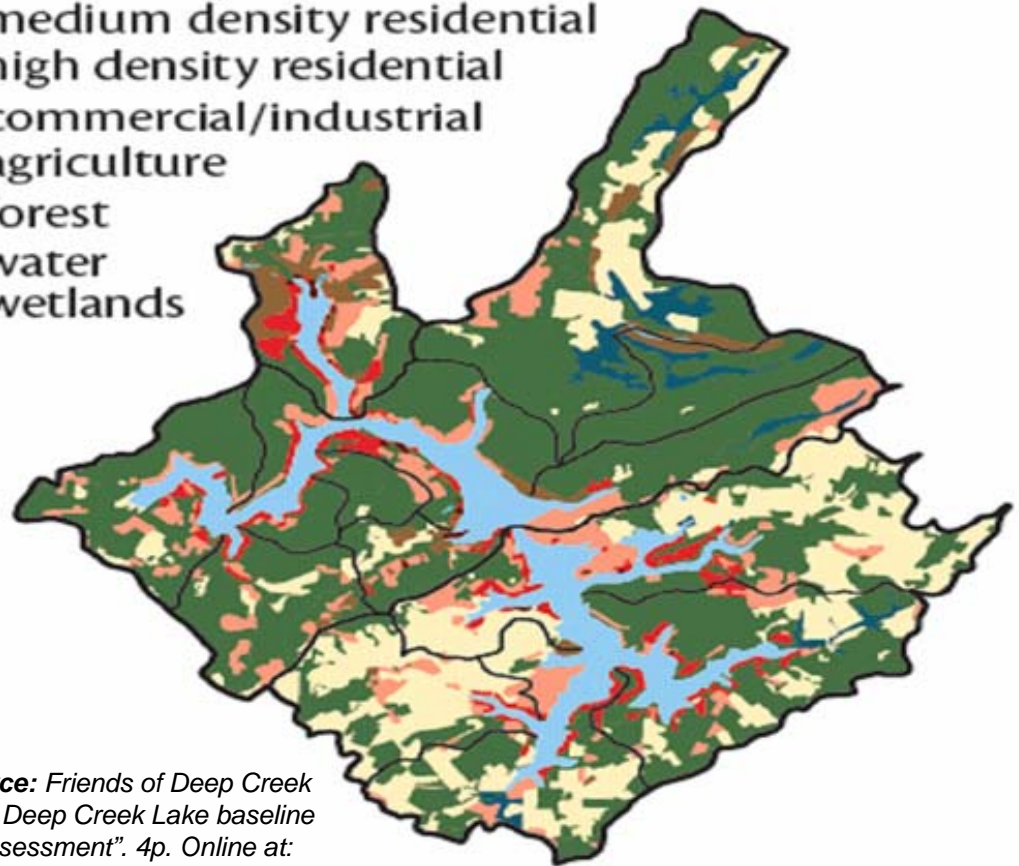


## “A lake is a reflection of its watershed” ...

DNR manages only a small portion of the Deep Creek Lake watershed - mostly the lake and buffer areas at the end of each sub-watershed. Private holdings make up most of the watershed.

As land use changes occur in the watershed, characteristics of the lake also will change. Addressing stresses in the watershed will slow changes in the quality of the lake and will maintain current conditions for this important asset for the county and State.

- low density residential
- medium density residential
- high density residential
- commercial/industrial
- agriculture
- forest
- water
- wetlands



*Image source: Friends of Deep Creek Lake. 2011. Deep Creek Lake baseline condition assessment". 4p. Online at: <http://www.eco-check.org>*



## Goals for Deep Creek Lake

- to protect the lake as a man-made resource,
- preserve its ecological balance, and
- maintain its use as a recreational and economic asset.

