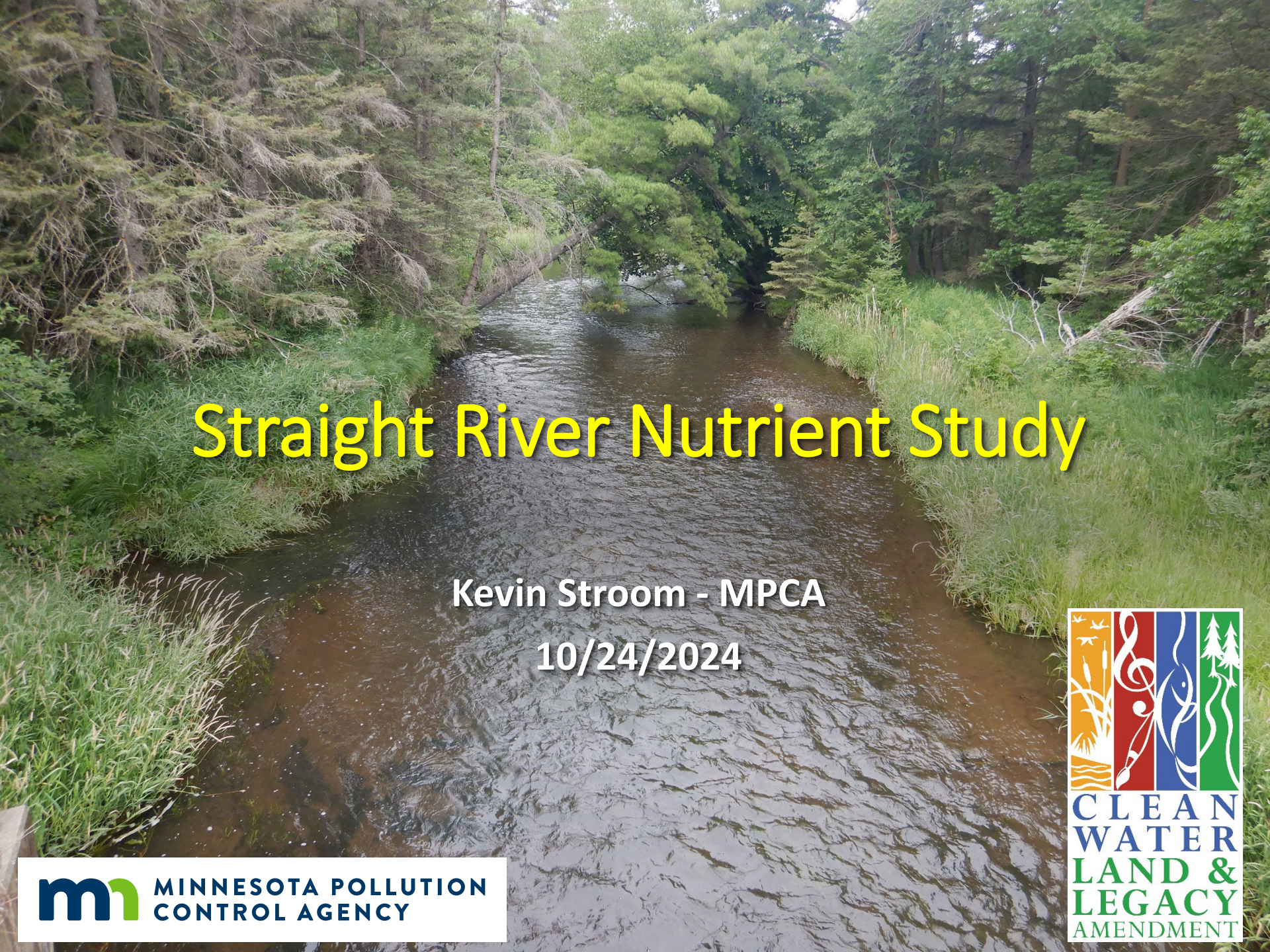


Straight River Nutrient Study

Kevin Stroom - MPCA

10/24/2024

MINNESOTA POLLUTION CONTROL AGENCY

CLEAN WATER LAND & LEGACY AMENDMENT

Groundwater-fed system

- **Pineland Sands Aquifer** – large surficial aquifer in sandy surficial geology
- **93-97%** of Straight's flow is groundwater - DNR, 2024

Two of the many springs that provide flow to the Straight River

Straight River nutrients study

Motivation:

Straight R. has a coldwater dissolved oxygen impairment (federally-listed).

