

NH Water Resources Research Center

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Overview

- *Mission*

Facilitate research, education, and outreach focused on NH and New England water resources

- *Resources*

About \$93k annually from the Interior Department appropriation, coming from the USGS budget. Federal funds must be matched 2:1 with non-Federal funds. Authorized but not in President's budget for last 8 years.

- *Partnerships*

USGS, Green Mountain Conservation Group (Ossipee River), Lamprey River Watershed Association/Advisory Committee, periodic DES projects, other watershed groups

Funding Allocation

- *15% administration*

Manage granting process, interact with USGS budget office, participate in National Institute of Water Resources (NIWR) meetings and programmatic planning

- *25% outreach*

Web site, presentations to local communities and watershed groups, service on advisory committees

- *60% funded projects*

Long-term water quality trends, impacts of land use on water quality, Great Bay groundwater input water quality, seed funding for NH Water Conference

Facilities and Staff

1. Water Quality Analysis Laboratory (WQAL) (2 FT staff)
 - 40,000 water quality analyses annually
 - Nutrients, dissolved organic carbon, major cations and anions
 - Support of research projects by UNH faculty, graduate students, watershed groups, and faculty/grads from other universities
2. Lamprey River Hydrologic Observatory (LRHO) (1 FT staff)
 - Ad hoc faculty consortium started in 2001 by McDowell, Davis and others
 - Dedicated to understanding long-term drivers of water resources in suburbanizing basin

LRHO – why the Lamprey?

- Large enough to be important part to NH, small enough to be workable (472 km² at USGS gauge)
- Predicted population growth very rapid (50% over 20 yrs)
- Variety of land use (ag, urban, rural, wetlands)
- Mainly septic disposal, but also one STP
- In-stream flow issues important
- Federal Wild and Scenic River
- Active Watershed Association

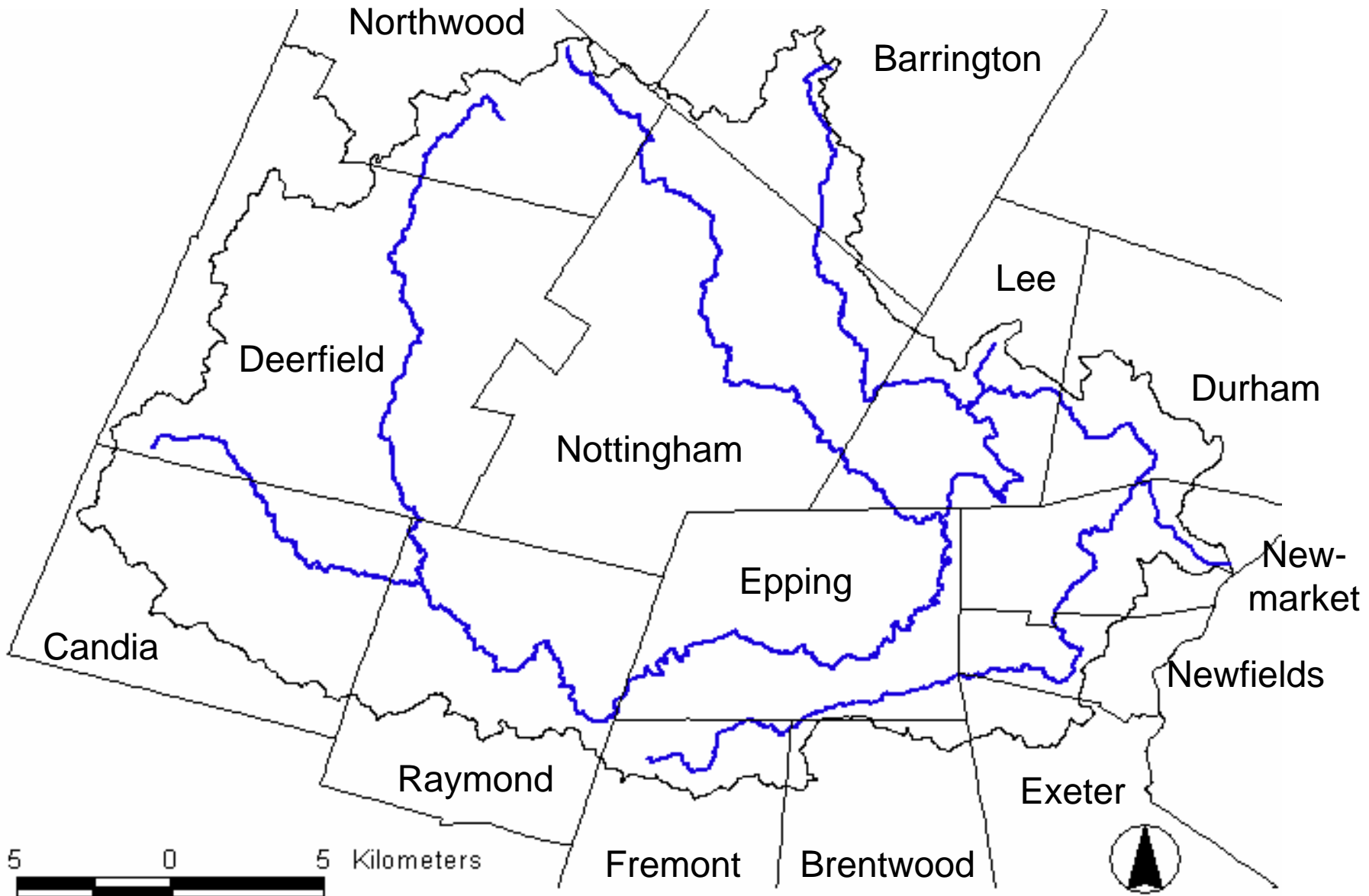
Long-term vision

- Platform for teaching, research, and outreach on watershed science and ecosystem ecology at UNH (Natural Resources and Earth Sciences Departments)
- Same approach and tool set as LTER or CUAHSI Hydrologic Observatory
- Site at which fundamental understanding of biogeochemical cycles can be readily applied to management issues

