Devils Lake
Water Improvement District

Brian Green

Kent Norris

David Skirvin

Kip Ward

Randy Weldon

Lake Manager: Paul Robertson

Water Quality

- HABS – Visible
- Lake Level – 9.50’ / 2.9M
- Temp – 55F / 13C
- Clarity - Fair to good

Regular Meeting: 2015-04-09

Public Hearing:

The purpose of the public hearing is for the board to take public input on the potential replacement of the impoundment structure otherwise known as the dam and the overall managed use and/or continuance of the District's Water Right Certificate 69267, Permit to Appropriate the Public Waters 52672 (also identified as S52672), Permit to Store the Public Waters R-11968, Water Right Certificate 89980, and all permits or certificates that may originate from Devils Lake Water Improvement District water right applications identified by Oregon Water Resources Department as S71813, R74720, or R71703.

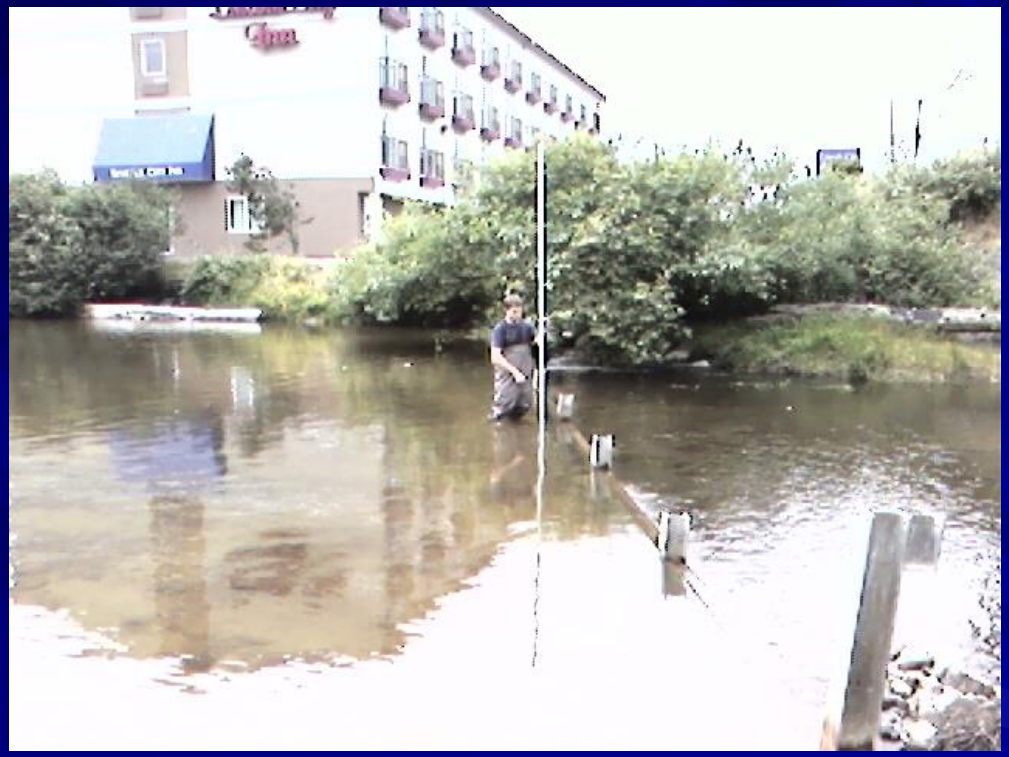
Timeline: D River Dam

- 1986 - Fish Control Structure
  - Grass Carp
- 1991 – Water Right Application
- 1996 Water Right Certificate
- Impounded - March 1997

Timeline: Continued

- 2006 - Dam Repaired
- 2007-2009 – Complaints & Accolades
- 2009 - Oregon WRD Review
  - DLWID in Violation of Permit
  - Max. = 9.53’ MSL = 1360 AF
- 2011-2012 – Shoreline Erosion Study
- 2012 – Public Hearing Water Right
- 2012- Policy Set: 9.0’ June 15
- 2012 – Lake Level Review
- 2013 - New Fish Weir
- 2015 – Public Hearing Dam Replacement & Water Right

Wood, Steel, & Concrete

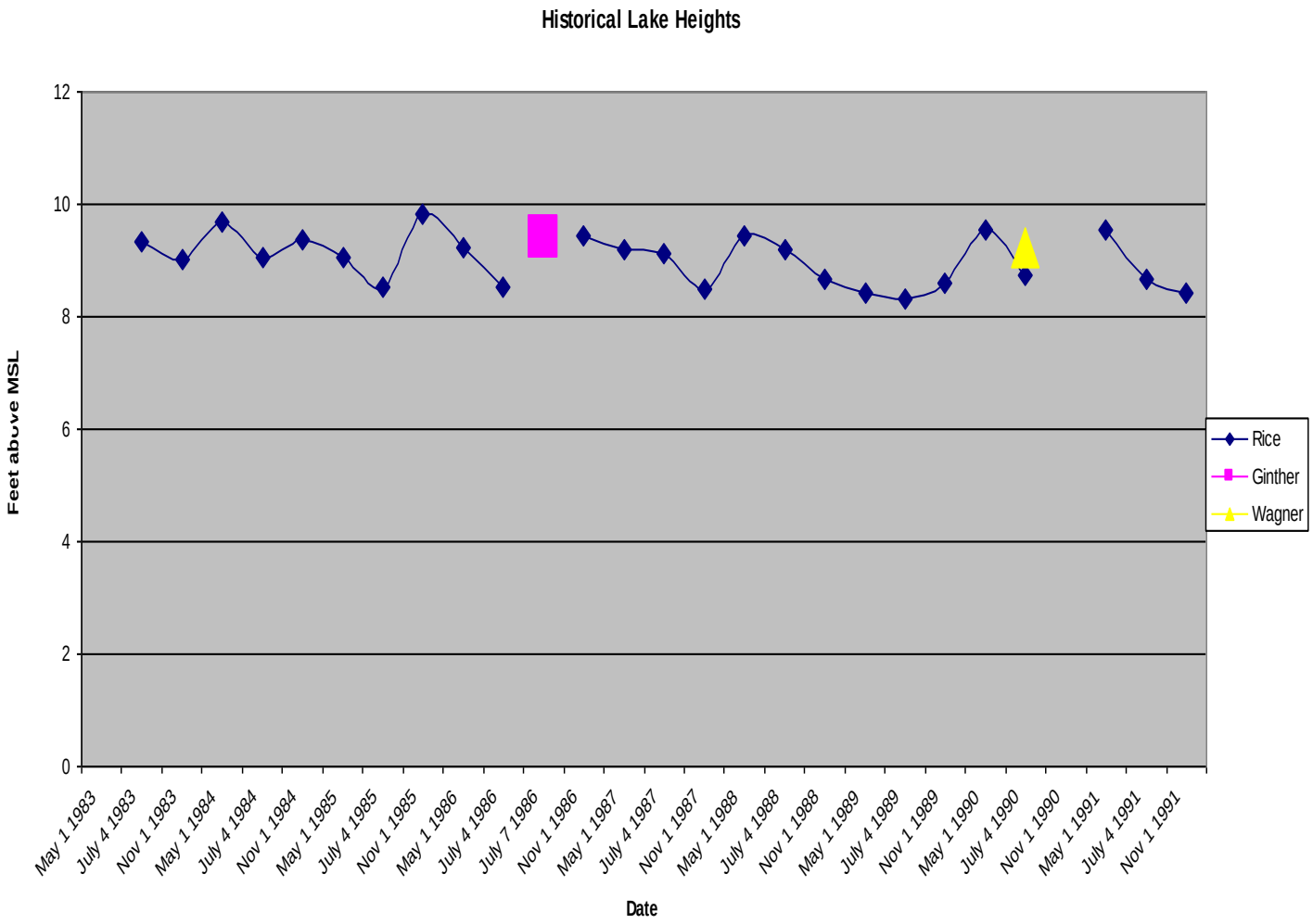


12” (9.0’) or up to 18” (9.53’) of Wood held by Steel I -Beams, atop Concrete Base which is at an elevation of 8.03’ MSL

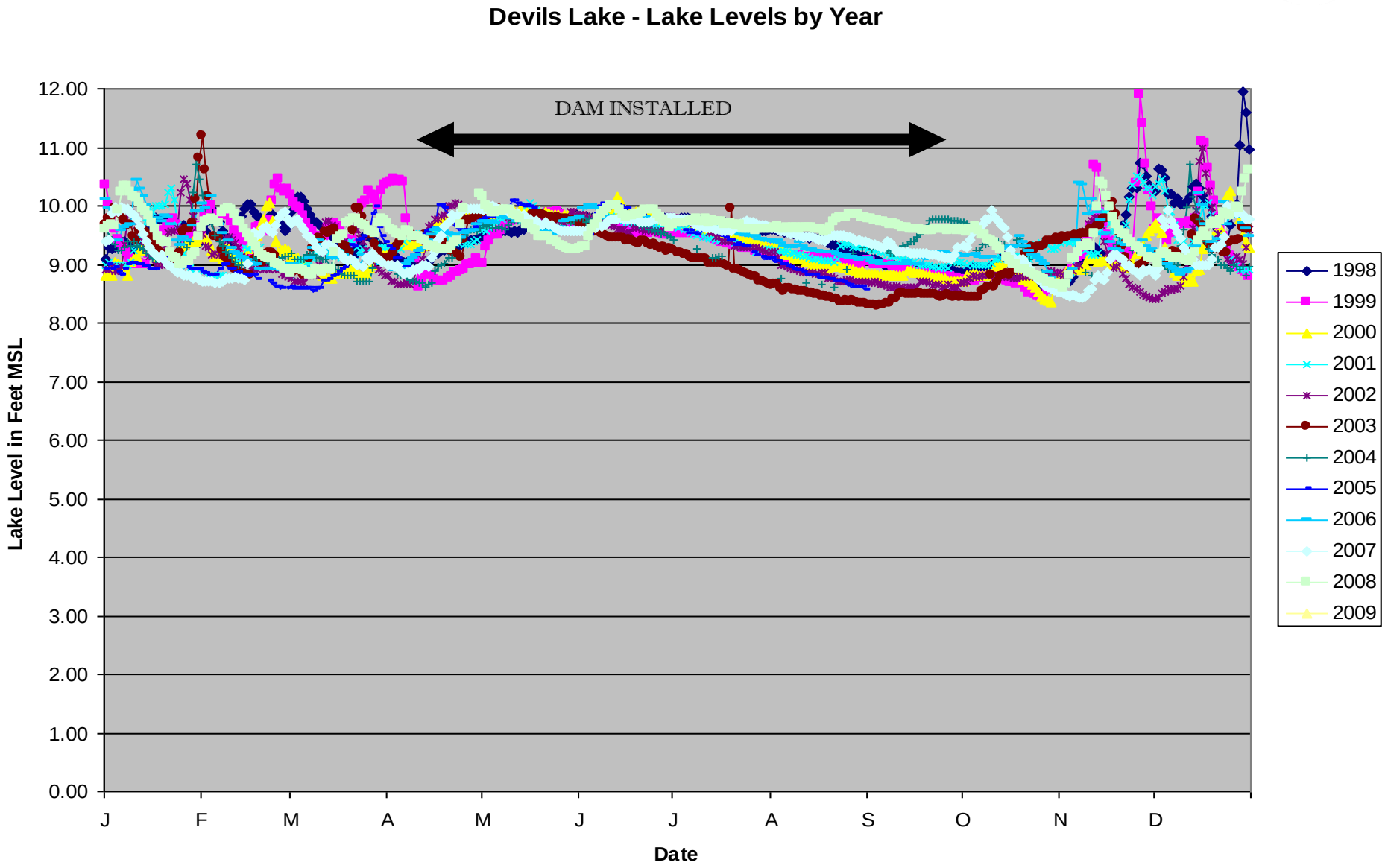
Impoundment Structure

Pre Dam Records of Lake Level 1983-1991: May 1st , July 4th , Nov 1st

Lake Height above MSL in Feet



Lake Level 1998 to 2009



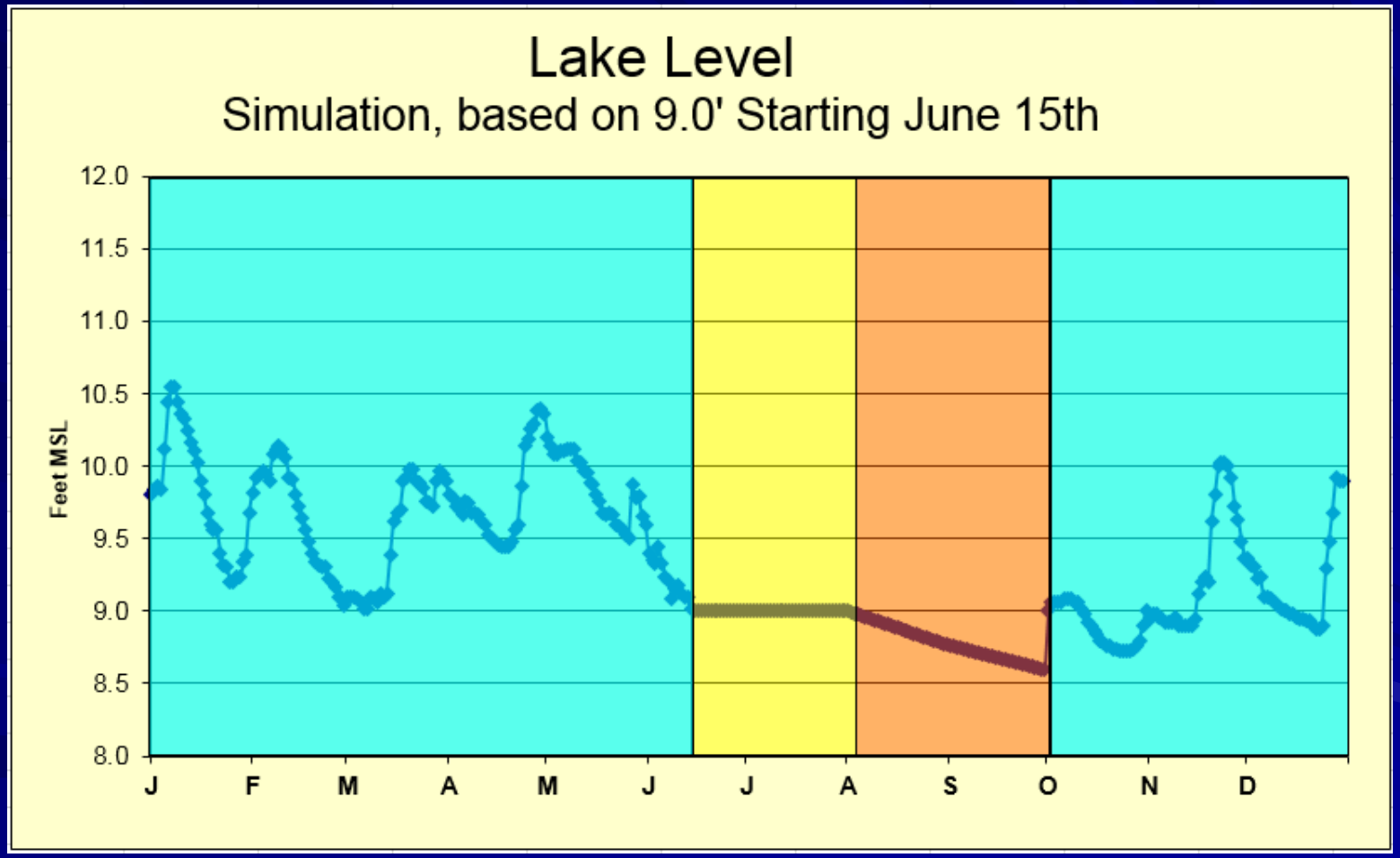
Previous Dam Operation

- April 15th
  - Install I beams and boards
  - Max 18” = 9.53 MSL
- May 15th- May 31st
  - Pulse dam every other night in an attempt to mitigate for Coho Juvenile Outward Migration
- August – Sept
  - Inflow = Outflow
  - Lake Level must decrease 0.5’ = 6”
  - Max 12” or 9.0 MSL by Sept 30th
- Oct 15th
  - Remove Boards and I beams

Current Dam Operation

- June 15th (or as early as June 1st if < 9.0')
  - Install I beams and boards
  - Max 12" = 9.0' MSL
- August – Sept
  - Inflow = Outflow
  - Lake Level must decrease 0.5' = 6"
  - Max 6" or 8.5 MSL by Sept 30th
- Oct 15th
  - Remove Boards and I beams

Simulated Lake Level



Potential Replacement of the Impoundment Structure

- **Objective:** Significantly modify or remove the cement sub base of the dam in favor of a truly temporary summer impoundment.

Assumptions

- Allow faster flowing, deeper channel
- Increase Velocity – Scour Sand
- Recede Faster during floods
- Improved Habitat – Coho
- Increase lake turnover – HABS
- *E. coli* – Sandbar - Birds
- Open to Paddlers

Dam as a sediment Trap

Tons of Sand Excavated
Tens of Thousands $$$

1994

1998

Scour Potential

$350 - $500
Excavation –
Existing Permits

2009-01-02 11.6’

D River

10.35’ -- 2008-01-07

Crystal Lagoon

High Risk of Flooding

Sand Point

Lake Level 10.45’

2008-12-31

Lake Level 11.6’

2009-01-02

2009-01-02

11.6’ D River

11.6’ - Campground

2009-01-02

11.6’ Regatta

11.6’ - Campground

2009-01-02 11.6’

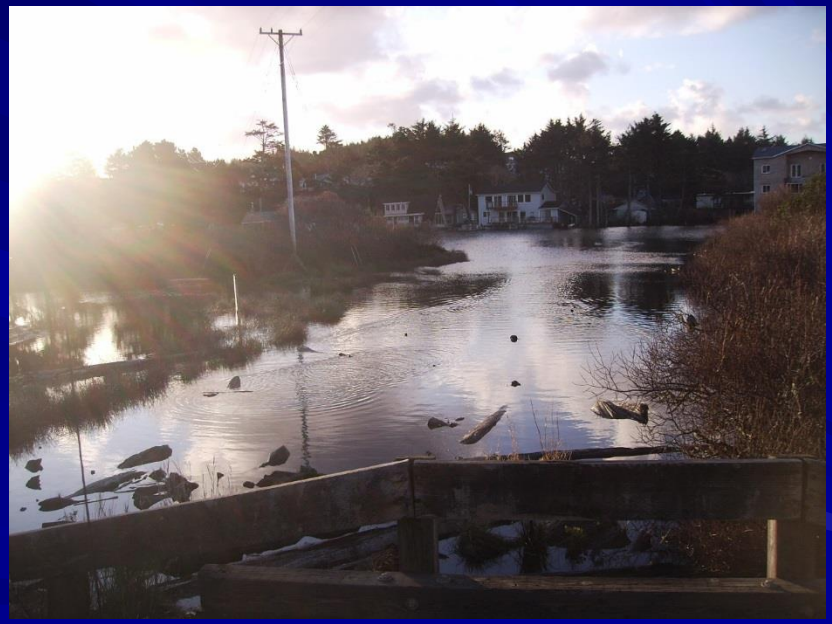
Regatta Grounds

Holmes Road

2009-01-02 11.6’

Thompson Creek

NE 1st Street Bridge



2009-01-02 11.6’

NE 1st Street Launch

Hosteller Park

Sand Scouring under 101 Bridge

Hydrologists Support

December 3, 2014

Randy Weldon
Board Member
Devils Lake Water Improvement District
Lincoln City, Oregon

Dear Mr. Weldon:

As per your request, I reviewed the recent staff report (Nov 2014) posted on the DLWID website. I examined your proposal to remove the concrete base of the structure at the outlet of Devils Lake. I believe that your proposal has merit and wish to offer my support for your concept. I have noticed in my years of work on Devils Lake that sediment, primarily comprised of sand, continues to accumulate at the terminus of the lake. This process will continue so long as there is a structure at the outlet that slows the flow of water and allows sediment to be deposited.

