Deep Creek Lake Water Quality Monitoring

Presentation to:

Deep Creek Lake Watershed Management Plan
Water Quality Subcommittee
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State goals for Deep Creek Lake

- to protect the lake as a natural resource,
- preserve its ecological balance, and
- further its use as a recreational resource.

*(**Source**: Code of Maryland Regulations 08.08.01.01)*

History of water quality monitoring in Deep Creek Lake - I

1940's
1948 -1952 – DCL report (MD Dept. Research and Educ.)

1950's
1952 – DCL survey (fisheries)

1960's
1963 – W.Md pH survey (includes DCL watershed ; +DCL)
1965, 1967 – W.Md mine drainage survey (+ DCL) (Md Dept. Water Resources)

1970's
1970 – DCL eutrophication status (EPA-Natl. Eutrophication Survey)
1972 – Aquatic resources in AMD streams (+DCL) (UMD Natural Res. Inst.)
1975 – Phytoplankton production in DCL
1978 – DCL biological study

History of water quality monitoring in Deep Creek Lake – 2

1980's

1981 – Assess acid inputs to DCL (Power Plant Siting Pgm) (also 1983, 1984)
1982, 1984 – DCL watershed samples for MD PPSP (Martin Marietta)
1985 – Statewide fisheries survey (includes DCL) (DNR)
1989 – Spring/summer WQ assessment of DCL

1990's

1991 – DNR Statewide fisheries survey (includes DCL)
– W. MD stream survey (includes DCL watershed)
1993 – Reservoir trophic condition assessed Statewide (includes DCL) (MDE)

early 2000's

2000 – Stream condition assessment (includes DCL watershed) (DNR)
2002 – TMDL for pH in Cherry Ck (MDE)
– TMDL for pH in Cherry Ck released (MDE)
– TMDL for mercury in DCL released (MDE)
2004 – Seasonal (May-Sep) bacteriological survey in DCL (Garrett Co Health)

History of water quality monitoring in Deep Creek Lake – 3

Late 2000's

2007, 2008 – Water quality, hydrologic, sediment surveys (2 years) (USGS)
2009-2014 – DCL Water quality assessment (DNR)

2010's

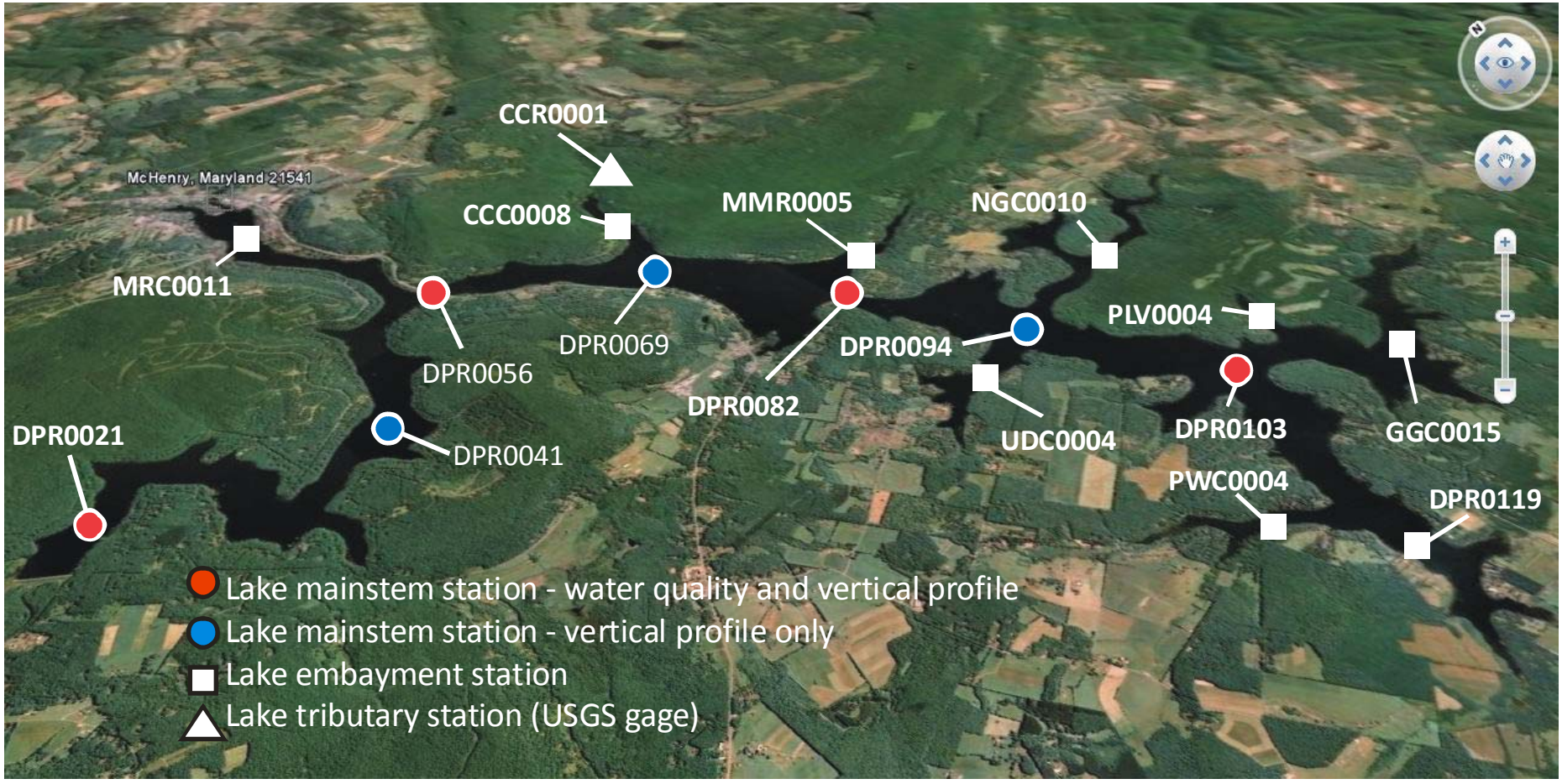
2010 – Report on biological impairment in DCL watershed (MDE)
– W. MD stream survey (includes DCL watershed) (DNR/Stream Waders)
– SAV surveys of DCL (continues)
2011 – Chloride/sulphate assessed in DCL (DNR)

