

# Phosphorus in Lake County Lakes

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Health Department and  
Community Health Center



Summerhill Estates Lake, Lake County IL

# **LCHD – Ecological Services**

- **Data collected 1988-2014 on 165 lakes**
  - **All 165 lakes have been monitored at least once since 2000**
    - **Monitor each lake ~5-7 years**
  - **Parameters**
    - **Nitrogen, Phosphorus, Alkalinity, Solids, Chloride/Conductivity, Water Clarity, DO, pH**
  - **Aquatic Vegetation**
  - **Shoreline**
  - **Beaches**

# Why Focus on Phosphorus?

Periodic Table of the Elements

1 H																	2 He														
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne														
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar														
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr														
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe														
55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une	110 Uun									111 Nh	112 Fl	113 Mc	114 Lv	115 Ts	116 Og								
			58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu															
			90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr															

Legend:

- hydrogen
- alkali metals
- alkali earth metals
- transition metals
- poor metals
- nonmetals
- noble gases
- rare earth metals

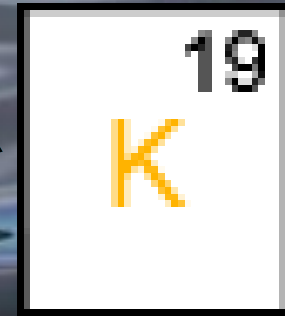
Nitrogen



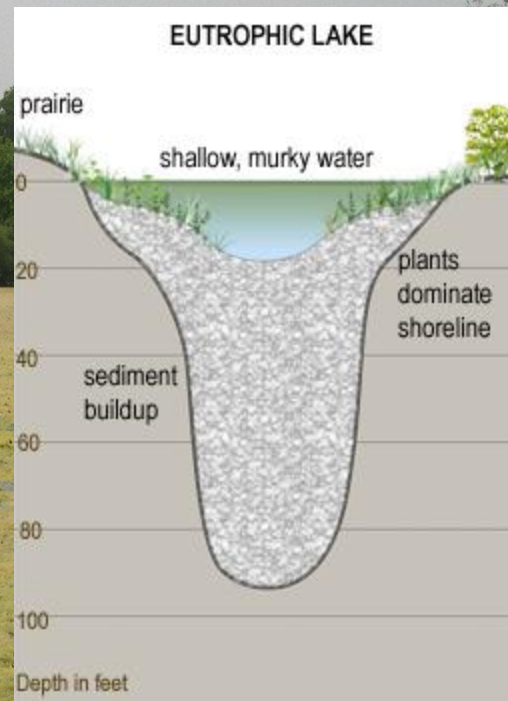
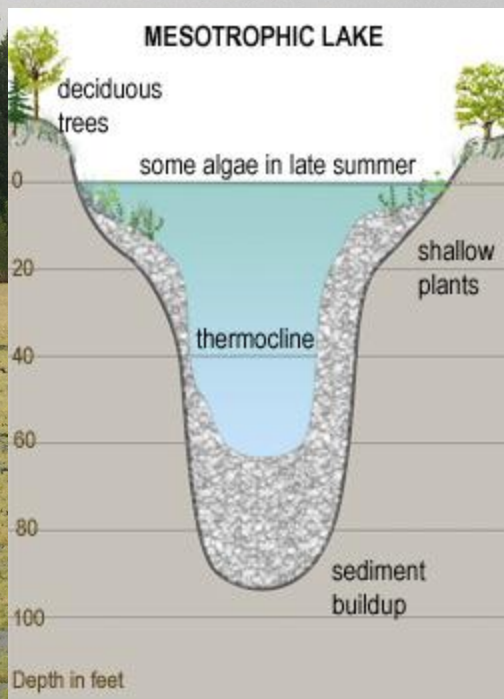
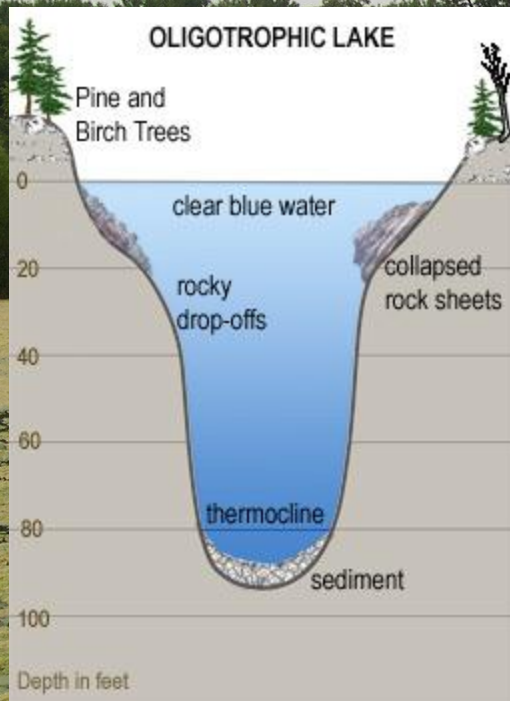
Phosphorus