## Monitoring Summary

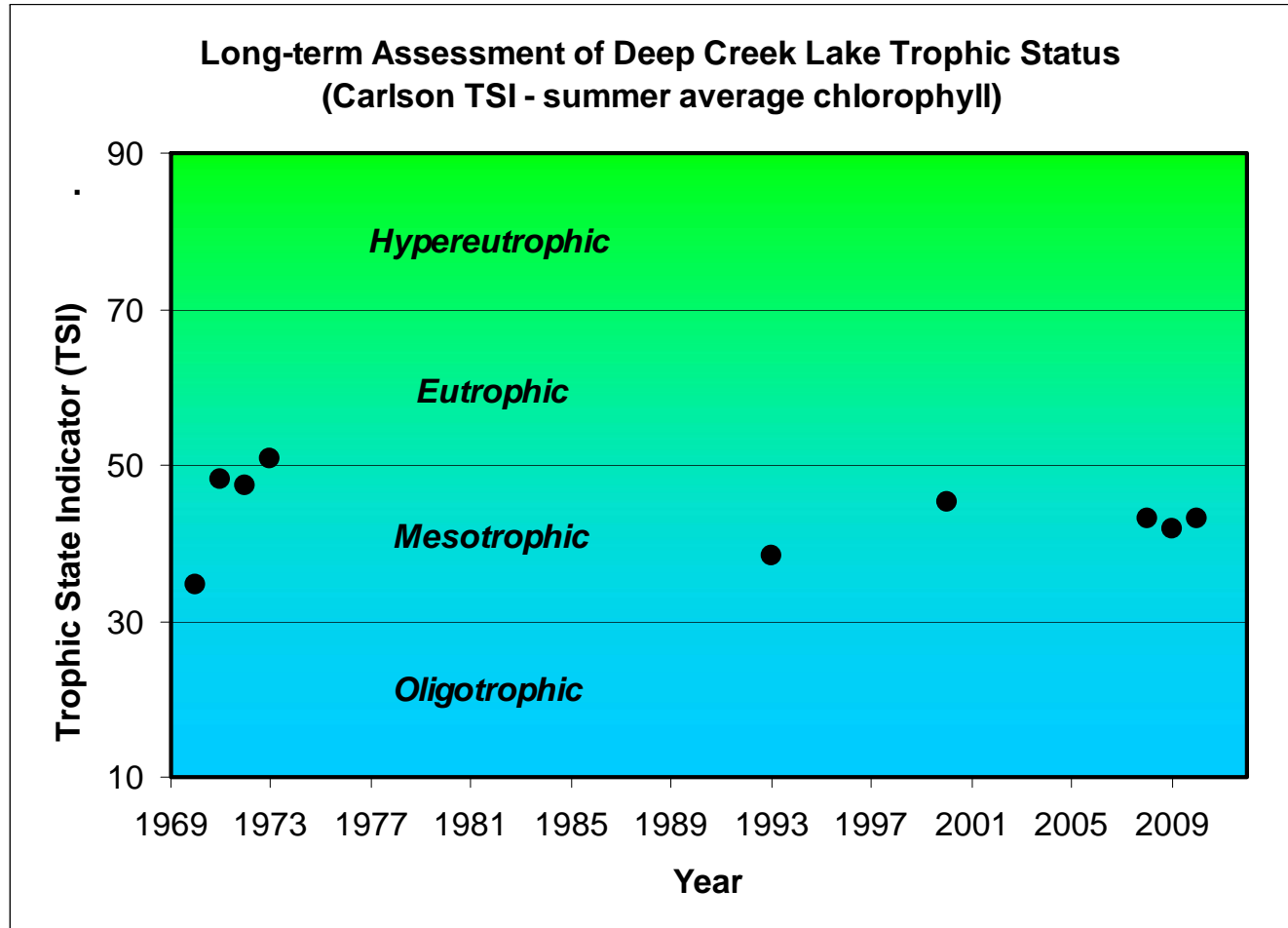
- Current monitoring program establishes a baseline to define trends that will allow us to evaluate changes in population and land use in the watershed to help us make decisions to protect the lake.
- Water quality supports aquatic life, recreational activities (swimming, fishing, boating), industrial (hydropower, irrigation) and downstream uses.
- The lake has a diverse aquatic plant community with a wide range of species ranging from microscopic phytoplankton species to vascular aquatic plants.
- Sedimentation rates in some cove areas can vary – some coves have gotten deeper, some have not changed and some are shallower.



## **Overall State of the Lake is healthy:**

- ***Good water quality***
- ***Diverse plant and animal life***
- ***Moderate loads of nutrients***

## Trophic condition - mesotrophic



nutrient pollution

overenrichment

moderate nutrients  
supports diverse aquatic  
habitat and fisheries

nutrients poor



## Deep Creek Lake Workgroup – formed in 2008

### Composition

- Technical staff and scientists from:
  - \* MD Department of Natural Resources
  - \* MD Department of the Environment
  - \* US Geological Survey
- County representatives
- Citizen representatives – 2 from POA

### Purpose

- forum for discussion
- review results of water quality monitoring
- distribute information to other interested groups



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## *The State of Deep Creek Lake, 2010 - 2011*