- Excess nutrients are often involved in dissolved oxygen problems of streams.
- Known elevated nitrate levels exist in the local surficial aquifer.
- Monitored the river for nitrate and phosphorus as part of Minnesota's WRAPS process.

Straight River nutrients study

- Collected supplemental data to compare 3 nitrate data sets (approximately 5- year intervals between sets)

  Set 1: 2004-2010

  Set 2: 2014-2016

  Set 3: 2020-2022

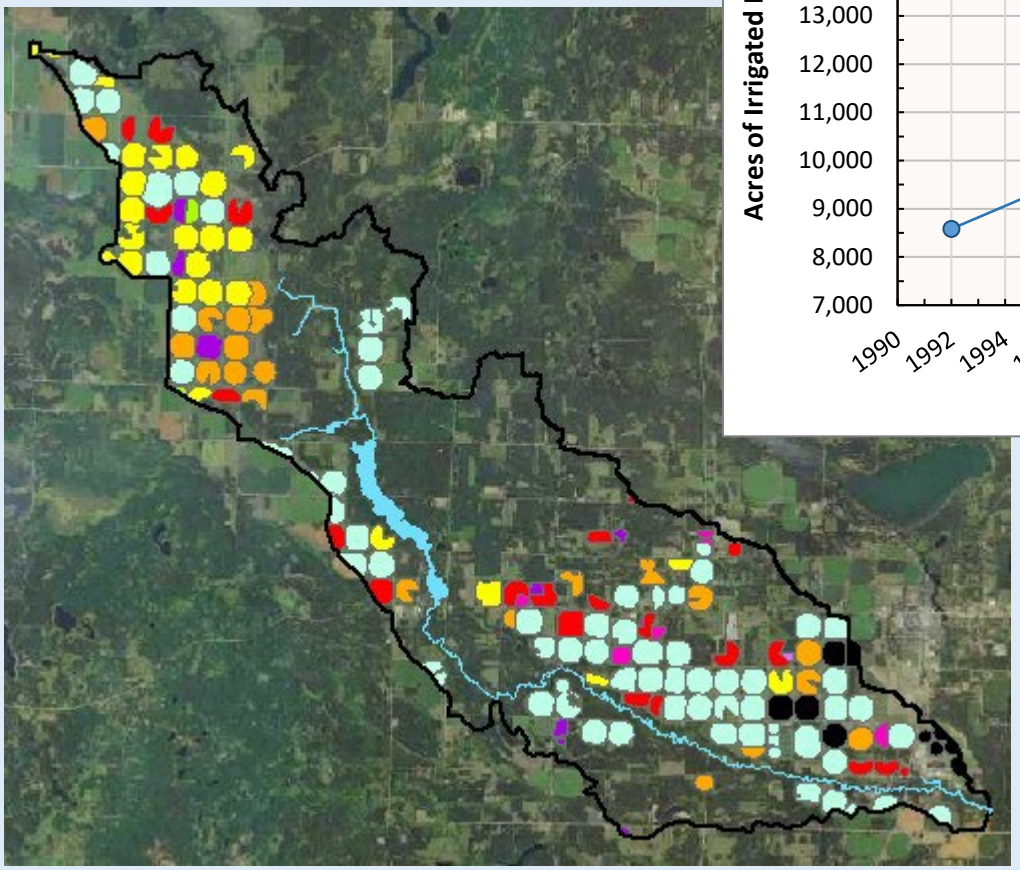
- Possible-source analysis - landscape assessment
  - Nitrate - fertilizers, human/animal wastes, industrial effluent
  - SR's watershed - Much of the land in row crops, very little animal ag., modest number of residences, modest urban runoff (Osage), no wastewater effluent dischargers.