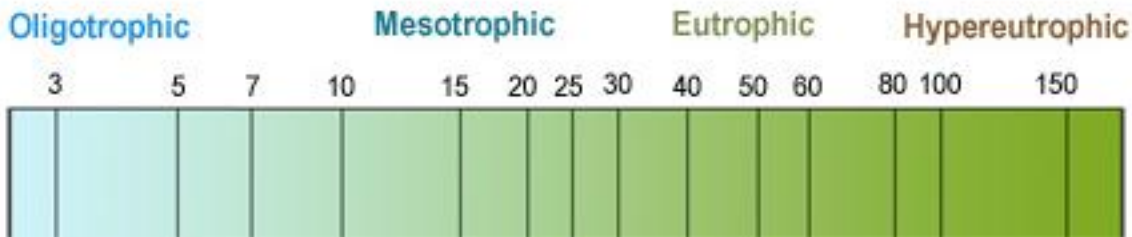
Potassium



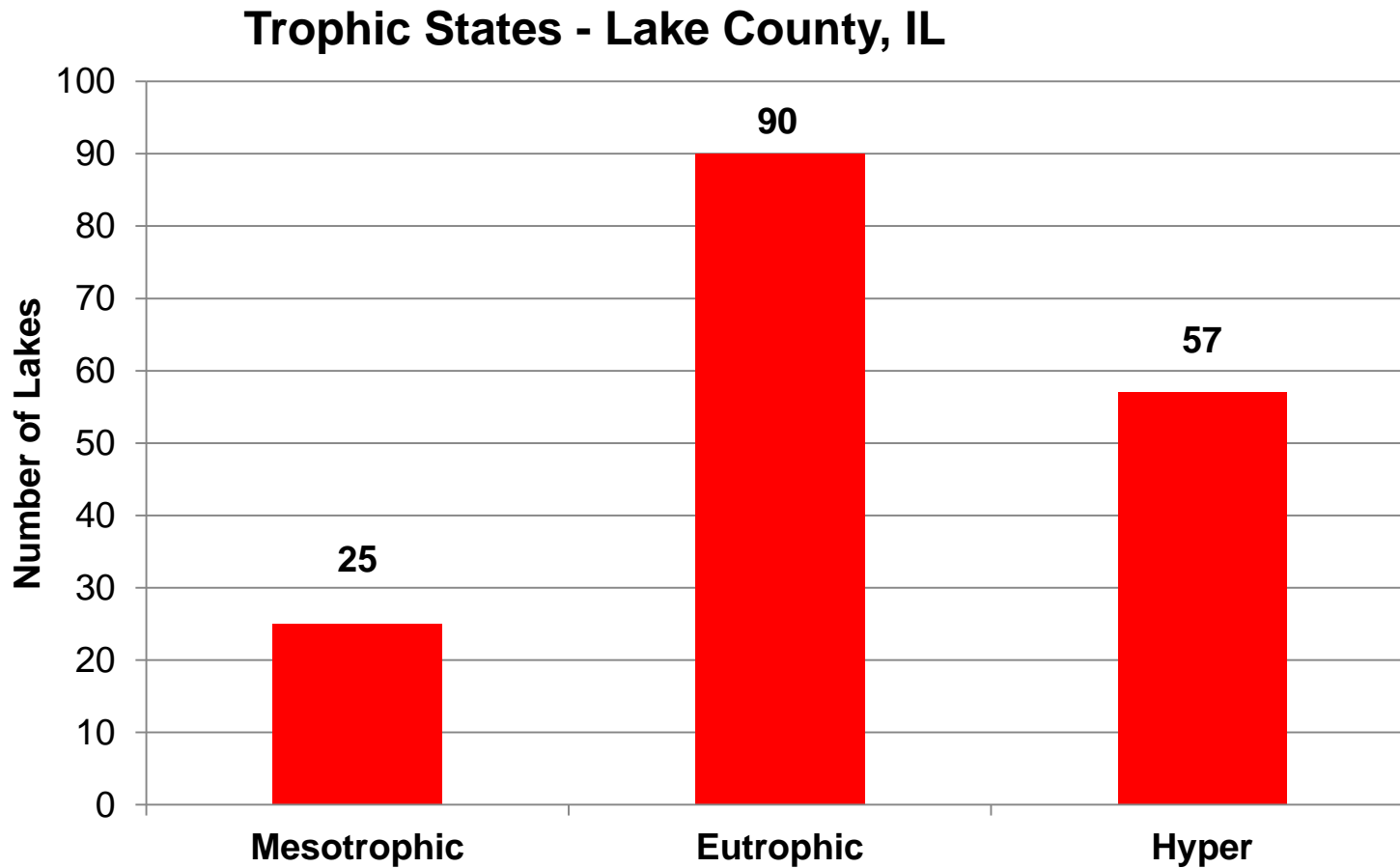
# Lake Response to Phosphorus



**Total Phosphorus (ppb) related to Lake Trophic State**

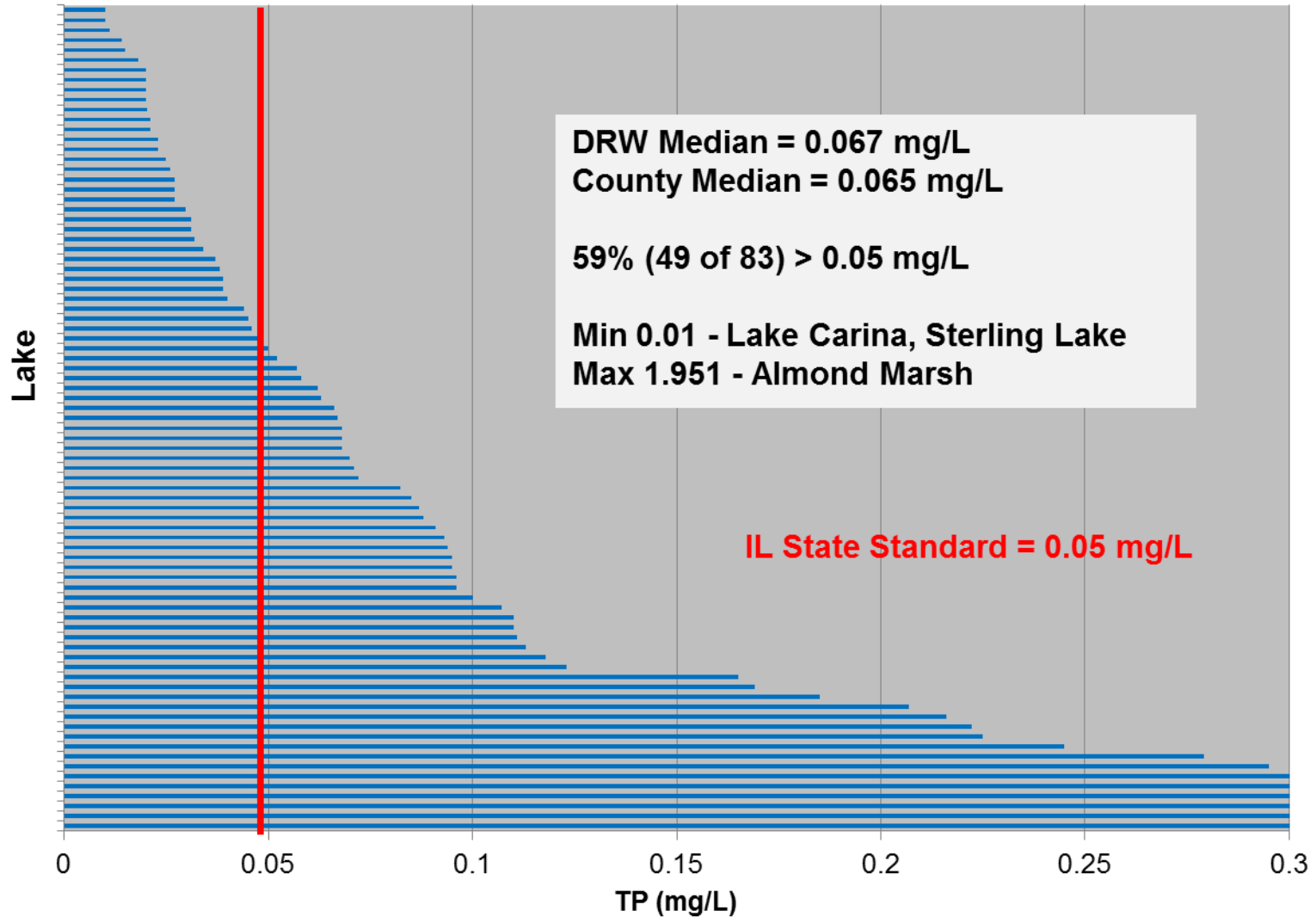


# Trophic State Index



# Des Plaines River Watershed Lakes (Lake Co.)

## Phosphorus



# Nutrients - where do they come from?

- External

- Origin and Morphology

- Watershed

- Lawns, fields, STPs, bank erosion, septics, etc.