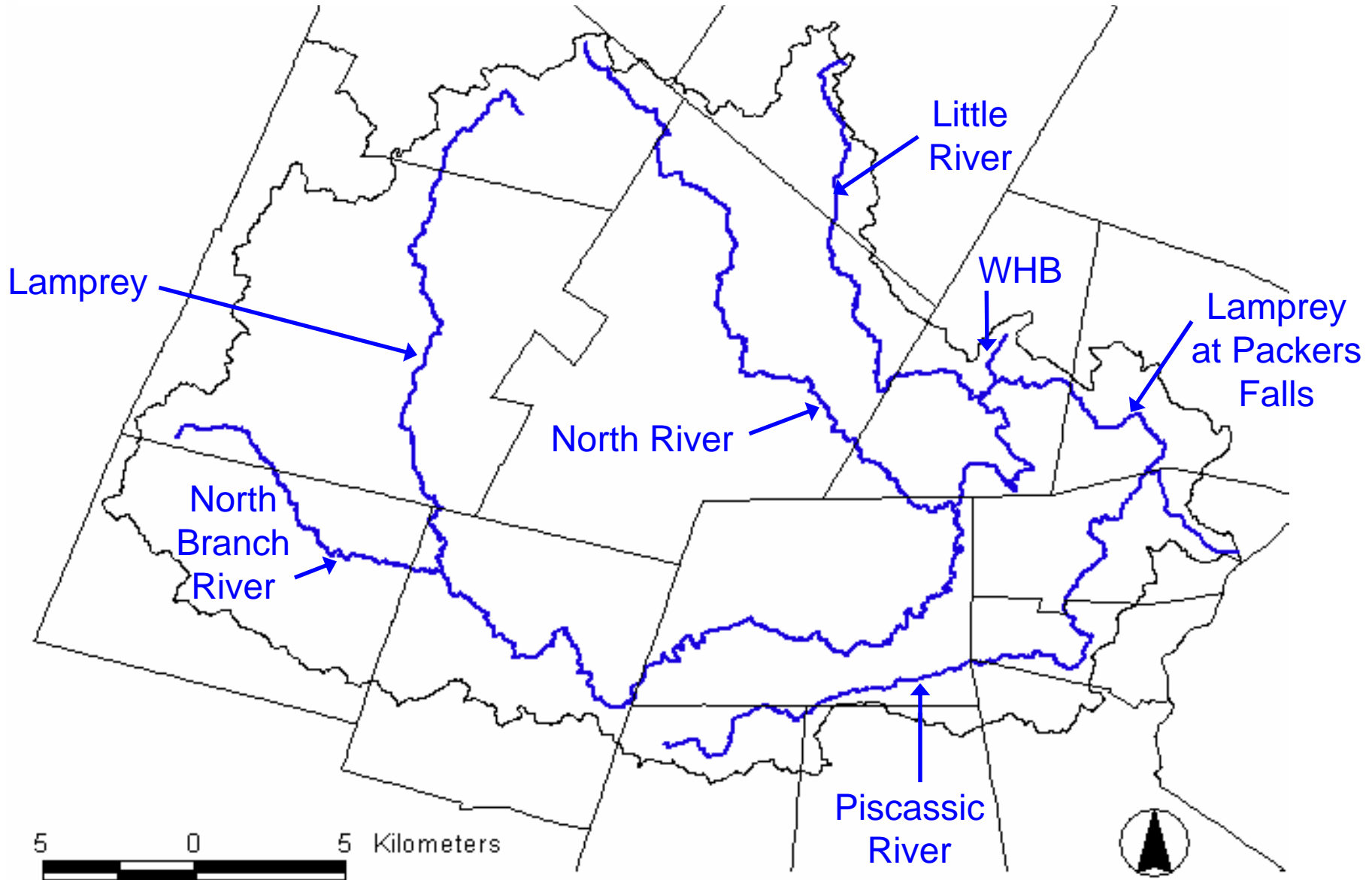
Research Questions

1. Are there long-term trends in Lamprey River chemistry driven by suburbanization?
2. Can variability in sub-basin surface water and groundwater chemistry be predicted by watershed attributes?
3. What drives long-term N balance in the Lamprey River watershed?