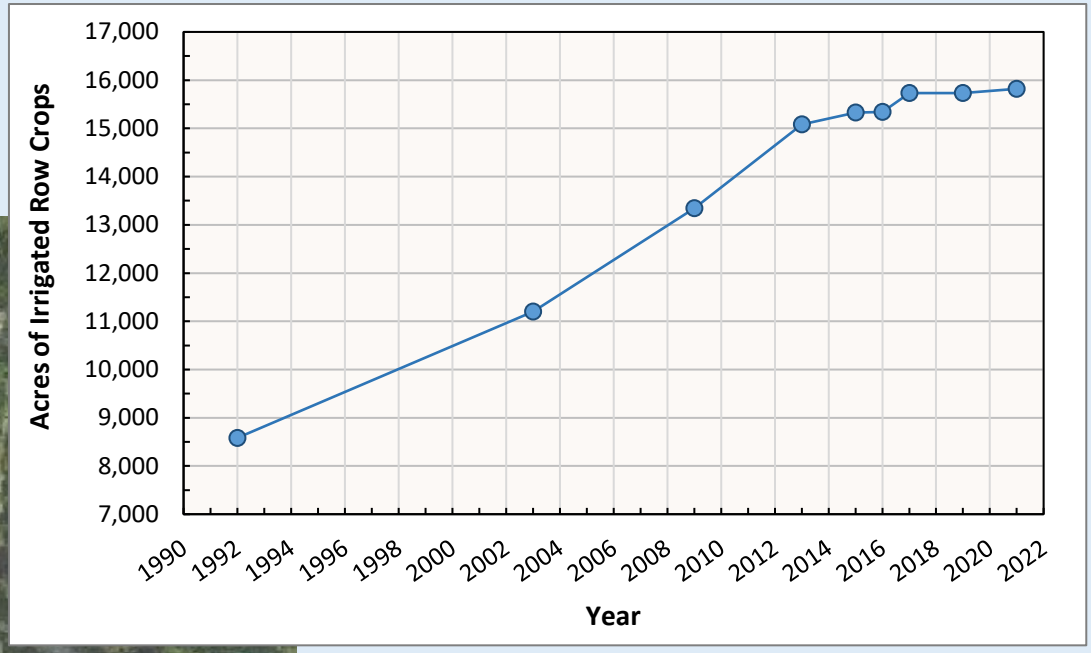
Straight River nutrients study

Examined landscape change over the full nitrate sampling period.

- Quantified irrigated acreage increase (1992-2021)
  Crops: Potatoes rotated with dry beans, soybeans, corn, spring wheat
- Finding: Irrigated acreage in the Straight R. subwatershed has progressively increased in the last 20 - 30 years.