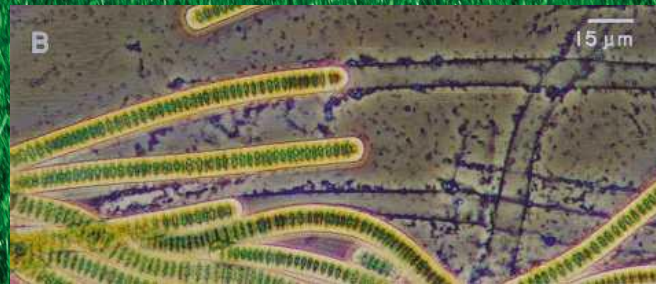
- Atmospheric



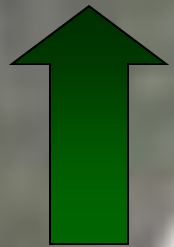
- Internal

- Recycling

- Legacy



# Effects of Eutrophication Driven by Phosphorus to Water Quality

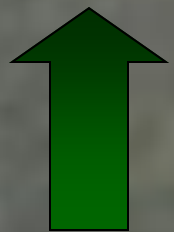
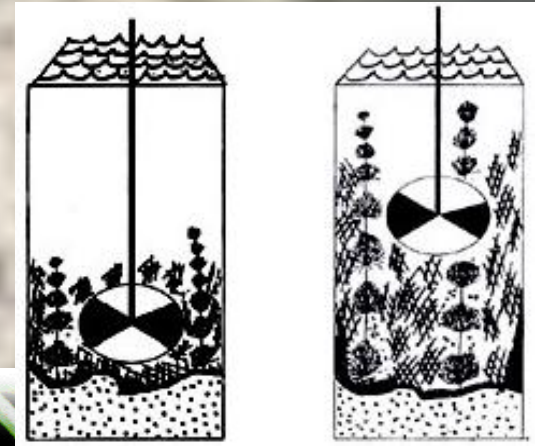


**Algae Blooms**

**Aquatic Plant Growth**



**Water Clarity**



**Fish Kills**





# Economic Damages due to Eutrophication

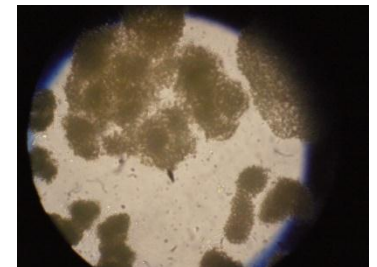
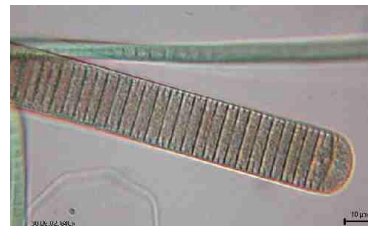
- Land Value
- Boating
- Fishing
- Swimming
- Health Issues-Blue Green Algae



# Harmful Algae Bloom (HAB) Toxins

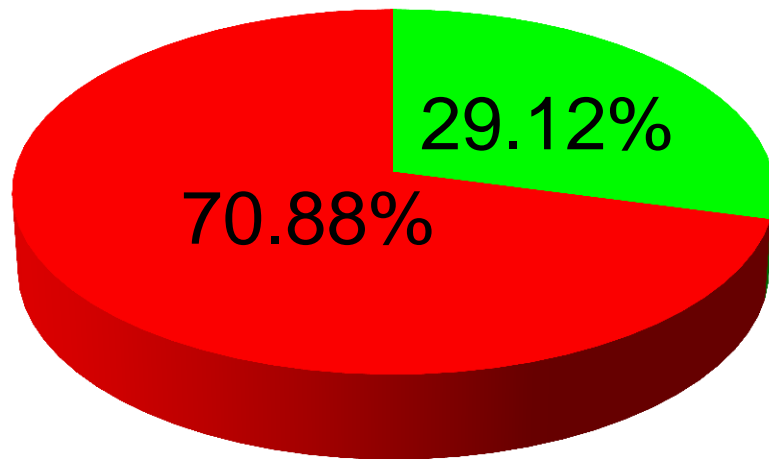
## Cyanobacteria (blue-green algae)

- Neurotoxin
- Hepatoxin



# Routine Beach Monitoring -2013

HAB - Non Detect	53/182	29.12%
HAB > 0.15 ppb	129/182	70.88%



28 of 30 lakes

- HAB - Non Detect
- HAB > 0.15 ppb

# World Health Organization (WHO) Guidance Values

Relative Probability of Acute Health Effects (Advisory Level)	Microcystin-LR (ug/L)	Total Cyanobacteria (cells/mL)
Low	<10	<20,000
Moderate	10-20	20,000-100,000
High	20-2,000	100,000-10,000,000
Very High	>2,000	>10,000,000

The World Health Organization (WHO 1999)

