Lake Mendota:

Tracking Nonpoint Phosphorus and Nitrogen

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Image taken by Robert Darlington

Research Question

- Lake Mendota overland flows
  - Nitrogen and phosphorus
- Eutrophication → Summer algal blooms
- Correlated land use types

Background on Mendota and Key Concepts

- Historically eutrophic lake
- Phosphorus and Nitrogen run off exacerbates eutrophication
- Different land covers produce different levels of nutrient run off
- Nutrients move downstream, polluting entire watershed

Data Collection Methods

- Identify sampling sites
- Sampling and testing timeline
- Equipment
  - Thermometer
  - Gloves
  - Bottles
  - Secchi Disc
  - Cooler
  - Nitrogen test strips and Phosphorus test kit
- Procedure

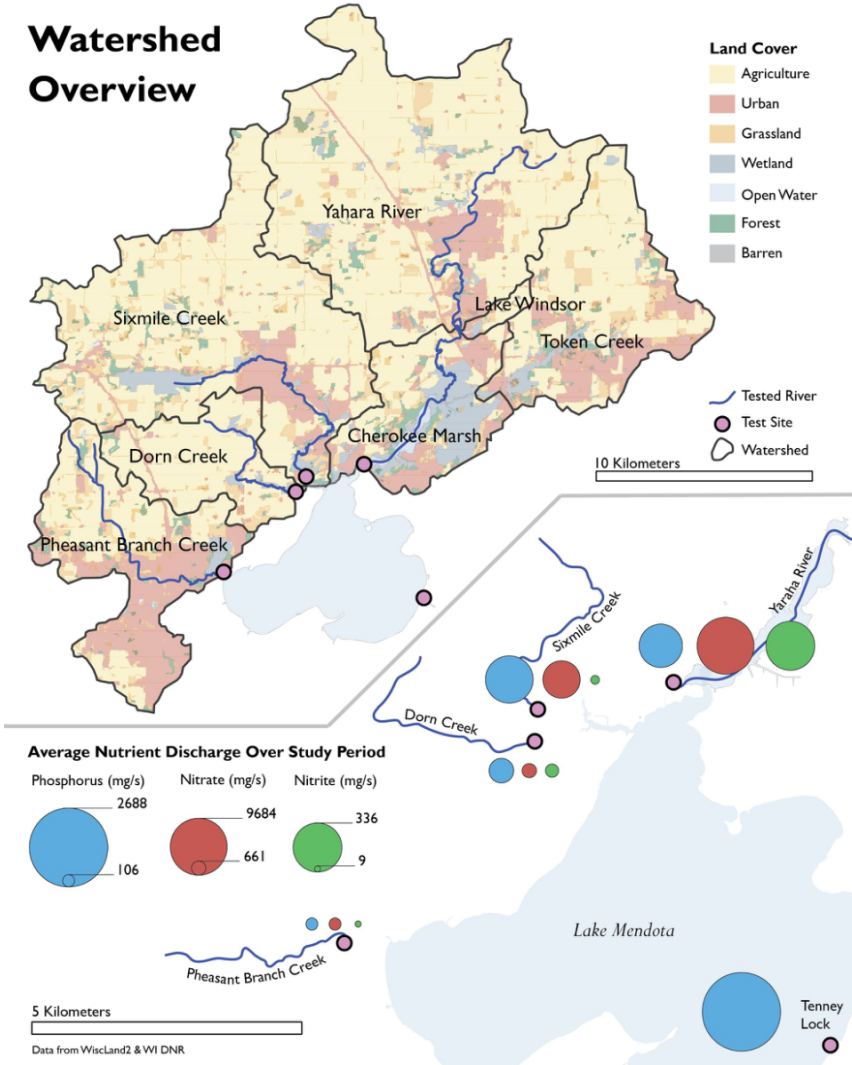
Images taken by Robert Darlington & City of Burnsville, MN