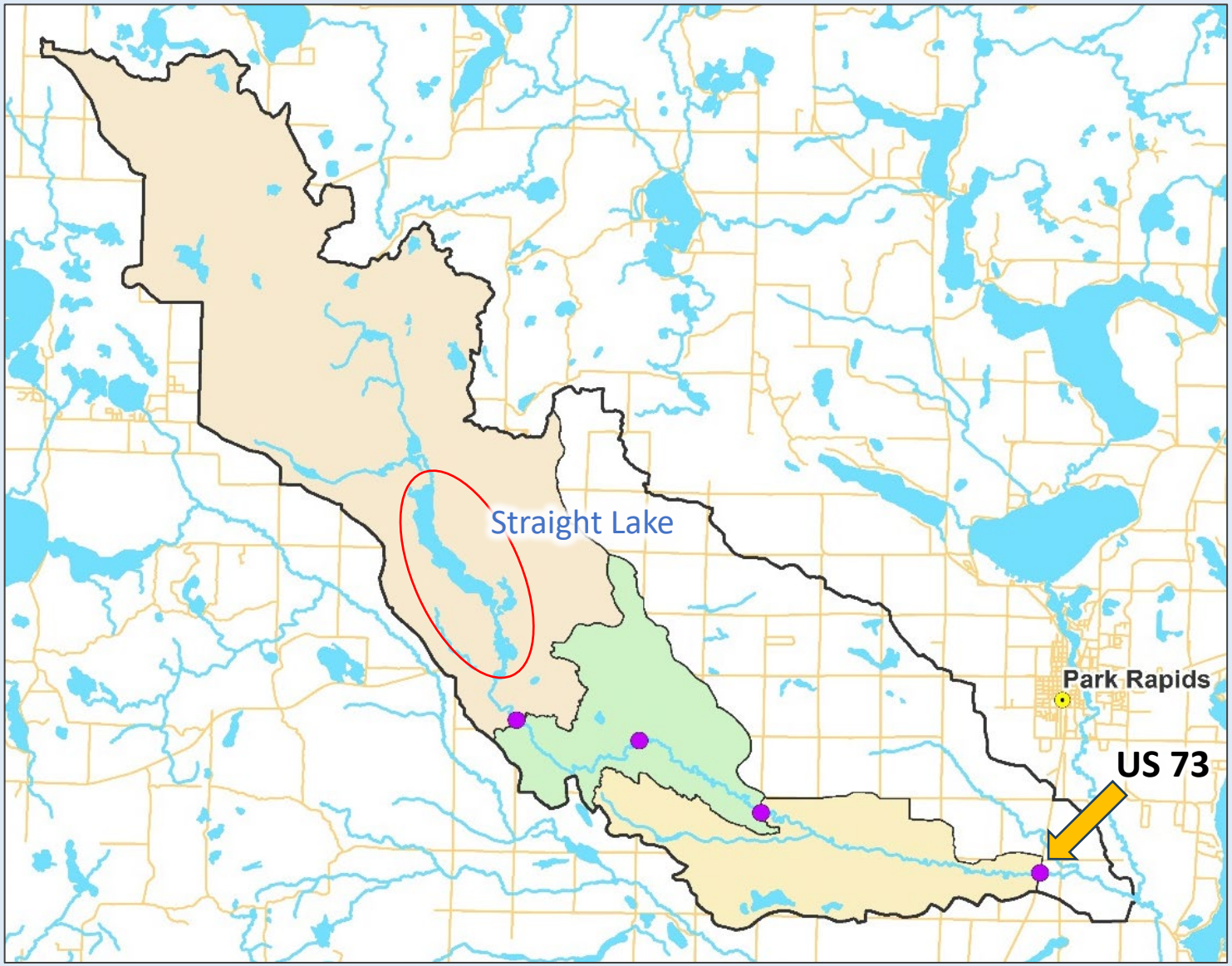
Irrigation change 1992 - 2021



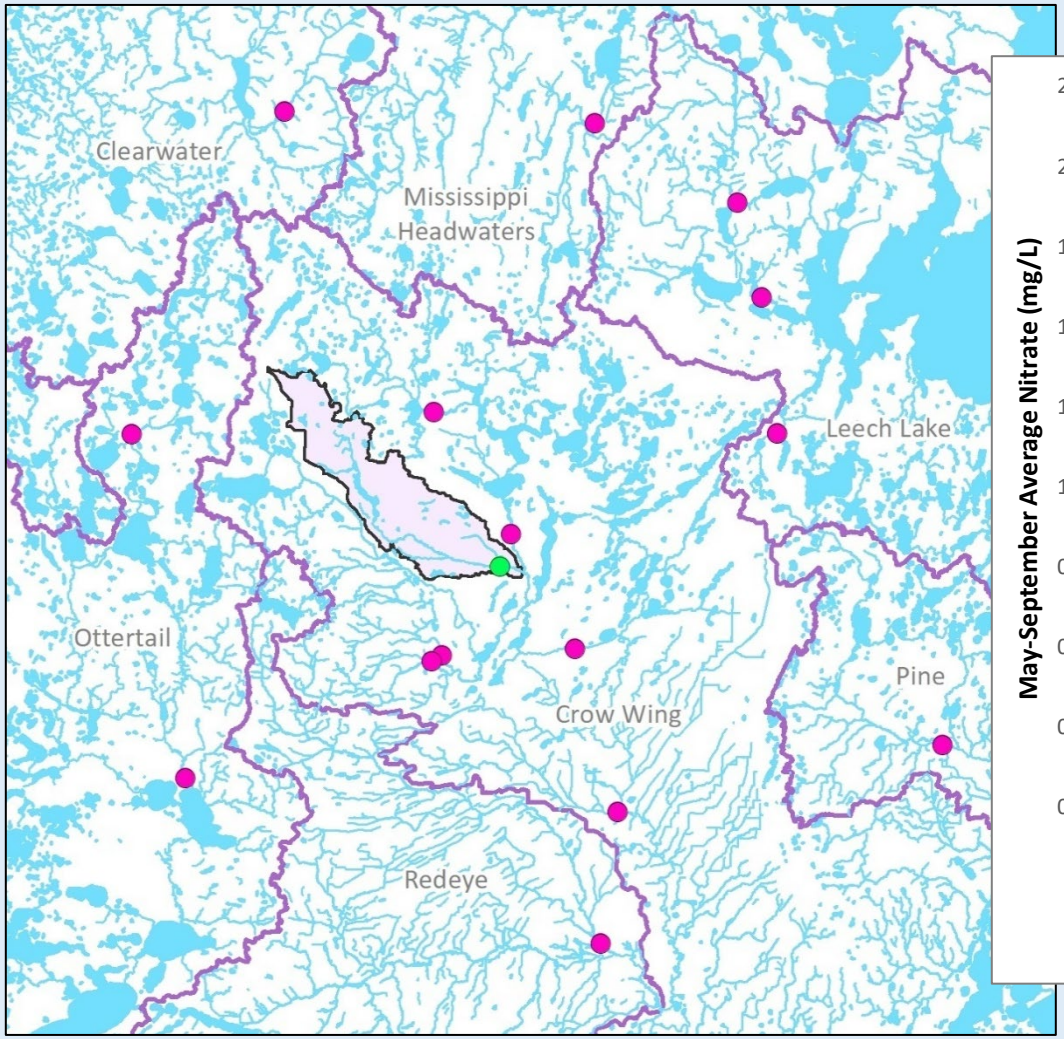


