



Protecting the Water Quality of Ontario's Inland Lakes

Evaluating impacts of shoreline development

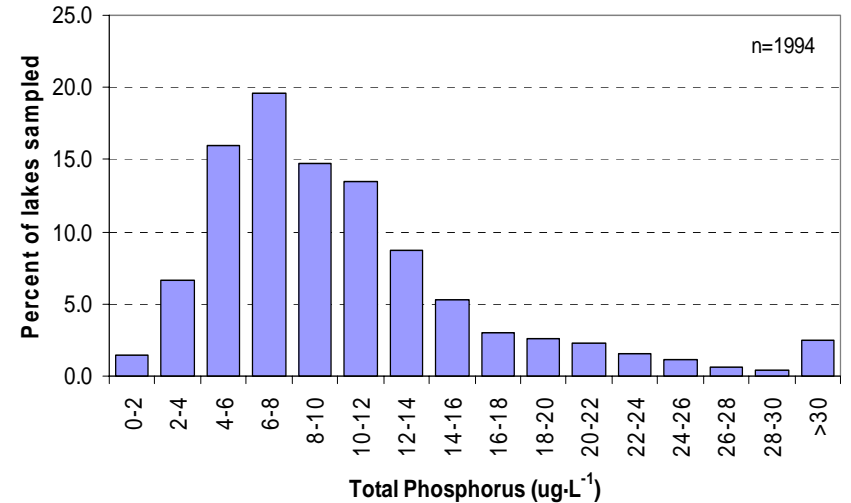
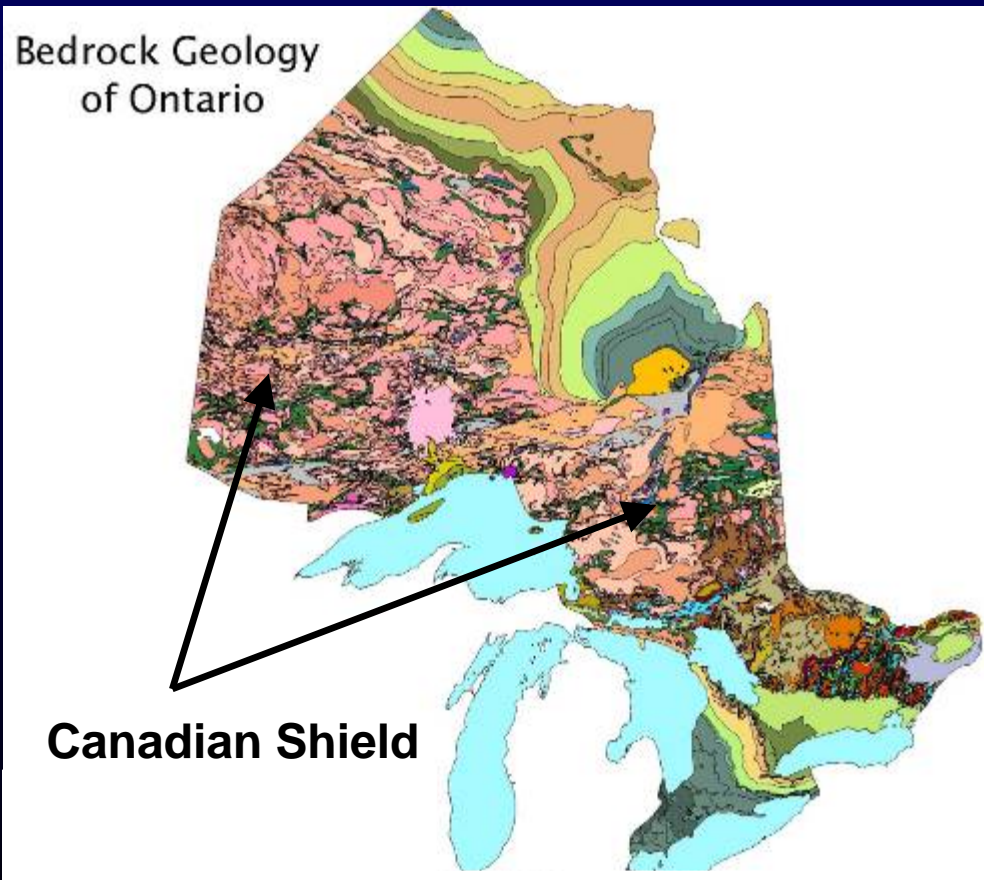
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Eastern Region**