Analysis Methods

- Convert nutrient ppm measurement to mg/s discharge rate
  - USGS daily discharge measurements for streams (cubic feet/sec)
  - 1ppm = 1mg/L
  - ppm -> mg/L -> L/cubic ft -> cubic ft/sec -> mg/sec
- Determination of Sub-watersheds
  - WI DNR delineation
  - Major inputs into Mendota
- Nutrient discharge and land cover type correlation
  - Pearson Correlation Coefficient
  - 1 = strong positive correlation, 0 = no correlation, -1 = strong negative correlation

Sampling Sites

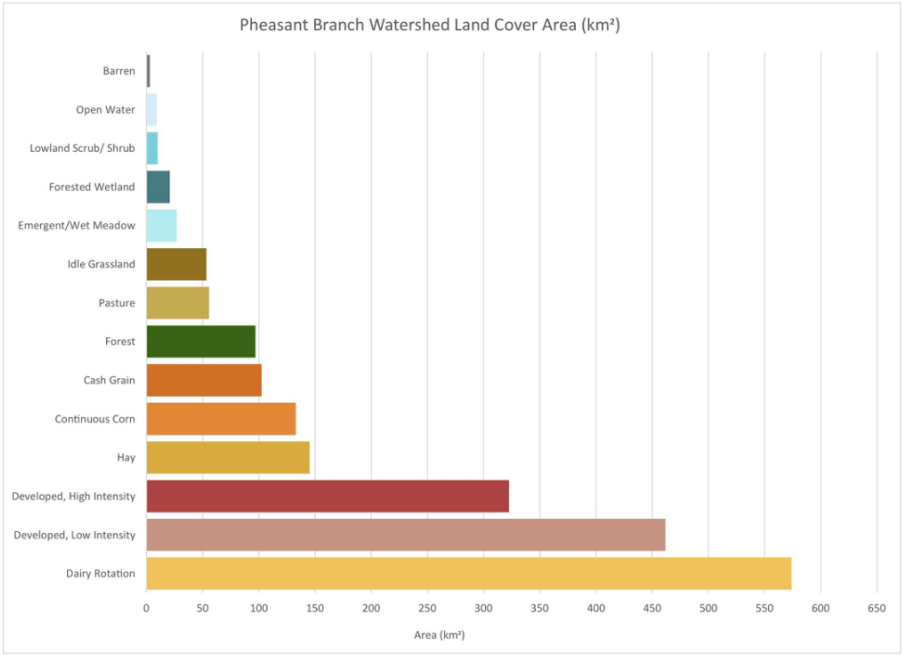
- 4 Major subwatersheds
- Yahara is consolidated
- Average discharge over 4 weeks