DNR Water quality monitoring goals for Deep Creek Lake, 2009-2014

- ***characterize existing water quality conditions in the lake and its tributary coves – physical and chemical characteristics, levels of nutrients and productivity***
- ***define baseline conditions for evaluating water quality trends***
- ***monitor water quality in selected tributaries***

Deep Creek Lake – Water Monitoring Program

Sampling stations, Deep Creek Lake Water Monitoring Program, 2013-2014



Water Monitoring Results

- **Water quality in the lake and its coves support a diverse biological community (plankton, aquatic plants, fish and wildlife)**
  - oxygen, pH (acidity), nutrients (nitrogen and phosphorus)
  - conductivity (dissolved salts/other compounds)
- **Algal levels are limited by the low concentrations of phosphorus in the lake.**

DNR water quality monitoring @ Deep Ck Lake …beyond 2014

- ***Periodic (5-year?) revisit to assess water quality changes, examine trends and report findings***
- ***Assist on SAV / sediment / invasive sp. work***
- ***Finalize sediment/nutrient load estimates from Cherry Ck / Poland Run monitoring efforts***
- ***Monitor water quality in selected tributaries***
- ***Assess shallow water habitat as support for spawning / nursery***

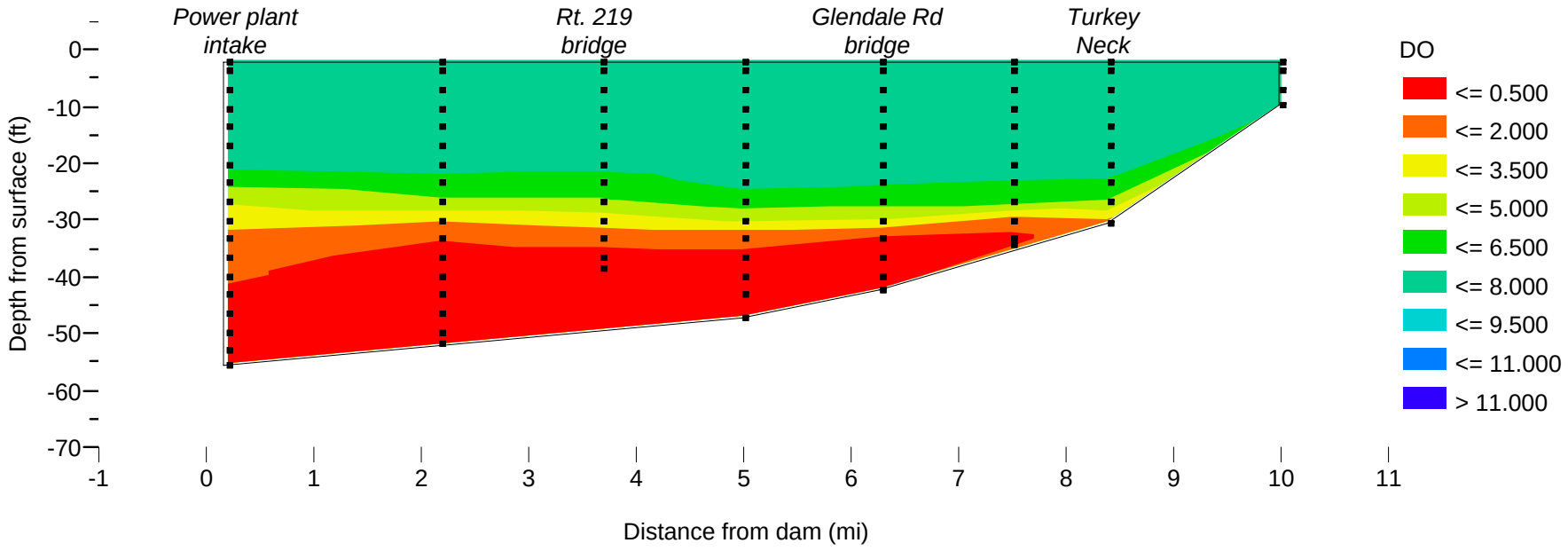
Lake dynamics/stratification