**And now...**

***...Details about the...***

***...Deep Creek Lake monitoring program***

***...and some results...***

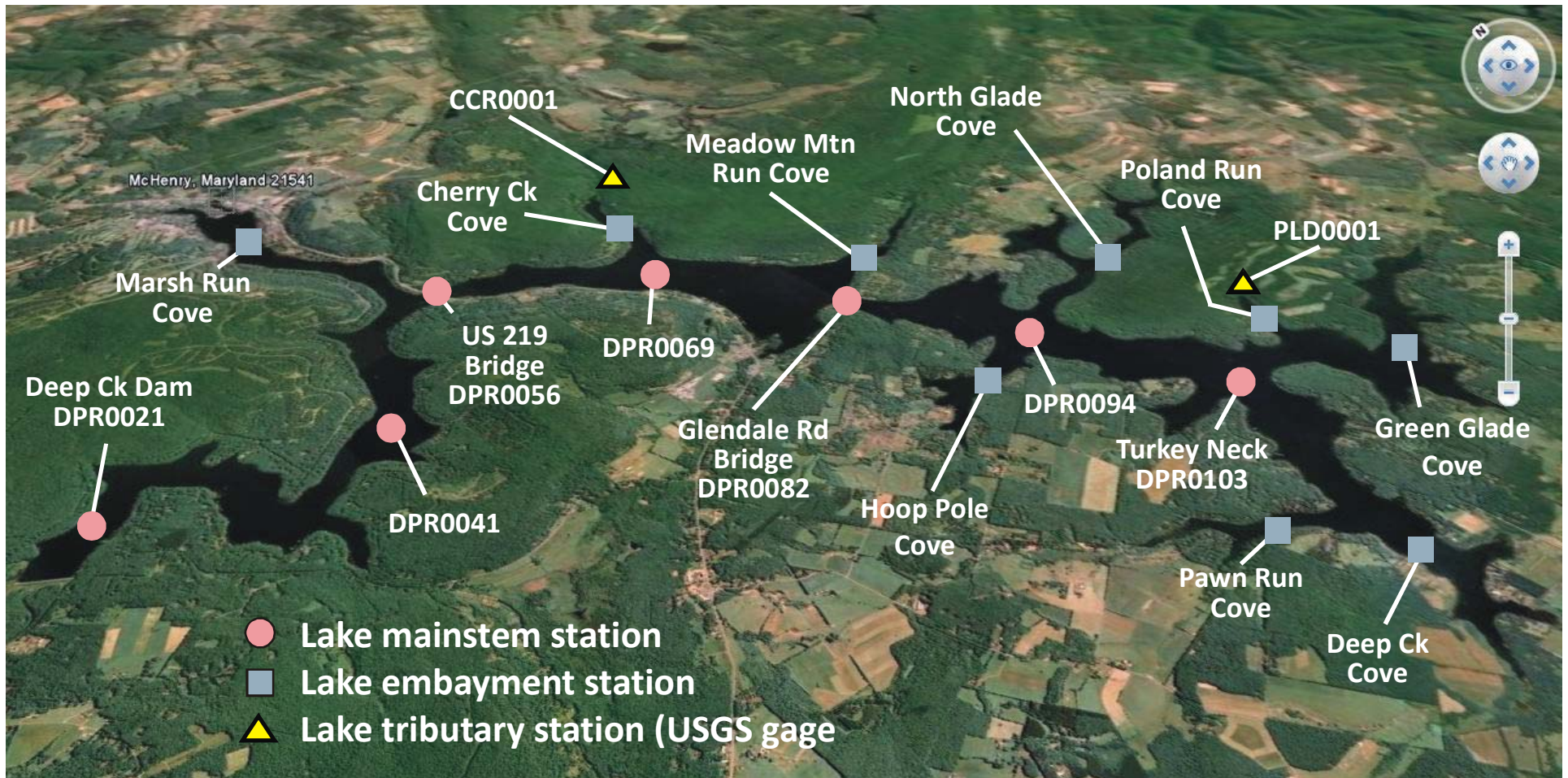
**presented by**

**Bruce D. Michael, Director  
Resource Assessment Service  
MD Department of Natural Resources  
Annapolis, MD**

## Water quality monitoring goals:

- *characterize existing water quality conditions in the lake and its tributary coves – physical and chemical characteristics, levels of nutrients and primary productivity*
- *establish baseline conditions to evaluate trends in water quality conditions*
- *define the existing phytoplankton community*
- *monitor water quality conditions at tributary stream gage sites to eventually determine nutrients and sediment loads entering the lake from the watershed*

## *The State of Deep Creek Lake, 2010 - 2011*





## **Deep Creek Lake water quality monitoring plan**

**Location** – 7 sites in the mainstem lake; 9 sites in select coves

**Season** – Samples at all sites in Spring (Mar), Summer (May-Sep), Fall (Nov)

**also**

- 2 mainstem sites sampled in Winter (Jan or Feb) through ice cover

**Field monitoring** – Water clarity and vertical profile (surface to bottom) of temperature, oxygen, pH and conductivity recorded at all sites

**Water samples** – Samples analyzed for nutrients (N, P), chlorophyll, turbidity

### **Initiated in 2010-2011**

**DNR-RAS** - Aquatic plant survey along transects at select sites in the lake and an aerial survey to identify species and distribution of plants in Deep Creek Lake

**DNR-MGS** - Assess quality of sediments and accretion/loss in select areas in Deep Creek Lake.

**MDE** - Assess nutrients and algae at shallow water sites in lake and cove areas in upper lake (upstream of Glendale Rd. bridge) in response to complaints about algal blooms and fish kills. Results may be used to define these waters as being impaired and require the development of a nutrient/pollutant loading limit for the watershed.



## **Deep Creek Lake - Water quality condition (I)**

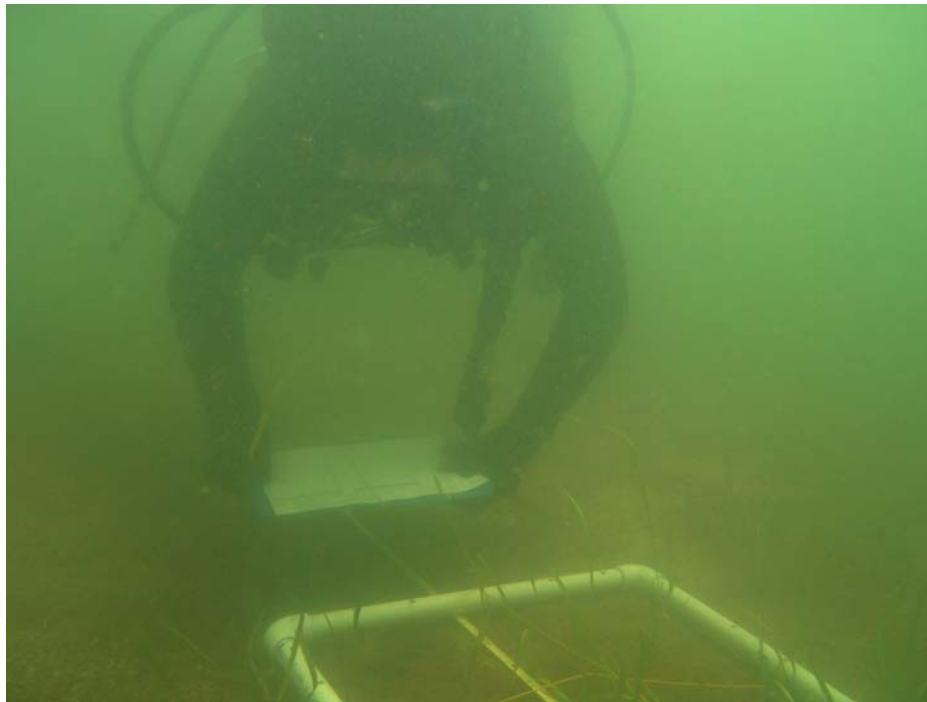
**Measured surface water quality conditions in Deep Creek Lake during 2009-2010 support the defined uses of the lake.**