You are well aware that the capacity of flowing water to carry sediment is a function of its velocity. I don't need to provide you with detailed mathematical support or complex modeling for this process as you can observe it with you own eyes at the outlet. You identify a number of likely benefits from this action and I concur with your assessment.

Good luck with your proposal.

Best Regards,

Joseph Eilers
Prof. Hydrologist-WQ (registration #1475)

MaxDepth Aquatics, Inc. 64110 Harris Way, Bend Oregon 97701
Email: j.eilers@maxdepthaq.com www.maxdepthaq.com 541-390-2911

Siuslaw National Forest

To: The Board of Directors of the Devil's Lake Water Improvement District
From: Kami Ellingson, Watershed Program Manager, Siuslaw National Forest
CC: Paul Robertson, Catherine Pruett, Randy Weldon
Date: 12/10/2014
Re: Site visit to D River

Comments: My name is Kami Ellingson. I am a hydrologist with the USFS with 20 years of field experience in physical hydrology. For the past 8 years I have been the Watershed Program Manager for the Siuslaw National Forest. I visited the D River site at the bridge and believe that the water quality, fish habitat/access and overall hydrology of the D River system would be considerably improved with the removal of the dam/sill. I understand that there are needs that will demand some outlet control during the summer low flows and I believe that there are a number of options that will provide the desired lake elevation through the summer months. Such options will meet the elevation needs of the users, while allowing improved hydrologic conditions the remainder of the year. Currently the dam or sill that remains in place year round is trapping sands, which alters the low flow channel and reduces the storage capacity of the lake during high flow events. High levels of deposition at the river mouth, has altered the hydrology at low flows. The deposit or sand bar spreads the flow into sheet flow across the channel. Salmonids have trouble navigating through sheet flow. They are exposed to predators and altered velocities. The deposition at the mouth also impacts the natural lake flushing that should occur seasonally. This impacts water quality. Temperatures increase and conditions will be optimal for hazardous algal blooms. In the winter with the dam/sill foundation in place, sand deposition will continue. This will reduce the amount of storm water the lake can hold, as well as the rate at which the flood waters recede. Projections for climate change and sea-level rise in all likelihood will exacerbate these problems for the D River system. Summer low flow periods may extend into the fall and winter tides and precipitation events are projected to increase.

I believe that it is important to reflect on the objective of the dam. Why was it built in the first place? Do we have the same needs now? Is the current structure meeting our needs? Is there a better option that will maximize the benefits for more of the resources that depend on this system?

Thank you for your time.

Water Right Implications

- None
- “As we discussed, I do not see any issue with using a different method for creating the dam since this dam is non statutory. Being non statutory, the District is not required to submit engineered plans and specifications when it makes alterations to the dam. Although it is not required, it is not a bad idea to consult with an engineer when making changes to a dam.”

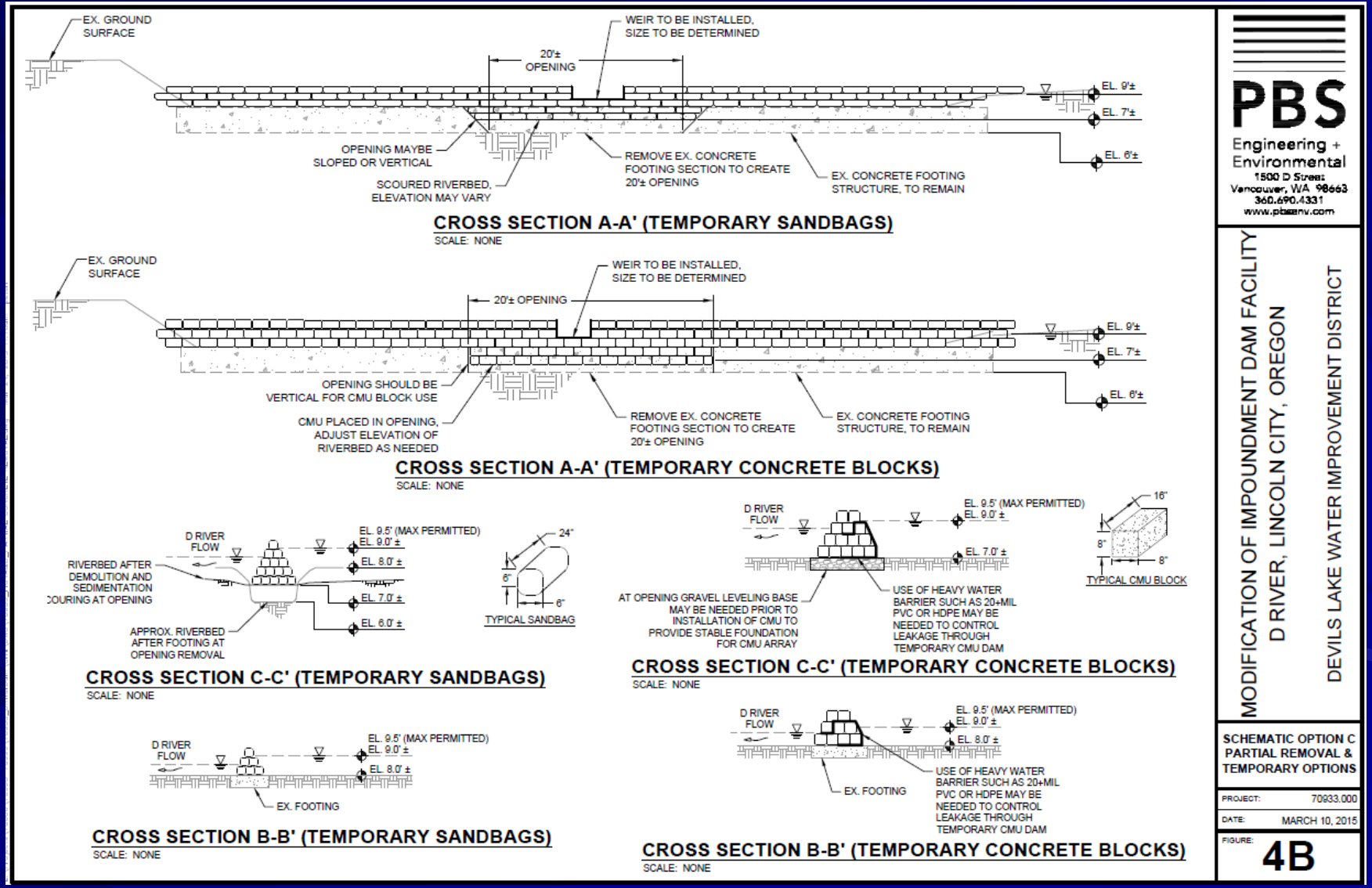
Mike McCord
NW Region Manager

Permitting

- USACE – Fit into SLOPES for easier permitting - 120 days
- DSL: removal – fill
- DEQ: bio-engineering bank stabilization

- Installation - Outside In-water work Period, but Supported by ODFW!
- Currently do in water work as well.

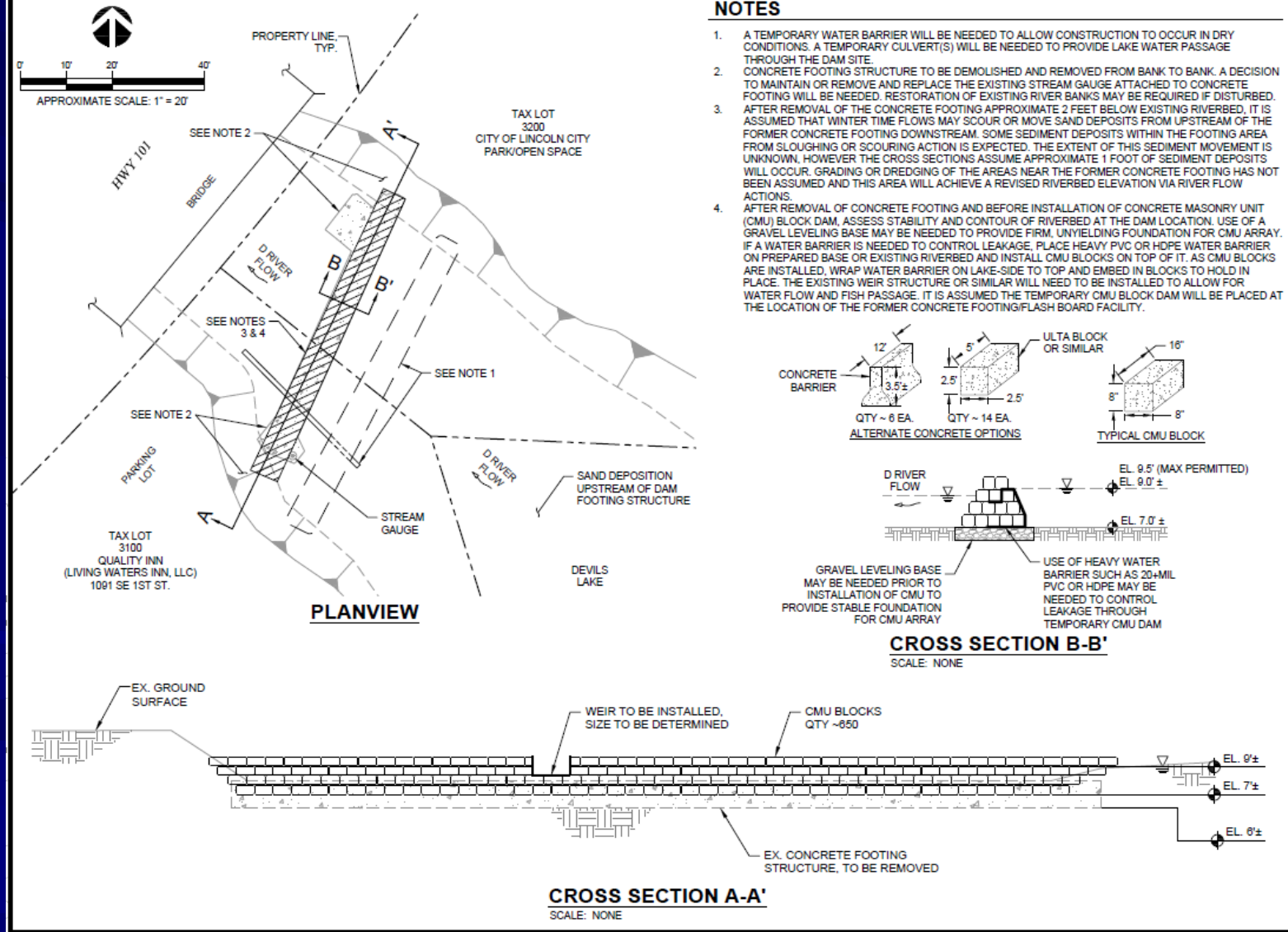
Sand Bag Option



Sand Bags +/-

- Full removal of concrete
- Natural river state created with potential for dynamic wintertime river scouring action
- Sandbags adaptable to changing riverbed configuration year to year
- Sandbags inexpensive to purchase
- Appears to meet OWRD permit conditions
- Footing demolition cost and permitting (one-time cost)
- Bank restoration cost and permitting (one-time cost)
- Sandbag dam not as secure, subject to vandalism
- Sandbag dam may not be visually appealing
- Sandbag filling and installation labor intensive
- Storage and transport of sandbags

Concrete Option

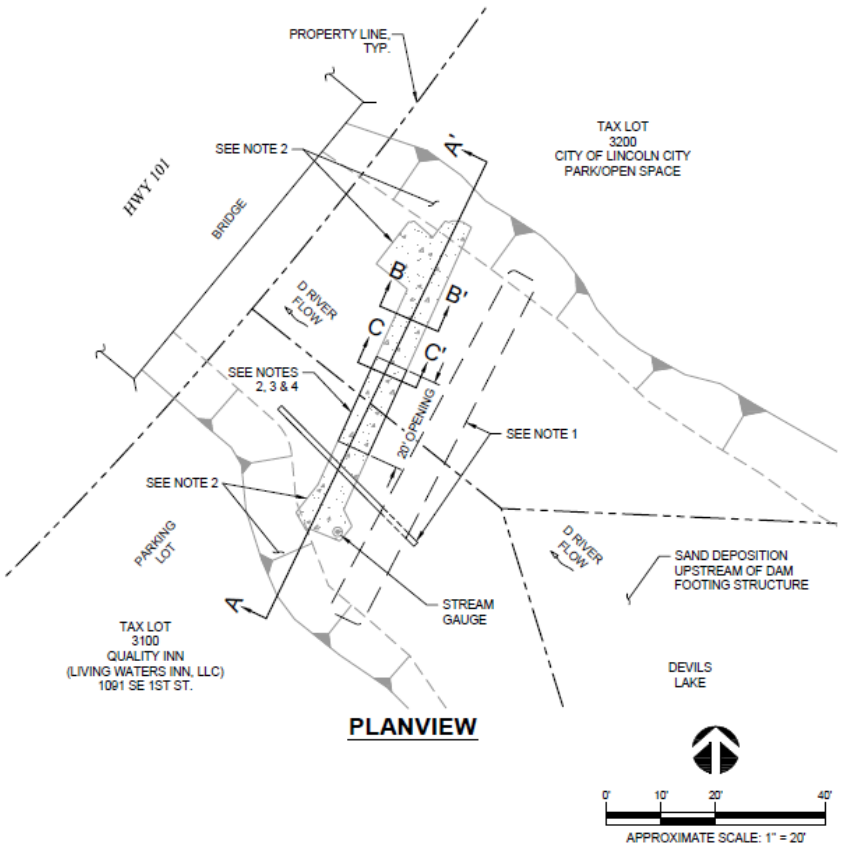


Concrete +/-

- Full removal of concrete
- Natural river state created with potential for dynamic wintertime river scouring action
- Concrete blocks and water barrier configuration adaptable to changing riverbed configuration year to year
- CMU blocks can be placed by hand
- Alternate large concrete blocks not subject to vandalism
- Appears to meet OWRD permit conditions

- Footing demolition cost and permitting (one-time cost)
- Bank restoration cost and permitting (one-time cost)
- CMU block and water barrier dam not as secure, subject to vandalism
- CMU block and water barrier dam may not be visually appealing
- CMU block installation labor intensive
- Storage, handling and transport of CMU blocks

Partial Removal



NOTES

1. A TEMPORARY WATER BARRIER WILL BE NEEDED TO ALLOW CONSTRUCTION TO OCCUR IN DRY CONDITIONS. A TEMPORARY CULVERT(S) WILL BE NEEDED TO PROVIDE LAKE WATER PASSAGE THROUGH THE DAM SITE.
2. EXISTING CONCRETE FOOTING STRUCTURE SHALL BE PARTIALLY REMOVED MID RIVER TO CREATE OPPORTUNITY FOR SCOURED OR DREDGED RIVERBED THROUGH THE EXISTING FOOTING. THE PORTIONS OF THE FOOTING ON EITHER SIDE WILL REMAIN IN PLACE. AN OPENING OF 20'%± WIDTH (±1/3 LENGTH OF FOOTING) IS SHOWN, ALTHOUGH CAN BE LARGER OR SMALLER.
3. AFTER REMOVAL OF THE CONCRETE FOOTING APPROXIMATE 2 FEET BELOW EXISTING RIVERBED, IT IS ASSUMED THAT WINTER TIME FLOWS MAY SCOUR OR MOVE SAND DEPOSITS FROM UPSTREAM OF THE FORMER CONCRETE FOOTING DOWNSTREAM. SOME SEDIMENT DEPOSITS WITHIN THE FOOTING AREA FROM SLOUGHING OR SCOURING ACTION IS EXPECTED. THE EXTENT OF THIS SEDIMENT MOVEMENT IS UNKNOWN, HOWEVER THE CROSS SECTIONS ASSUME APPROXIMATE 1 FOOT OF SEDIMENT DEPOSITS WILL OCCUR. GRADING OR DREDGING OF THE AREAS NEAR THE FORMER CONCRETE FOOTING HAS NOT BEEN ASSUMED AND THIS AREA WILL ACHIEVE A REVISED RIVERBED ELEVATION VIA RIVER FLOW ACTIONS.
4. IN THIS OPTION, THE TEMPORARY IMPOUNDMENT STRUCTURE ON THE EXISTING FOOTING COULD BE EITHER THE SANDBAG ARRAY OR THE CONCRETE BLOCK ARRAY, MODIFIED FOR NEEDED HEIGHT OF ABOUT 1 TO 1.5 FOOT. AT THE REMOVED MID-RIVER SECTION, THE TEMPORARY IMPOUNDMENT WOULD NEED TO FILL IN AND BE CONFIGURED TO SUIT THE OPENING IN THE CONCRETE FOOTING. THE PLIABLE SANDBAGS COULD BE PLACED IN THE OPENING AND CONFORM TO THE RIVERBED AND OPENING SURFACES. THE CONCRETE BLOCKS WOULD NOT BE ABLE TO CONFORM TO IRREGULAR SURFACES OF THE OPENING AS WELL AND MORE CARE IN DEMOLITION OF THE OPENING MAY BE NEEDED FOR CONFIGURING CONCRETE BLOCK PLACEMENT WITHIN THE OPENING. THE MODIFICATION AND USE OF THE FLASH BOARD ASSEMBLY AT THE MID-RIVER OPENING HAS NOT BEEN EVALUATED IN THIS TIME.
5. SEE FIGURE 4B FOR CROSS SECTIONS A-A' AND B-B' SHOWING THE TEMPORARY SANDBAG AND CONCRETE BLOCK OPTIONS.