- Local climate and the depth of the lake defined the physical environment of the lake with two stratification periods (summer and winter) and two mixed periods (spring and fall) in the mainstem. Shallower tributary coves are well mixed year-round.

- During the summer stratification period, the deep water mass below the thermocline layer (25-30 feet) is not aerated and dissolved oxygen levels will decline from until the fall mixing event (overturn). Oxygen levels will be low (0.5 to 2.0 mg/L – *hypoxia*) or nearly absent (<0.5 mg/L - *anoxia*) – all of which is less than the 5-6 mg/L needed to support fish, mussels, aquatic insects.

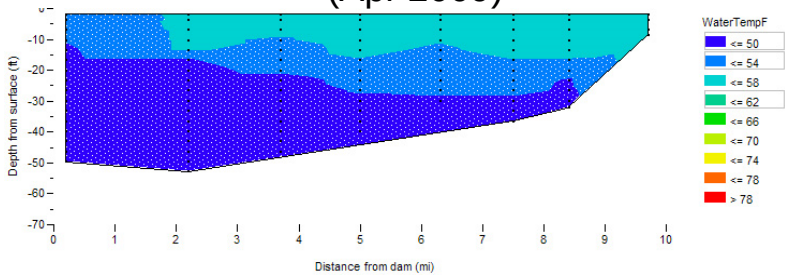
Mainstem lake profile – Dissolved oxygen

July



Deep Creek Lake – Water Monitoring Program

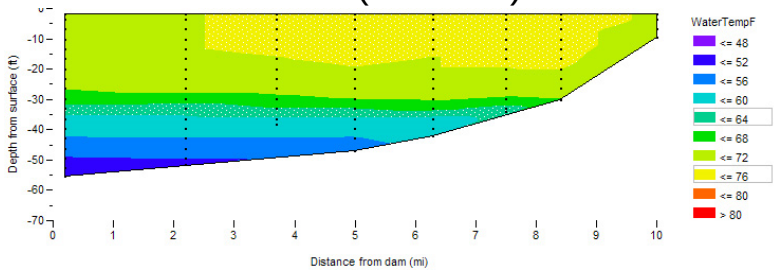
Spring
(Apr 2009)



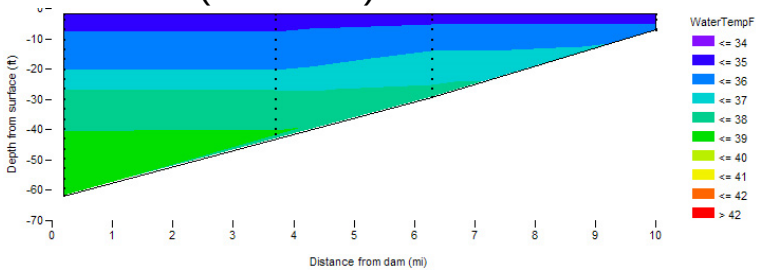
spring overturn (mixing)

stratification (stability)

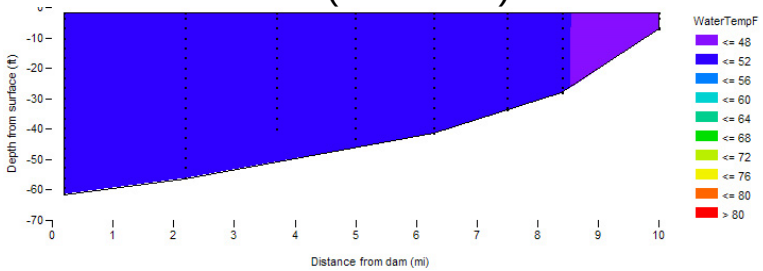
Summer
(Jul 2009)



Winter
(Jan 2010)



Fall
(Nov 2009)



stratification (stability)

fall overturn (mixing)

Trophic (productivity) condition

- Based on the amount of algae encountered in the lake (measured by chlorophyll concentration), the trophic classification Deep Creek Lake received in 1993 remains as ***mesotrophic*** - a moderately productive condition (good fisheries, clarity, few algal blooms, seasonal low oxygen). This places Deep Creek Lake in the middle of the State's largest reservoir and between the Savage River and Baltimore Reservoir types).