Summary of Presentation

- Overview of water quality impacts related to shoreline development
- Role of phosphorus and dissolved oxygen
- The “At-Capacity” Designation
- Brief description of the Lakeshore Capacity Model

Ontario's Inland Lakes



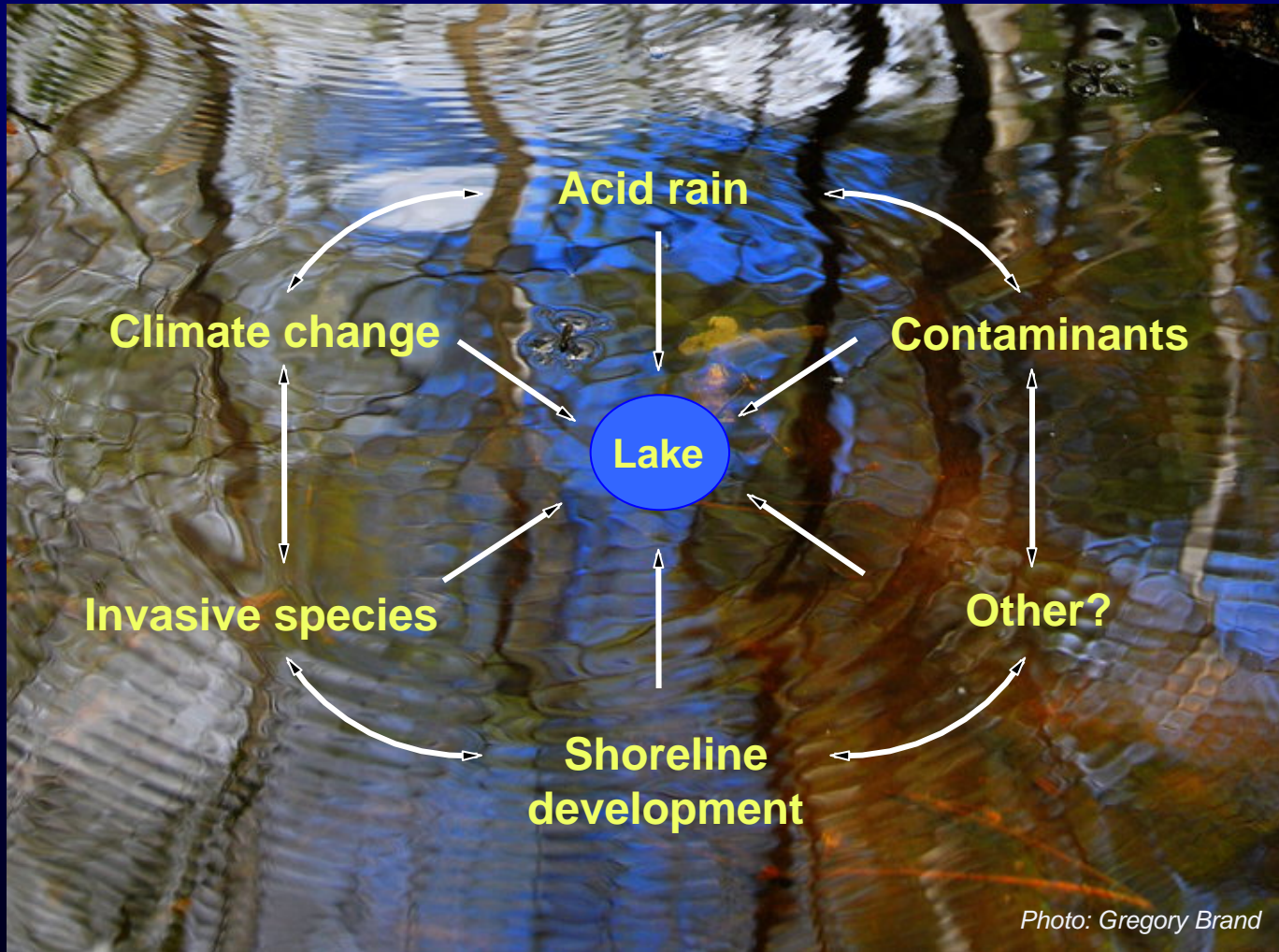
- ~250,000 lakes greater than 1 ha in size
- majority on Canadian Shield
- water quality is generally good

