Introduction
The St. Louis River Watershed is located in northeastern Minnesota. It is the largest freshwater tributary to Lake Superior in Minnesota. The St. Louis River begins at Seven Beaver Lake and flows approx. 201 miles to its confluence with Lake Superior. It contains 488 streams, ditches, channels and has 13 sub-basins within it. The St. Louis River Watershed has suffered much damage throughout history for many factors such as paper mills, and saw mills. It has been deemed “polluted” by the Federal Water Pollution Control Administration (1967). Also, large scale logging, and especially mining has changed the dynamics of the land cover permanently. The project focus was to investigate and access the impacts of land cover change on the St. Louis River watershed.

Question
What are the impacts of land cover/land use change on water quality and quantity in the St. Louis River watershed?

Methods
This study used remotely sensed data to determine if land cover changes over time would have an influence on the watershed, by comparing 1992 land cover classes to 2006 land cover classes using the interface in ArcMap 10.1 called ArcSWAT. The time period was from 2003-2010; however, the years including 2005, 2006, and 2008 were selected for the purposes of this research as they corresponded to the wettest, driest, and most average years.

Data: Obtained from DNR Data Deli, USGS, TAMU, and National Map
- Retrieved land cover, digital elevation model (DEM), watershed boundaries, and Minnesota counties data
- Used the mosaic tool in ArcMap 10.1 to convert the DEM multiple tiles and the National Land Cover Data multiple tiles into one file for each
- Reclassified all of the 16 different land classes into only five different schemes for better comparison of 1992 and 2006
- Projected all layers to be the same
- ArcSWAT run: Watershed Delineation, HRU Analysis, and Swat Simulation

Results
- Output data showed that forest land cover decreased from 1992 to 2006
- Output data showed wetlands land cover increased from 1992 to 2006
- Surface Runoff from both 1992 land cover and 2006 land cover did not change significantly
- Sediment yield had a slight increase from 1992 to 2006

Discussion
- A decrease in forests and an increase in wetlands from 1992 to 2006 have caused an increased amount of sediment yield in the St. Louis River watershed
- Sediment yield is highest in March-April because runoff is highest due to the snowmelt
- The winter months have very little to no sediment yield because the snow and cold temperatures are prohibiting erosion and deposition of the sediments
- When the snow melts in the spring, the most sediment yield occurs
- Surface runoff drove the sediment yield hence, occurred at same time
- When evapotranspiration started to increase, surface runoff peak began to decrease
- Further research is needed to look at a larger time frame, such as 30-50 years to be able to analyze the data more accurately

Special Thanks to:
This student internship project was funded through a NASA Curriculum Improvement Partnership Award for the Integration of Research (CIPAIR) award, and is part of the Environmental Modeling and Research Experience (EMARE) project at Fond du Lac Tribal and Community College (FOLTCC). Research was performed at the National Space Science and Technology Center (NSSTC) in Huntsville, Alabama during the 2013 Summer Research Experience, which offers EMARE participants an opportunity to engage in a research project with NASA scientists and immerse themselves in the research culture at a partnering NASA facility. Project team investigators include FOLTCC-STEM faculty members Elizabeth Jones (PI), Ted Wetherbee (Co-I), Connie Wappes (Co-I), Michael Gillespie (Co-I), Jay Sandal (Co-I) and Andy Wold (Co-I); and NASA research scientists Dr. Mohammad Al-Hamdani (Co-I), Mr. Maurice Estes (Co-I), and Mrs. Sue Estes of the Universities Space Research Association at the NSSTC. Special thanks to all project participants and associated staff, and for the support provided by NASA to engage in this collaborative research opportunity.