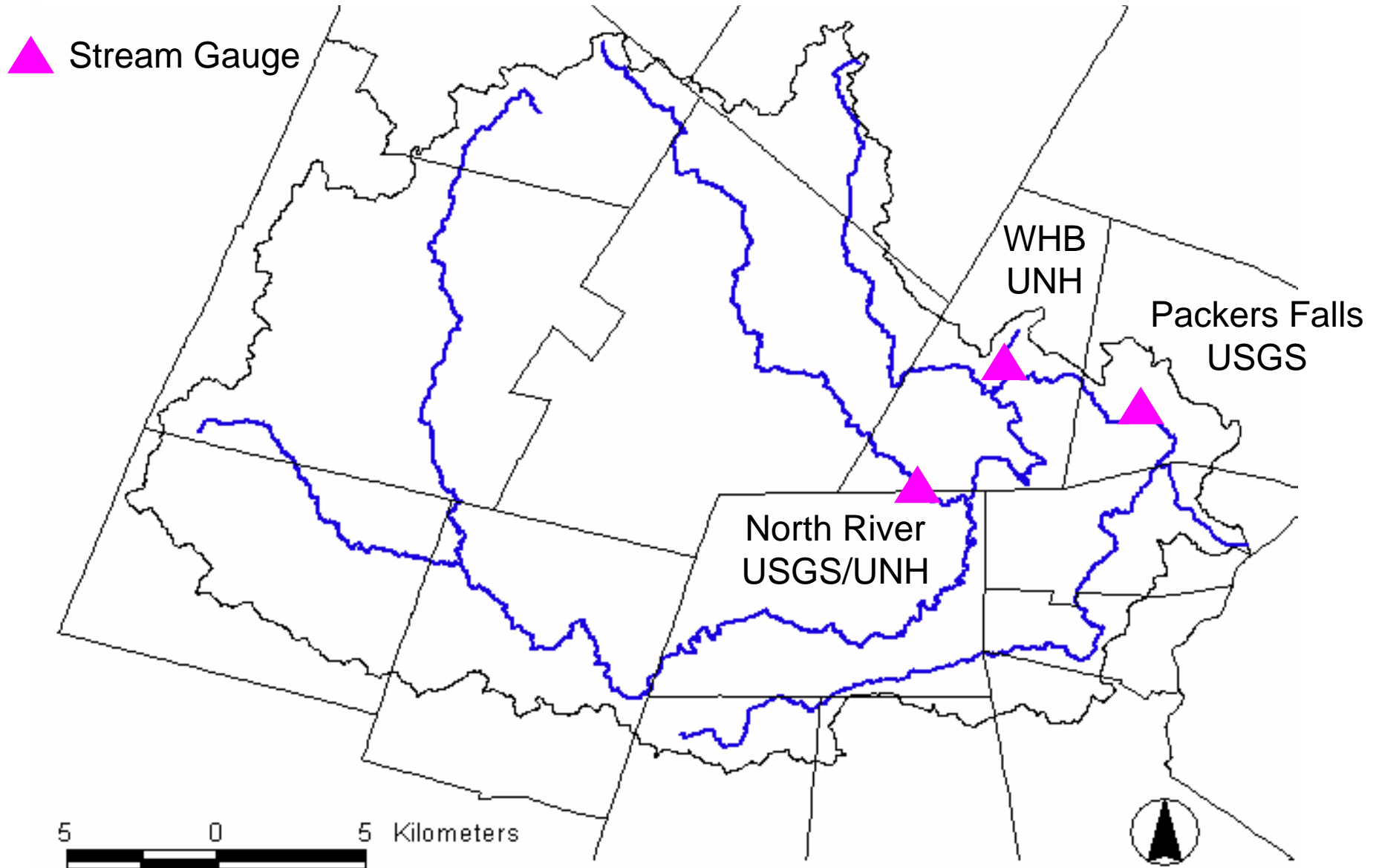
Lamprey River Hydrologic Observatory



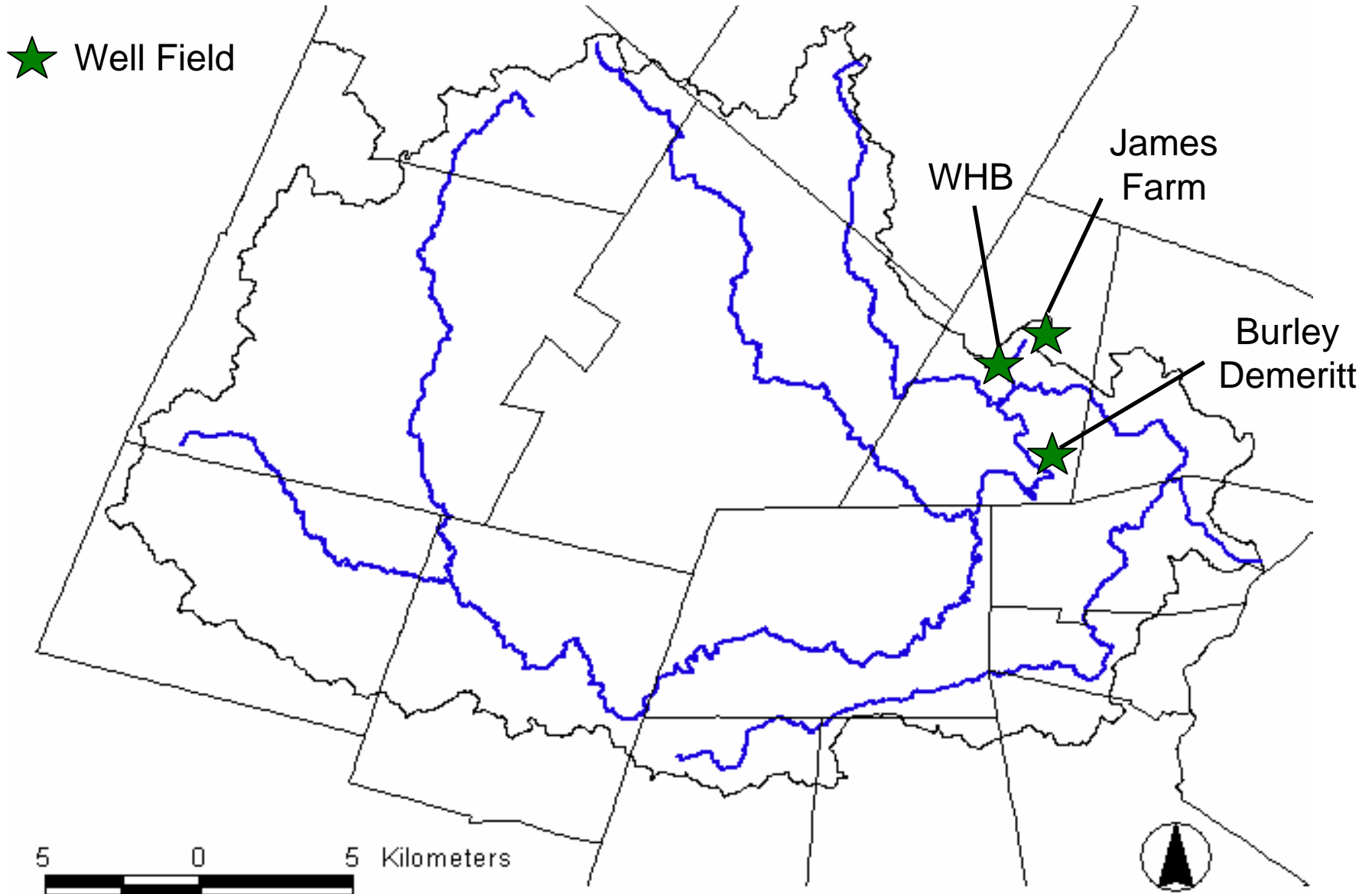
Lamprey River Hydrologic Observatory



Lamprey River Hydrologic Observatory

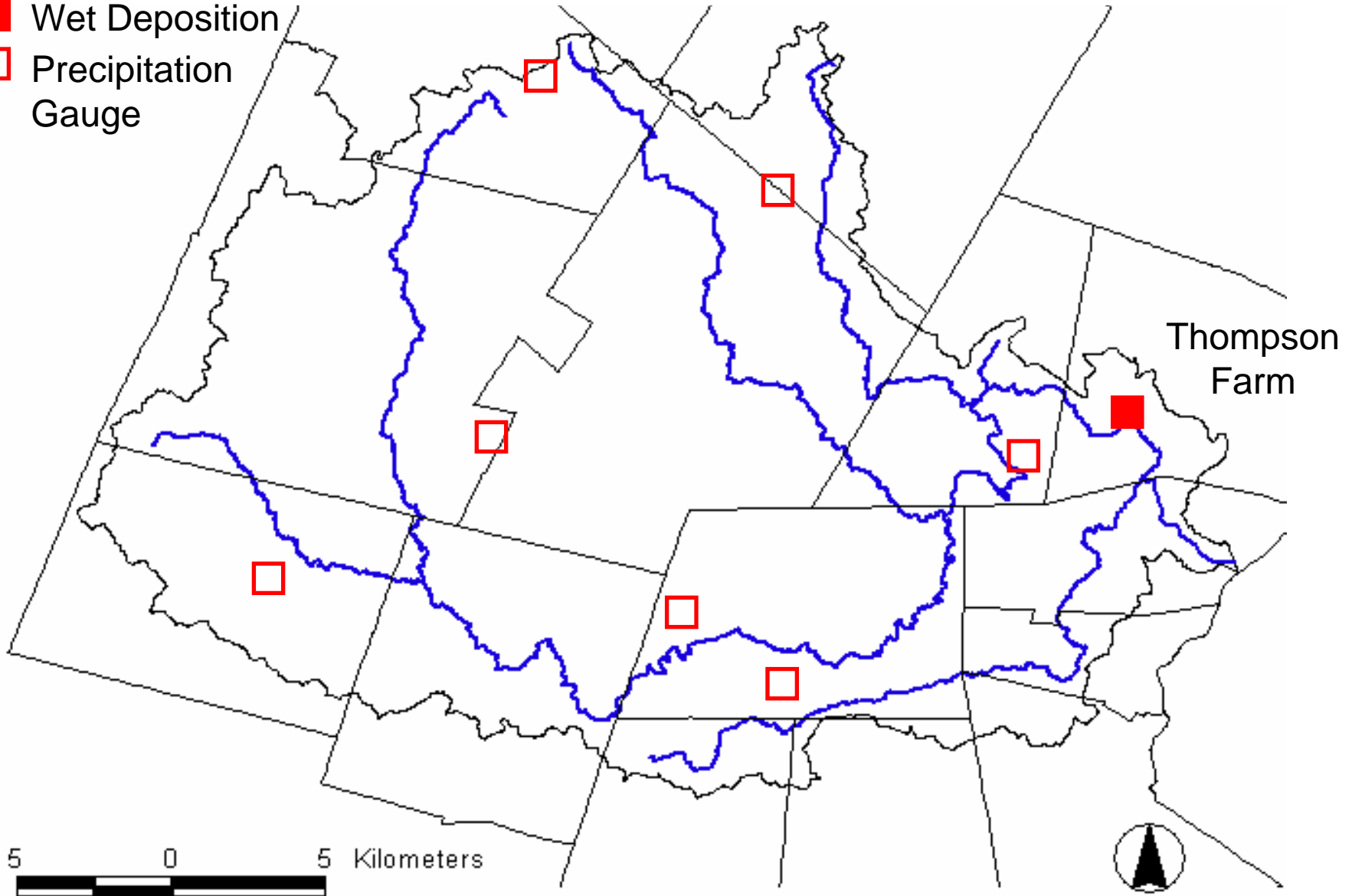


Lamprey River Hydrologic Observatory



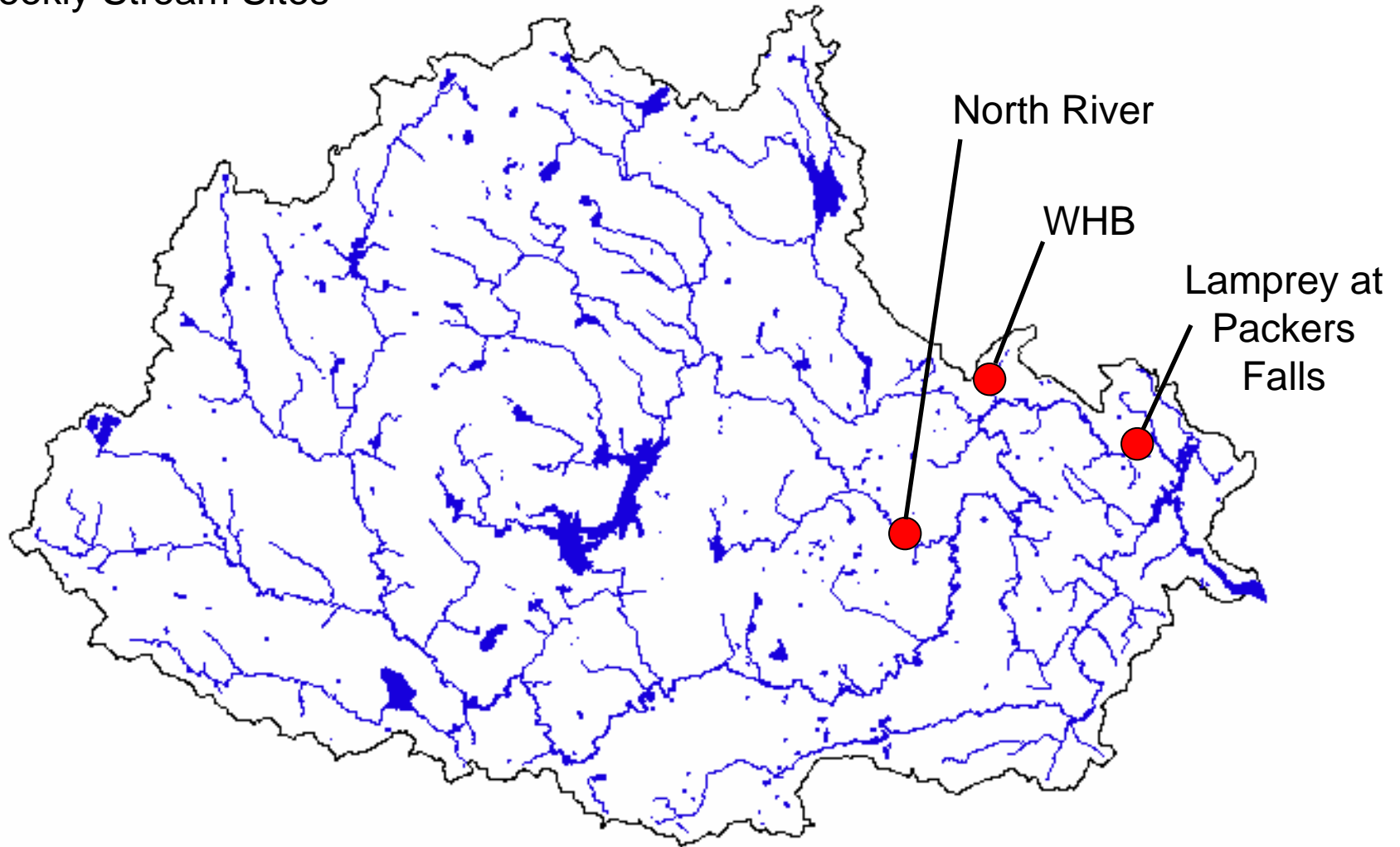
Lamprey River Hydrologic Observatory

- Wet Deposition
- Precipitation Gauge



Lamprey River Hydrologic Observatory

● Weekly Stream Sites

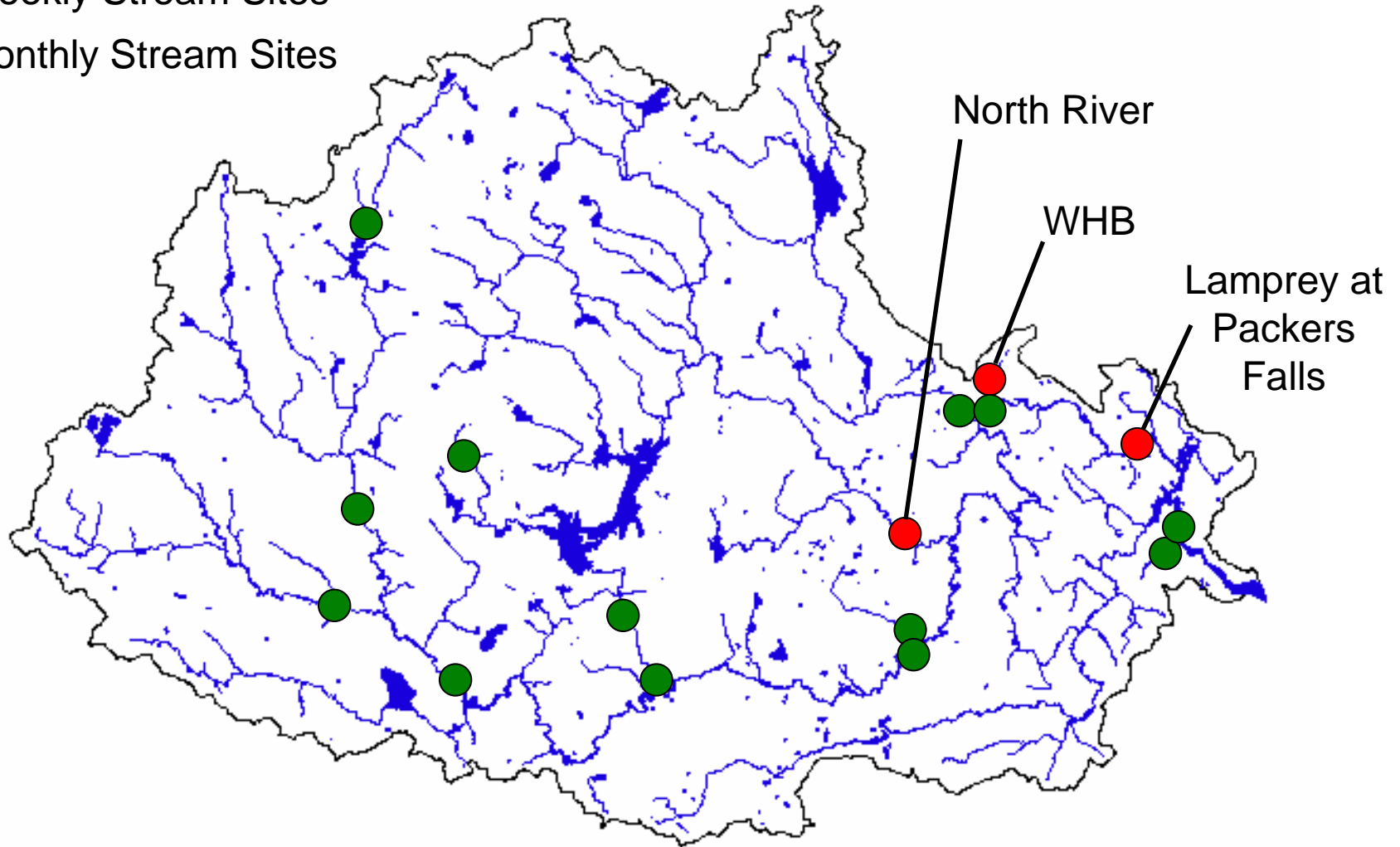


5 0 5 Kilometers



Lamprey River Hydrologic Observatory

- Weekly Stream Sites