PBS
Engineering + Environmental
1500 D Street
Vancouver, WA 98663
360.690.4331
www.pbsenv.com

MODIFICATION OF IMPOUNDMENT DAM FACILITY
D RIVER, LINCOLN CITY, OREGON
DEVILS LAKE WATER IMPROVEMENT DISTRICT

SCHEMATIC OPTION C PARTIAL REMOVAL & TEMPORARY OPTIONS

PROJECT:	70933.000
DATE:	MARCH 10, 2015
FIGURE:	4A

Partial Removal +/-

- Partial removal of concrete footing
- Natural river state created through footing opening with potential for dynamic wintertime river scouring action
- Temporary impoundment facility of sandbags or concrete blocks will be adaptable to changing riverbed configuration year to year
- No disturbance of banks or stream gauge
- Appears to meet OWRD permit conditions
- Partial footing removal not full river width, may still be a restriction
- Footing demolition cost and permitting (one time cost)
- Temporary impoundment facility of sandbags or concrete blocks not as secure, subject to vandalism, may not be visually appealing, installation is labor intensive and storage & transport

Costs

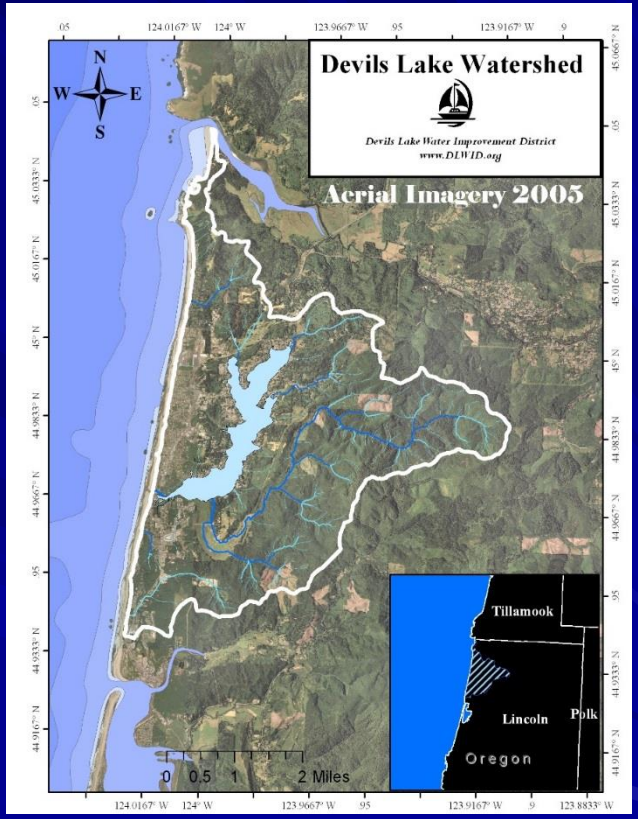
- Removal < $25,000 (est.)
- Replacement ~ $1100, plus labor
- Existing Labor = $5,096
  - Install - Remove annual
  - Lake Level recording
  - 20 hours additional hours

Managed Use and/or Continuance of Water Rights

- Certificate 69267
- Permit to Appropriate the Public Waters 52672 (also identified as S52672)
- Permit to Store the Public Waters R-11968
- Water Right Certificate 89980
- Applications S71813, R74720, or R71703.

Topics to Cover

- Water Quality
- Fish & Wildlife
- Shoreline Erosion Study
- Recreation & Accessibility
- Septic Systems
- Riparian Vegetation
- Dam Replacement Options



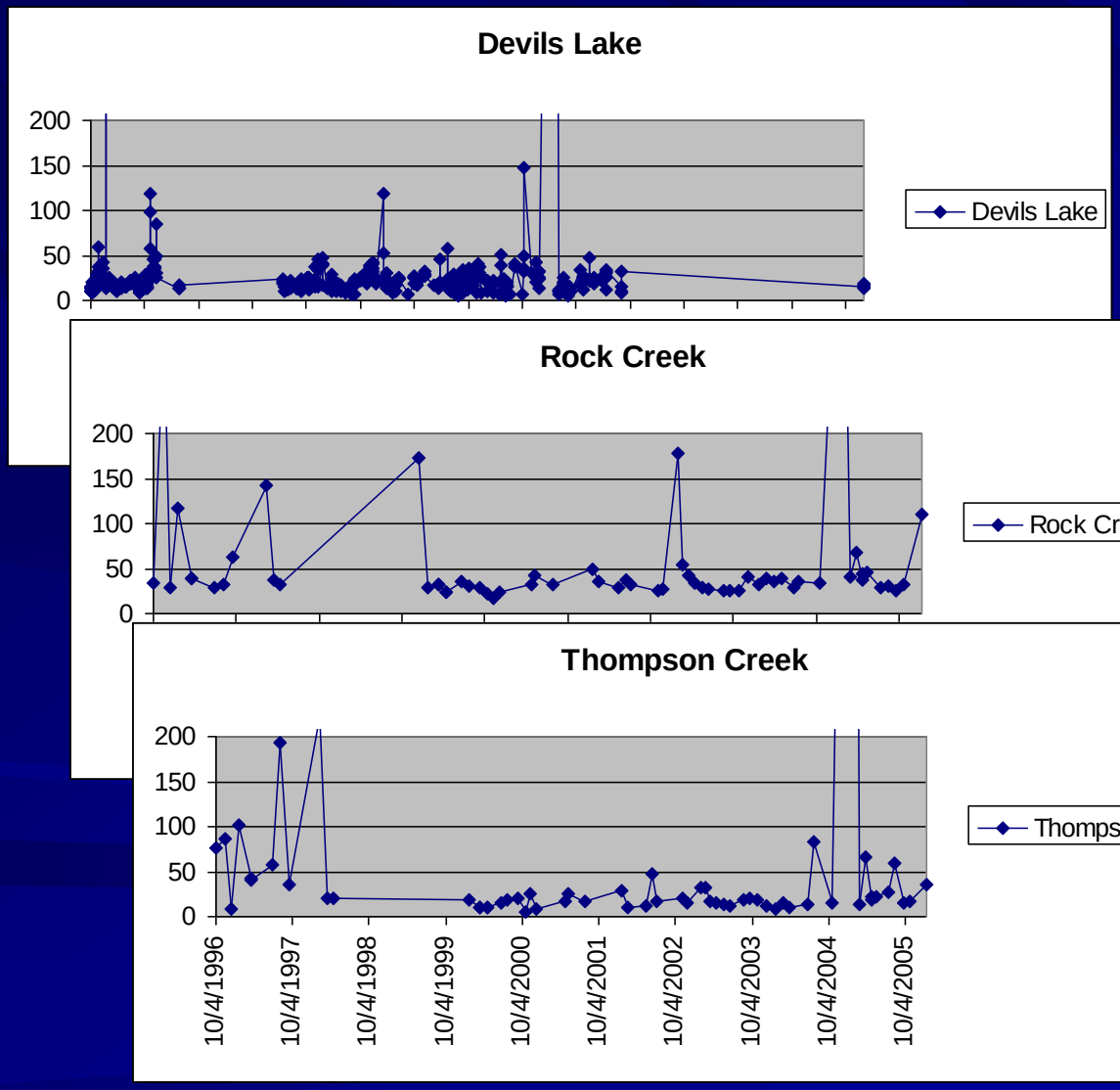
Water Quality (WQ)

WQ & D River Dam

- Dam blocks, traps
  - Toxic blue-green algae (HABs)
  - Feathers & Bird Feces--- *E. coli*
  - Dead Animals
  - Debris

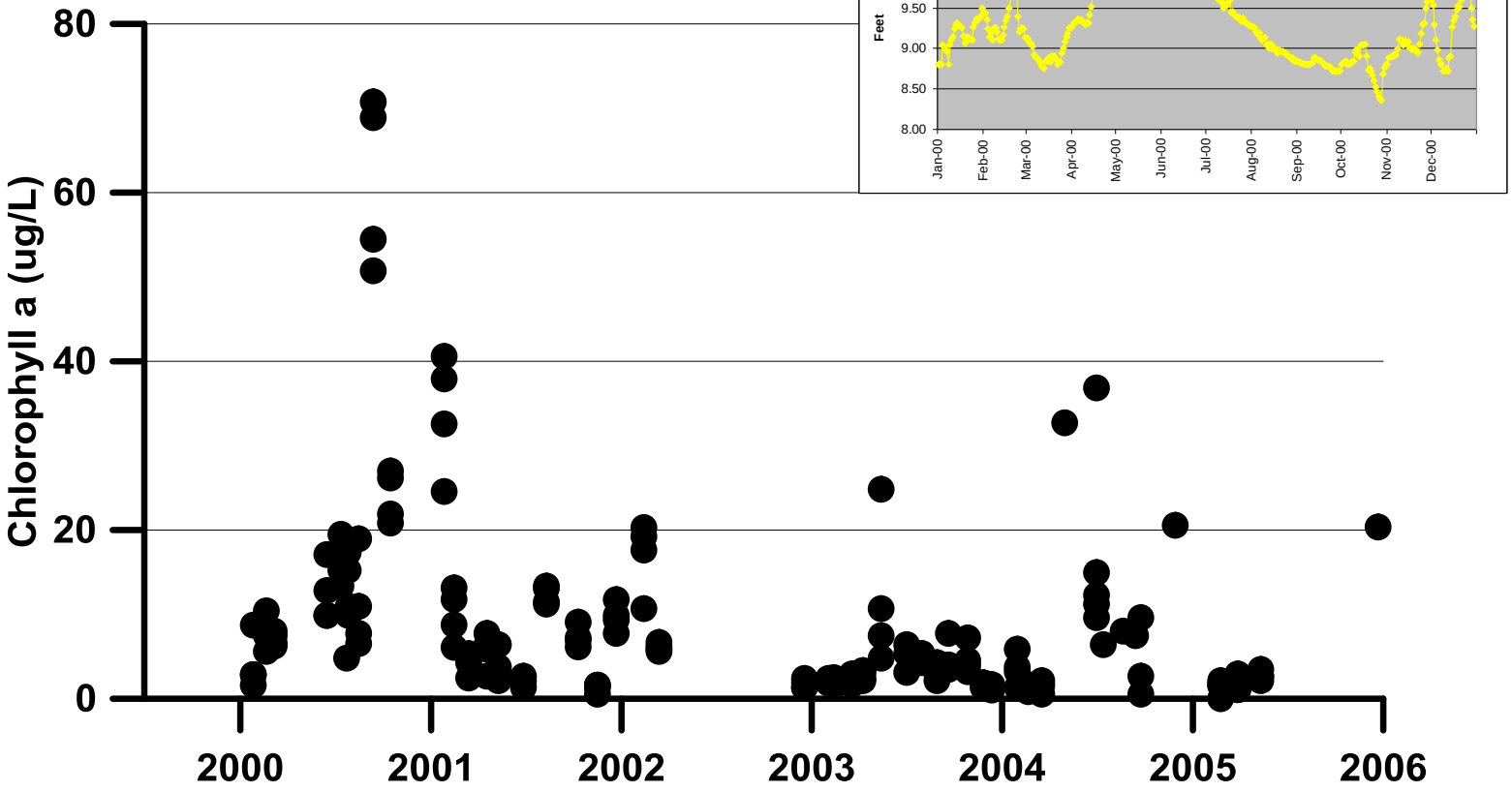
- Flowing water = more oxygen = more flushing = better water quality

WQ: [Phosphorus]

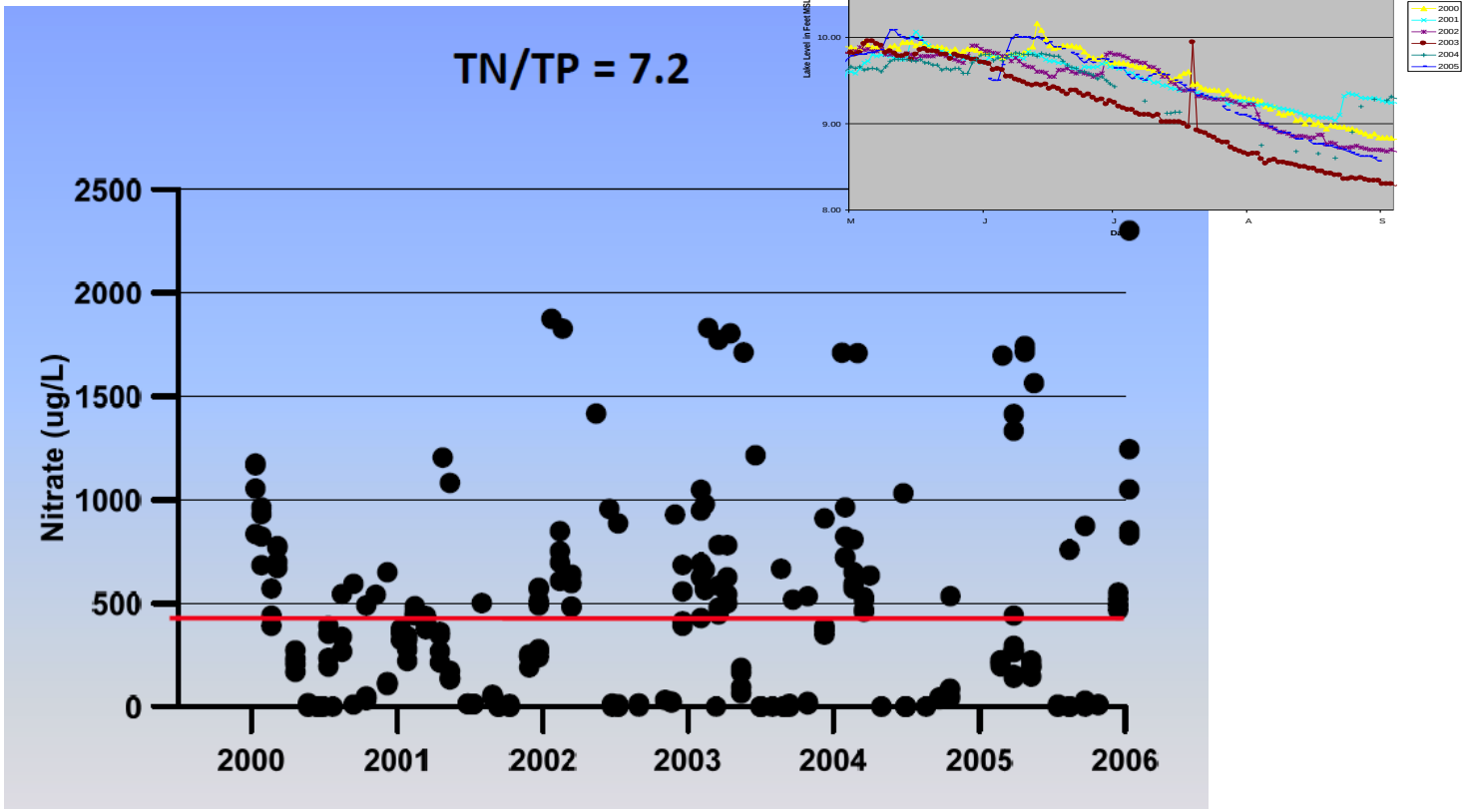


Tributaries typically have Phosphorus concentrations at or higher than the Lake.

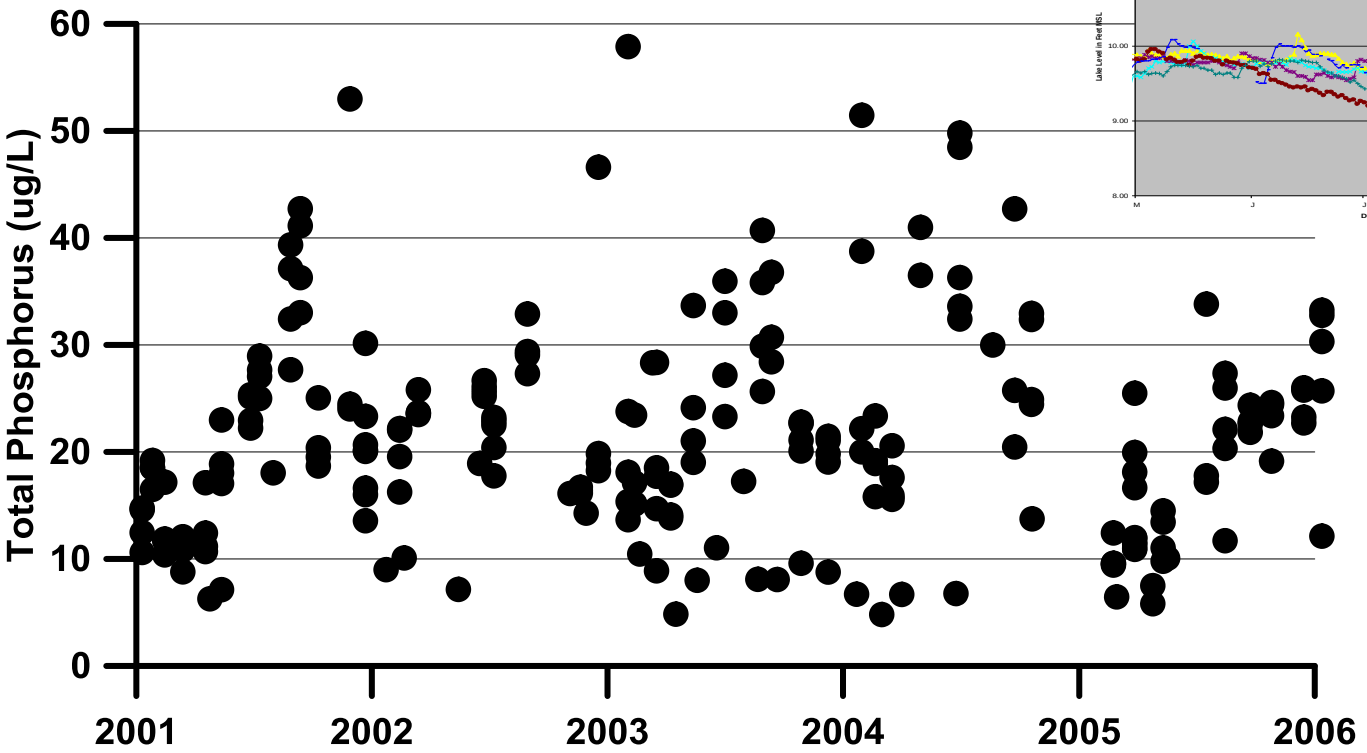
Chlorophyll a (2000-2006)
Lake Level (2000 - highest year)

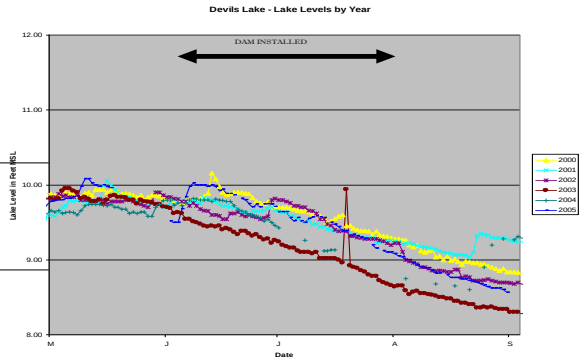


Nitrate (2000-2006)
Lake Level (summer 2000 – 2005)



Phosphorus & Lake Level 2001-2006





Modified from Eilers et.al, 2005

Sediment Accumulation Rate

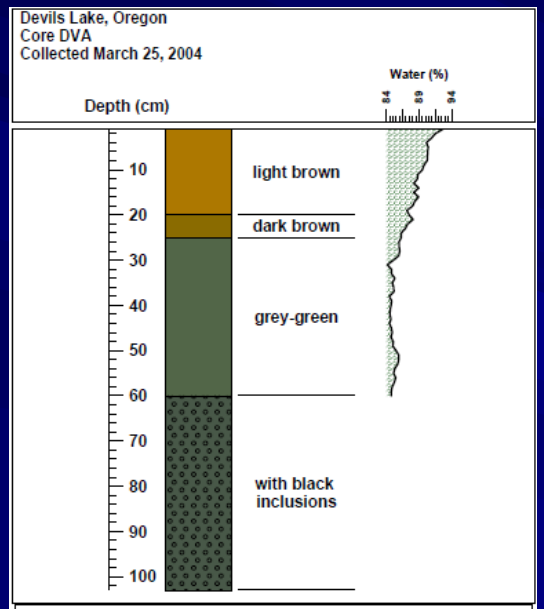


Figure 4. Diagram of major visual demarcations in sediment core DVA from Devils Lake.

