

# Nutrient TMDLs in Idaho

US Environmental Protection  
Agency  
2008

The background of the slide is a solid blue color. In the lower right quadrant, there are several concentric circles of varying shades of blue, resembling ripples on water. These circles are centered around the bottom right corner and extend towards the center of the slide.

# EPA National Goal #2

- “Restore and maintain oceans, watersheds, and their aquatic ecosystems to protect human health, support economic and recreational activities, and provide healthy habitat for fish, plants, and wildlife”.

- “The Clean Water Act seeks to improve water quality by maintaining and restoring the physical, chemical, and biological integrity of the nation's waters”



# History of Water Pollution Laws

- The Federal Water Pollution Control Act of 1948
  - Amended in 1972
  - Amended in 1977 (became known as “The Clean Water Act”)
  - Additional amendments in 1981, 1987, 1990.
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# What are Nutrients?

- Nutrients are substances which encourage the growth of plants.
- There are many substances considered nutrients or micronutrients
- Nitrogen
- Phosphorus

# How much phosphorus is too much?

➤ Trophic State	Total Phosphorus ( $\mu\text{g/l}$ )
• Ultra-Oligotrophic	<5
• Oligotrophic	5-20
• Mesotrophic	20-50
• Eutrophic	50-100
• Hypereutrophic	>100

# Eutrophication of fresh water is a growing problem worldwide.

- Some examples include:
  - The Great Lakes – Lake Erie
  - The Chesapeake Bay
  - Hypoxia issues in the Gulf of Mexico – Mississippi River drainage



# Why Phosphorus? Why Now?

- Phosphorus is the prime cause of eutrophication in fresh water ecosystems.
- Phosphorus concentrations in surface water in the Pacific Northwest are historically low.
- Species and ecosystems in Idaho have evolved in this low nutrient (oligotrophic) environment.

- The actions of humans have greatly increased the amount of phosphorus in surface waters.
- Excess phosphorus results in degradation of aquatic systems which can result in the following issues:



- Nuisance populations of algae and macrophytes
- Severe dissolved oxygen sags
- Loss of native species
- Increase in un-desirable species
- Taste and odor problems in drinking water
- Occasionally, serious toxicity issues with cyanobacteria may occur.

- Loss of revenue from recreational activities
- Water can have a noxious odor
- Loss of aesthetic value of surface waters





# Idaho 2003 Fishing Survey

- 48,000 surveys sent by mail
  - 12,000 each quarter to reduce memory bias
  - selected randomly from 2003 license holders
  - 1500 per IDFG Region each quarter
  - 1500 to non-residents each quarter
  - follow up reminder postcards sent twice
- Last mailing complete in January, 2004
- 25,583 valid returns
- Valid sample for all Idaho counties and 176 waters with sample size of > 20 returns



# Angler Spending in Idaho

2003

- **\$438 million spent**
- **\$1093/angler/year**
- **\$112/day**
- **41% spent by non-residents**
- **\$279/day non-resident**

2001 (national)

- (\$409 million)
- (\$100/day)
- (\$983/angler/year)

# Top Waters in Idaho

➤ Coeur d'Alene Lake	<u>92,000 trips</u>	\$6.7 million	\$73/trip
Brownlee Reservoir	83,000 trips	\$11.4 million	\$139/trip
➤ Henry's Fork	59,000 trips	<u>\$23 million</u>	\$393/trip
➤ Middle FK Salmon	8,787 trips	\$16 million	<u>\$1895/trip</u>

# Reason for Fishing

## ➤ Extremely Important

- For relaxation, to be with family or friends
- Fun of catching a fish
- To be outdoors and experience an unpolluted natural surrounding

## ➤ Least Important

- To obtain trophy fish or win a prize
- To obtain fish for eating

# Excess TP in Reservoirs and Lakes

- Vegetation increases until cyanobacteria (blue green algae) out competes other plants.
  - Green algae populations decline.
  - Beneficial macrophytes are shaded out and decline or disappear because sunlight doesn't penetrate "bloom" of cyanobacteria.
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- The background of the slide features several concentric, glowing blue circles that resemble ripples on water, scattered across the lower half of the image.

- Deeper growing plants cannot carry out photosynthesis due to a lack of light.
- When the lake/reservoir stratifies the lower, dark hypolimnion layer becomes anoxic.
- Summer fish kills can and do result.