- Monthly Stream Sites



5 0 5 Kilometers



Well Fields

James Farm – Est. 1995

WHB – Est. 2004



Plus recently installed wells at Burley Demeritt Farm

Precipitation Collection



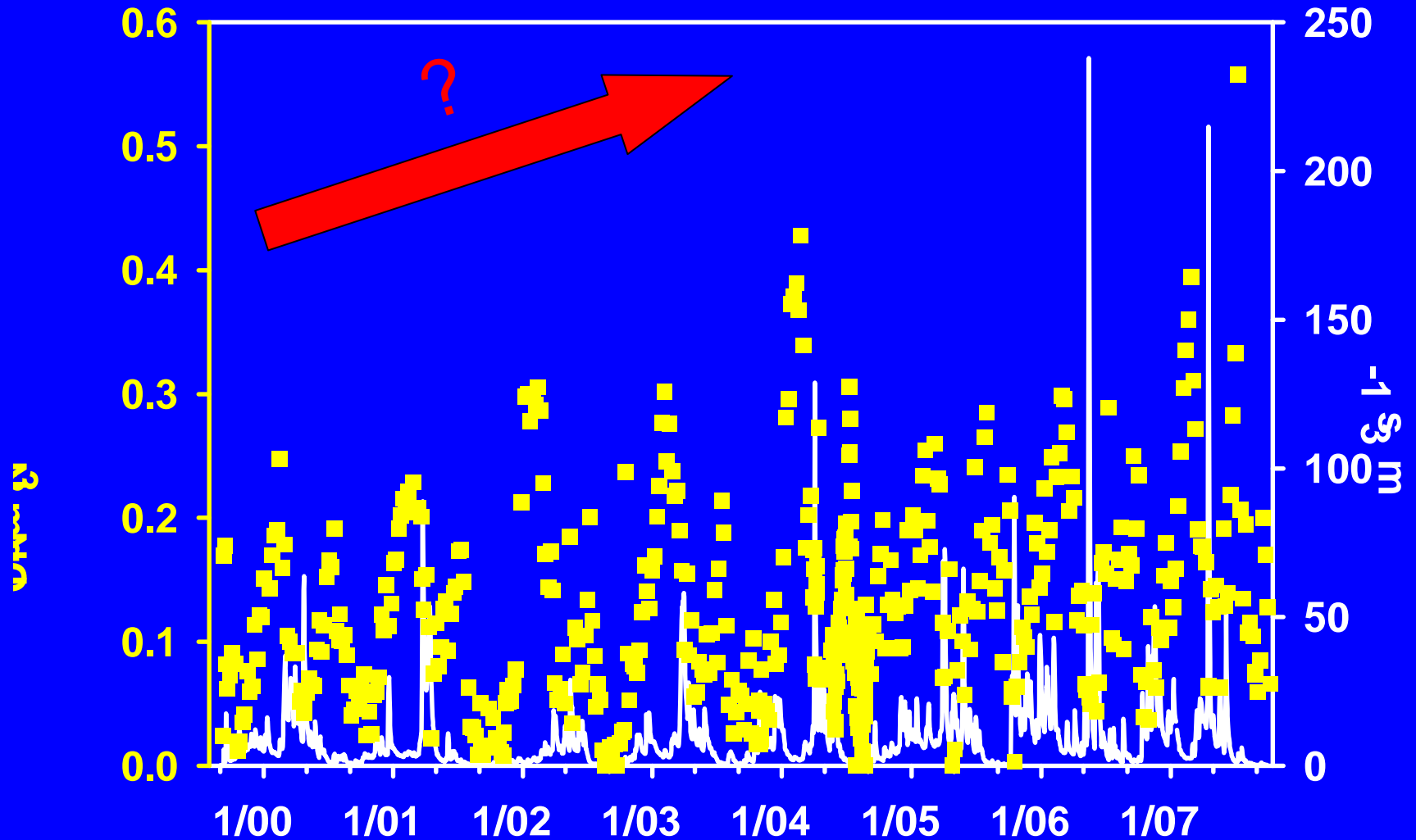
Volunteer Precipitation Monitoring
Established October 2003



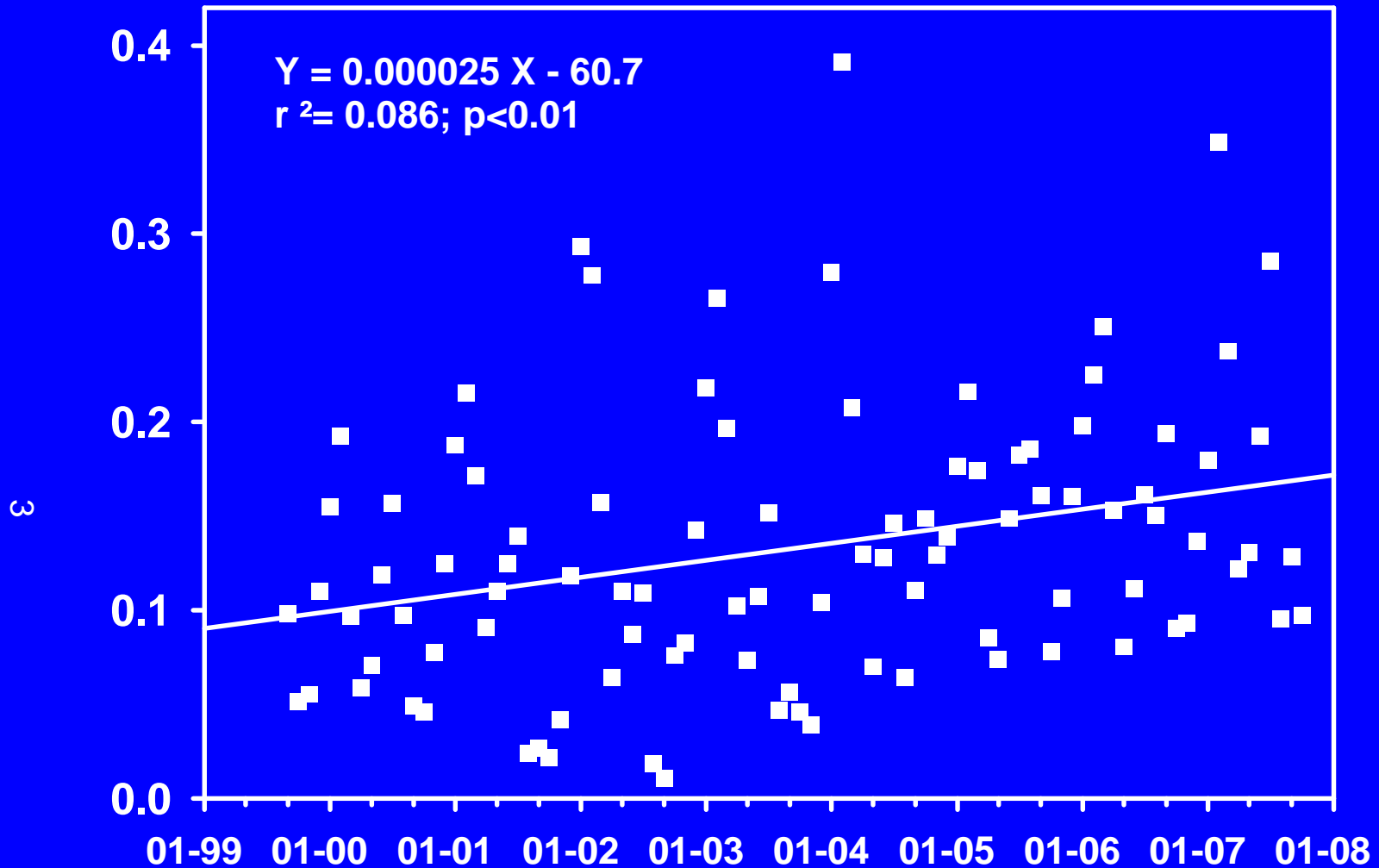
Precipitation Chemistry
Collection Established
November 2003 (now
part of AIRMAP)

Sampling Category	Parameters Measured
3 Weekly Stream Sites (Lamprey since 09/99; WHB and North River since 2004)	DOC, DON, NO ₃ , NH ₄ , PO ₄ , SiO ₂ , Cl, SO ₄ , Na, Mg, K, Ca, TP, TDP, pH, SC, DO
Additional Parameters for the Lamprey (since 10/02)	DIC, TSS, Particulate C and Particulate N
13 Monthly Stream Sites (weekly during 2004; monthly since 2005)	DOC, DON, NO ₃ , NH ₄ , PO ₄ , SiO ₂ , Cl, SO ₄ , Na, Mg, K, Ca, pH, SC, DO
Precipitation Chemistry at Thompson Farm (event basis since 11/03)	DOC, DON, NO ₃ , NH ₄ , PO ₄ , SiO ₂ , Cl, SO ₄ , Oxalate, Na, Mg, K, Ca, pH, SC
WHB and James Farm Well Fields (Monthly 07/04 to 05/07; Quarterly since 05/07)	DOC, DON, NO ₃ , NH ₄ , PO ₄ , SiO ₂ , Cl, SO ₄ , Na, Mg, K, Ca, pH, SC, DO