Sediment Core from Devils Lake

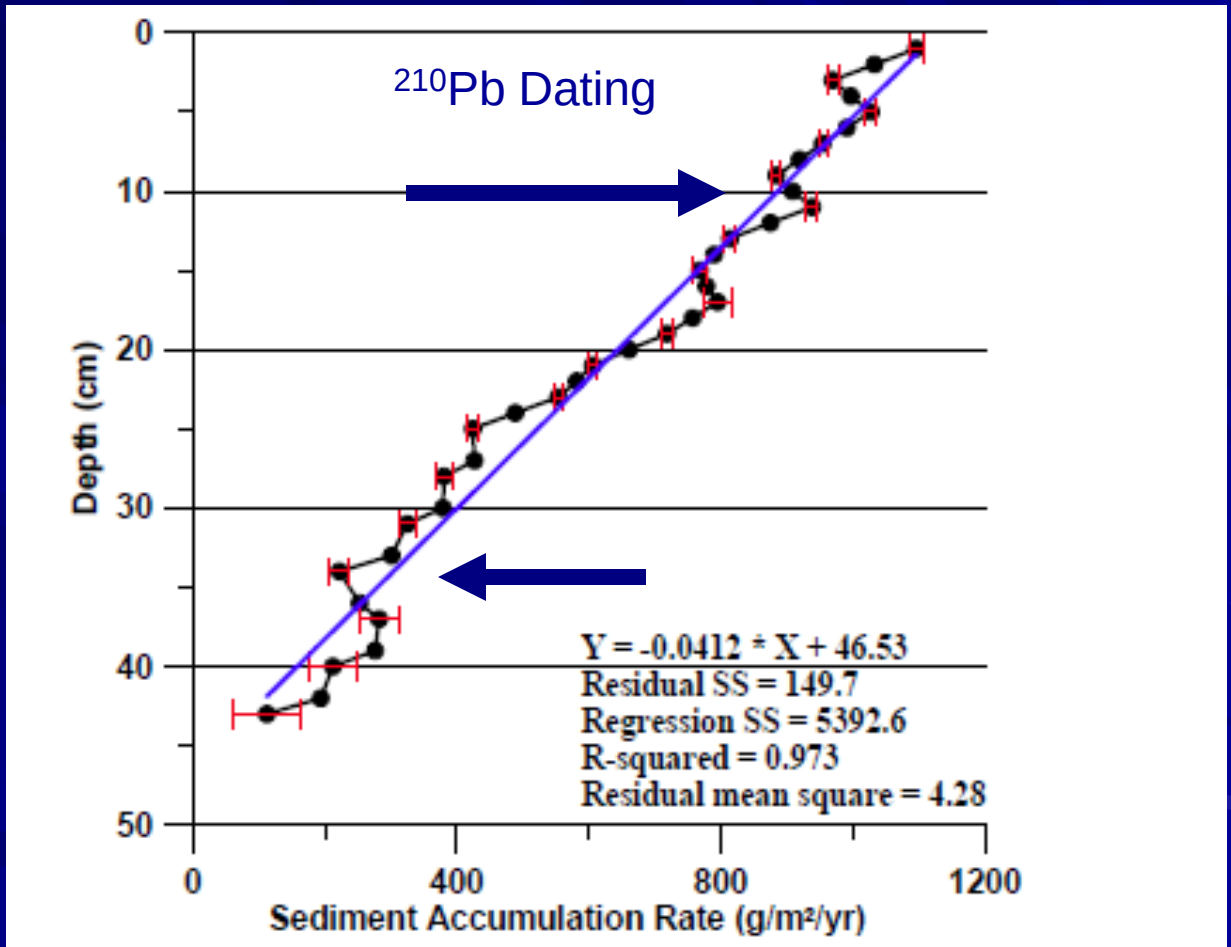


Figure 8. Sediment accumulation rate in Devils Lake based on ^{210}Pb dating. The blue line shows the best-fit linear regression.

Nutrients in Sediment

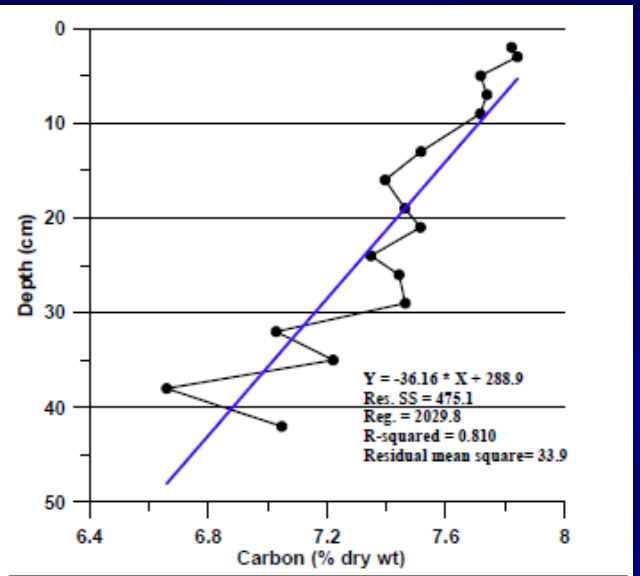


Figure 9. Carbon content in the sediments of Devils Lake. The blue line is the best-fit linear regression.

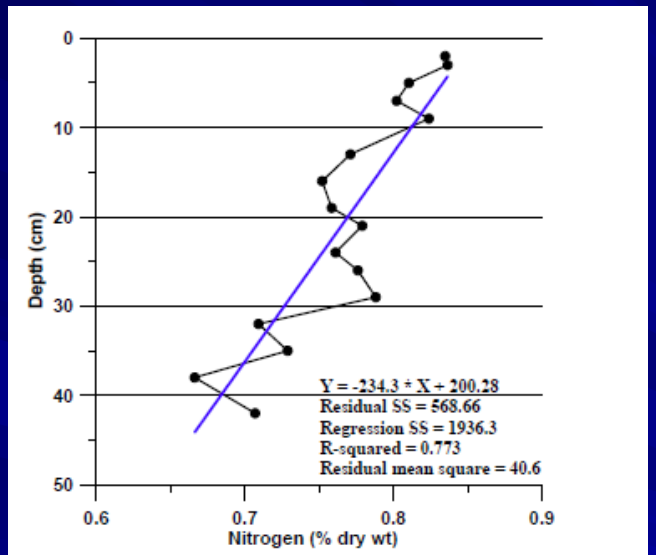


Figure 10. Nitrogen content in the sediments of Devils Lake. The blue line is the best-fit linear regression.

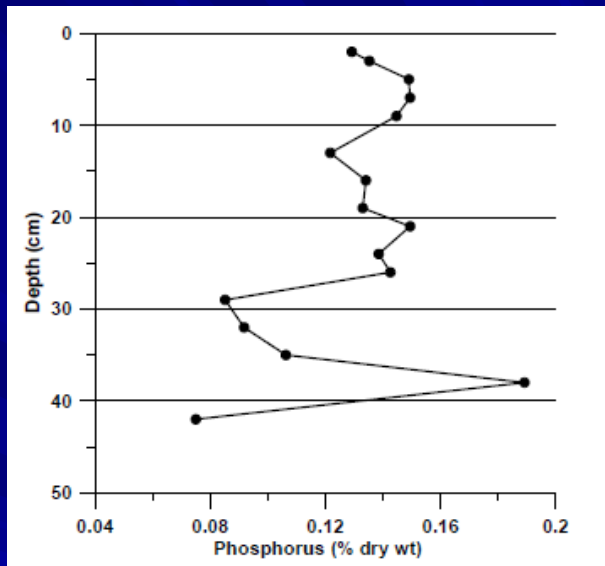
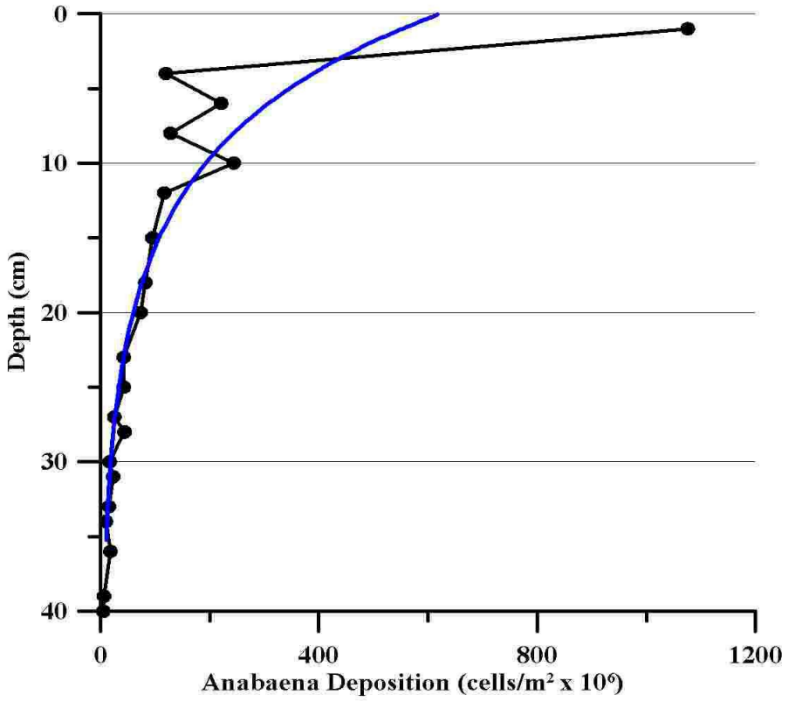


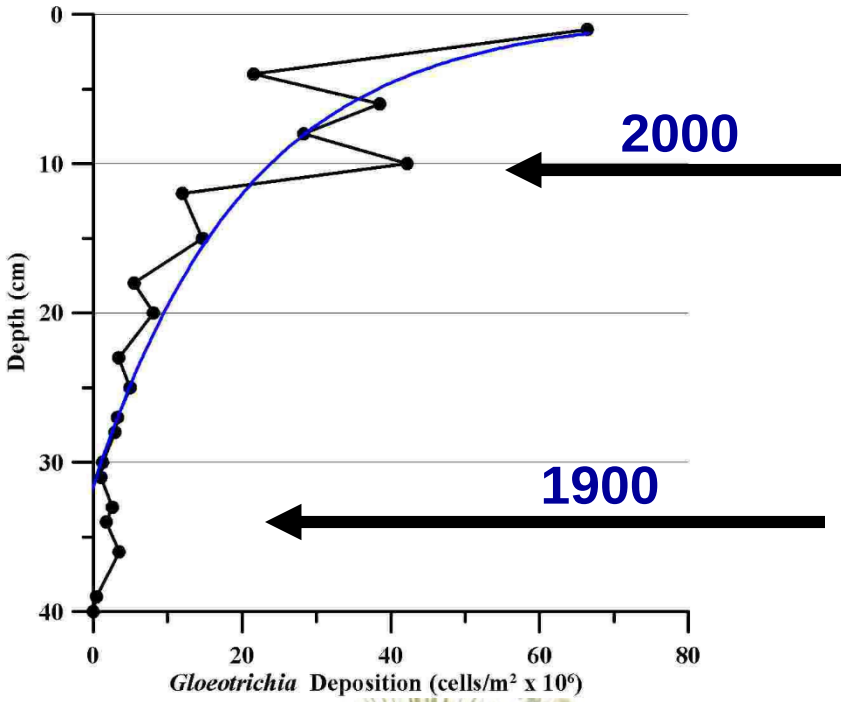
Figure 11. Phosphorus content in the sediments of Devils Lake.

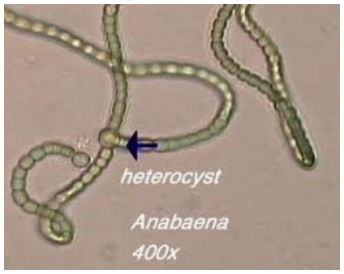
Carbon Nitrogen Phosphorus

Modified from Eilers et.al, 2005

Blue-Green Algae
(Exponential Growth)





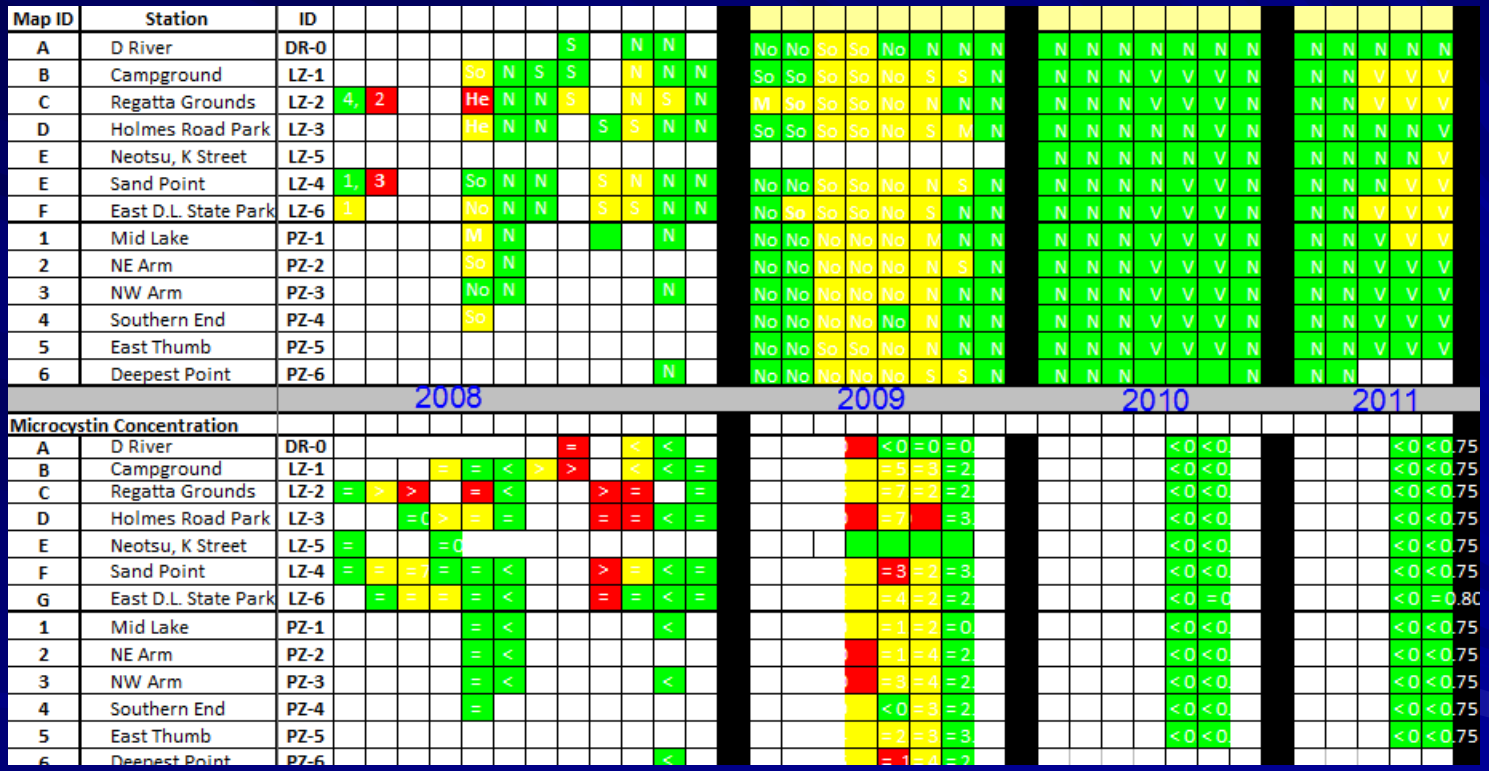


^{210}Pb Dating

Modified from Eilers et.al, 2005

HABs 2008, 2009, 2010, 2011

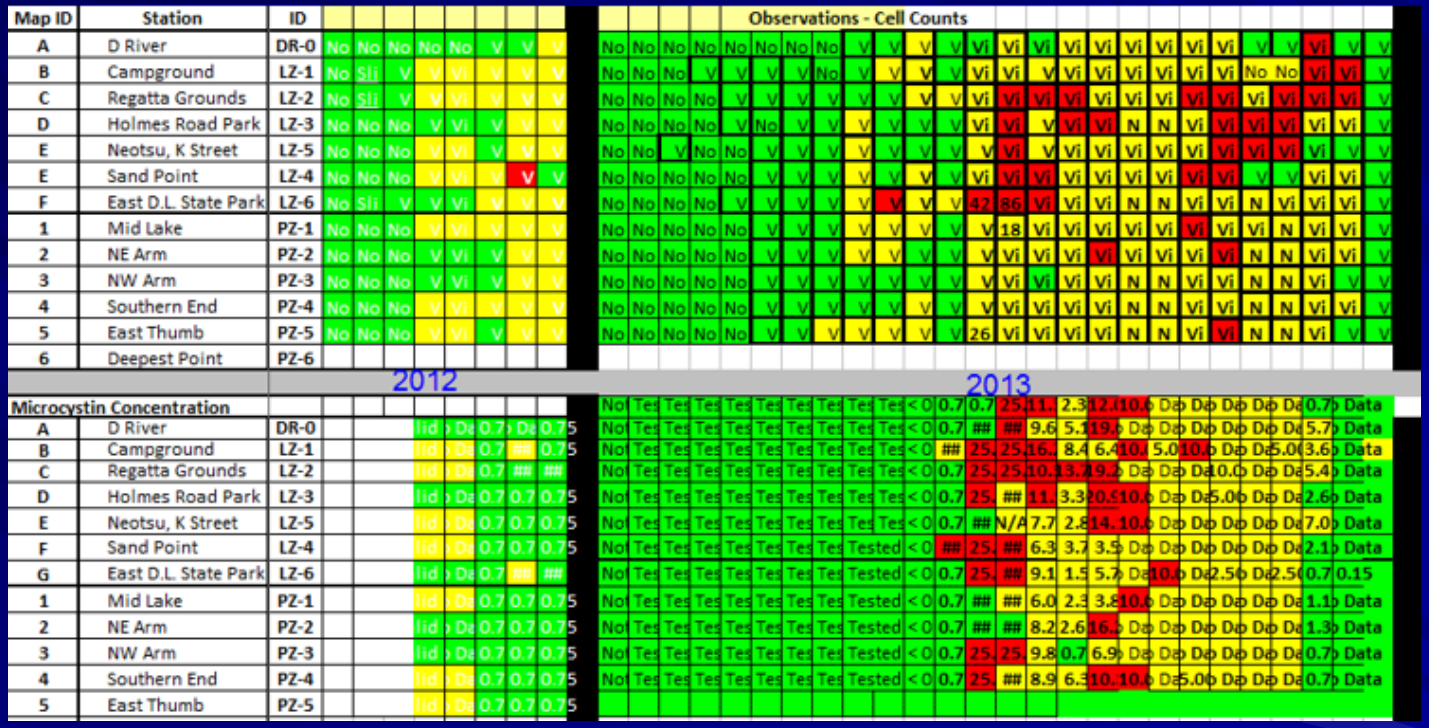
Official Bloom Years: 2008, 2009, 2013, 2014