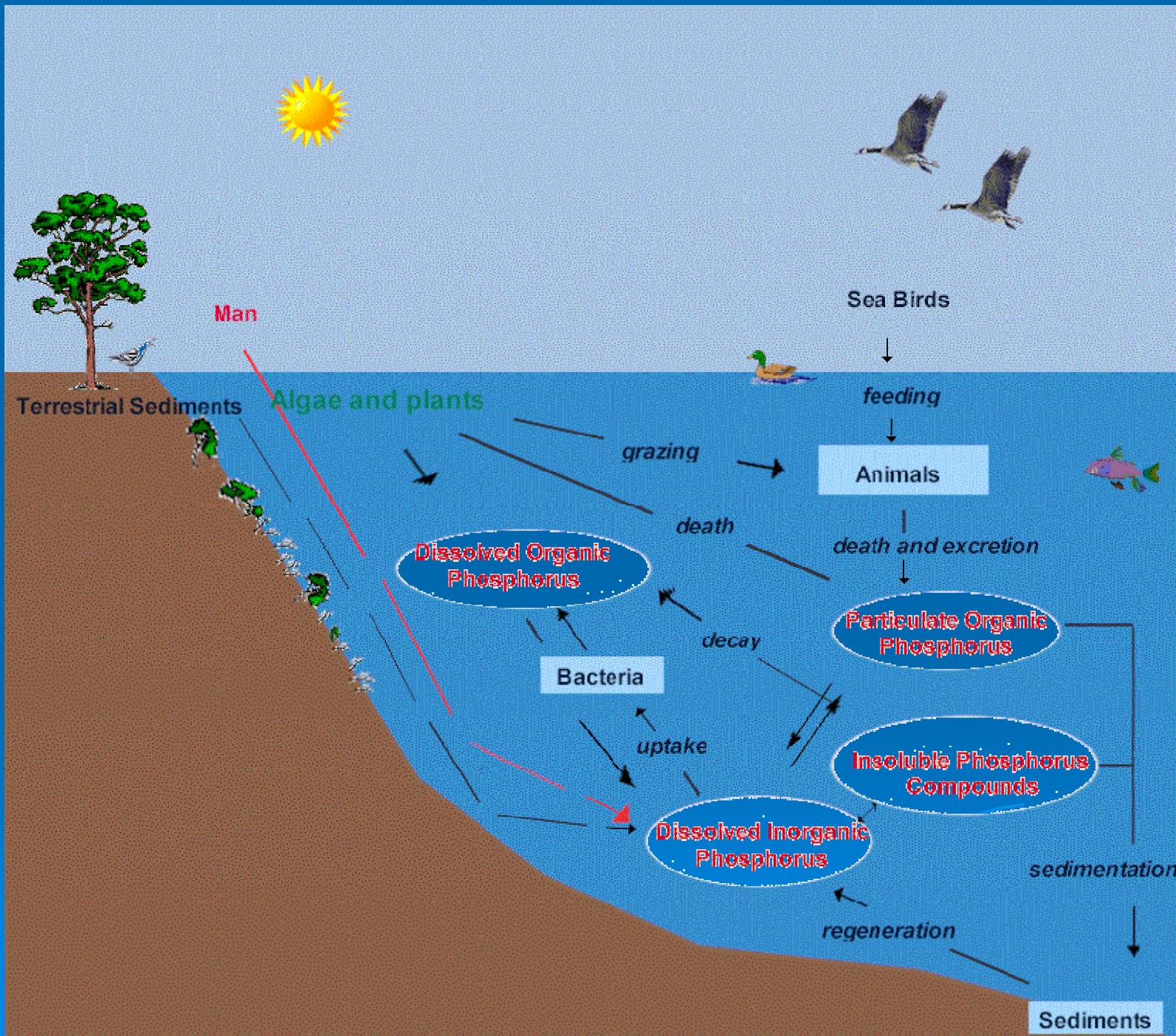


# How do cyanobacteria out compete other plants?

- Phosphorus is not a component of the atmosphere.
- Nitrogen is a major component of the atmosphere.
- When the TP concentration in the water is high enough, cyanobacteria have the ability to “fix” atmospheric nitrogen.
- Other green algae or plants cannot do this.







# Excess TP in Rivers and Streams

- Periphyton growth will increase to nuisance proportions (app. 200 mg/m<sup>2</sup>)
- Macrophyte growth to extremely dense levels.
- Dissolved oxygen sags.
- Loss of species diversity and usable habitat.
- Loss of aesthetics and recreational use.(\$)



# What are the sources of Phosphorus in surface water?

- Runoff from farms
  - Municipal stormwater
  - Livestock waste
  - Decomposing organic matter
  - Industrial dischargers
  - Laundry and dishwashing detergents
  - Municipal wastewater treatment plants
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# How are Wasteload Allocations Set in TMDLs?

- Each TMDL is unique and methods vary.
- Natural background is determined.
  - Reference conditions?
  - Ecoregions?



- An analysis is done to determine how much TP above natural condition will support beneficial uses of the waterbody.
- A load capacity for TP is determined and a margin of safety is applied.
- Load allocations and wasteload allocations are determined.



