The Influence of Lake Age and Watershed Condition on Lake Eutrophication in Kansas

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Mean Chl-a 20 Federal Lakes 1985-2005
By 3 Year Time Periods

Prepared by KDHE BEFS
October 21, 2005
Max Chl-a 20 Federal Lakes 1985-2005
By 3 Year Time Periods

Prepared by KDHE-BEFS
October 21, 2005
Federal Lakes Chl-a
Versus Gross land Use

Prepared by KDHE-EEFS
March 15, 2005

Chlorophyll-a (µg/L)

Lower Ag

Higher Ag
Federal Lakes TP
Versus Gross land Use

Prepared by KDHE-BEFS
March 15, 2005

Total Phosphorus (ug/L)

0 20 40 60 80 100 120

Lower Ag

Higher Ag
Dam Age Taken From The ACOE Dam Safety Database

Http://crunch.tec.army.mil/nid/webpages/nid.cfm
Watershed Land Use Taken From Physical Surveys
The Four Groups of Smaller Lakes

(“Good” and “Poor” Refer to the Potential for Lower Nutrient Loadings)

NG: Newer Lake/Good Quality Watershed
NP: Newer Lake/Poorer Quality Watershed
OG: Older Lake/Good Quality Watershed
OP: Older Lake/Poorer Quality Watershed
Lake Age by Group

Prepared by KDHE-EEFS
March 18, 2004

Age (years)
0  20  40  60  80  100

NG  NP  OG  OP
Watershed Pollution Risk by Group

Prepared by KDHE-BEFS
March 18, 2004
Lake Surface Area by Group

Prepared by KDHE-BEFS
March 18, 2004
Lake Retention Time by Group

Retention Time (years)

NG
NP
OG
OP

Prepared by KDHE-BEFS
March 18, 2004
Mean Chlorophyll-a by Group

Prepared by KDHE-BEFS
March 18, 2004
Selected Correlation Analyses

Trophic State

Lake Age versus

Chlorophyll-a = 0.11
Total Phosphorus = -0.13
Total Nitrogen = -0.16
Secchi Depth = 0.02

Watershed Condition versus

Chlorophyll-a = 0.68
Total Phosphorus = 0.50
Total Nitrogen = 0.61
Secchi Depth = -0.73
Macrophyte Community Surveys Had Been Conducted for 6-8 Lakes In Each Grouping. Therefore, Aquatic Plant Community Metrics Could Also Be Examined.
Macrophyte Community by Group

Prepared by KDHE-BEFS
February 10, 2005
Charophytes or Stoneworts
Macrophyte Community by Group
Charophyte Abundance

Prepared by KDHE-BEFS
April 10, 2006
Myriophyllum and Ceratophyllum
Macrophyte Community by Group
Myriophyllum+Ceratophyllum Abundance

Total Cover X % Myrio.+Cerato.

NG  NP  OG  OP

Prepared by KDHE-BEFS
April 10, 2006
Selected Correlation Analyses

Macrophyte Community

Lake Age versus
- Frequency = 0.25
- Richness = 0.08
- Diversity = 0.13
- Charophytes = 0.22

Watershed Condition versus
- Frequency = -0.05
- Richness = -0.42
- Diversity = -0.45
- Charophytes = -0.43
Conclusions

Overall, time has no observable impact on trophic state development in Kansas lakes (over about a century). There may be evidence of a time driven trend for some aspects of the macrophyte community.

Over several centuries?

However, watershed condition exerts tremendous impact on trophic state, apparently over short time frames.

Collectively, the larger lakes in Kansas will achieve hypereutrophic status sometime around 2030 if the observed trend holds.

Lakes in high quality watersheds, regardless of age, tend to approach the conditions describing “reference” waterbodies.

The good news.......Of the two variables, time versus land uses, watershed condition is something we CAN influence directly. The big question.......Will society find the will to exert that influence?