The economic value of clean water in Ontario

- ~2 million adult anglers per year
- \$1.2 billion in fishing gear, boats, etc.
- \$1.3 billion in activities related to fishing
- \$1 billion annually on recreational boating
- commercial fisheries (~\$42.5 million)
- water-related tourism (~\$5.5 billion)

(Source: Economic Services Branch, MOE, 1997)

Threats to water quality of inland lakes



IMPACTS TO LAKES

- Shoreline development
- erosion, fertilizers, impermeable surfaces
- Septic tank disposal systems
 - Contaminants (ie. pharmaceuticals)
 - Phosphorus
 - Nitrogen
 - Bacteria

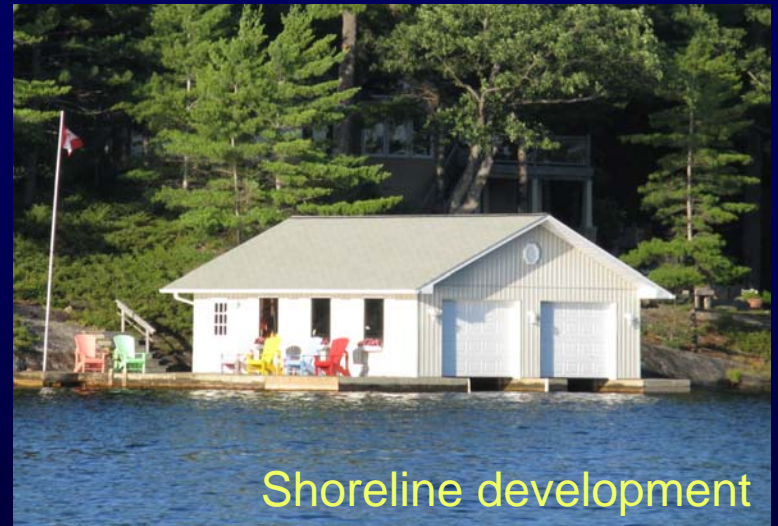
DEGRADATION OF LAKE QUALITY

- DEVELOPMENT = NUTRIENT INPUT
- INCREASED LEVELS OF PHOSPHORUS AND NITROGEN
- PROMOTES ALGAE AND AQUATIC PLANT GROWTH
- CAUSES DECOMPOSITION AND CONSUMES OXYGEN
- REDUCES AMOUNT OF DISSOLVED OXYGEN – IMPORTANT LAKE TROUT

Phosphorus- the link



Algae blooms
Photo: Kathryn Hargan



Shoreline development

Nutrient enrichment is one of the primary water quality concerns in Ontario's inland lakes



Algal blooms:

- 1) Reduced water clarity**
- 2) Loss of deep-water oxygen**
- 3) Taste and odour**
- 4) Toxins**



What factors control the growth of algae?

- 1) Light/water clarity
- 2) Temperature
- 3) Biological factors
- 4) Nutrients...