# CDC Reporting & Literature

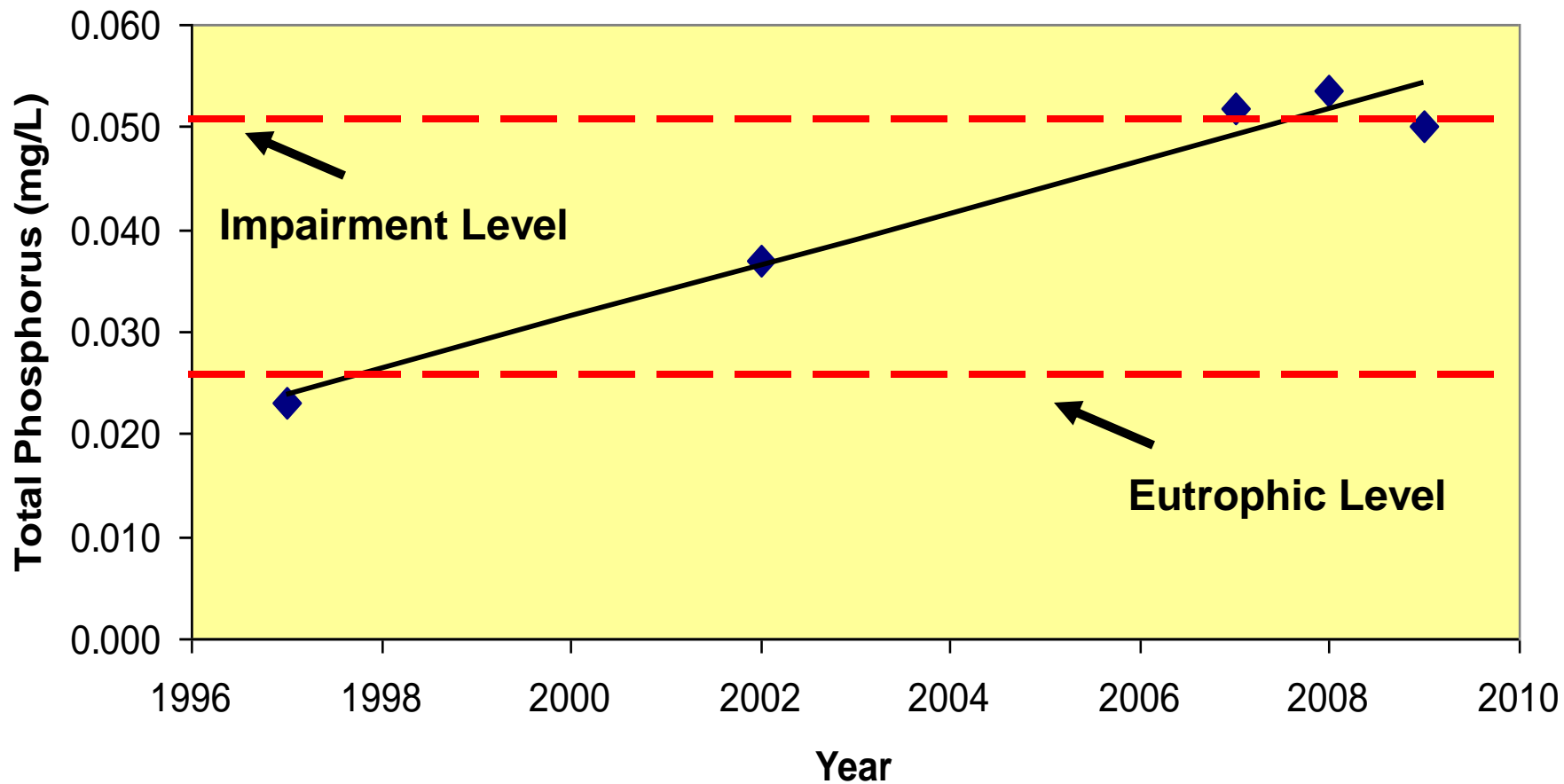
- Recreational Water–Associated Disease Outbreaks — United States, 2009–2010, MMWR 63 (01); 6-10, January 2014
  - “Of 24 outbreaks associated with untreated recreational water venues (e.g., lakes), almost half (46%) were confirmed or suspected to have been caused by cyanobacterial toxins.”
- Dodds WK, Bouska WW, Eitzmann JL, et al. Eutrophication of U.S. freshwaters: analysis of potential economic damages. Environ Sci Technol 2009;43:12–9
  - “Closing or not using U.S. freshwater lakes for recreational activities because of hypereutrophication (i.e., HABs) is estimated to cost \$0.37–1.16 billion per year”

# Impaired Lakes

- 366 Lakes Assessed Statewide
  - 313 Listed as Impaired
- 193 Impaired for Total Phosphorus
- 76 Lakes TMDL Development for TP
- Half of these are in Lake County

