SENECA LAKE WATERSHED LAND USE
LAND COVER VS. NUTRIENT LOADING

ABSTRACT

The purpose of this study was to identify a relationship between the amount of agricultural lands and the nutrients found within seven subwatersheds of the Seneca Lake watershed. This study broke up the land use land cover in the watersheds into three categories, urban/industrial/residential, agriculture including orchards, and Forests/scrub. This data of the land use land cover was then compared with nutrient data found in a previous study by John Halfman. The study found a possible relationship between the land cover and the nutrients but determined that there was more acting on the subwatersheds than the land use land cover alone.

Table 1. This table breaks down the land are by percent of the total dividing the watersheds into three categories. The percents do total one hundred percent because there are certain land types that were left out such as transition lands and wetlands that are both incorporated in the total of each watershed.

	% Industrial/urban/ residential	% Agricultural	% undevoloped/ forest
Wilson	0.26	92.9	2.4
Reeder	15.13	70.7	13.8
Plum	0.38	59.6	10.8
Keuka	2.5	90.6	6.9
Kashong	0.42	71.4	7.6
Catherine	1.8	18.5	76.4
Big stream	0.27	31.3	64.1

BMPS

- Cultural BMPs minimize nutrient inputs to waterways through land management practices
- Structural BMPs change the transport of the pollutant to waterways through physical means
- BMPs save the lake from the increasing nutrient levels and prevent the depletion of nutrients in the agricultural land
- Farmers are far more likely to implement BPMs if they are taught by Extension Educators and given incentives (Herendeen, 2009)
- Examples of BMPs from nearby watersheds: winter manure spreading being eliminated, manure management, fertilizer use reduced, subsurface drainage tiles, grass filter strips, contour tillage, roof water separation, fall tillage curtailed, cover crops, cattle fenced out of stream, gully plugs

	Total Flux(kg/ day)
Wilson	434.40
Reeder	103.40
Plum*	45.00
Keuka	5186.60
Kashong*	602.40
Catherine*	10256.60
Big stream*	263.70

Table 2. This table shows the amount of total nutrient and suspended solids being put into the lake by each of the 7 streams in kilograms per day. Note that the largest contributor is the watershed with the largest area.*

*Stripmine in watershed

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Figure 1. Is a map depicting the land use land cover of the subwatersheds within Seneca lake that were looked at in this study. The urban/industrial/residential is represented by yellow, agriculture including orchards is represented by red, and Forests/scrub are represented by green.

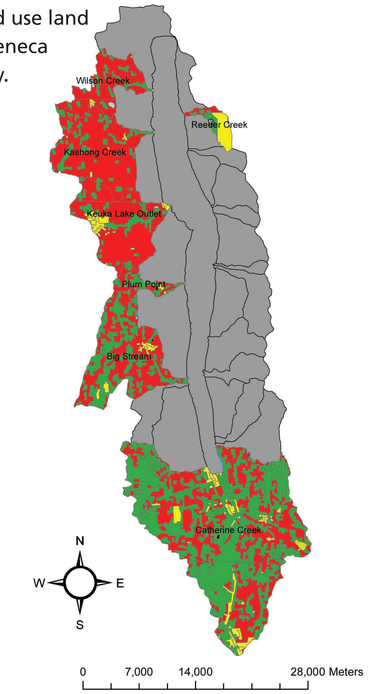

Figure 2. (Minnesota DOA) This is a picture of a few BMPs that can contribute to a reduction of nutrients in the waterways.

RESULTS

This study found that there was a small relationship between the amount of agricultural lands and the proportions of nutrients. What was realized from the data we found was that the percent agriculture does not show which ones are impacting the lake the most but the watersheds that might be most effected by the implementation of BMPs. This is important because if BMPs are implemented in a watershed such as Catherine creek their effect will be minimal because there is not much agricultural land so therefore the nutrients must be coming from something besides the agricultural land. Therefore in the places with a smaller amount of agriculture and large nutrient loads other studied must be done to see what the sources of the nutrients are.

- Amount of nutrients is controlled by the size of the watershed not percent agricultural lands
- Catherine creek and big stream had largest amount of forestland
- Catherine creek is found to have smaller proportions of nutrients but larger suspended solids
- highest nitrate and silica levels are found in Plum creek but it also had the lowest total input (Table 2)

INTRODUCTION

- We hypothesize that there will be lower nutrient levels but higher suspended solid levels in the areas with higher percent forested area
- This will help determine what subwatersheds
- Seven subwatersheds:Wilson creek, Kashong creek, Keuka Lake outlet, Reeder creek, Plum Point, Big Stream, Catherine Creek
- Other studies have shown that nutrient loading can be related to the amount of agricultural land in a watershed (Allan, 1997, Evans, 2008, Makarewicz, et.al., 2008, Herlihy et. Al. , 1998)
- Nutrients studied: nitrate, total phosphate, dissolved phosphate, silica and total suspended solids

Table 3. This table shows the percent of the total each of the nutrients represents for each of the seven subwatersheds. Notice that Catherine creek has the highest forested percent and the lowest nutrients and highest suspended solids.*

	Nitrate % daily flux	Phosphate % Daily Flux	Dissolved Phosphate % Daily Flux	Silica % Daily Flux	Total Suspended Solids %daily flux
Wilson	7.87	0.41	0.32	11.56	79.83
Reeder	10.83	0.77	1.16	24.27	62.96
Plum*	16.89	0.00	0.22	37.56	45.33
Keuka	3.41	0.15	0.08	3.36	93.00
Kashong*	9.91	0.28	0.17	15.59	74.05
Catherine*	0.36	0.08	0.03	4.92	94.60
Big stream*	8.95	0.30	0.87	27.65	62.23

*Stripmine in watershed

CONCLUSIONS

- There did not seem to be a strong relationship between the percent agriculture in the subwatershed and the amount of nutrients being put into the Lake
- The amount of wetland may be controlling the nutrients in the watershed.
- BMPs will have the greatest effect in areas where there is more agricultural land
- The Keuka outlet, Kashong Creek and Wilson Creek subwatersheds be considered for implementation of BMPs
- Three highest agricultural land cover as well as the three highest fluxes*
- Through the implementation of BMPs in these subwatersheds Seneca Lake might be able to greatly reduce the nutrient fluxes into the lake

*except Catherine creek

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