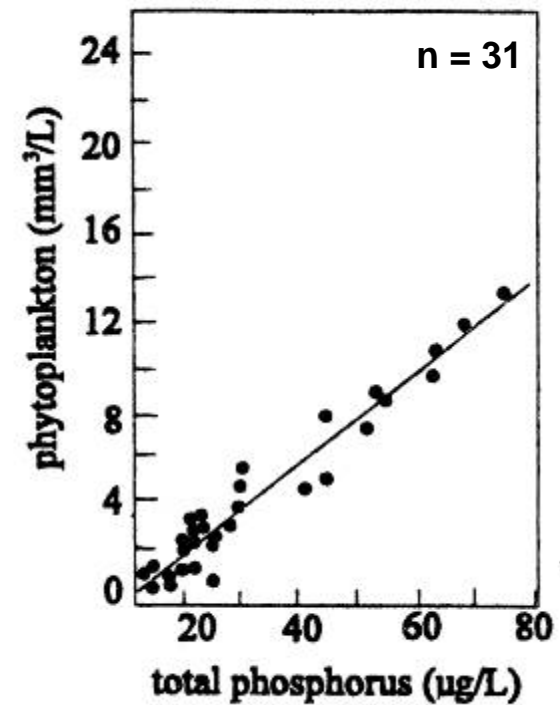
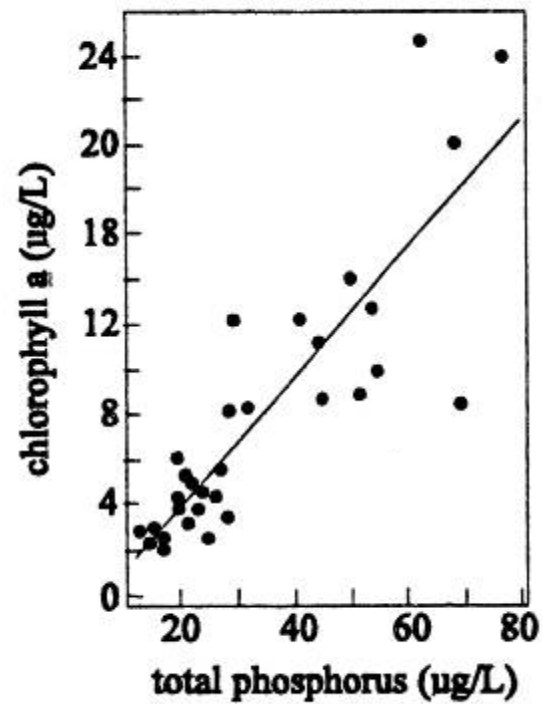
C, N and *Phosphorus*



C, N

(Courtesy: Fisheries and Ocean Canada)