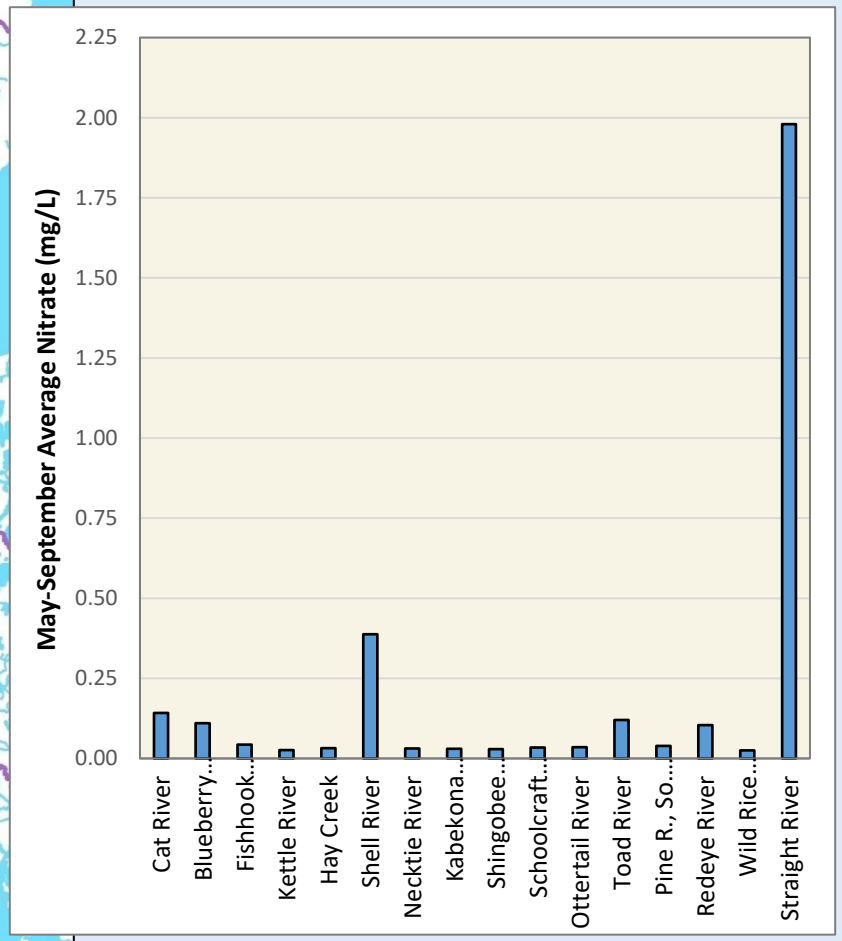
1992 = 8582 ac
2003 = 11203 ac
2017 = 15733 ac