**HAIG POINTE DETENTION BASIN**  
**Vernon Hills, IL**

## Total Phosphorus Trend for Diamond Lake 1997-2009



# Land Uses in the Indian Creek Watershed

## •Major Land Uses

•**Single Family 29.3%**

•Agriculture 14.9%

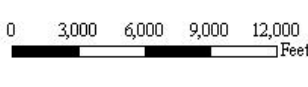
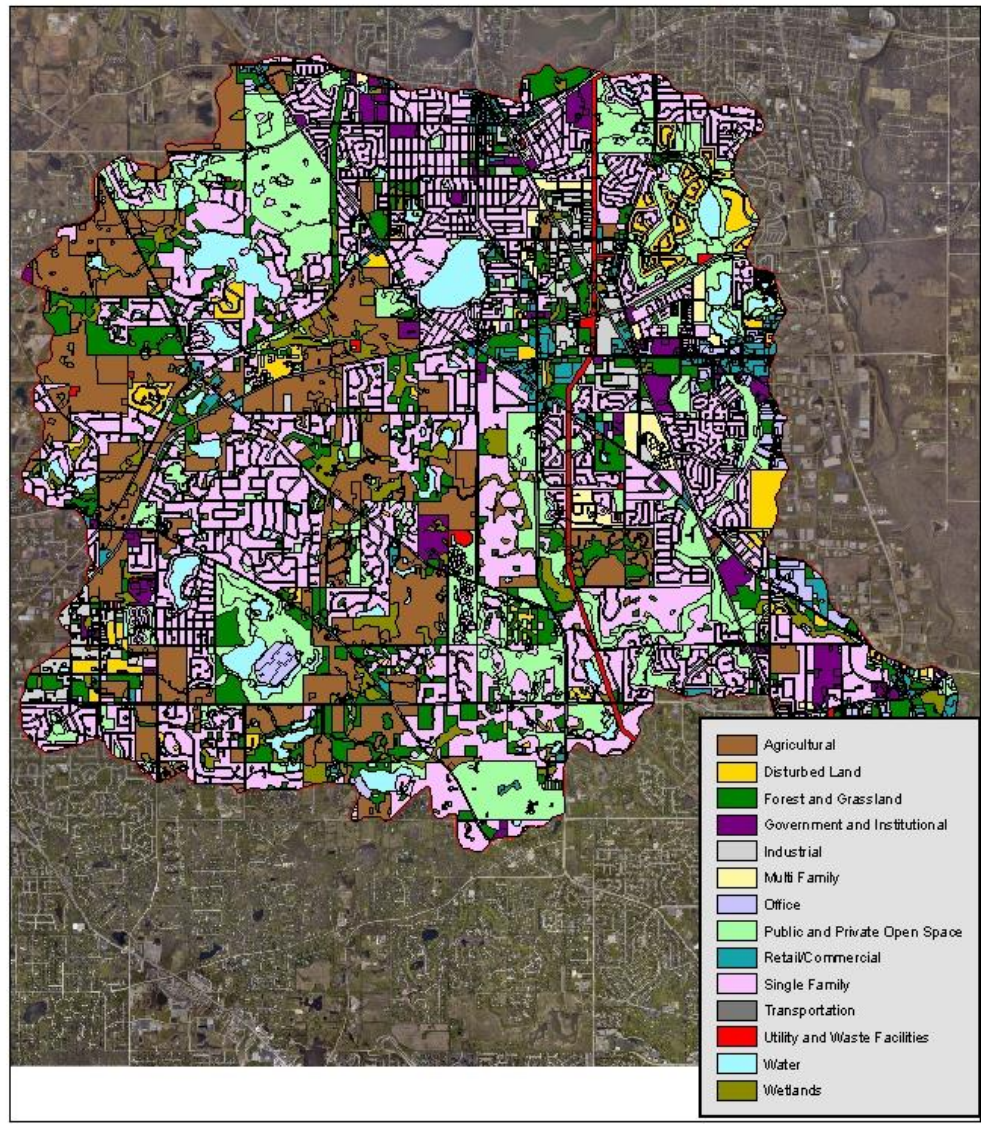
•Public and Private Open Space 13.3%