The importance of phosphorus → algae



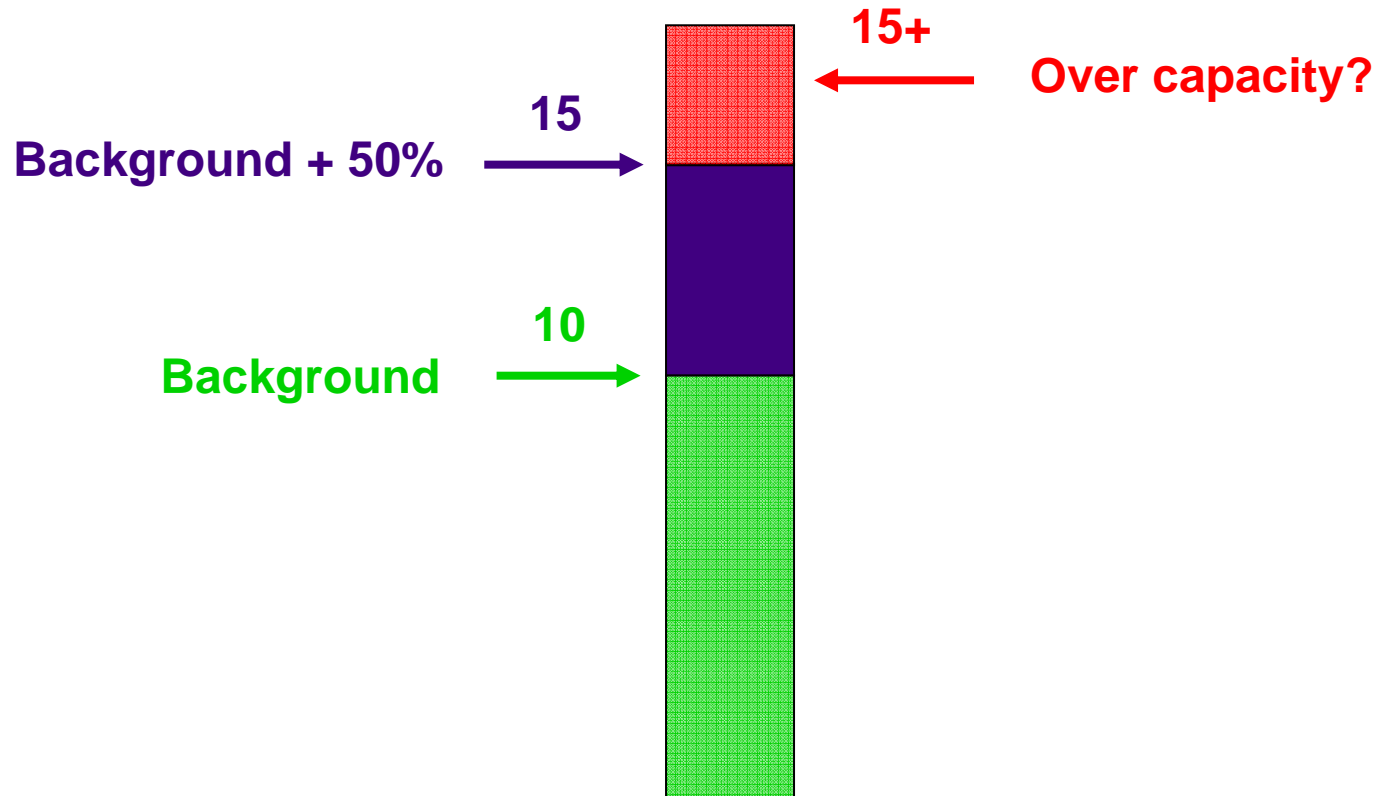
At Capacity Designation

- What are the thresholds?
- Lake Trout Lakes – 7 mg/L dissolved oxygen
- If < 7 mg/L lake is considered At-Capacity
- If > 7 mg/L not At-Capacity
- How much more development?

At Capacity Designation

- Recreational Lakes – background phosphorus plus 50%
- $>$ Background plus 50% lake may be At-Capacity
- $<$ Background plus 50% TP not At-Capacity
- How much more development?