2010 Estimated - summer only: Bloom did occur after summer season, but is not shown.

HABs 2012, 2013

Official Bloom Years: 2008, 2009, 2013, 2014



2013 Bloom: Officially Aug 1- Nov 21

HABs 2014

Official Bloom Years: 2008, 2009, 2013, 2014

Map ID	Station	ID
A	D River	DR-0
B	Campground	LZ-1
C	Regatta Grounds	LZ-2
D	Holmes Road Park	LZ-3
E	Neotsu, K Street	LZ-5
E	Sand Point	LZ-4
F	East D.L. State Park	LZ-6
1	Mid Lake	PZ-1
2	NE Arm	PZ-2
3	NW Arm	PZ-3
4	Southern End	PZ-4
5	East Thumb	PZ-5
6	Deepest Point	PZ-6

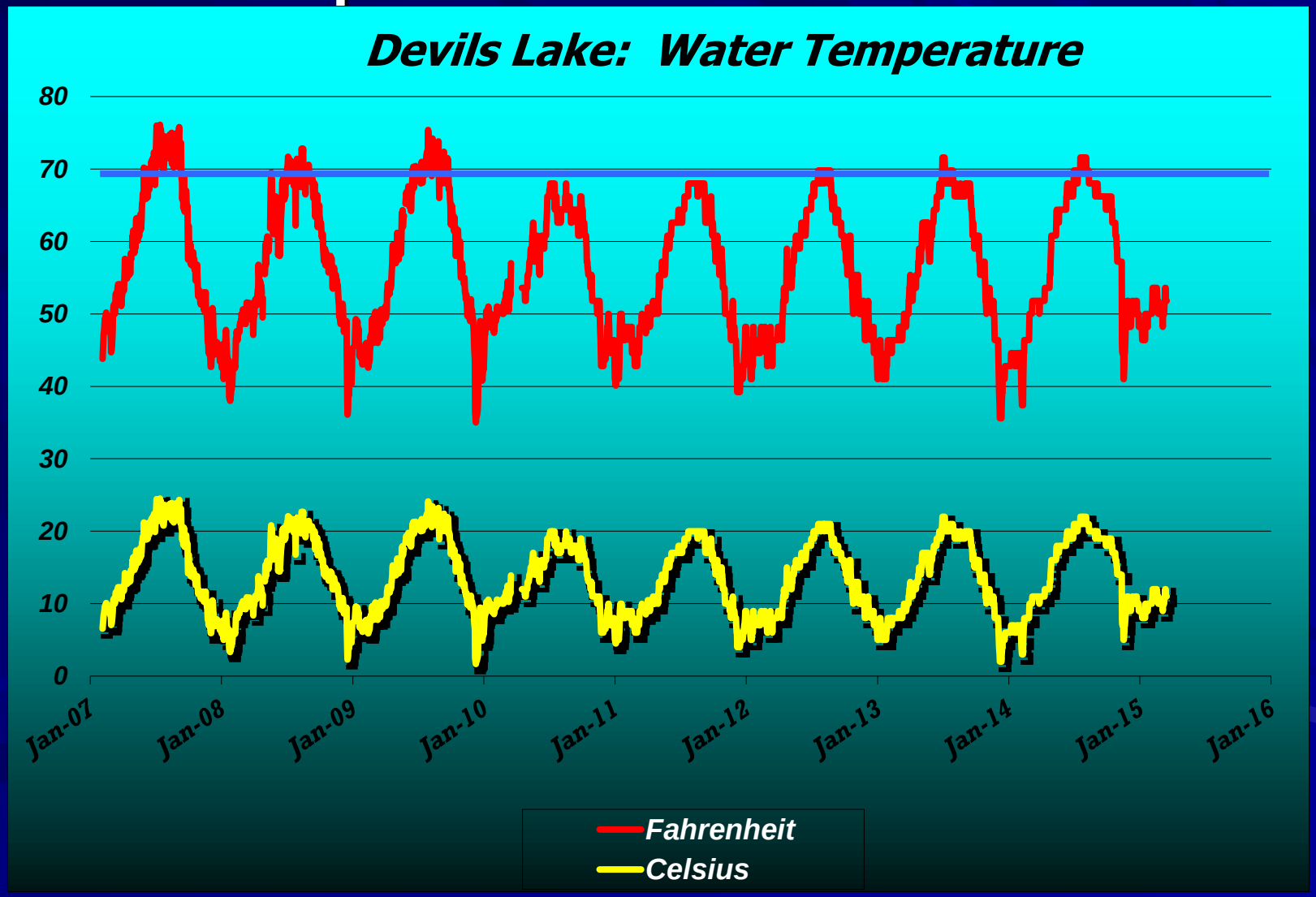
Microcystin Concentration		
A	D River	DR-0
B	Campground	LZ-1
C	Regatta Grounds	LZ-2
D	Holmes Road Park	LZ-3
E	Neotsu, K Street	LZ-5
F	Sand Point	LZ-4
G	East D.L. State Park	LZ-6
1	Mid Lake	PZ-1
2	NE Arm	PZ-2
3	NW Arm	PZ-3
4	Southern End	PZ-4
5	East Thumb	PZ-5

1st Bloom: Started Mid January - Crashed April 9th, 2014

Jan 15, 2014: 45F and 9.52' - April 9, 2014: 52F and 9.70'

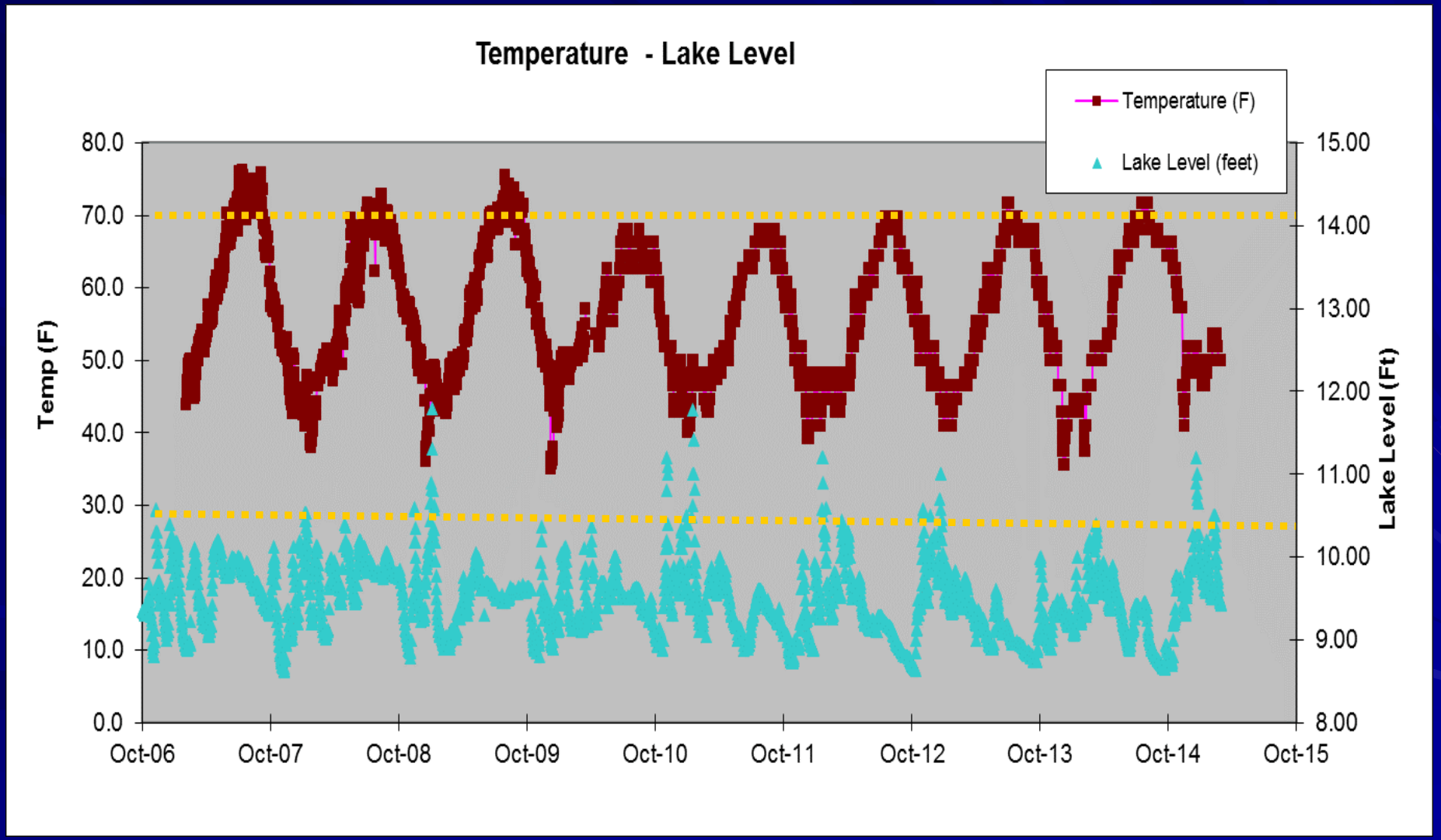
2nd Bloom: Officially August 1, 2014 – November 25, 2014