Sampling locations

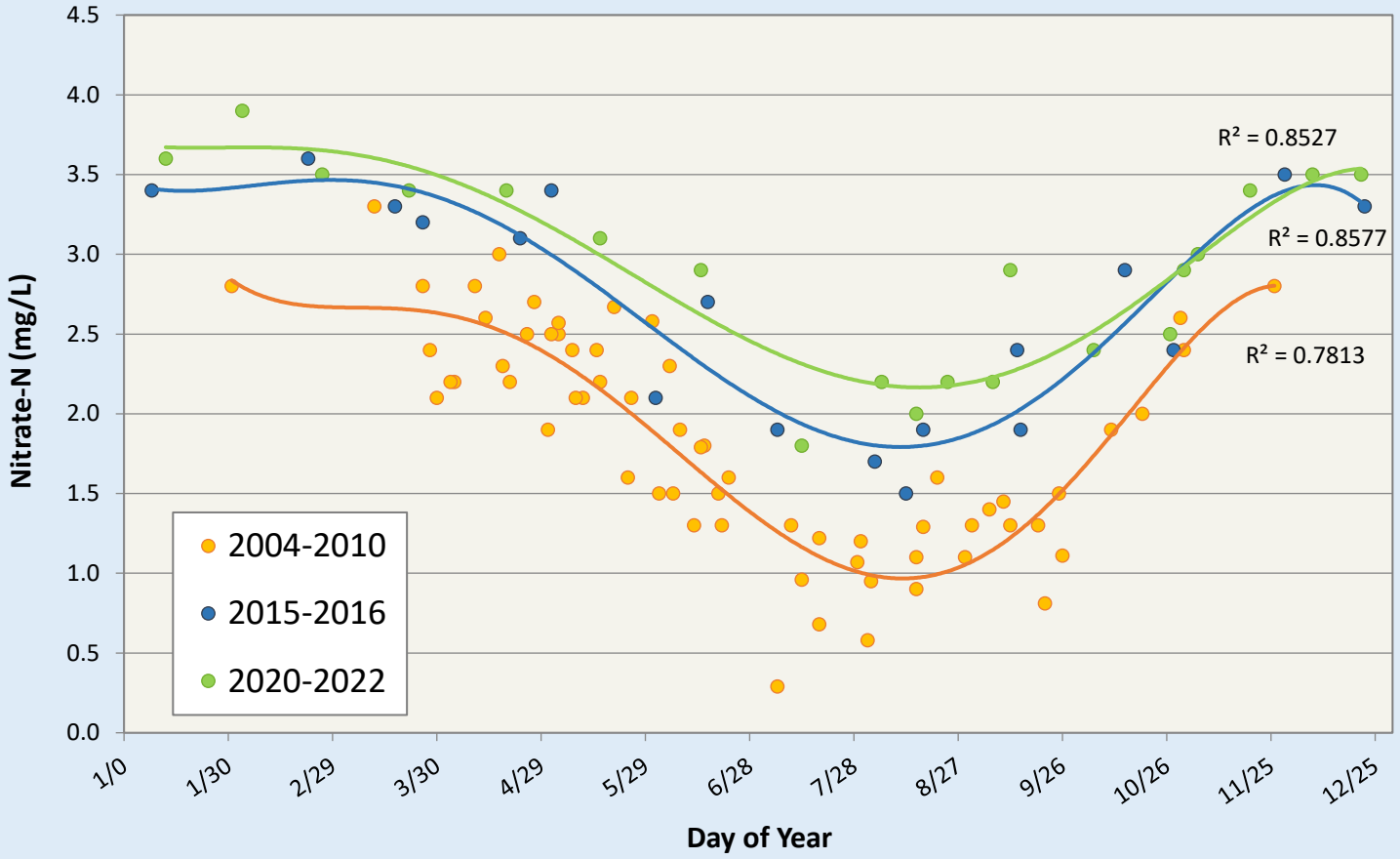


Regional nitrate comparison to SR @ Hwy 71





Nitrate dataset comparison at Hwy 71



Statistically significant difference between 2004-2010 and 2015-2016 (M-W p = 0.003