Revised guideline for phosphorus



New PWQO = background + 50% of pre-development TP

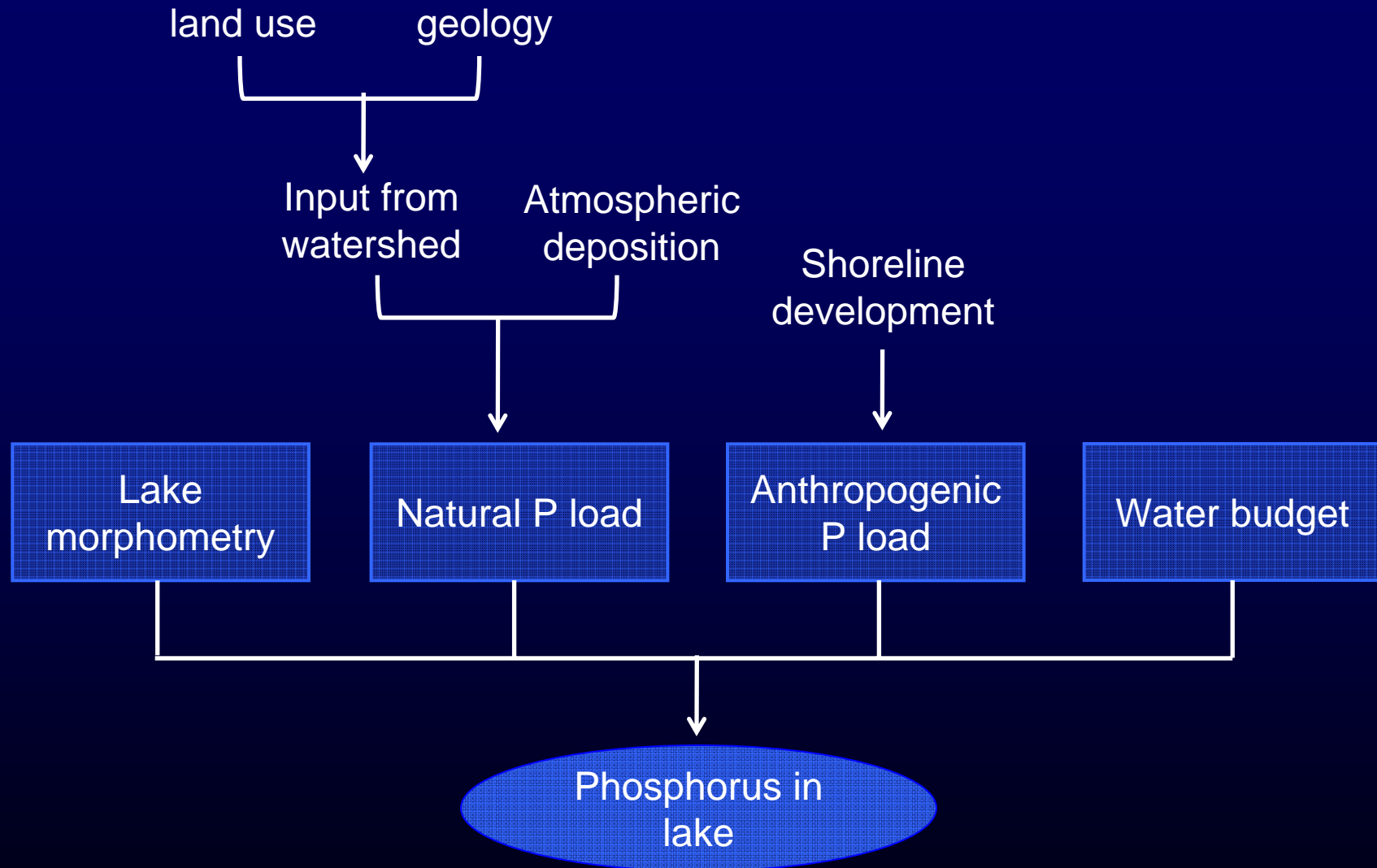
When is development permitted on at-capacity lakes?

- Setback of tilebed greater than 300 metres from highwater mark
- Vacant lots of record
- Drainage to a non-sensitive watershed
- Severing of property with existing dwellings and septics
- Redevelopment of existing land uses that result in no net increase in phosphorus

How does the Lakeshore Capacity Model work?



P budget for a lake



1 What would be the impact on water quality (phosphorus) of adding X number of new lots?

- risk assessment

2 How much development (ie. number of new lots) can be added before water quality (phosphorus) is degraded beyond a given end-point?