Water quality collected by DNR data show:

- no observations of dissolved oxygen levels below 5 mg/L
- only a single observation of a low pH measure (6.0; less than 6.5) out of 279 observations; no high pH measures above 8.5 were observed.
- many surface water temperature observations during the summer were above the temperature criteria of 20 degrees C (68 degrees F). These are due to natural insolation (solar radiation) and are not considered an exceedance of State criteria.

The Garrett County Health Department did not report any high levels of bacteria in Deep Creek Lake in their 2011 routine beach monitoring program.

## Assessing aquatic vegetation



*DNR divers surveying aquatic plant species and abundance along transects at selected shallow water sites in Deep Creek Lake (2010)*

In summer of 2010 and 2011, DNR biologists surveyed selected transects to identify: type, distribution and abundance of aquatic vegetation in the lake.

Sixteen vascular plants and 2 macroalgae were identified in these surveys.



## Summary of aquatic plant surveys

- Deep Creek Lake has a healthy, thriving and diverse mix of aquatic vegetation growing as deep as 16 to 20 feet.
- Fish were present in all vegetated areas using the plant stems/leaves as habitat and refuge
- Water near piers where aquatic vegetation had been removed were more turbid than where aquatic plants remained.
- Eurasian Watermilfoil did not change from 2010 to 2011, but DNR plans to implement a survey in 2012 with a reconnaissance survey conducted November 15, 2011



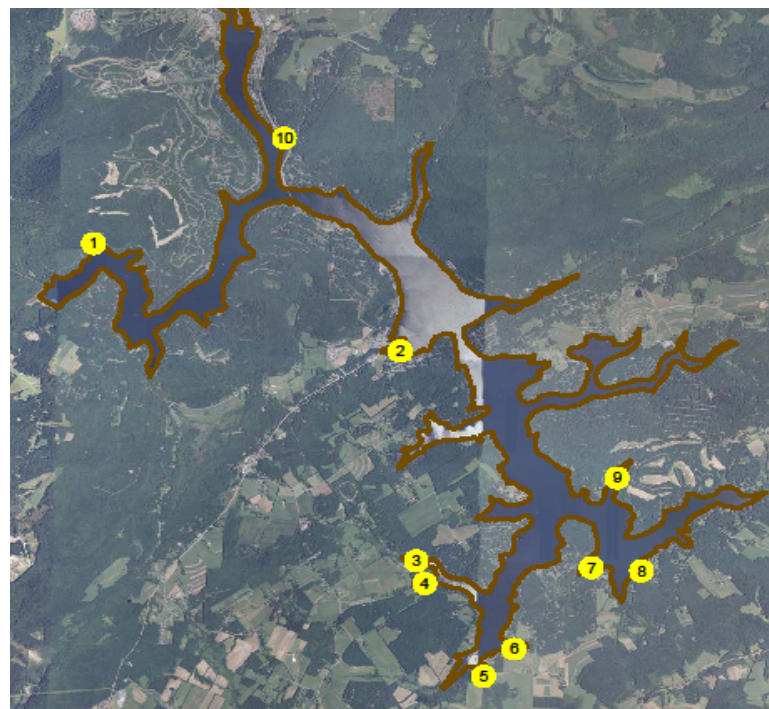
## Assessing Eurasian watermilfoil

**To address Eurasian watermilfoil (EWM) in the lake, DNR will:**

- Conduct EWM reconnaissance on November 15, 2011 – providing quantitative measures of the extent of the EWM beds.
- Develop targeted strategy and budgets to assess spatial distribution
- Recommend additional monitoring that may be necessary.
- Evaluate results of existing SAV survey and the EWM-specific survey to guide lake management in control measures for implementation in spring of 2012
- 2012 SAV surveys will occur in June

## Sediment Survey sites – FY 2011

Site #	Location
1	Brushy Run
2	Arrowhead Cove
3	Pawn Run Cove
4	Penn Cove
5	Chadderton School Cove
6	Hickory Ridge Cove
7	Turkey Neck Cove
8	Hazelhurst Cove
9	Poland Run Cove
10	Gravelly Run Cove



**Difference between 1974 bathymetry and measured bathymetry in 2010 and 2011 defines:**

- **Erosional sites** (deeper than 17 years ago),
- **Depositional sites** (shallower than 17 years ago) and
- **No change areas** (<6 in increase or decrease)

## Summary of sedimentation survey

Erosional Sites—Mean observed changes < -0.5 feet accumulation:

- **Site 1 (Brushy Run)**
- **Site 10 (Gravelly Run Cove)**

No Change—Mean observed changes between -0.5 and 0.5 feet:

- **Site 6 (Hickory Ridge Cove)**
- **Site 7 (Turkey Neck Cove)**
- **Site 8 (Hazelhurst Cove)**

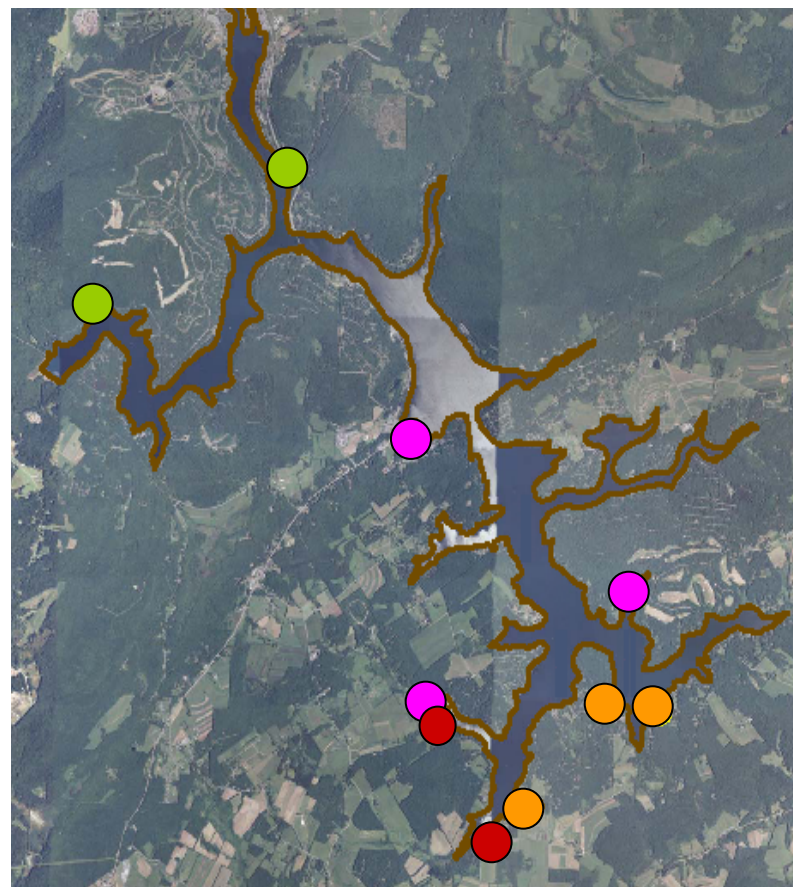
Depositional Sites – Mean observed changes > 0.5 feet accumulation

*at depth:*

- **Site 4 (Penn Cove)**
- **Site 5 (Chadderton School Cove)**

*throughout cove:*

- **Site 2 (Arrowhead Cove)**
- **Site 3 (Pawn Run Cove)**
- **Site 9 (Poland Run Cove)**