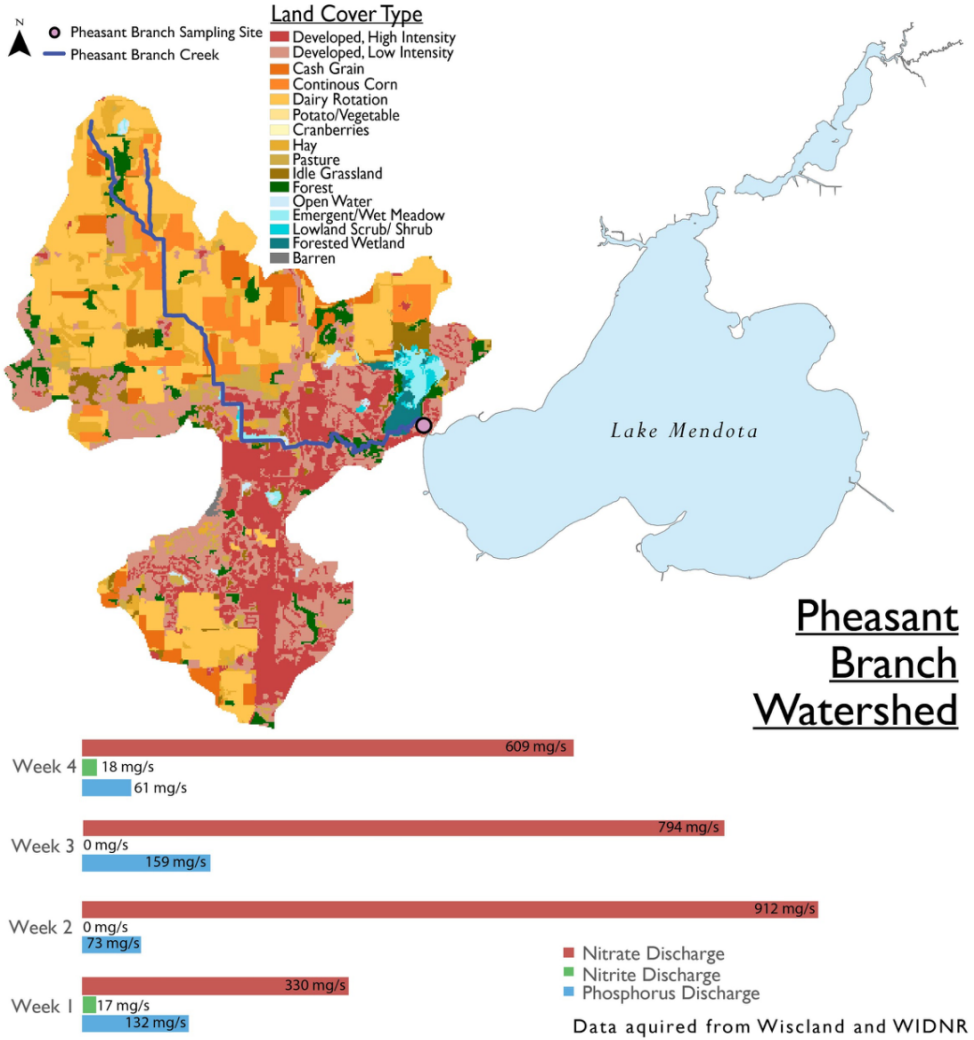


Pheasant Branch Creek Sampling Site, Middleton, Wisconsin

Image taken by Will Sherer

Pheasant Branch Creek