Temperature 2007-2015

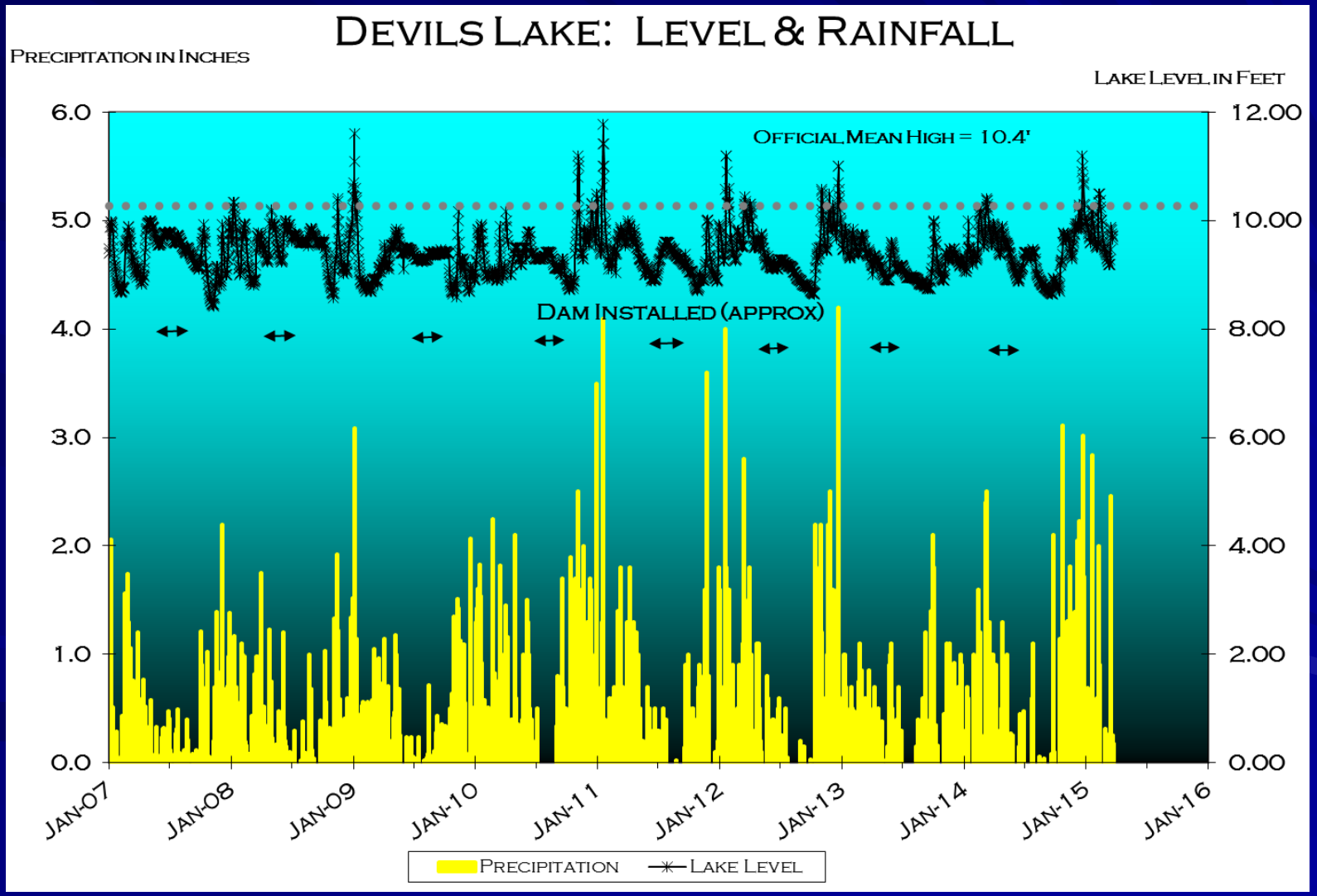


Official Bloom Years: 2008, 2009, 2013, 2014

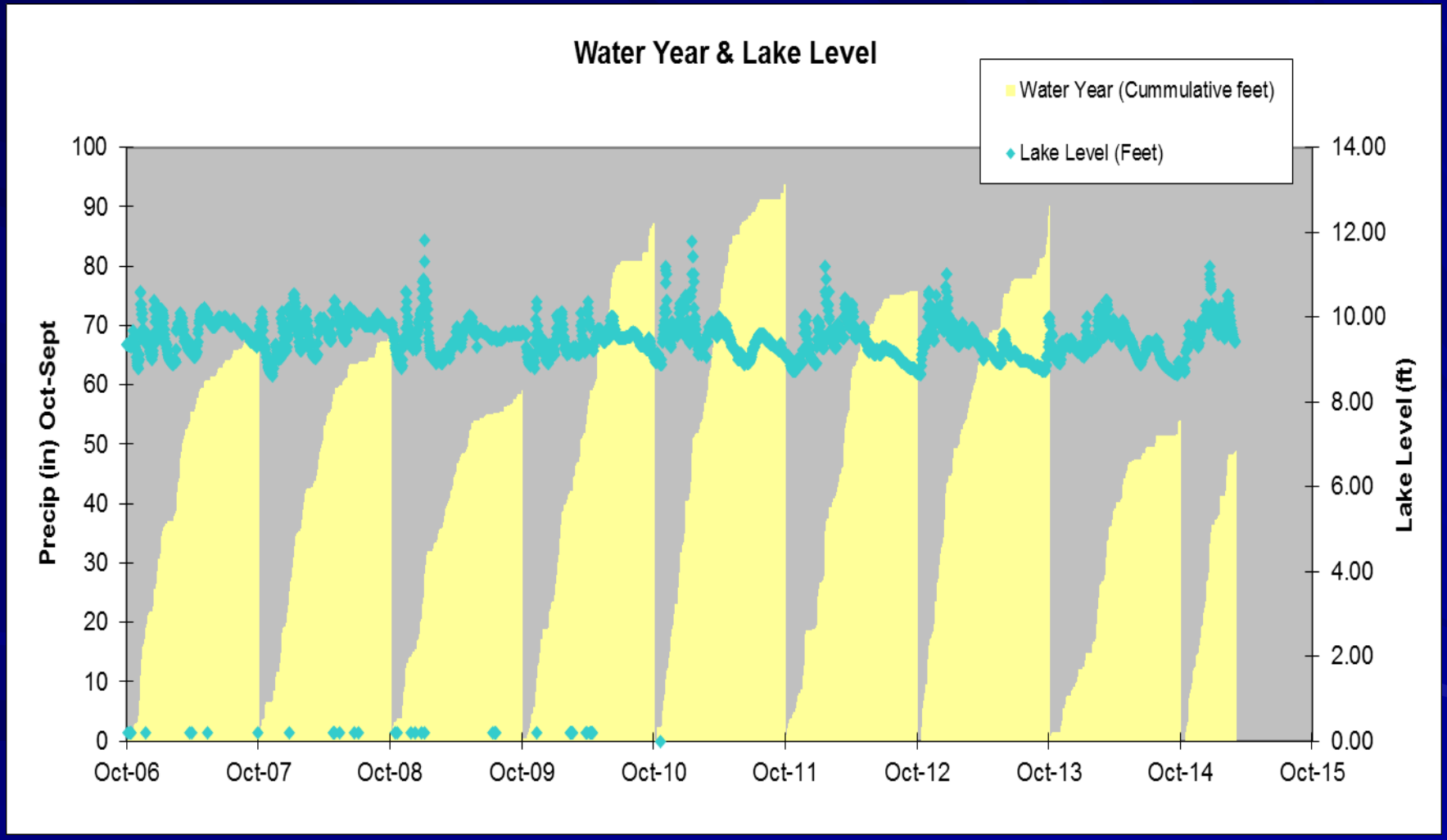
Temperature vs. Lake Level 2007 to 2015



Precipitation & Lake Level

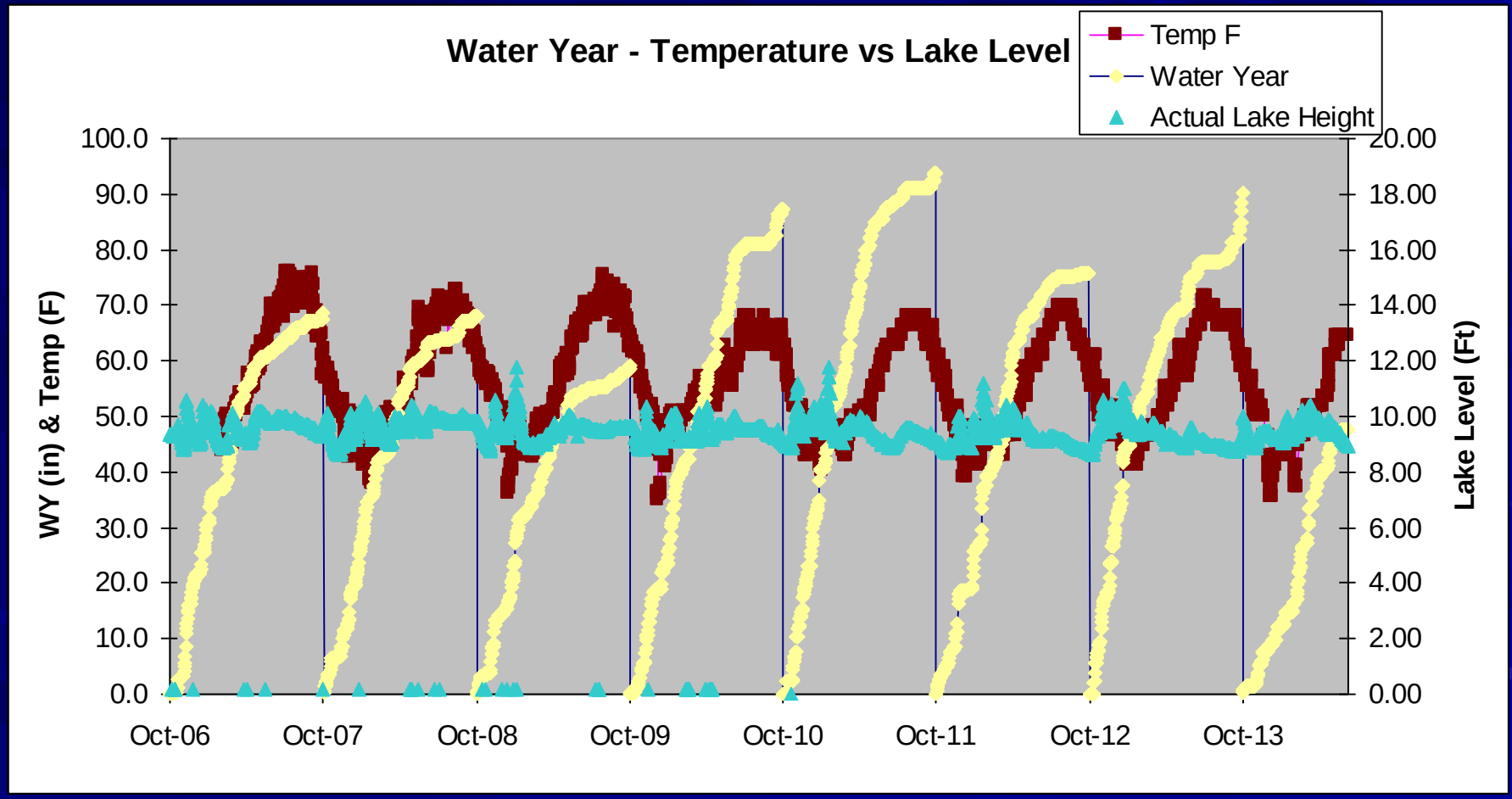


Water Year & Lake Level



Official Bloom Years: 2008, 2009, 2013, 2014

WY –Temp & Lake Level



Official Bloom Years: 2008, 2009, 2013, 2014

How To Reduce Algae (Cyanobacteria)?

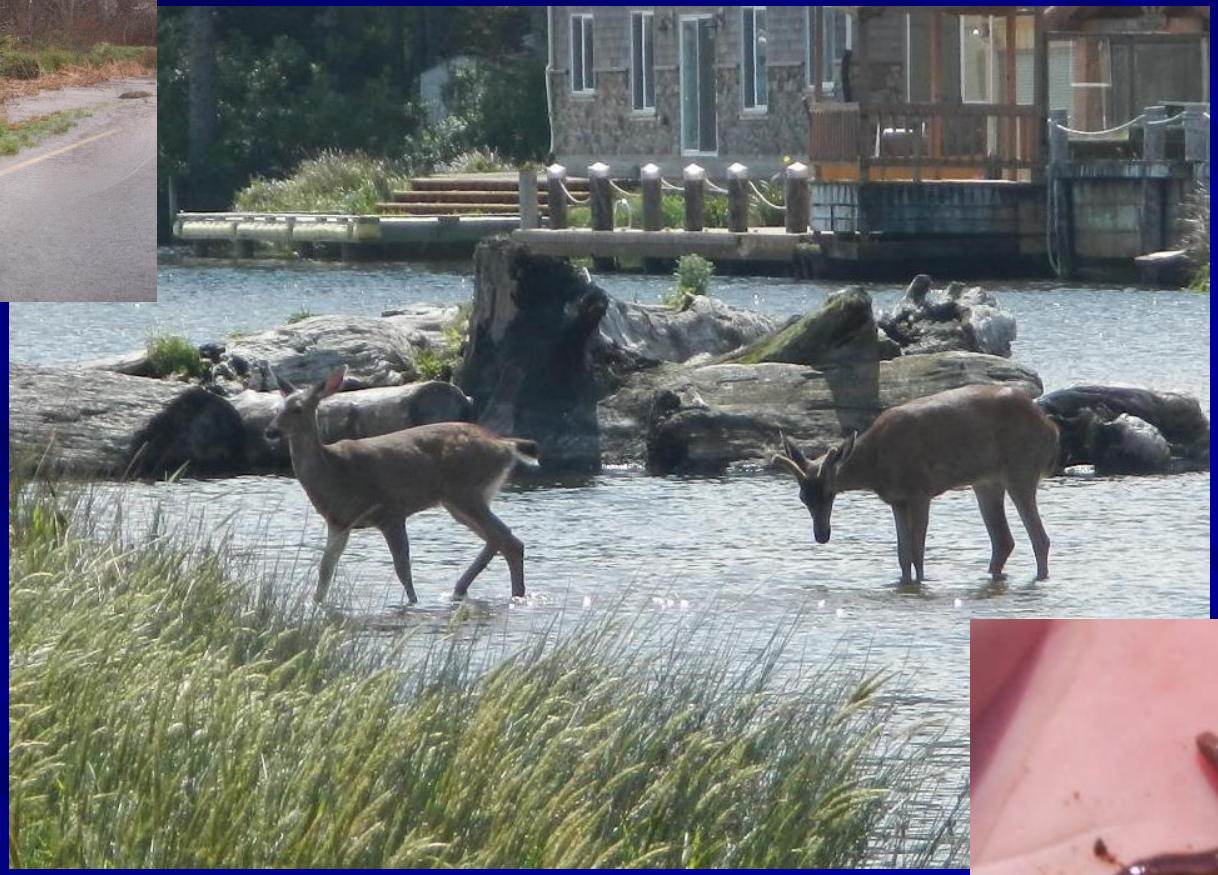
Short Term

- Let grass carp die out
- Inactivate P with alum
- Increase flushing (steal water from Salmon River – just kidding!)
- Decrease residence time by keeping lake at minimum stage
- Increase shading with dyes
- Apply oxidants (sodium percarbonate)
- Aeration (for circulation)
- Introduce silver carp

Long Term

- Sewer lakeshore homes
- Increase wetlands
- Divert storm sewers/Detention basins
- Eliminate yard/lawn use of fertilizer applications in watershed (use lake water instead)
- Restore shoreline

Fish and Wildlife



Coho Salmon

- Endangered Species List
  - Status: **Threatened**
- Dam
  - Impedes outward migration of smolts
    - May – Mid July
  - Adult upward migration unaffected – dam not in place

http://www.nmfs.noaa.gov/pr/species/fish/cohosalmon.htm

Juvenile Coho -- Outward migration

Essential Behavior Pattern: Need to migrate

Fish Passage:
"(more is better), and as wide as possible"

- "To encourage out-migration…depth of at least 6 inches (**more is better**) and as wide as possible.", Tom Stahl, OFDW

- Coho Outward Migration
  - May – Mid July

http://www.nmfs.noaa.gov/pr/species/fish/cohosalmon.htm

Bass and Coho Interactions

- **Issue:** Dam creates a pinch point were smolts are vulnerable to predation by non-native warm-water fish such as bass

- **Predation:** "…largemouth bass were responsible for an average of 98% of the predation on coho salmon in all lakes.."

  – Effects of Introduced Fishes on Wild Juvenile Coho Salmon Using Three Shallow Western Washington Lakes

Bonar, 2004, USGS http://wdfw.wa.gov/publications/00152/wdfw00152.pdf

Other Fish & Wildlife

- **Sea** Run Cutthroat
  - Anadromous
  - Outward Migration June – Mid August

http://seagrant.oregonstate.edu/sgpubs/onlinepubs/g99012.html

- Pacific Lamprey Migration
  - Anadromous
  - Inward Migration Feb - Oct

http://www.psmfc.org/habitat/edu_lamprey_fact.html

http://www.fws.gov/oregonfwo/Species/Data/PacificLamprey/Documents/012808PL-FactSheet.pdf

Loss of Critical Habitat

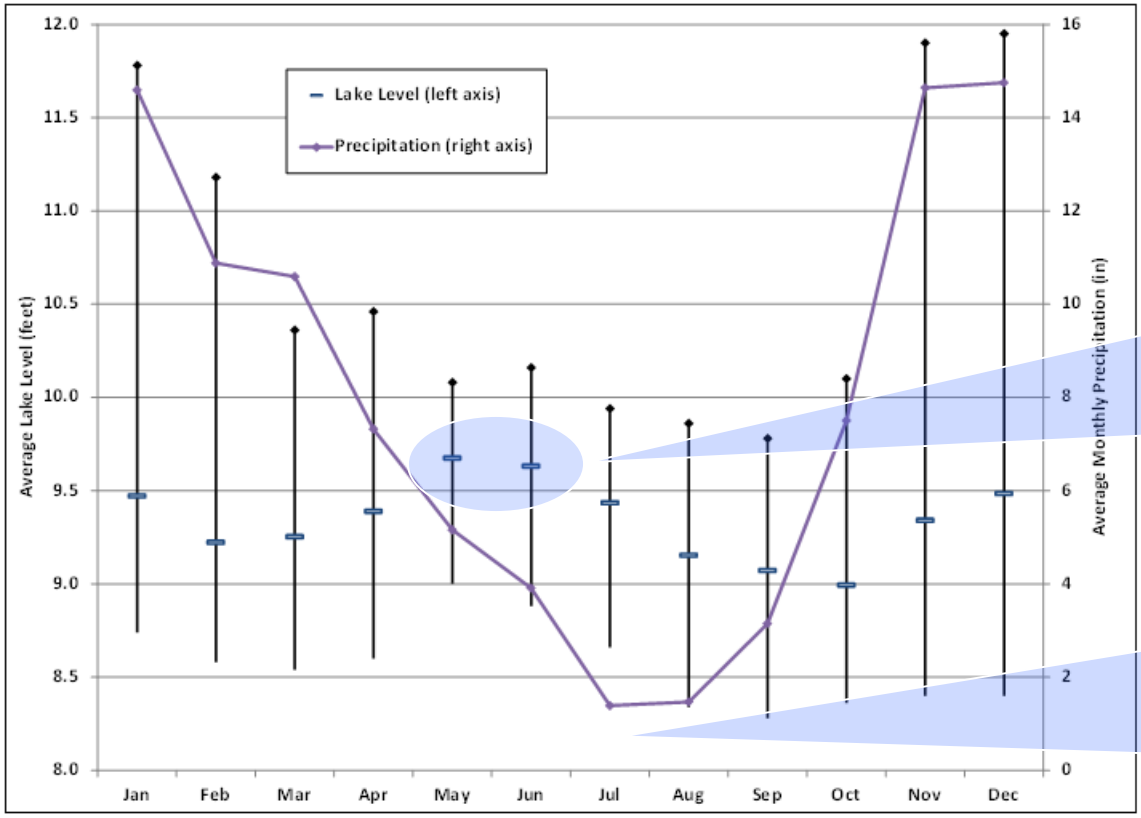
- Erosion prevention measures protect human homes at expense of fish and wildlife

Shoreline Erosion Study

Relevant Findings

- Full impoundment = 27 additional acres of land inundated
- Operation of the dam reversed the natural hydrology
- Highest average lake level in May and June vs. winter
- With dam, wave energy focused on Narrow Bandwidth year-round
- Approximately 2 miles of shoreline is eroding
- Areas of highest erosion currently are areas most impacted by summertime wind waves
- Boat waves 18% total wave energy, but may be up to 49%

Changed Natural Hydrology



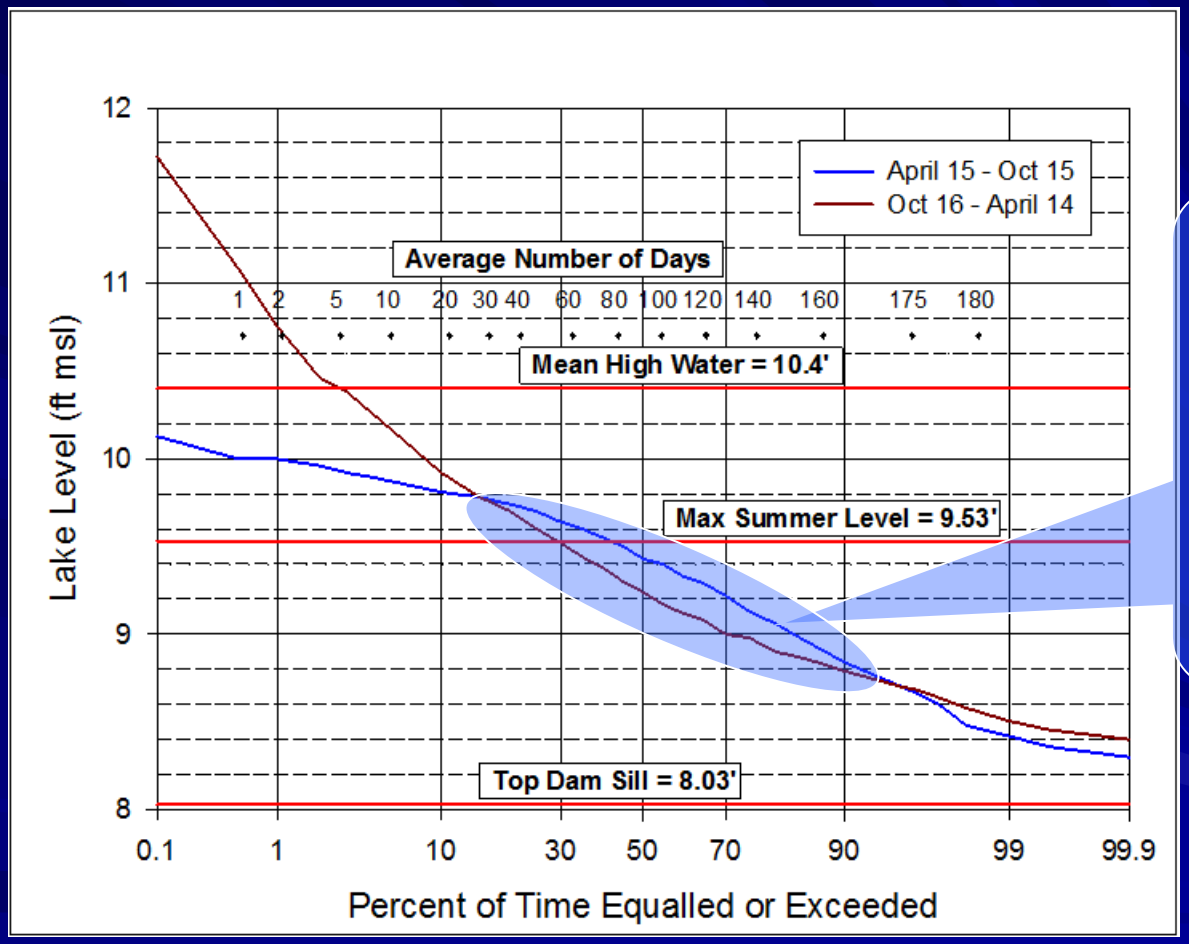
Note: Vertical black lines indicate the range of lake levels during each month. Purple line represents the average monthly precipitation (values on right vertical axis)

Figure 16. Average monthly lake levels (presented as dashes) based on data for the period from January 1998 through September 2011

Variability is greatest in winter, but highest monthly averages are May and June

July - lowest rainfall, yet higher average monthly lake level than rainy, Feb, Mar, Oct, & Nov

Hydrology reversed



Summer levels higher than winter approx. 80% of the time

- Figure 17. Duration curves of Devils Lake levels during the summer recreational period and the winter non-recreational period based on recorded lake levels from January 1998 through September 2011

Greatest Erosion Currently

- Northwest (summer) winds hitting areas of highest erosion.
- Areas also vulnerable to boat wakes
- Recent changes included higher lake levels in summer and transition to wake boats

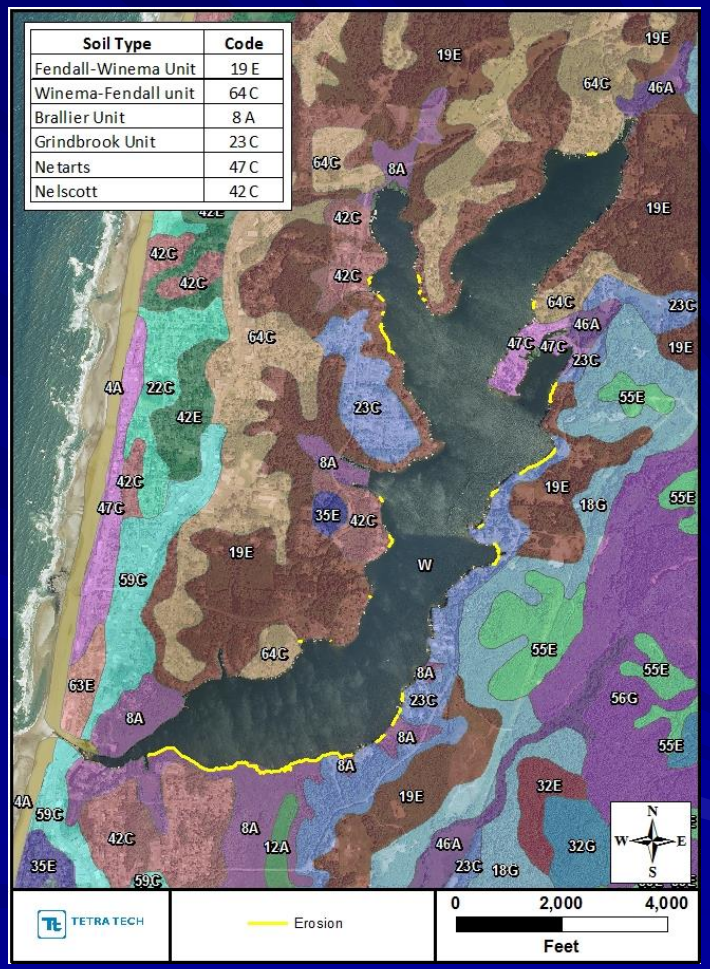


Figure 3. Soil types and locations of eroding shoreline areas (yellow)