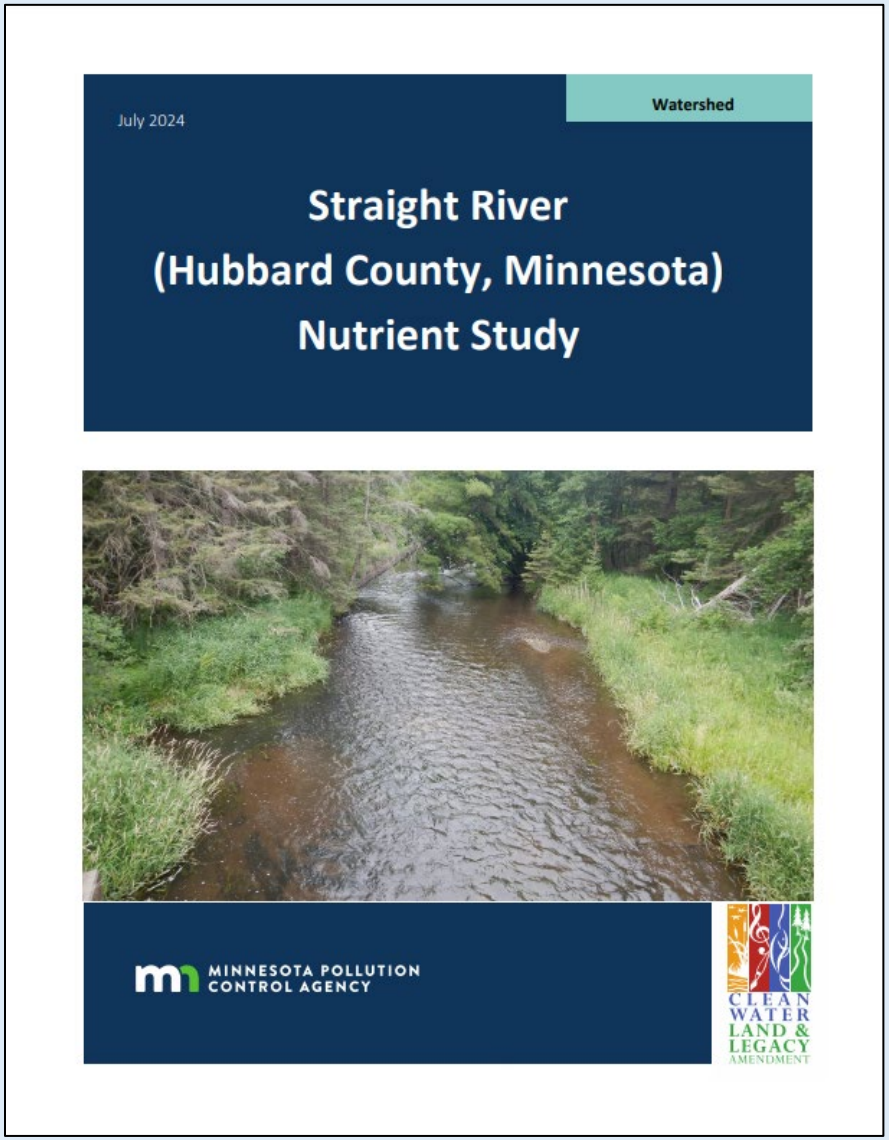
Non-statistically significant difference between 2015-2016 (M-W p = 0.251)

Conclusions

- Known strong groundwater/surface water connectivity.
- Area recognized as having groundwater sensitivity to pollution and elevated nitrate levels.
- Surrounding streams have lower intensity or no agriculture and much lower nitrate concentrations.
- Increased river nitrate occurred correspondingly with increased row crop agriculture.

1) Likely that the agricultural system has been increasingly influencing river water quality (eutrophication) via a groundwater pathway
2) This understanding could be improved by monitoring groundwater nitrate for trends and modelling of lateral groundwater movement to the river channel.

MPCA Report - July 2024



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