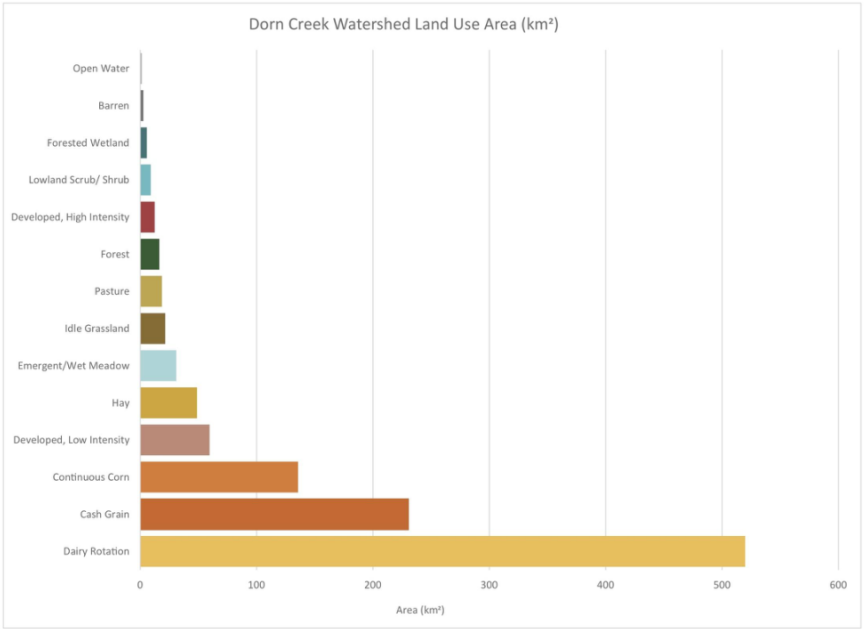


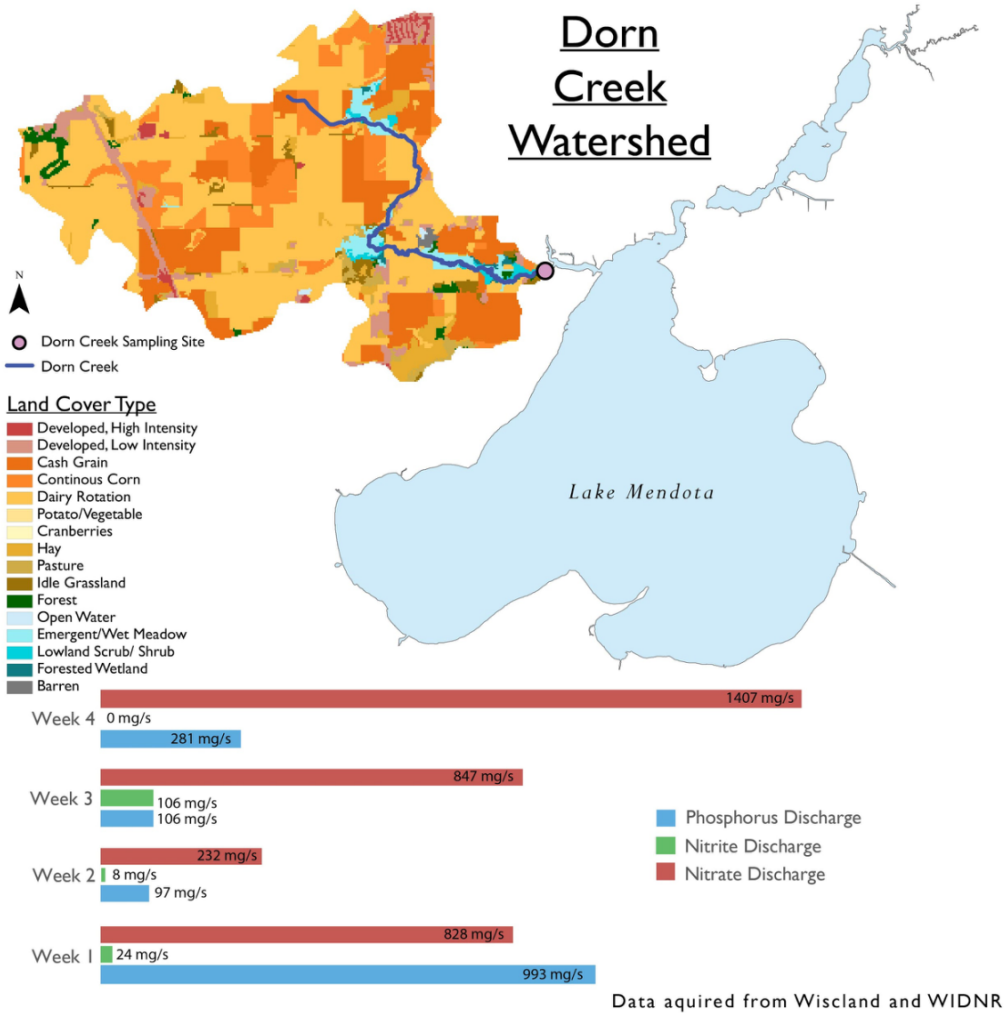


Dorn Creek Sampling Site, Waunakee, Wisconsin