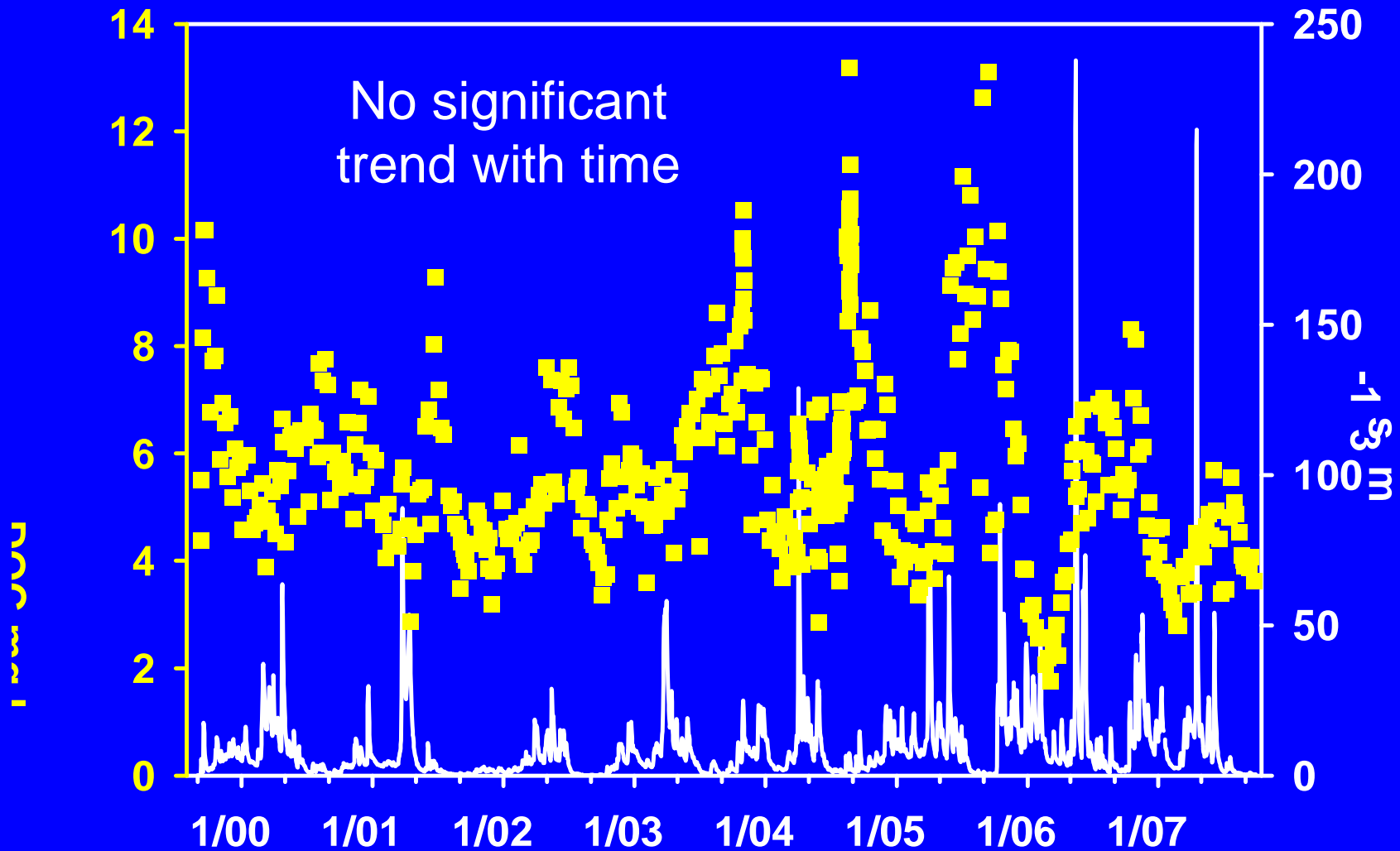
Nitrate Over Time in the Lamprey River



Monthly Nitrate in the Lamprey River

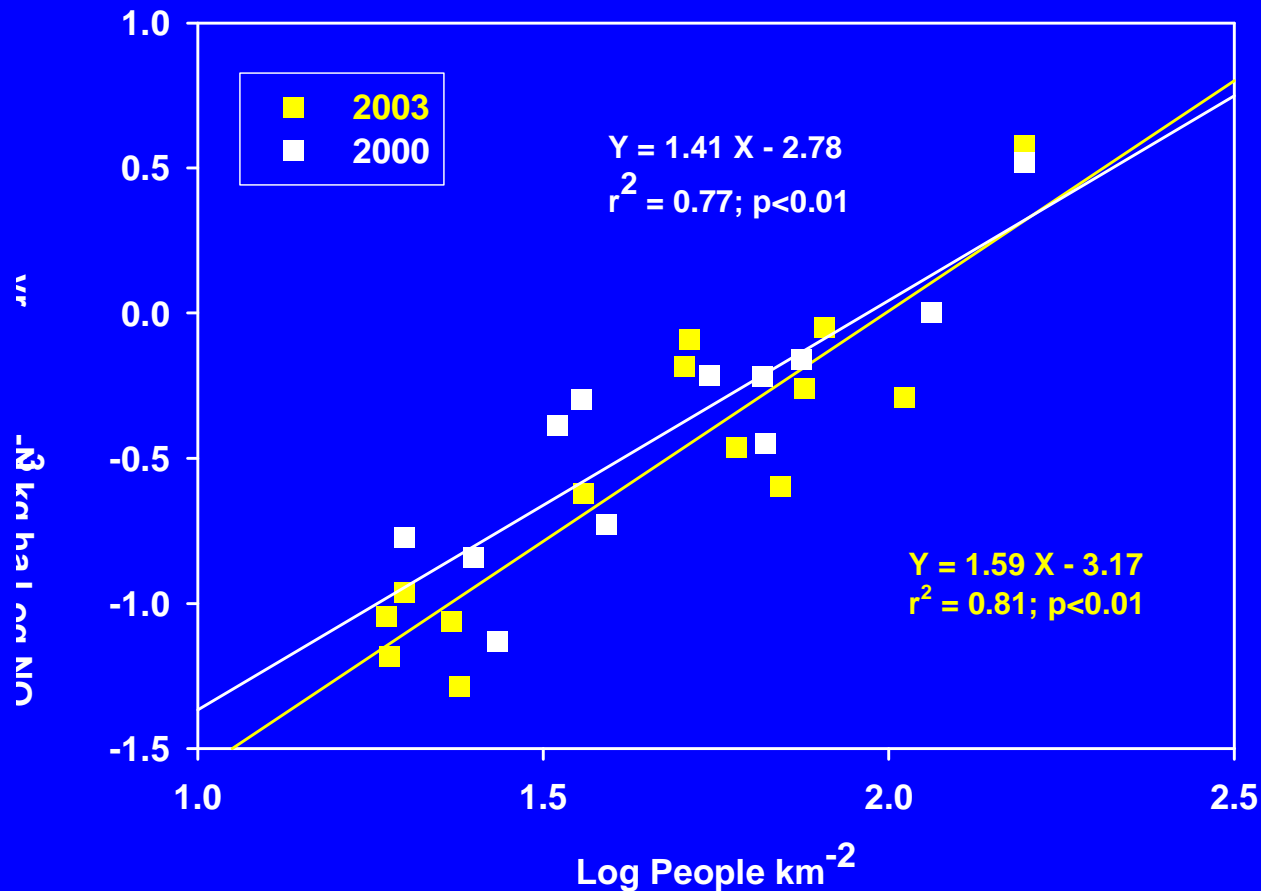


Dissolved Organic Carbon Over Time in the Lamprey River