## •Major Runoff Based on Land Uses

•**Transportation 36.7%**

•Single Family 30.6%

•Retail/Commercial 8.1%



Lakes Management Unit  
Indian Creek Landuse  
Revised 4/2010



# 1 lb of Phosphorus can produce 300-500 lbs of Algae!

1.50lb  
Bag of  
Fertilizer



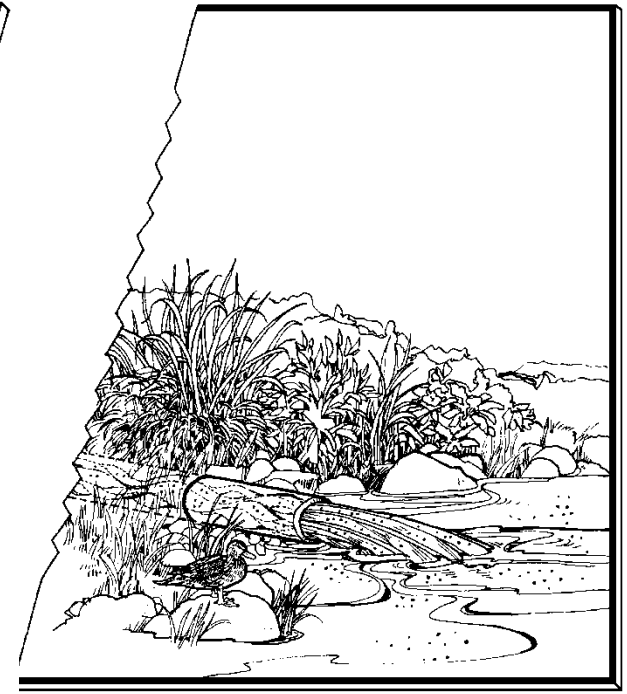
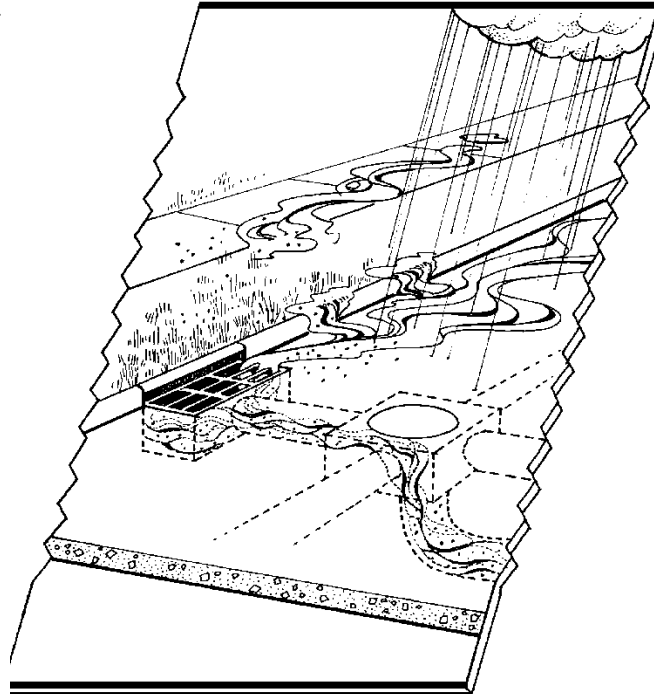
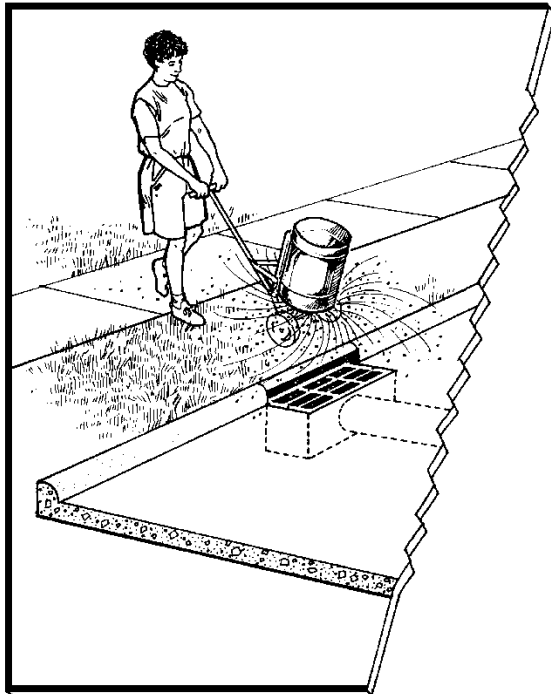
=5lbs of  
Phosphorus