Image taken by Will Sherer

Dorn Creek



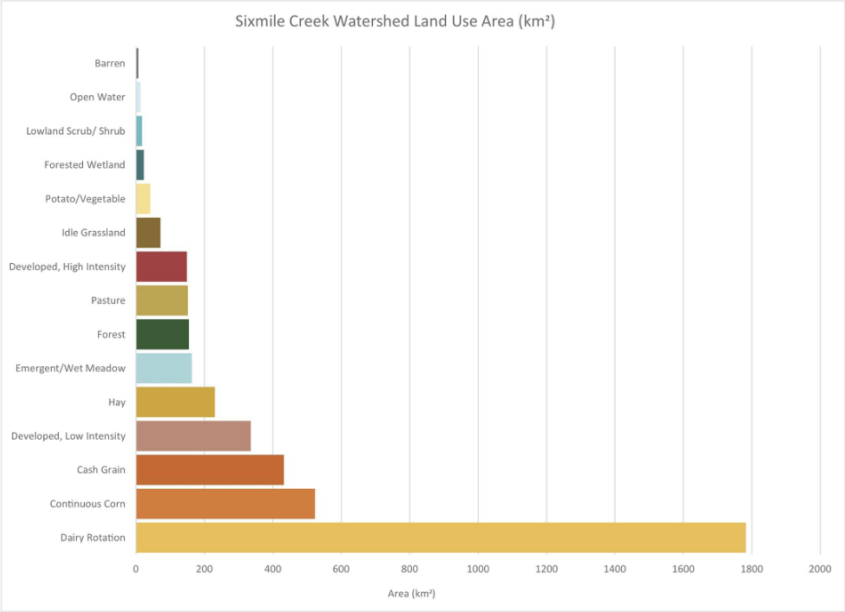


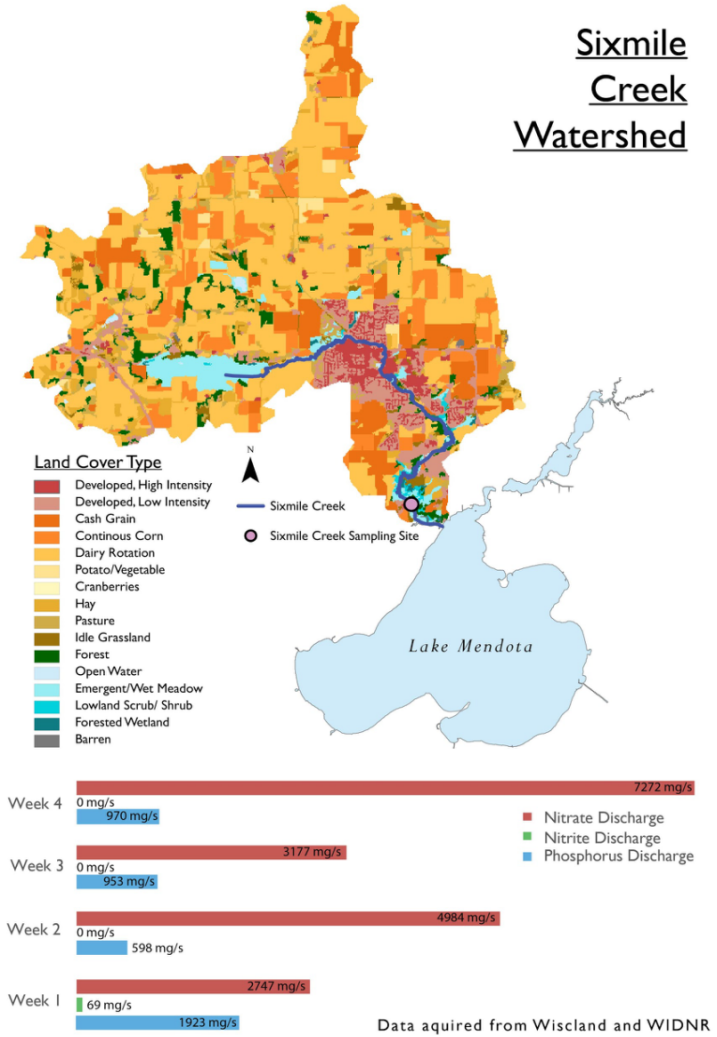
Data aquired from Wisconsland and WIDNR