Water clarity

- Water clarity is highest in the middle portion of the mainstem lake between the US 219 and Glendale Road bridges. Lower water clarity in the southern mainstem is due to many nearby tributary sources (runoff, erosion, wake and wave disturbance). Clarity is higher in some small cove areas, where watersheds are small or where there are fewer watershed disturbances.

Nutrients and suspended sediments

Nutrients and suspended sediments/turbid conditions are lowest in the main lake and increase upstream, away from the dam and into embayments.

Phytoplankton community

The lake's phytoplankton community is diverse and of moderate abundance. Several potentially harmful species of algae have been identified in low abundance – however, they need optimal conditions (nutrients, temperature, light) to grow to problem levels.

Deep Creek Lake – Water Monitoring Program

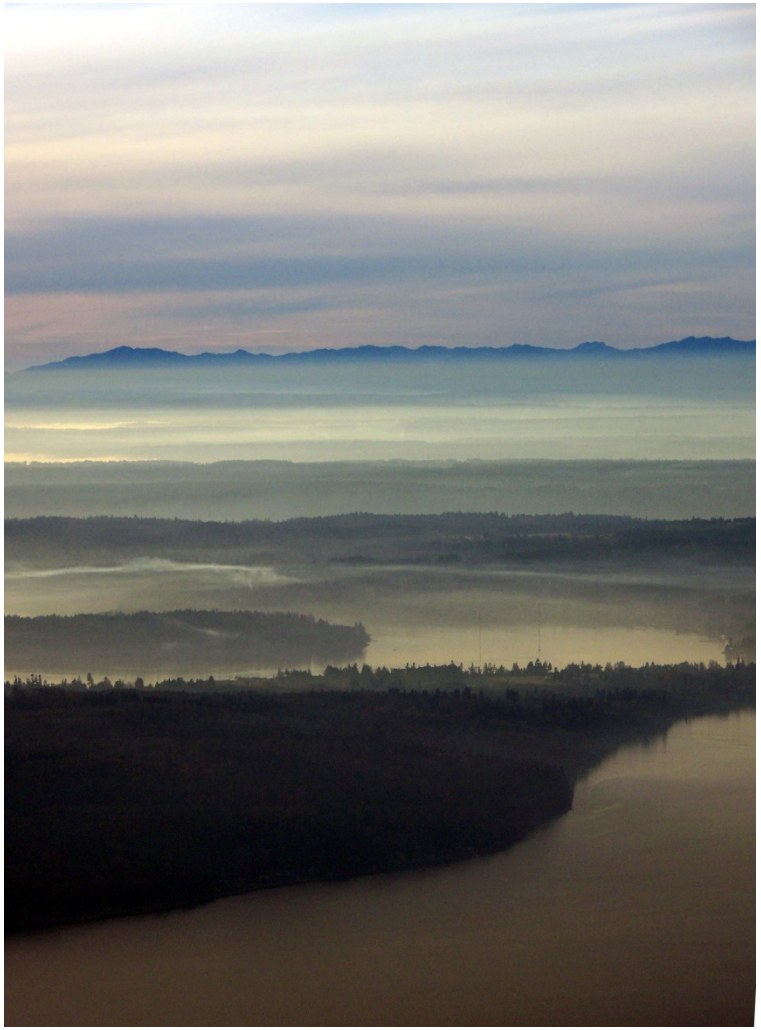
Source: B. Beelar

Summary

The current water quality condition of Deep Creek Lake reflects a balance of conditions in the watershed and how the lake is currently managed.

Are there monitoring or information needs to implement the watershed plan?

- Is a water budget or data for watershed / lake modelling needed? e.g., precipitation, evaporation, ground water flows in/out, retention time ?
- Continue / expand stream water quality/quantity work
- Assess microfauna (bacteria, phyto- and zoo-plankton)
- Define / promote in-lake and shoreland habitat to protect the lake, wildlife and fisheries
- Define production in coves to determine oxygen demand
- Assess sewage / runoff impacts
- Invasive species management / control
- Provide public access (e.g. website for water temperature/weather)



Questions?

For more information about this program, contact:

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