Fetch vs. Vertical Location

- “Although the lake level has an insignificant effect on the amount of wave energy approaching the shoreline, *it can have a significant impact on the erosional characteristics of those waves depending on the specific vertical location at which they impact.”*

Concentrating the Impact Zone

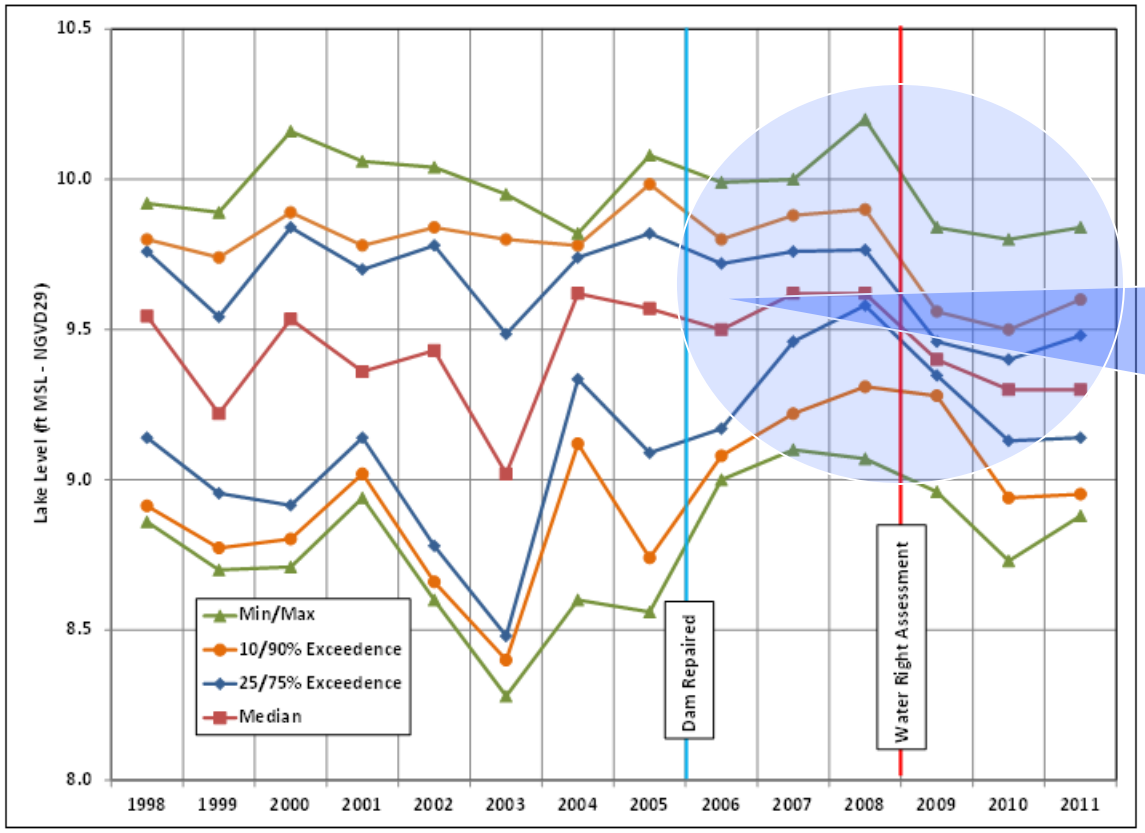


Figure 18. Variation in Devils Lake levels during the summer recreation periods in 1998 through 2011

Dam repair in 2006.

Summer time lake level band narrowed

Retaining Walls:

Wood, Concrete, or Rock

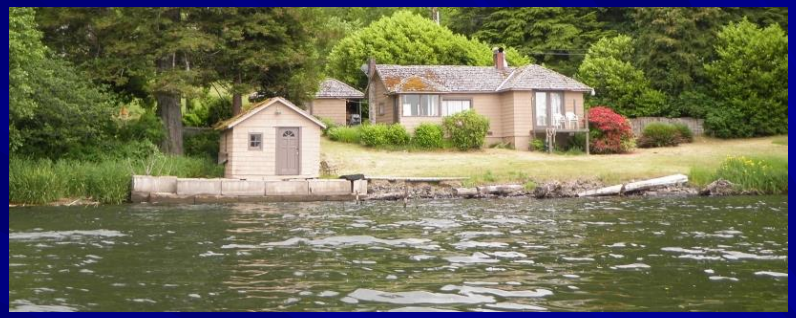
- **Reflection:** "…much of the wave energy that impacts the wall is reflected back into the lake and/or down the shoreline where it can combine with and enhance other waves."

- **Underneath:** "The trough of the waves, however, exposes at least several inches of the unprotected shoreline below the wall to erosion."

- **Overtop:** "Significant waves can also overtop some of the walls, absorbing, rather than reflecting that part of the wave energy and subjecting the unprotected areas behind the wall to erosion."

Retaining Walls:

Wood, Concrete, or Rock



Increased Tendency of Erosion

- "As a result, holding the lake at a higher level during periods of high natural or boat-induced wave activity will increase the tendency for erosion."

Inundation and Vegetation

- "…recreational water levels could inundate shorelines at a time when they might otherwise be open to plant propagules that require saturated, but not inundated, sediment. The period of recreational water level also corresponds to increasing day length which is important in plant establishment and growth, particularly seed germination and flowering."

Wetland & Shoreline Emergent Vegetation

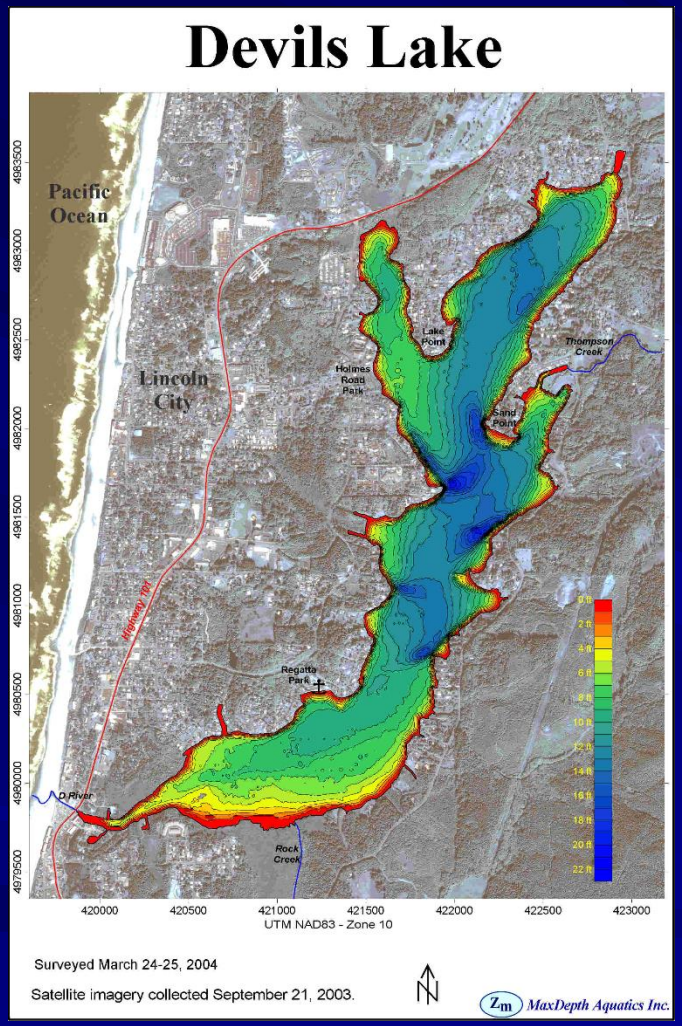
Wetlands and Reservoirs

- Hydrology disrupted
  - Lack of drier, growth period
- Shoreline flooded then exposed
- Wetland plants require “saturated, but not inundated”
  - Reduced growth in standing water
  - Loss of growth leads to root loss
  - Root loss leads to erosion

Wetland & Shoreline Vegetation

- Naturally Dynamic:
  - Grow and shrink year to year.
- Adapted to routine inundation and dry periods
  - Not year-round inundation
- Water fluctuation is a natural part of the system

Vegetation - Drown out?



Too shallow, light penetrates to bottom regardless of added depth.

Septic Tanks & Leachfields

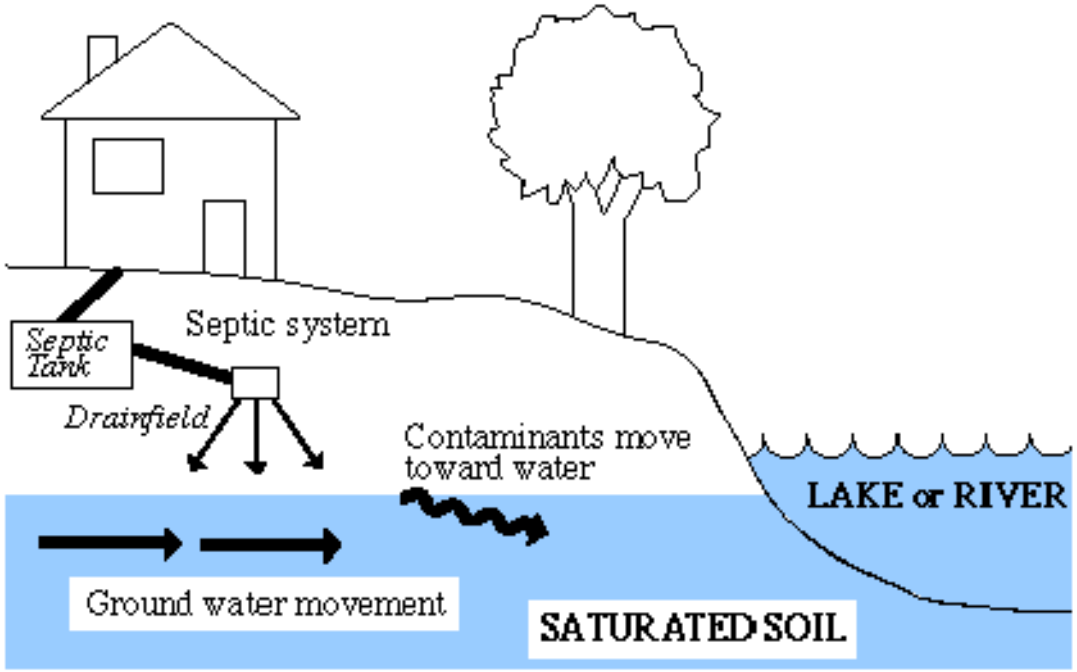
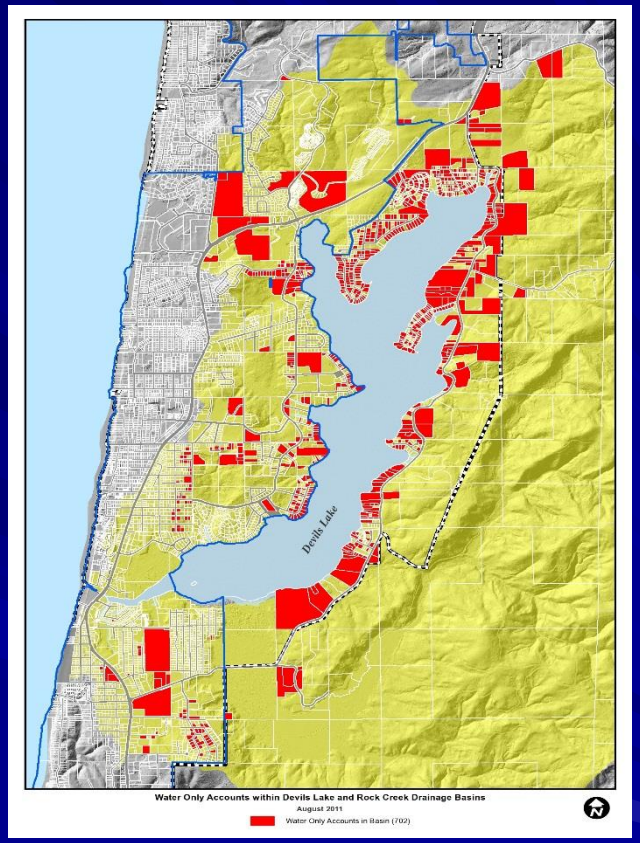


Figure 2: Avoid water contamination from inadequate wastewater treatment! If your system is improperly designed or located too close to the water, contaminants may reach your lake. This figure shows how ground water moving toward the lake can carry contaminants in saturated soil.

Image Credit: University of Minnesota, Extension
http://www.extension.umn.edu/distribution/naturalresources/components/DD6946b.html

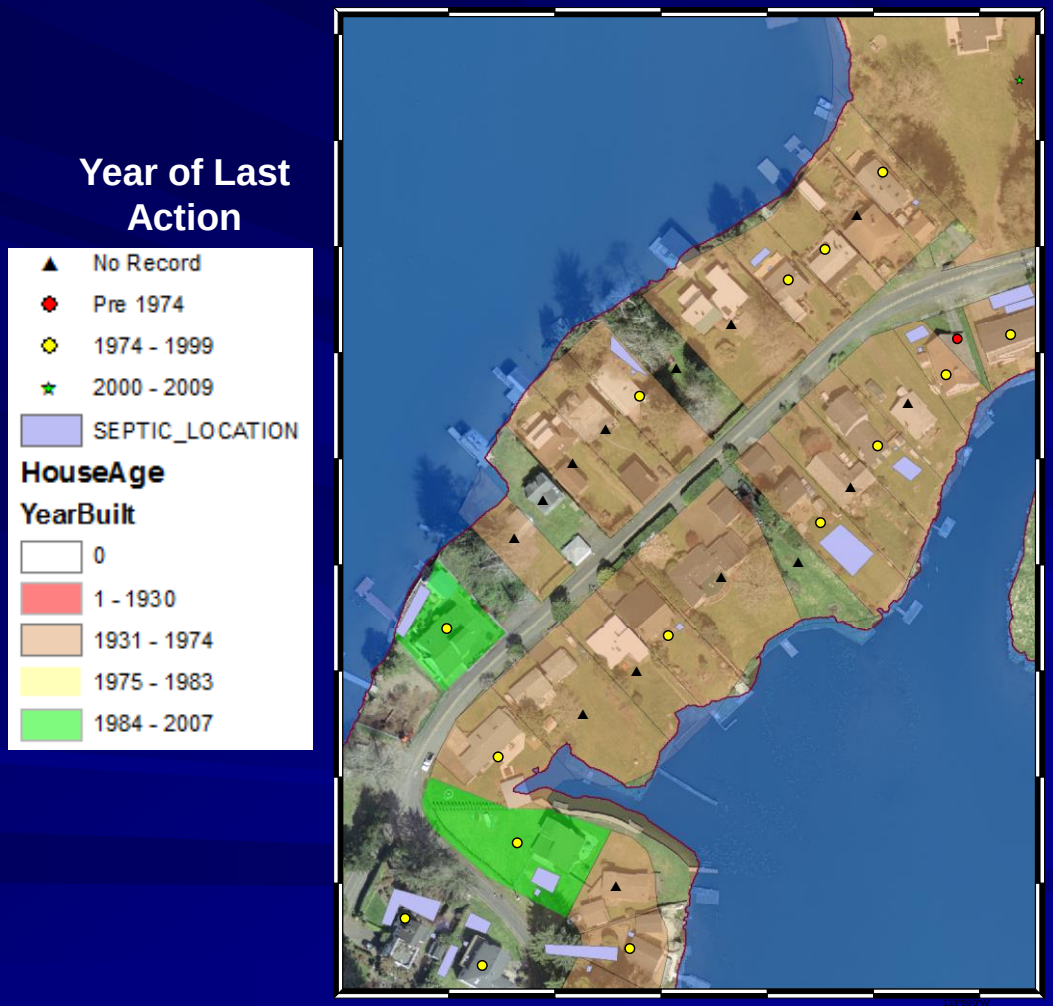
Septic Tanks & Leachfields

- Dam raises the saturation level of soils
  - Occurs during peak use of many residences
- Saturated soils reduce the effectiveness
  - Less treatment time
  - Nutrients feed HABs & invasive weeds



- 685 Septic Systems
- 1/3 undocumented

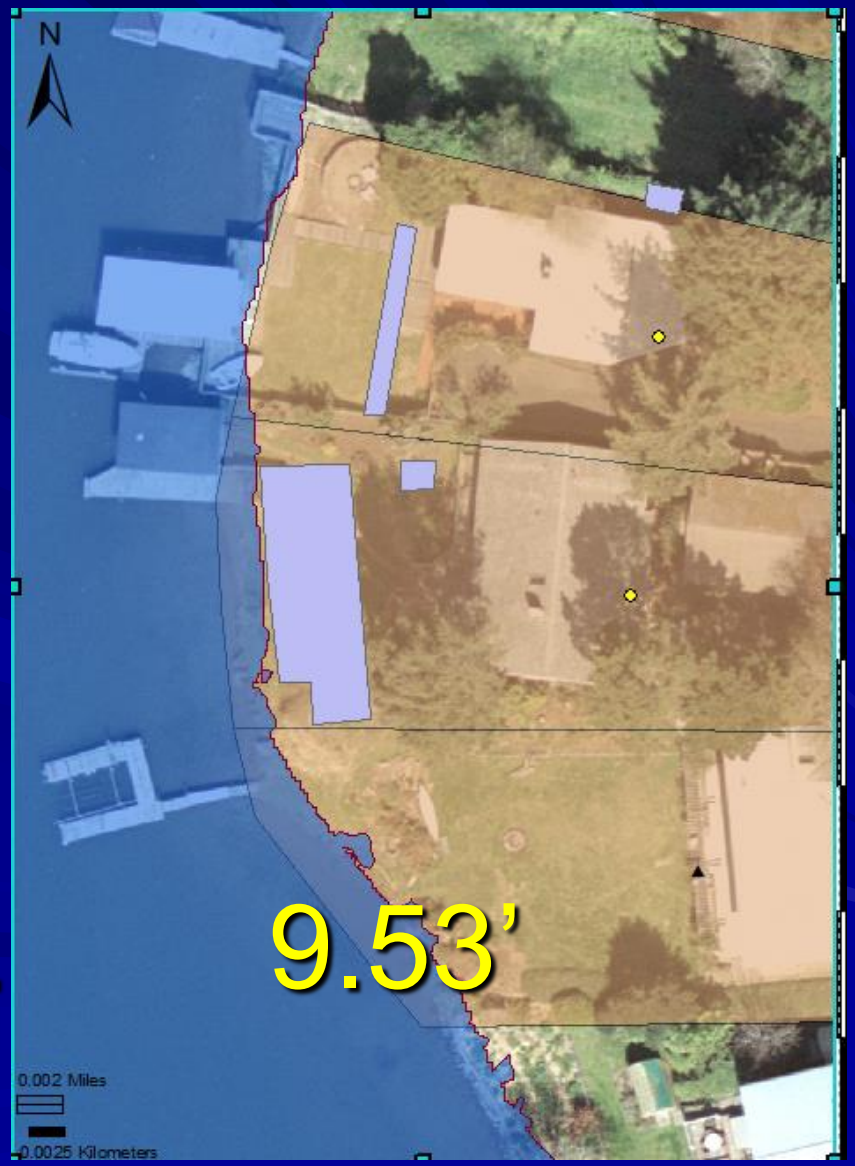
Septics System Inventory



- 685 septic systems in the Watershed
- 285 (42%) Border lake
- 104 (36%) No record
- 64 (23%) 20 years+
- At least 20 sand filters
- At least 10 ATT (Advanced Treatment Technology)

Septic System drainfields in relation to shoreline and increased inundation

vs.