Sixmile Creek Sampling Site, Waunakee, Wisconsin

Image taken by Will Sherer

Sixmile Creek

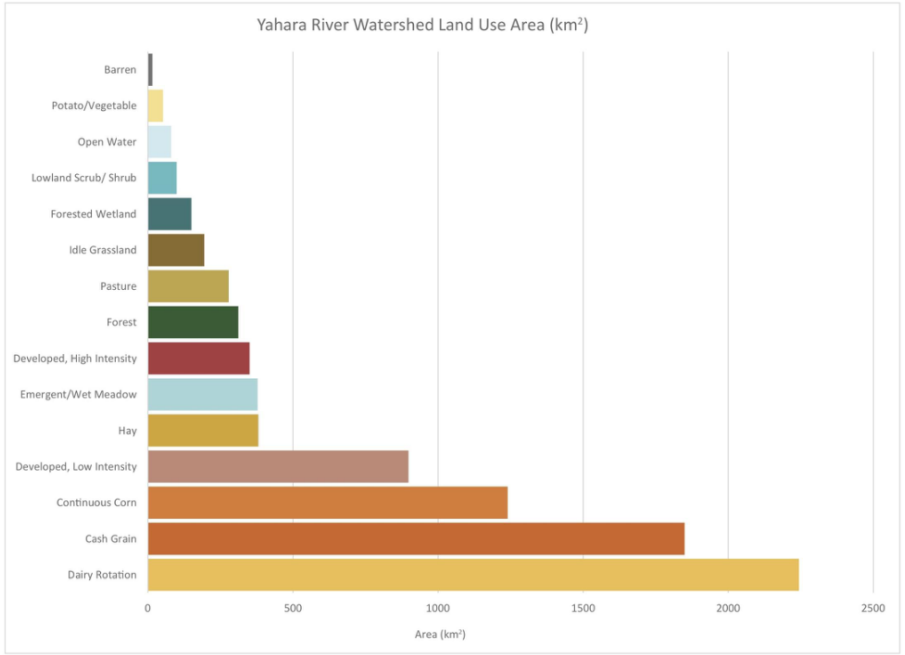