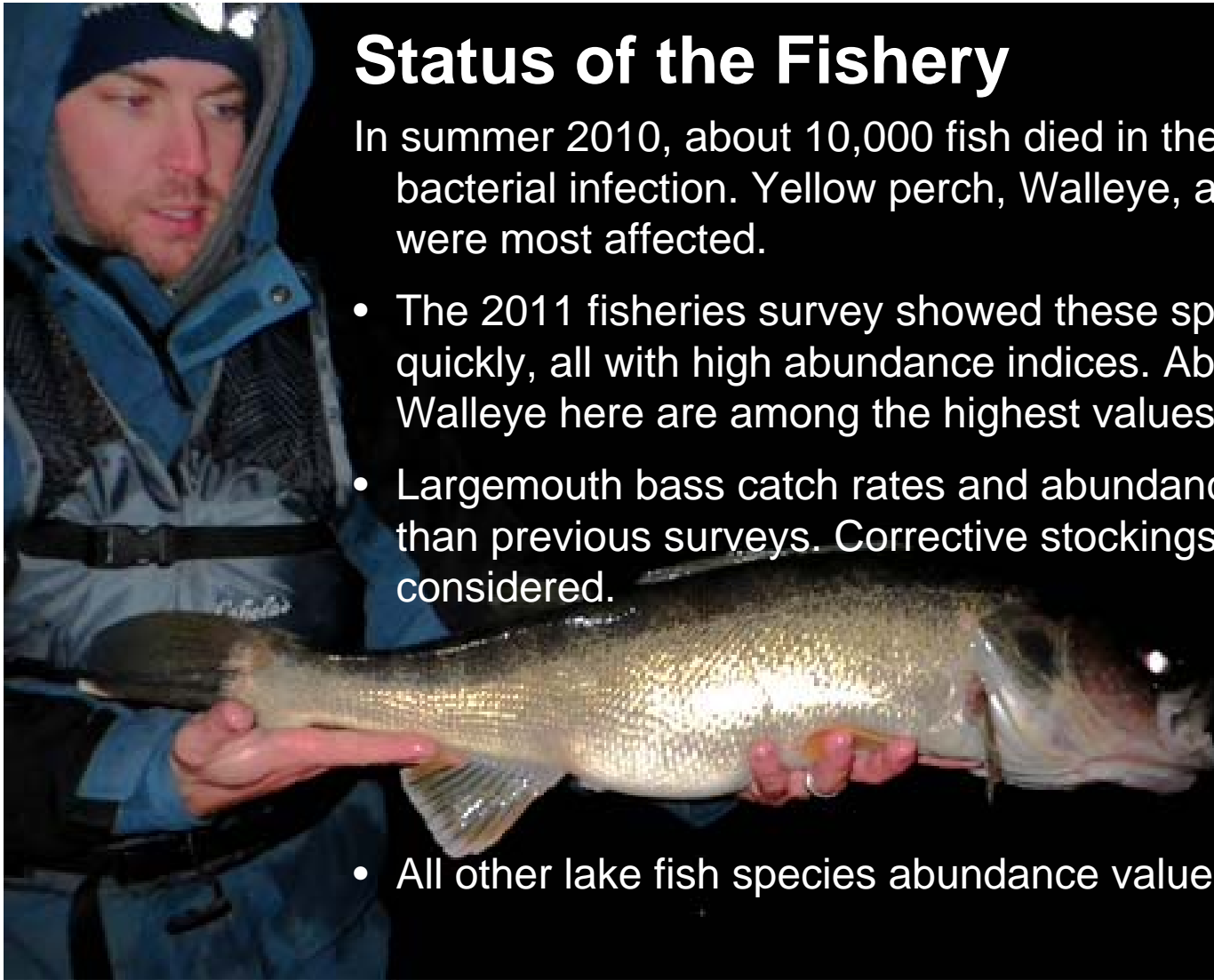
## Phase II Sediment Management Plan

- Quantify and characterize the accumulated sediment
- Conduct Alternatives Analysis – identify realistic, feasible, sustainable alternative to address accumulated sediments
- Identify Sediment Input Reductions – minimize additional accumulated sediments

## Status of the Fishery

In summer 2010, about 10,000 fish died in the lake from a bacterial infection. Yellow perch, Walleye, and Smallmouth bass were most affected.

- The 2011 fisheries survey showed these species rebounded quickly, all with high abundance indices. Abundance indices for Walleye here are among the highest values observed to date.
- Largemouth bass catch rates and abundance indices are lower than previous surveys. Corrective stockings are being considered.
- All other lake fish species abundance values remained stable.





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### ***Affect on Water Levels for 1999 and 2005-2010***

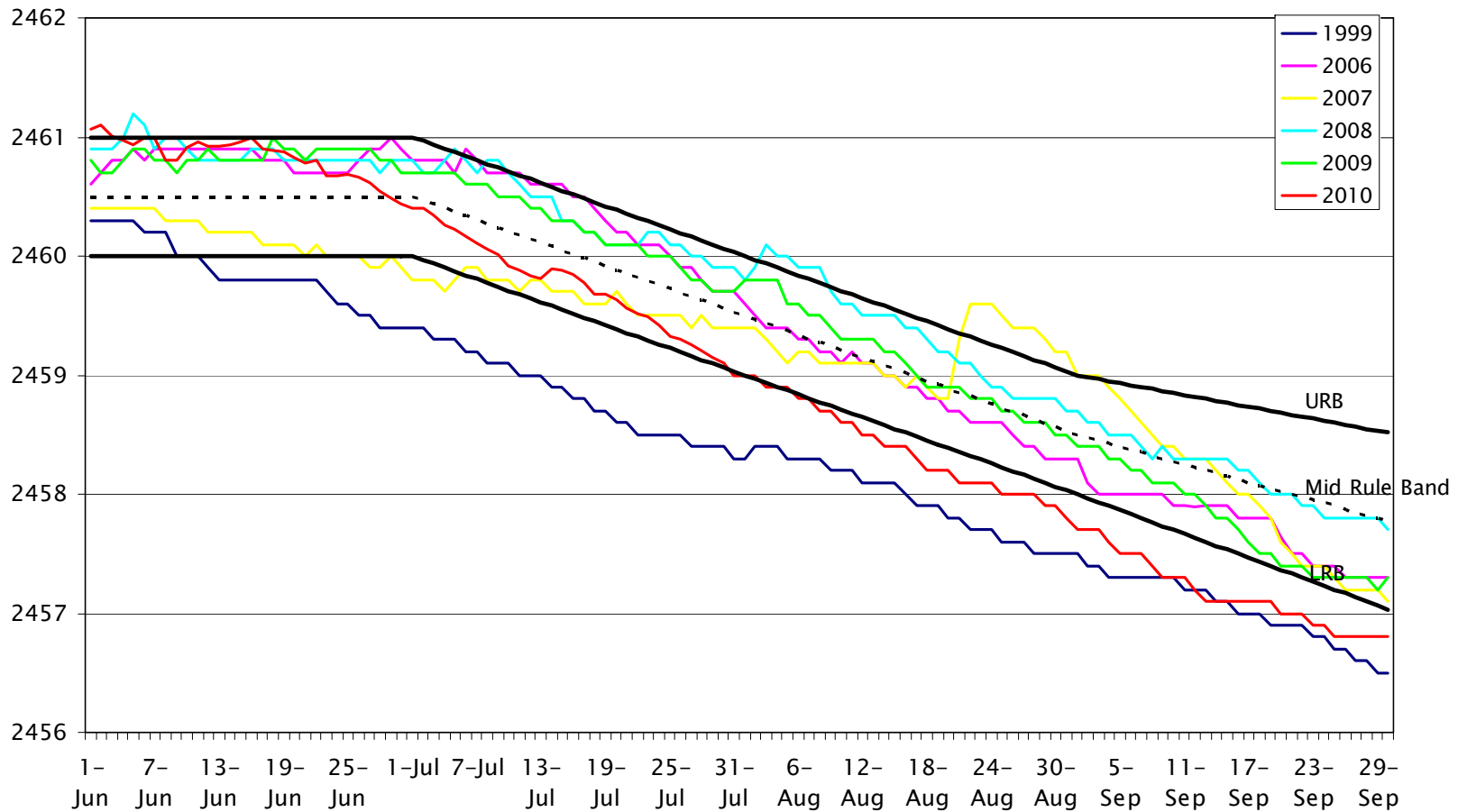
<b>Total Feet of Pool, July thru September</b>							
Category	1999	2005	2006	2007	2008	2009	2010
<b>Measured Change Starting June 1</b>	(2.90)	(3.10)	(3.60)	(2.80)	(3.10)	(3.40)	(3.47)
<b>WWR</b>	(0.55)	(1.17)	(1.43)	(1.48)	(1.75)	(1.79)	(1.29)
<b>TER</b>	(0.47)	(0.35)	(0.44)	(0.15)	(0.21)	(0.42)	(0.76)
<b>Discretionary and Rule Band</b>	(0.06)	(0.84)	(1.56)	(3.05)	(2.03)	(0.44)	(0.07)
<b>Wickett</b>	(0.44)	(0.42)	(0.40)	(0.39)	(0.41)	(0.41)	(0.42)
<b>Bypass</b>	(0.42)	(0.13)	(0.12)	(0.04)	(0.19)	(0.24)	(0.38)
<b>Recreational Industries</b>	-	-	-	(0.01)	(0.02)	(0.03)	(0.01)
<b>Other Loses, Inc Evap</b>	(1.94)	(3.11)	(1.16)	(1.65)	(1.34)	(1.07)	(1.45)