90% absorption  
=0.5 lbs of Runoff

=250lbs of Algae

X 40 Homeowners around a lake = 10,000 lbs of Algae

X 40,000 Homeowners in a watershed = 10,000,000lbs of Algae





**Van Buren bans use of phosphorus fertilizer**

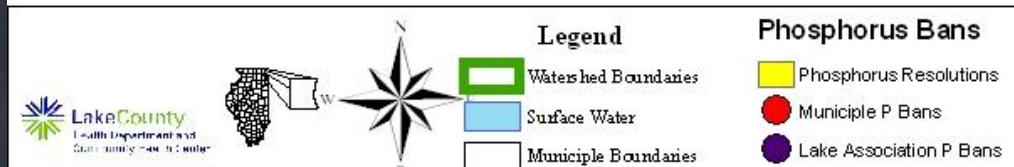
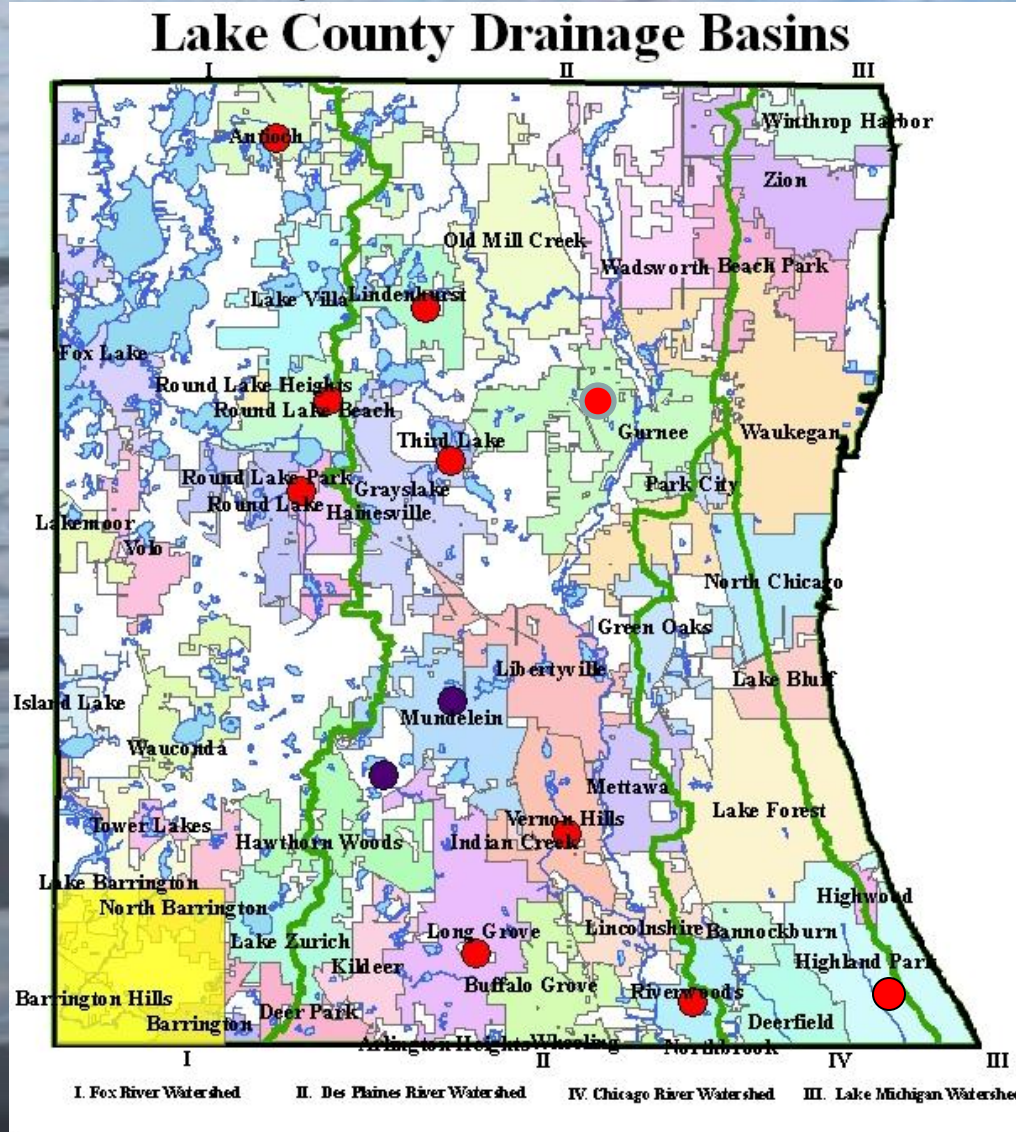
**New phosphorus lawn fertilizer law aims to protect Minnesota lakes and rivers**

**Cazenovia seeks to ban use of phosphorus in Cazenovia Lake watershed**

**Annapolis Bans Use of Lawn Fertilizer Containing Phosphorus**

**Wisconsin lawmakers discuss possible ban on phosphorus in lawn fertilizers**

# Lake County Phosphorus Bans



# Now Therefore, Be It Ordained

- No Commercial or Non-Commercial Applicator shall apply any Fertilizer which contains any amount of phosphorus.
- The Village Prohibits the Application of Fertilizer Containing Phosphorus to Any Lawn or Turf Area and Any Impervious Surface, Drainage Way, Wetland or Buffer Zone
- Signs proclaiming the law must be posted anywhere that sells Fertilizer.

# Exceptions

- Soil Tests Confirm a Phosphorus Deficiency
- Does not apply to Flower Beds and Vegetable Gardens
- Farming or Agricultural Business
  - provided the use of fertilizers is related to the growth of a product or maintenance of growing fields

# Enforcement

- Enforced by the Chief of Police and Director of Planning, Zoning, and Building
- Any Entity found in violation of this ordinance shall be liable for penalties not less than \$250.00 and not more than \$750.00 per violation.

- **EDUCATION**



# Statewide Ban

- Commercial Applicators
- State-owned land



# Industry Response





# Questions?



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