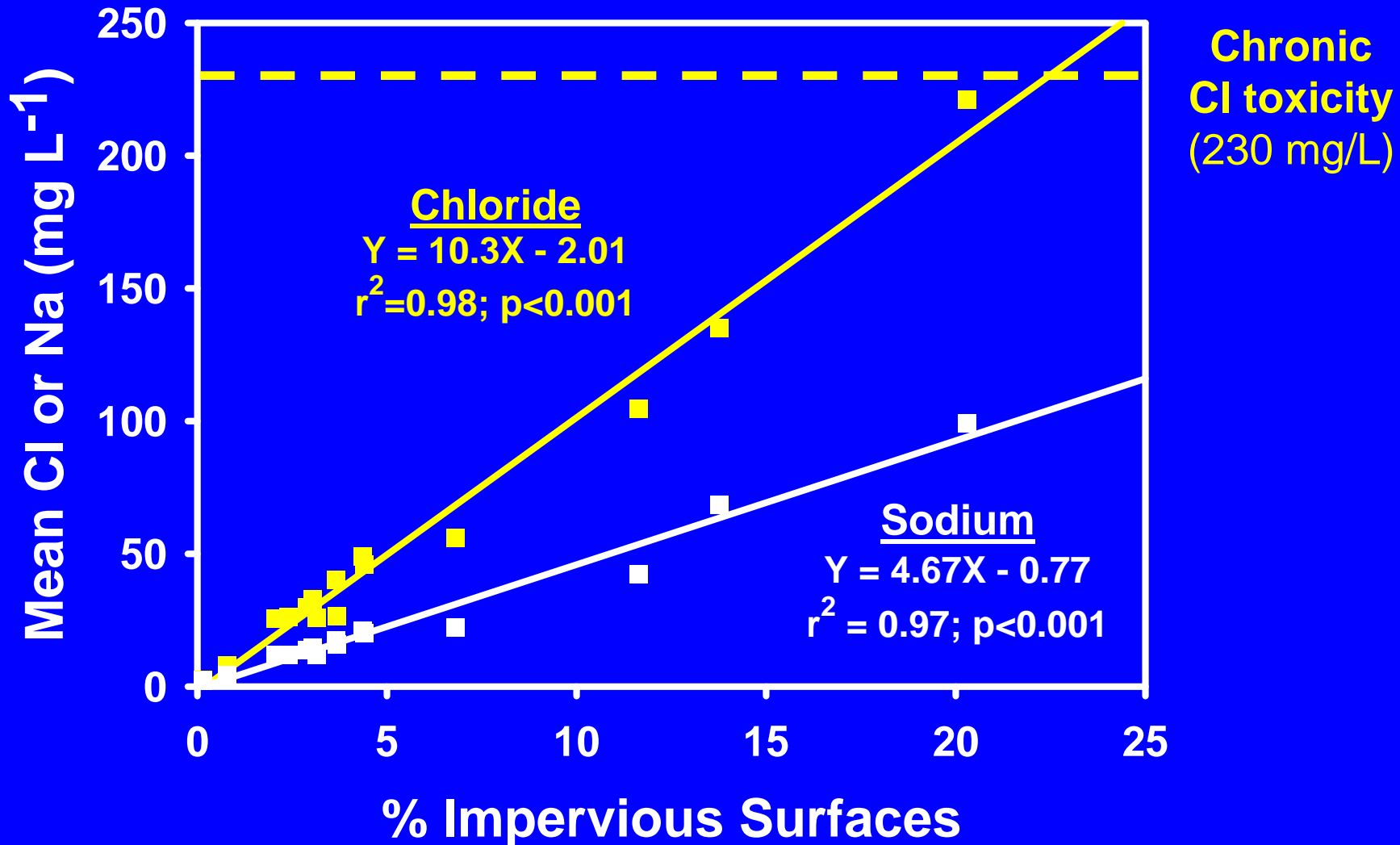
Surface water nitrate is best predicted by human population density

Lamprey Sub-basins



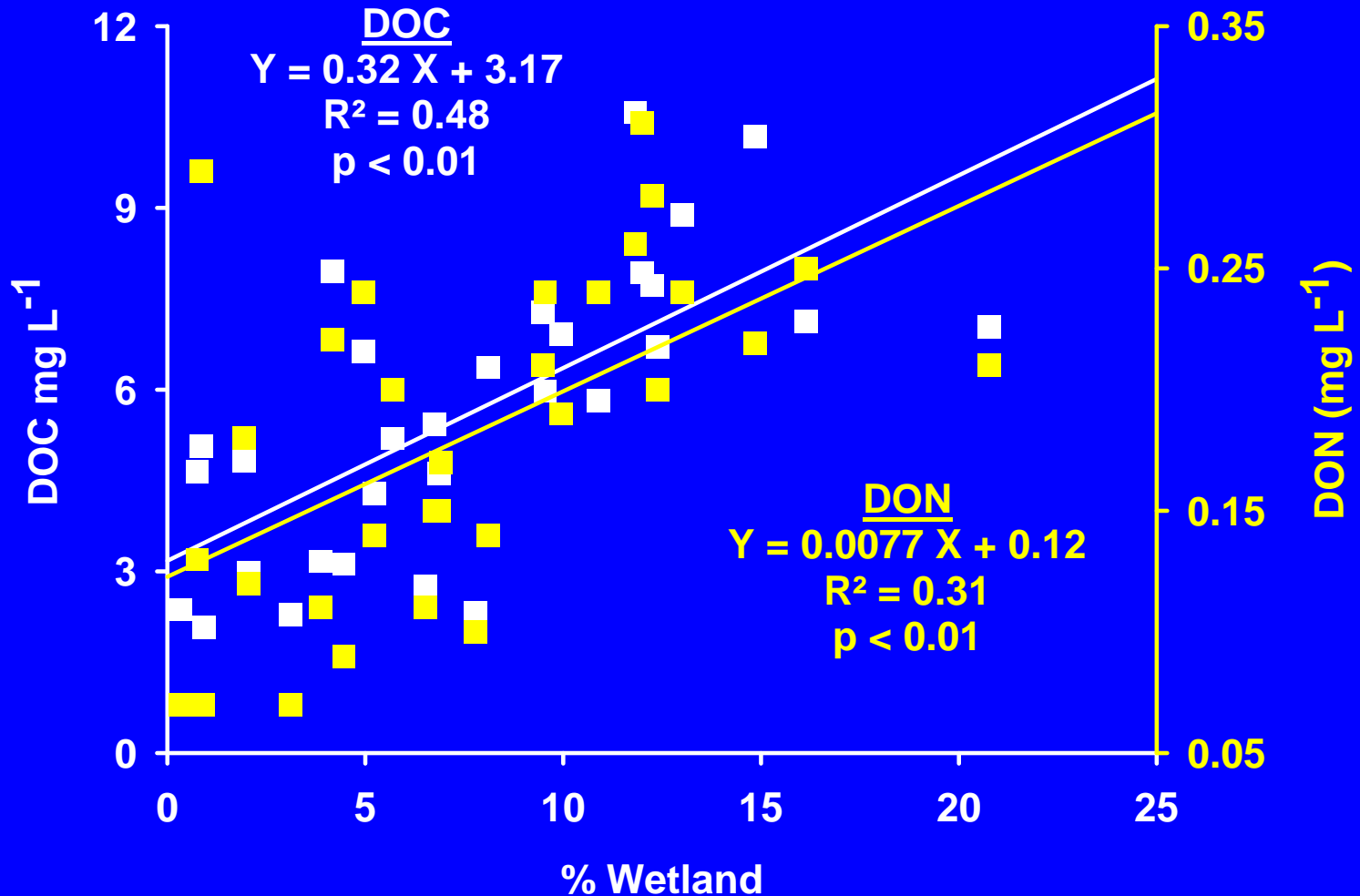
Cl and Na are related to Impervious Surfaces