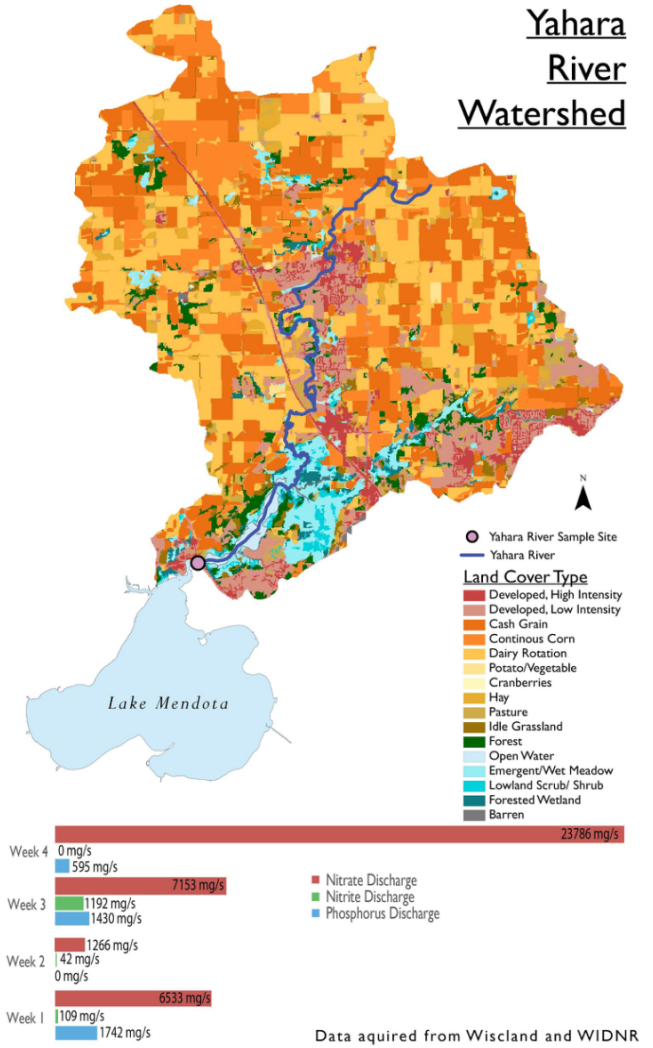


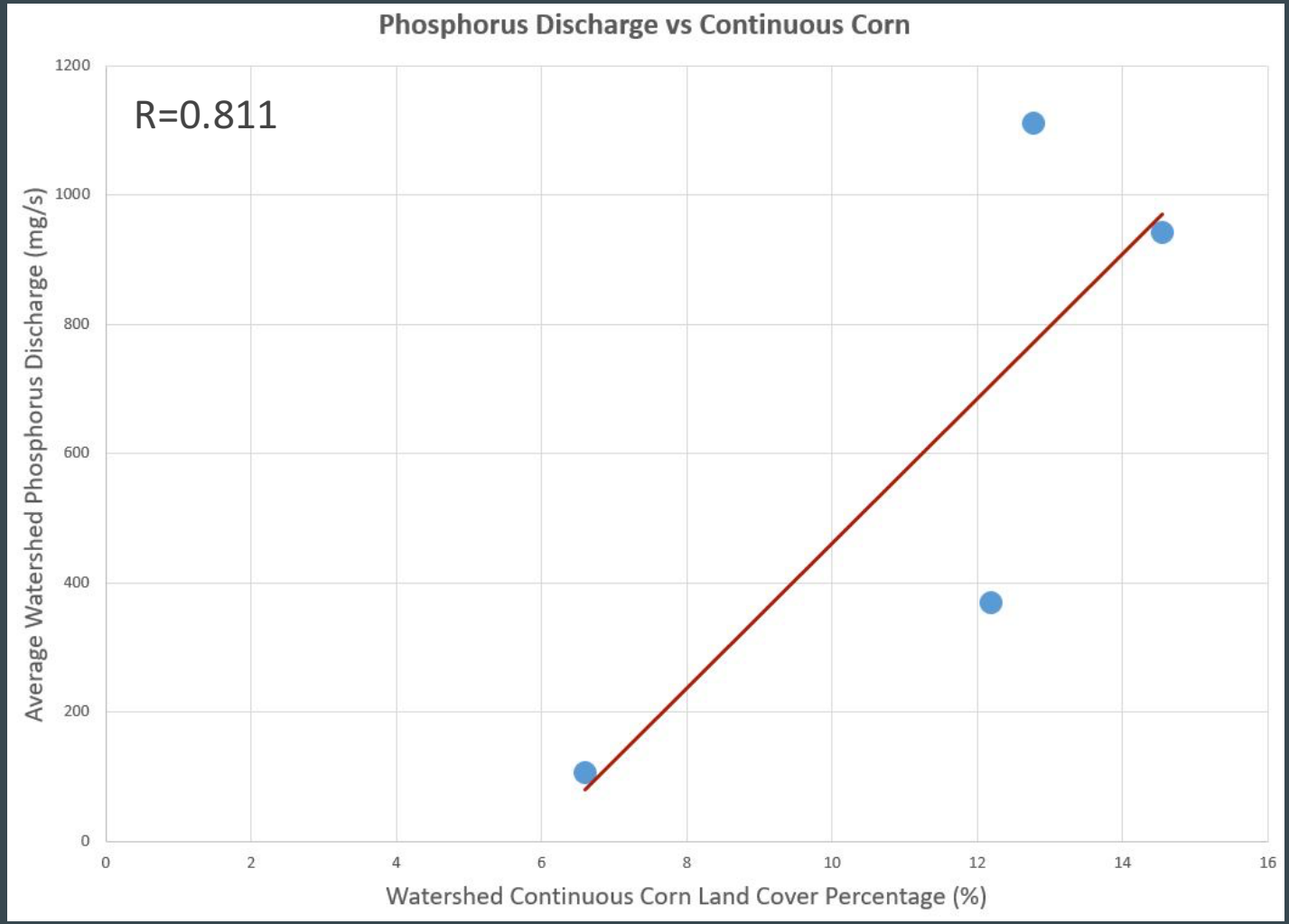
Yahara River Sampling Site, Madison, Wisconsin