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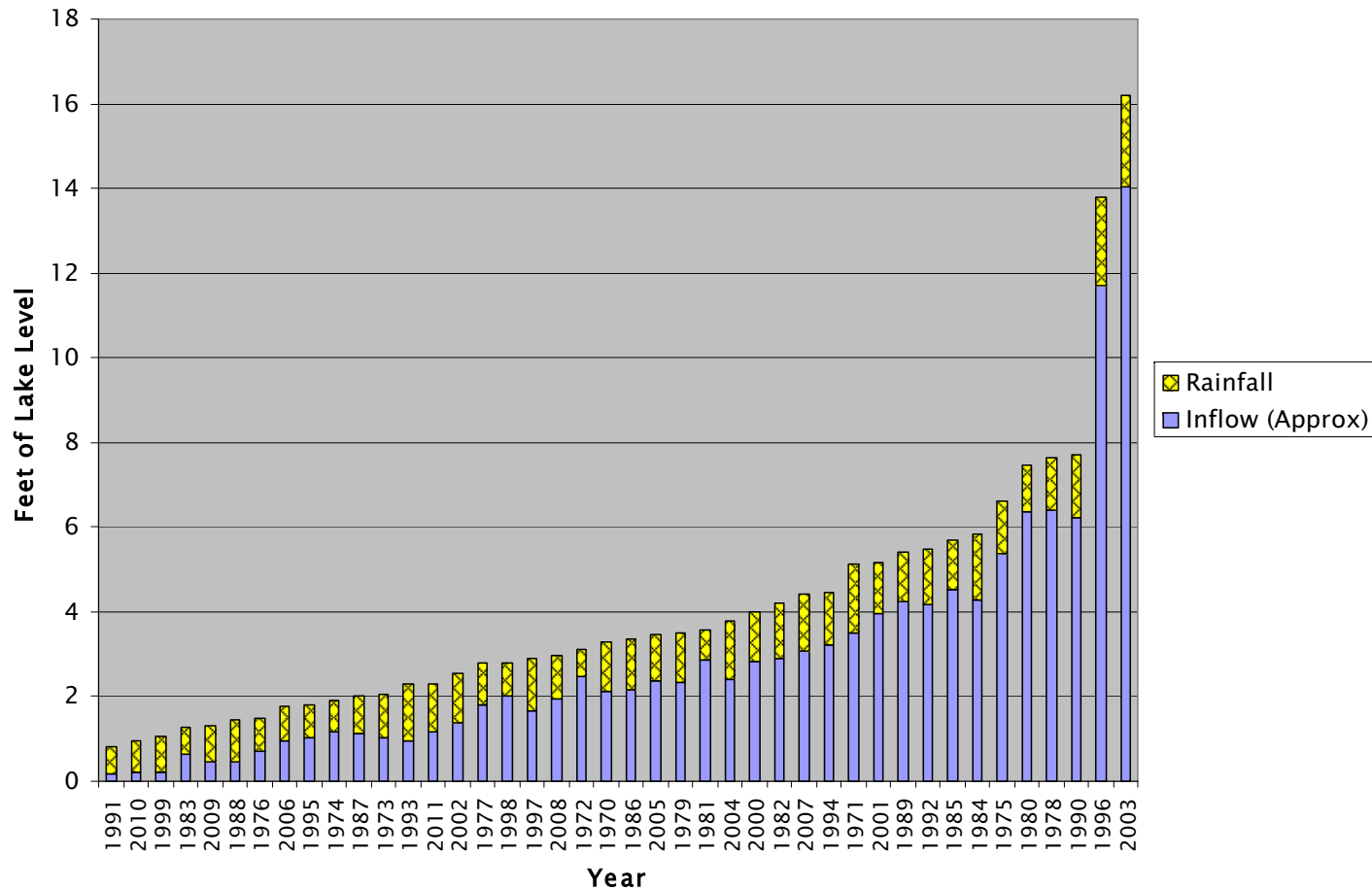
## The State of Deep Creek Lake, 2010 - 2011