Lamprey and Oyster Sub-basins

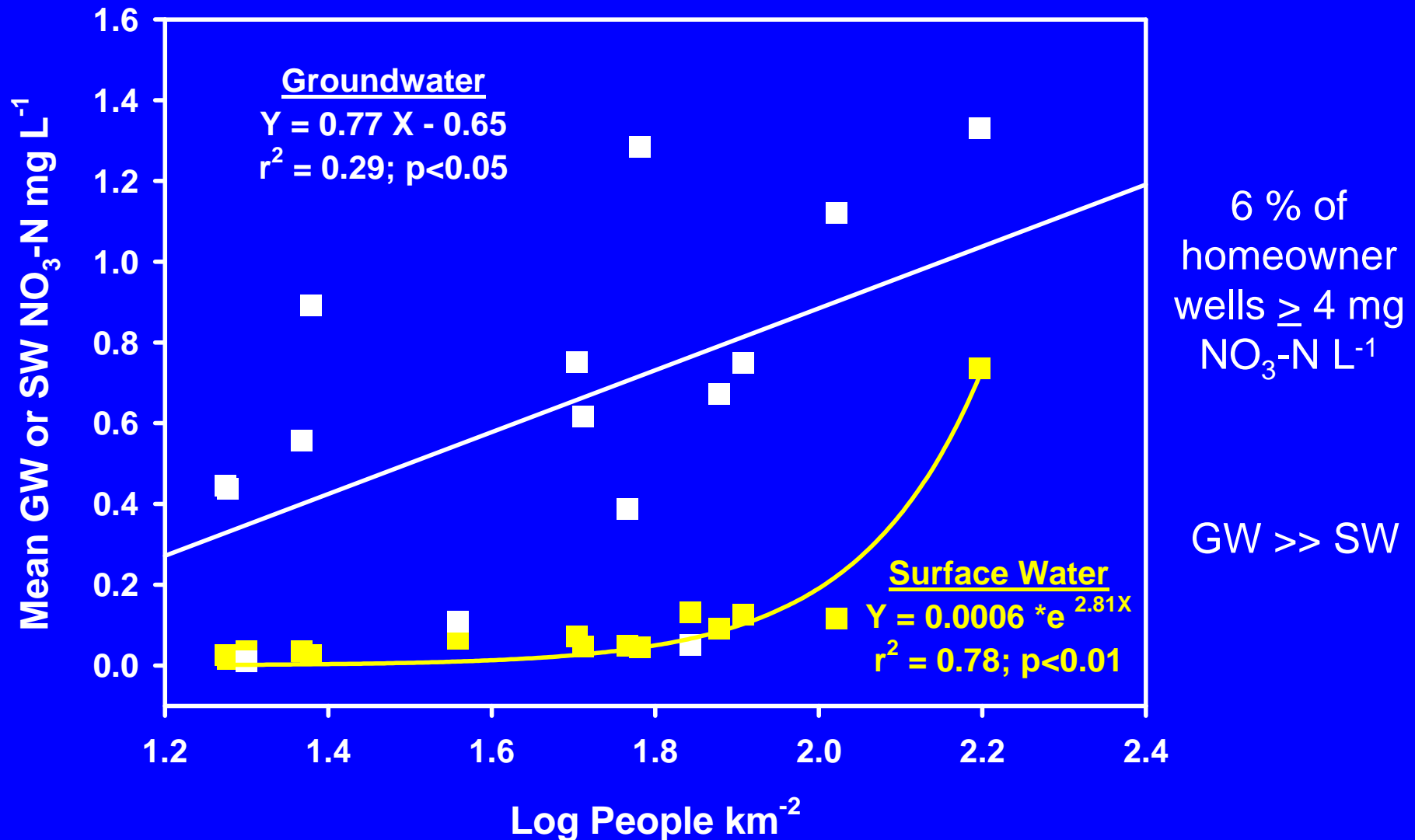


Dissolved Organic Matter is Related to Wetland Cover

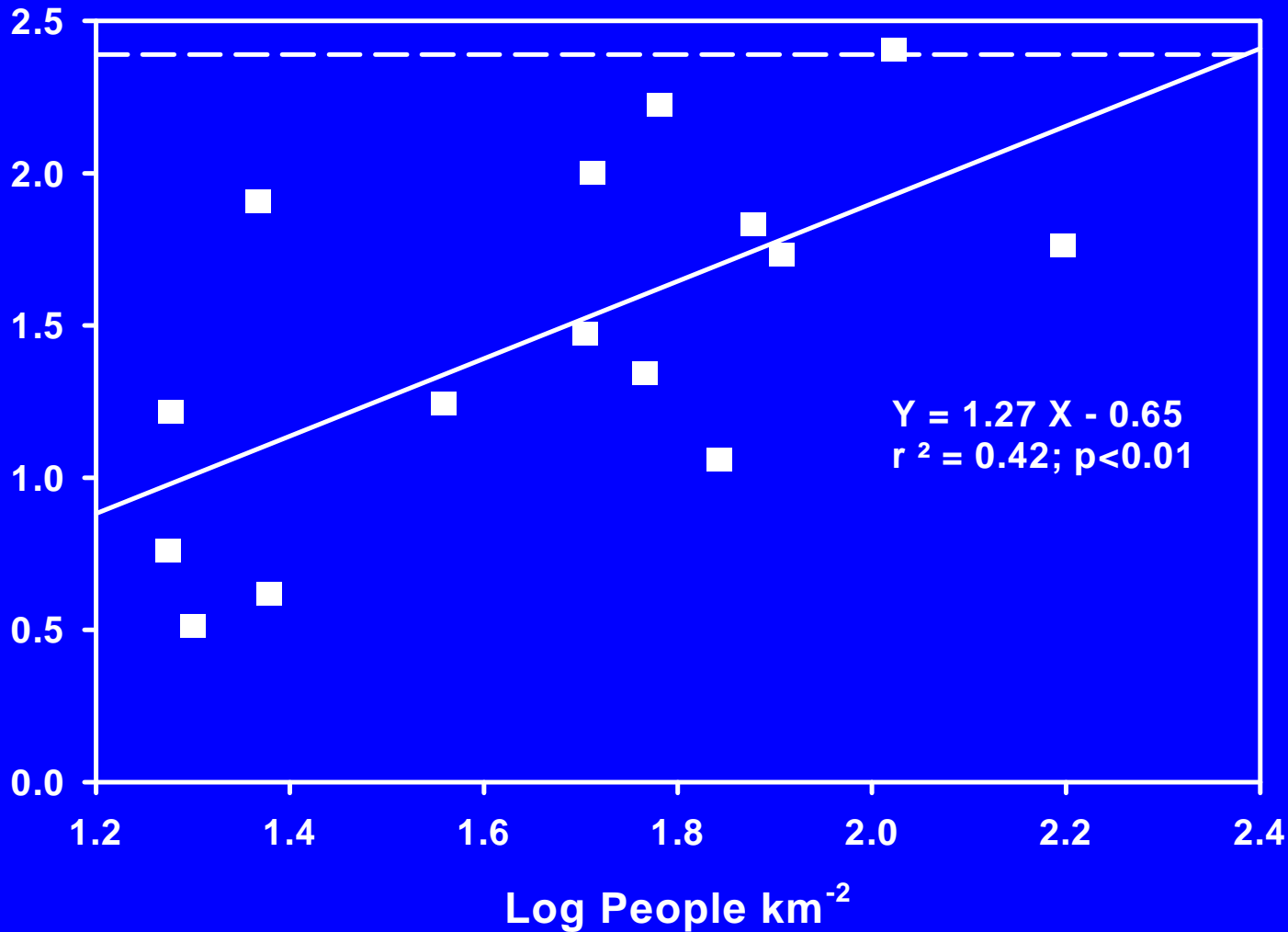
Lamprey, Ossipee and Oyster Sub-basins



Mean Groundwater Nitrate in Lamprey Sub-basins is best predicted by human population density



Mean Groundwater Chloride in Lamprey Sub-basins is best predicted by human population density



MCL = 250
mg L⁻¹ Cl

6 % of
homeowner
wells \geq
MCL

OPPORTUNITIES FOR ADDITIONAL DES- WRRC INTERACTION

- Develop shared research agenda that matches WRRC funding to pressing research needs of DES
- Integrate DES priorities into LRHO research program
- Develop more structured opportunities for graduate education of DES employees
- Develop strategic plan for analytical facilities that best meet needs of DES and UNH without unwarranted overlap