Image taken by Will Sherer

Yahara River






Phosphorus Discharge vs Continuous Corn
R=0.811
Average Watershed Phosphorus Discharge (mg/s)
Watershed Continuous Corn Land Cover Percentage (%)
0
200
400
600
800
1000
1200
0
2
4
6
8
10
12
14
16

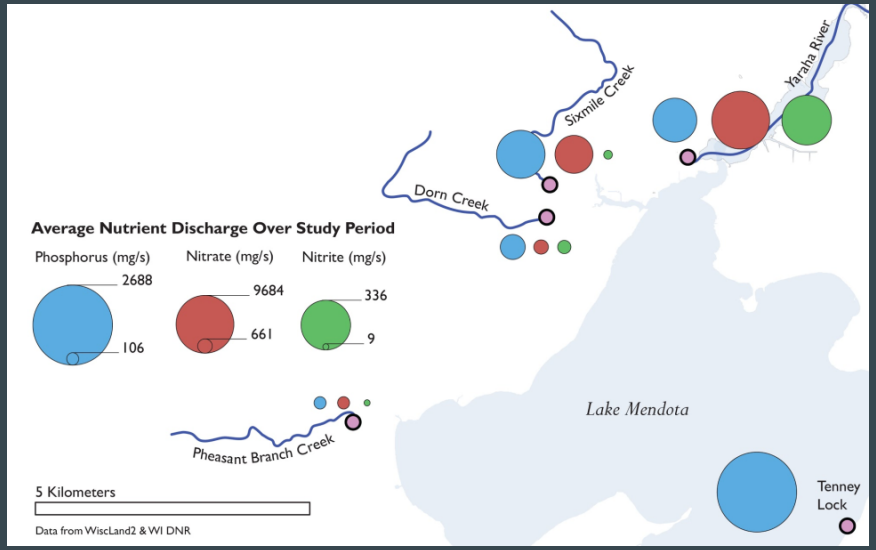
Statistics

- Strong positive correlations:
  - P, Nitrate and Continuous Corn
  - P, Nitrate and Emergent/Wet Meadow
- Positive correlations:
  - P, Nitrate, Nitrite and Pasture
- Negative correlation:
  - P and Developed High and Low Intensity

Land Cover Class	Phosphorus Pearson Coefficient	Nitrate Pearson Coefficient	Nitrite Pearson Coefficient
Cash Grain	0.319	0.495	0.646
Continuous Corn	0.811	0.740	0.622
Dairy Rotation	0.119	-0.453	-0.596
Developed, High Intensity	-0.603	-0.355	-0.264
Developed, Low Intensity	-0.571	-0.264	-0.159
Emergent/Wet Meadow	0.940	0.852	0.644
Pasture	0.721	0.617	0.274

Analysis

- Land cover with highest impact (high positive or negative correlation)
- Land cover with least impact (no correlation)
- Individual stream nutrient contribution
- Tenney Lock sample site phosphorus levels



Discussion

- More precise testing tools
- More weeks tested
- Considerations
  - Beaver Dam
  - Weather
  - Water clarity
- Historic land cover & legacy P

Images taken by Jacob Hrubecky

Questions?