### Deep Creek Summer Season Lake Levels in Selected Years



*The State of Deep Creek Lake, 2010 - 2011*

Deep Creek Lake: July Thru Sept Inflow Into the Lake and Rainfall On to the Lake Surface For 1970 to 2011



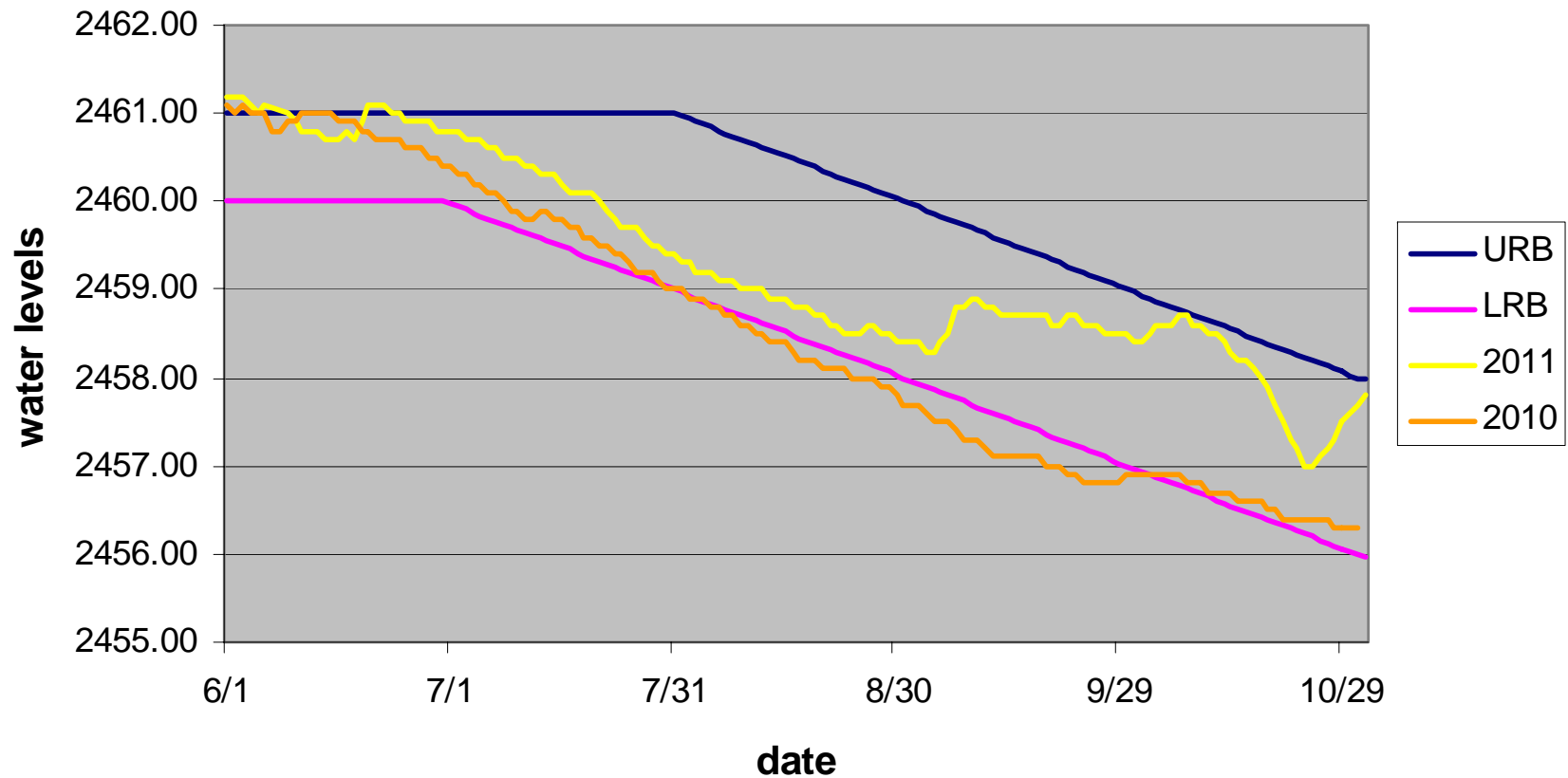


## ***Brookfield Power 2011 Permit***

- **Reflected input from all stakeholders**
- **Preserved lower rule band**
- **Modified upper rule band to allow more water in lake in summer**
- **Preserved whitewater scheduled releases**
- **Cancelled TERs on whitewater release days**
- **Reduced by-pass flow releases**
- **Required plan for addressing wicket gate leakage by December 31, 2011**

*The State of Deep Creek Lake, 2010 - 2011*

**Deep Creek Lake water levels for 2010 and 2011 and current rule bands**





## Looking ahead...

The following are areas of concern that will require further investigation and continued collaboration among partners:

- **Management of aquatic plants**
- **Management of stormwater and sediment**
- **Protection of shorelines**
- **Protection of the buffer strip**
- **Management of recreational uses**



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**Our greatest collective challenge...**

**To take a watershed approach to  
future lake management.**