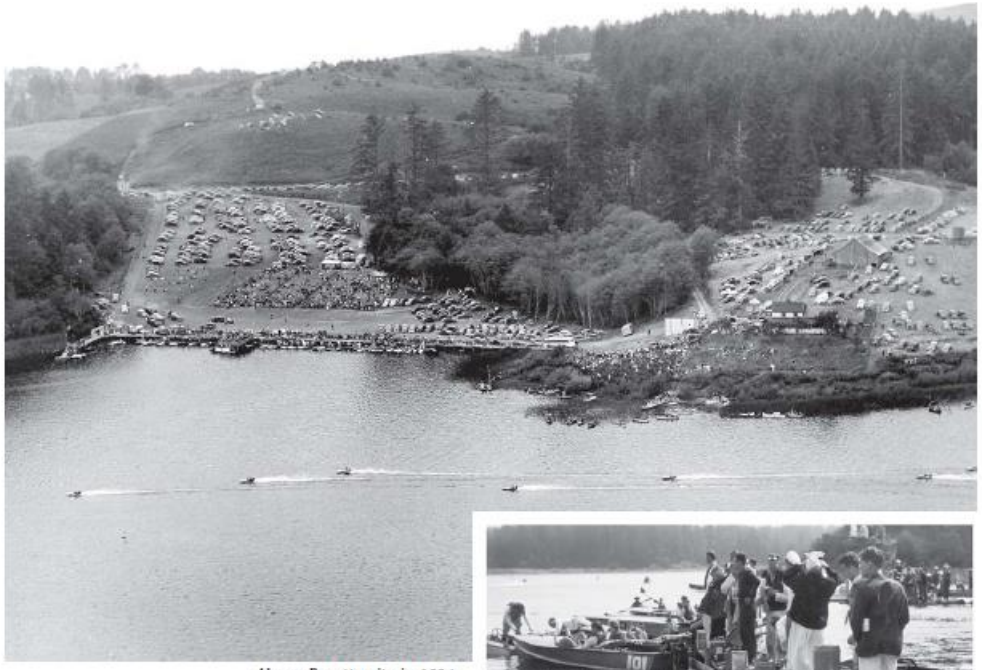


Recreation and Access

"*World's Fastest Lake*"

Record Setting

Hydro-plane racing



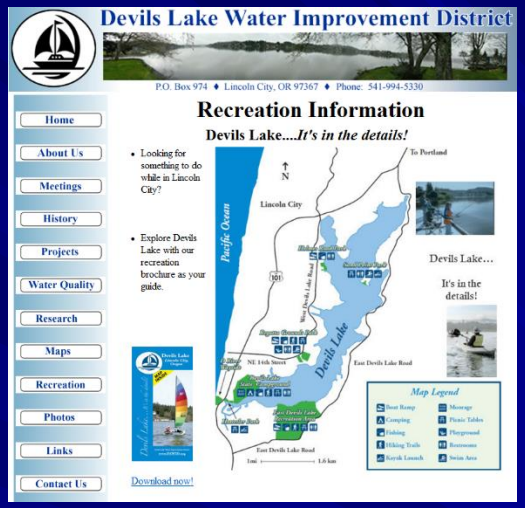
Above: Regatta site in 1934
Right: Speed boats at the Regatta

Admirals from the Devils Lake Yacht Club escorting Regatta court

Regatta Grounds 1934

Photo Credits: From Delake Lincoln City's Playground, written by Anne Hall, North Lincoln Historical Society for Lincoln City Urban Renewal

Major Public Access



OSMB records show Regatta Grounds (1978-1981) and East Devils Lake (1993-1995) improved with state $$$ and built before impoundment. Both serve naturally fluctuating lake elevations (2' variation).

Holmes Road Park – poorly engineered ramp– not state project – not effective for even 10.4' level (17" depth), but fixable.

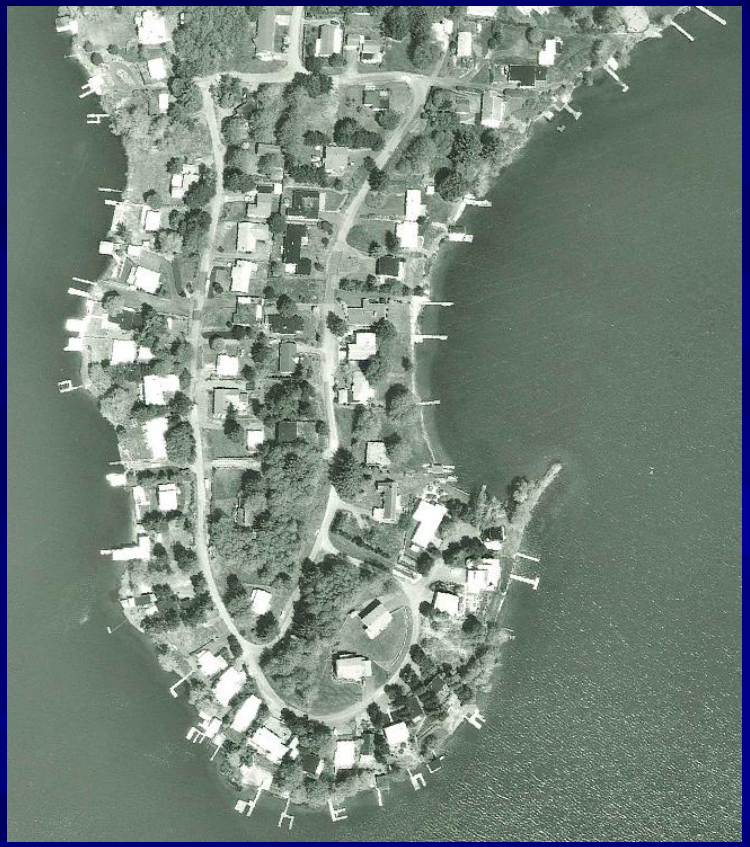
Dock Study

Conservatively estimated mean depths of all 393 structures was 2.70 @ 8.60', 3.10' @ 9 .0' and estimated 3.63' deep when the lake is at 9.53'.
When considering the 175 structures which were reasonably assumed to be for larger motor boats the depths averaged 3.15', 3.55', and 4.08' for each of the estimated lake levels, respectively

	Depth 1 @ 9.53	Depth 1 @ 9.0	Depth 1 @ 8.6'			Depth 1 @ 9.53	Depth 1 @ 9.0	Depth 1 @ 8.6'
ALL 393 Structures					**Optional Docking area**			
Mean	3.63	3.10	2.70		**Mean**	3.72	3.19	2.79
Median	3.65	3.12	2.72		**Median**	3.84	3.31	2.91
Mode	3.90	3.37	2.97		**Mode**	4.65	4.12	3.72
StDev	1.17	1.17	1.17		**St Dev**	1.18	1.18	1.18
175 Motor Boat Structures (all are Jurisdictional)					**Optional Docking area**			
Mean	4.08	3.55	3.15		**Mean**	4.17	3.64	3.24
Median	4.13	3.60	3.20		**Median**	4.15	3.62	3.22
Mode	4.65	4.12	3.72		**Mode**	4.65	4.12	3.72
StDev	1.00	1.00	1.00		**St Dev**	1.00	1.00	1.00
114 Small Craft Docks (Jurisdictional & Non)					**Optional Docking area**			
Mean	3.08	2.55	2.15		**Mean**	3.12	2.59	2.19
Median	2.93	2.40	2.00		**Median**	3.01	2.48	2.08
Mode	2.71	2.18	1.78		**Mode**	2.71	2.18	1.78
StDev	1.22	1.22	1.22		**St Dev**	1.26	1.26	1.26
91 Small Craft Docks (Jurisdictional)					**Optional Docking area**			
Mean	3.27	2.74	2.34		**Mean**	3.32	2.79	2.39
Median	3.15	2.62	2.22		**Median**	3.15	2.62	2.22
Mode	2.71	2.18	1.78		**Mode**	2.71	2.18	1.78
StDev	1.18	1.18	1.18		**StDev**	1.23	1.23	1.23
14 Piers (all are Jurisdicational)					**Optional Docking area**			
Mean	3.40	2.87	2.47		**Mean**	3.40	2.87	2.47
Median	3.15	2.62	2.22		**Median**	3.15	2.62	2.22
Mode	2.65	2.12	1.72		**Mode**	2.65	2.12	1.72
StDev	0.97	0.97	0.97		**StDev**	0.97	0.97	0.97

1992 (pre dam) 2007 (post dam)

Of the 393 total structures only 17%-25% likely built after water rights were obtained.



39 structures

41 structures

Private Property Access
Dredged Canal

1962

1977

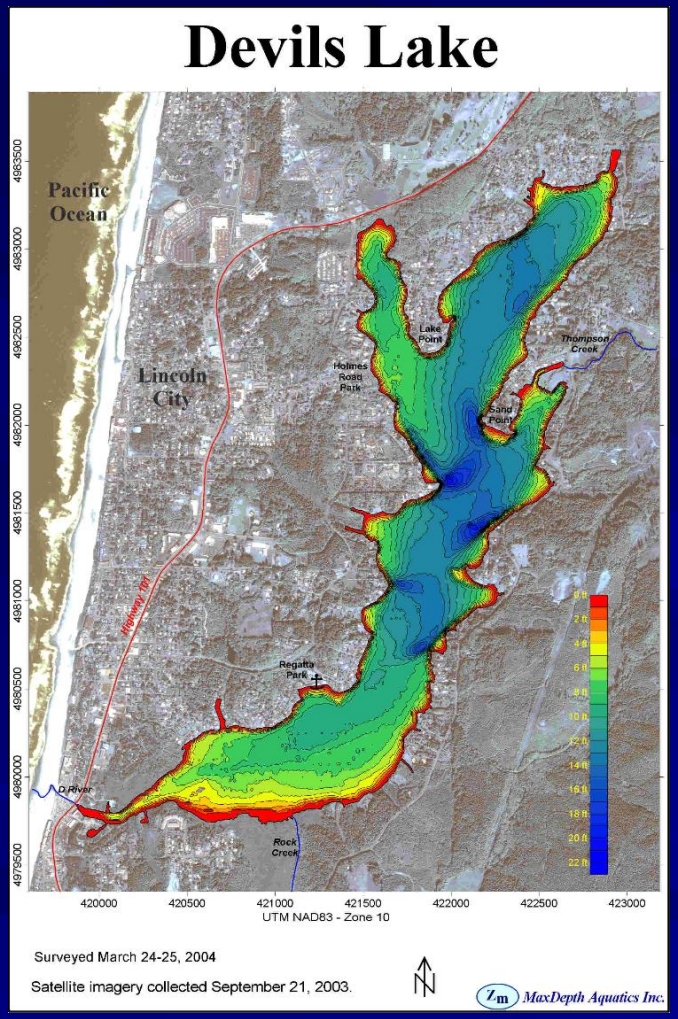
Thompson Creek Canal

- **Periodically Since 1970's canal has been re-dredged**

- **Large watershed upstream, more sediment transport**

- **Last parcel up canal, nearly cut off year-round**

Water Depths



Delake, Lincoln City's Playground

Researched, written, and compiled by Anne Hall

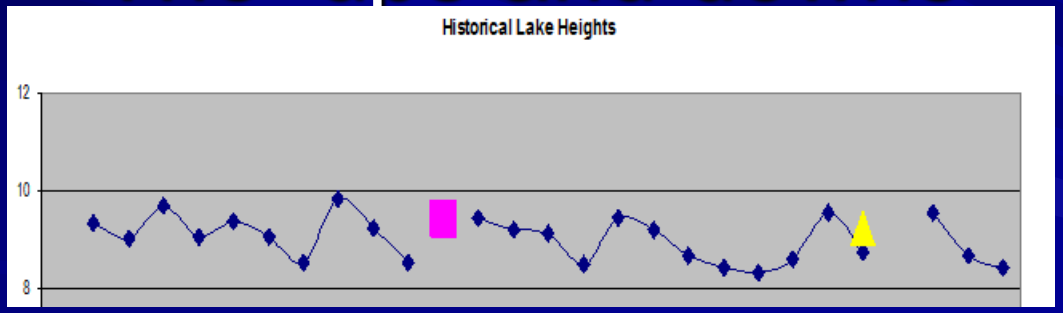
Delake was truly a playground in its early years. According to Vivian Reed, who along with her husband Robin planned the Rod and Gun Club, it was: "A place where deep sea fishing, lake and mountain stream fishing are available, as well as wild duck and other small game; deer, cougar, elk, moose, etc. A combination found in few places on earth… The lake isn't used as a play lake like it used to be. There were a lot of fish then, and there were boats all over. We even used to horseback ride on the beach."

Graphic design and layout by Debra Lumpkins, debralumpkins@gmail.com
All photographs courtesy of the North Lincoln County Historical Museum

2

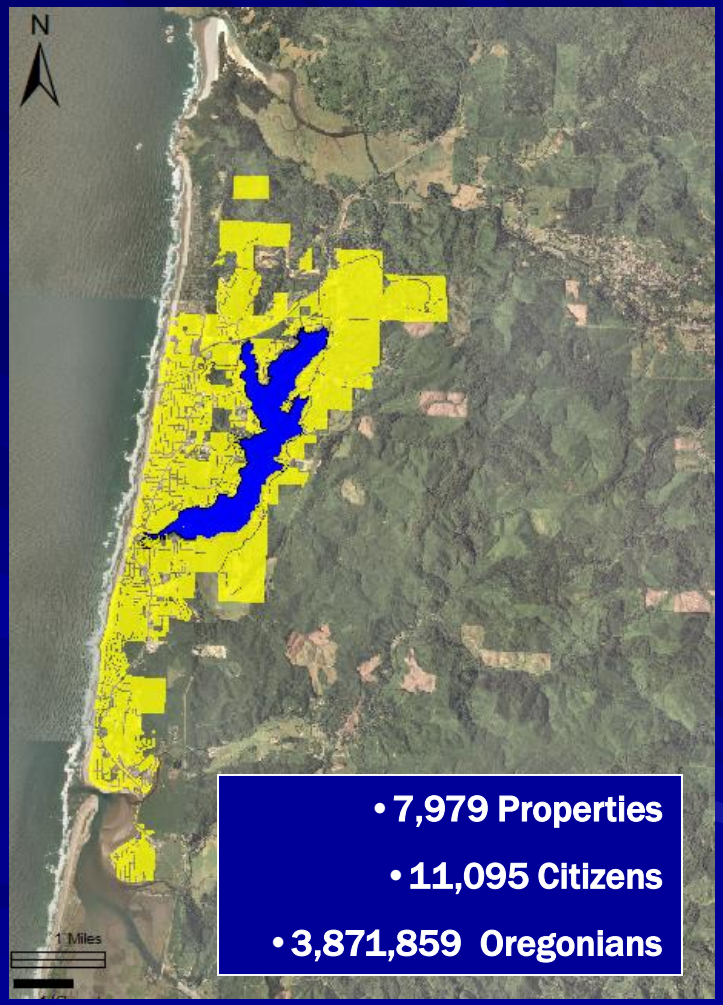
Evaluating Impacts

"The ups and downs"



DLWID Mission and Representation

- Improve
  - Water quality
  - Environment for fish, wildlife, and humans
  - Recreational opportunities
  - Safe and efficient navigation
  - Economy
- Increase
  - Public access
  - Public awareness and public education



Public Input 2015

- Written Correspondence

- Sheryl Smith – Remove the Dam
- Les Davis – Modify dam, retain 9.53’
- Patrick Apfel & Robert Olenick – oppose removal of dam
- John Flory – Find Win Win, open to modifying dam, but do not jeopardize water right

- Petition: remove the dam, discontinue the water rights
  - 90 signers

Natural Hydrology vs. Reservoir

- Decreases residence time inhibiting Harmful Algal Blooms
- Decreased tendency for erosion in summer
- Increase fish passage for Threatened Coho
- Reduced septic system connectivity
- Greater wave dissipation, less erosive force
- Less wave reflection, less erosive force
- Increased aesthetic value of Hostetler Park
- Improves wetland function & resilience
- Optimal conditions for shoreline vegetation
- Restores hydrology of watershed
- Most docks & boat houses built prior to dam

- Some docks built for higher lake levels
- Expands boat moorage options on some docks
- Some boat lifts optimally positioned for higher water

Considerations…

- Maintain Existing Policy & Structure – 9.0’
  - Summer only – Using existing structure
- Return to Maximum Impoundment – 9.53’
  - April 15 – October 15
- Replace Dam
  - Remove cement (all or part)
  - Use temporary structure (e.g. Sand bags, blocks)
  - Summer only or return to April – October
  - Set elevation (e.g. 9.0’ or 9.53’)
- Remove Dam & Return to Natural Hydrology
- Other?

Devils Lake Water Improvement District

DLWID

3788 SE High School Drive

PO Box 974

Lincoln City, OR 97367

(541) 994-5330

Board@DLWID.org

Lake.Manager@dlwid.org

www.DLWID.org