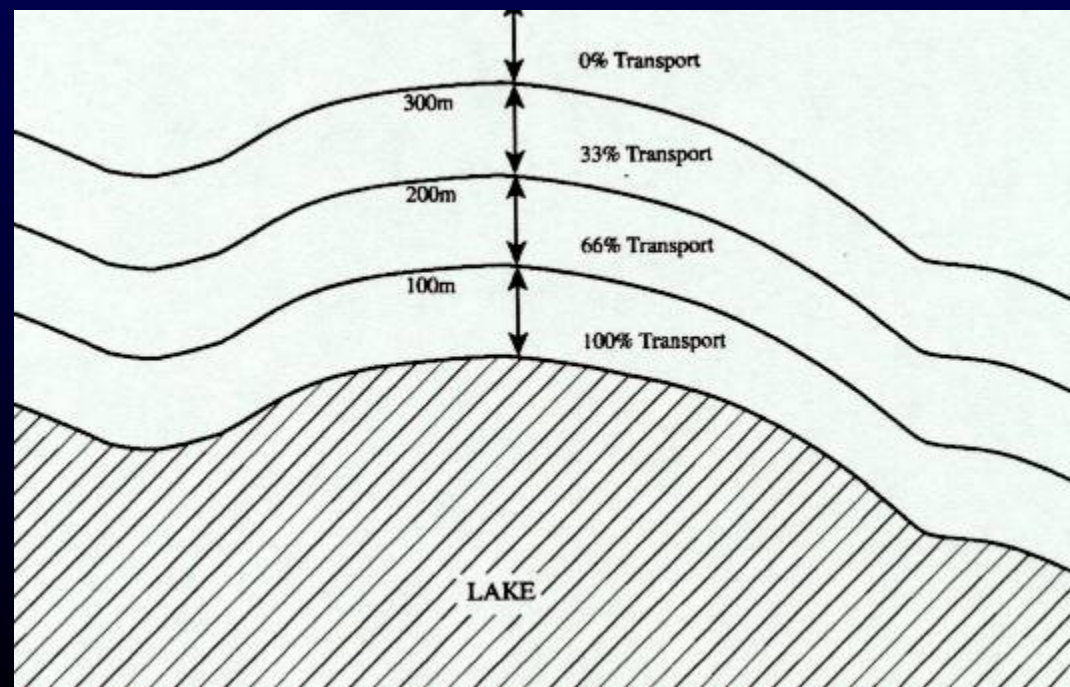
- currently 10 micrograms/L

- proposed guideline: natural + 50%

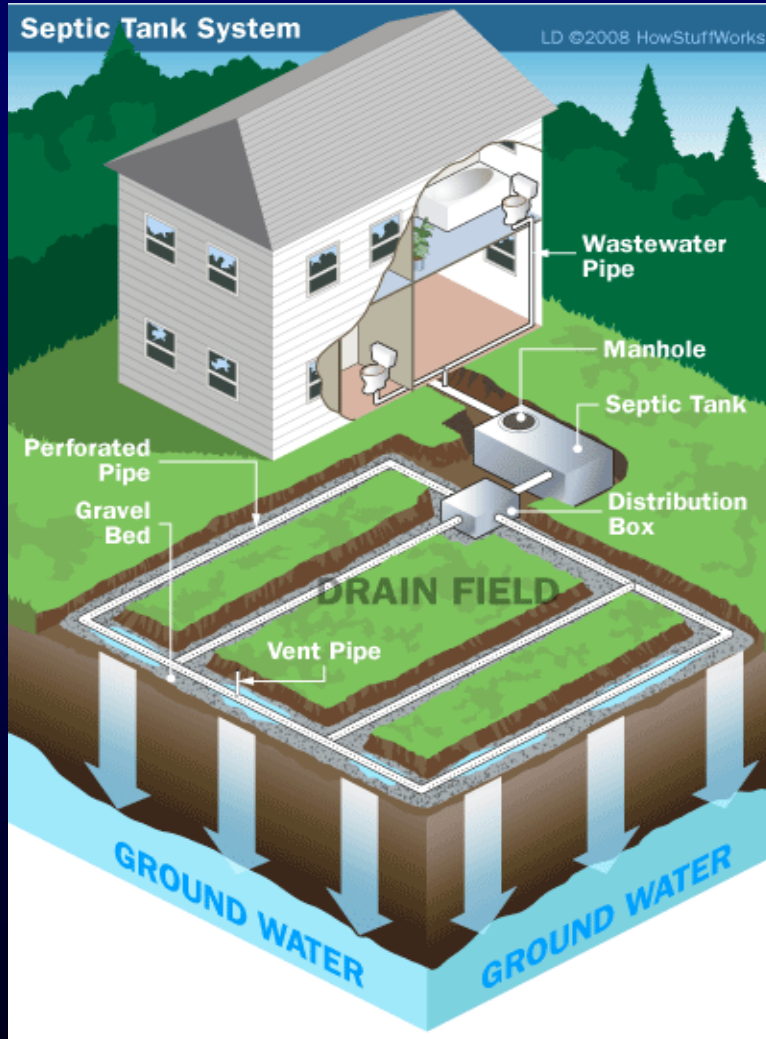
Major assumptions

1) 100% of phosphorus from septic/sewage systems (within 300 metres) reaches lake

- precautionary approach
- lag effects



Attenuation of septic system P in soils



“Precautionary Principle”

- all septic system TP eventually reaches lake

P attenuation can occur by:

adsorption to charged surfaces of sediments
(temporary to permanent)

precipitation/mineralization

of Fe/Al complexes as insoluble minerals

(P may remobilize if soil becomes saturated)