Linking Groundwater Quality to Landscape Characteristics in the Lamprey River Basin

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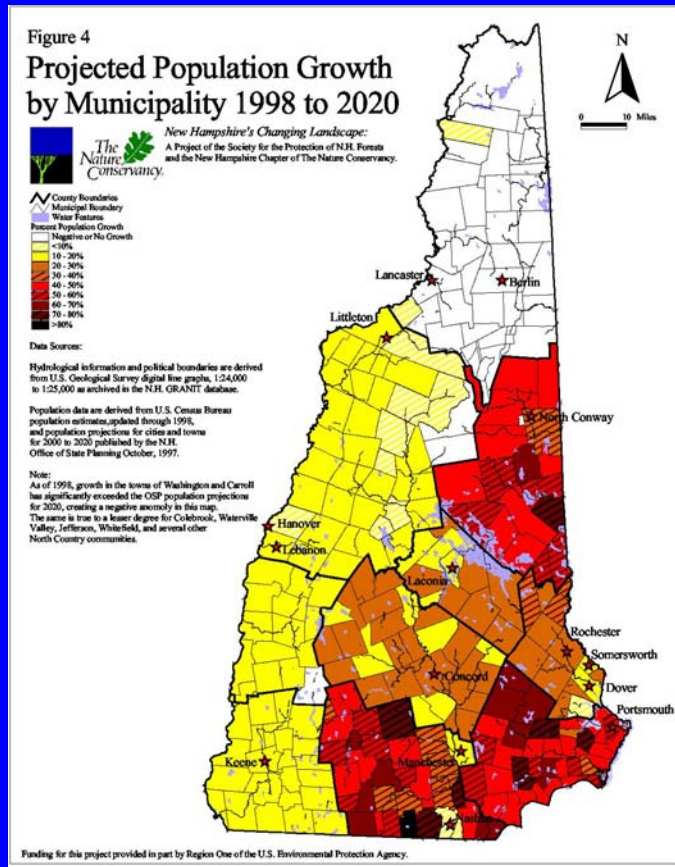
Why should we care about groundwater resources?

- Rapid growth in Seacoast NH will increase pressure on our groundwater resources
- >37% of the people in NH rely on private wells for drinking water (US Census 1990)
- Drinking water quality in private wells is not regulated and often unknown



Research Objectives

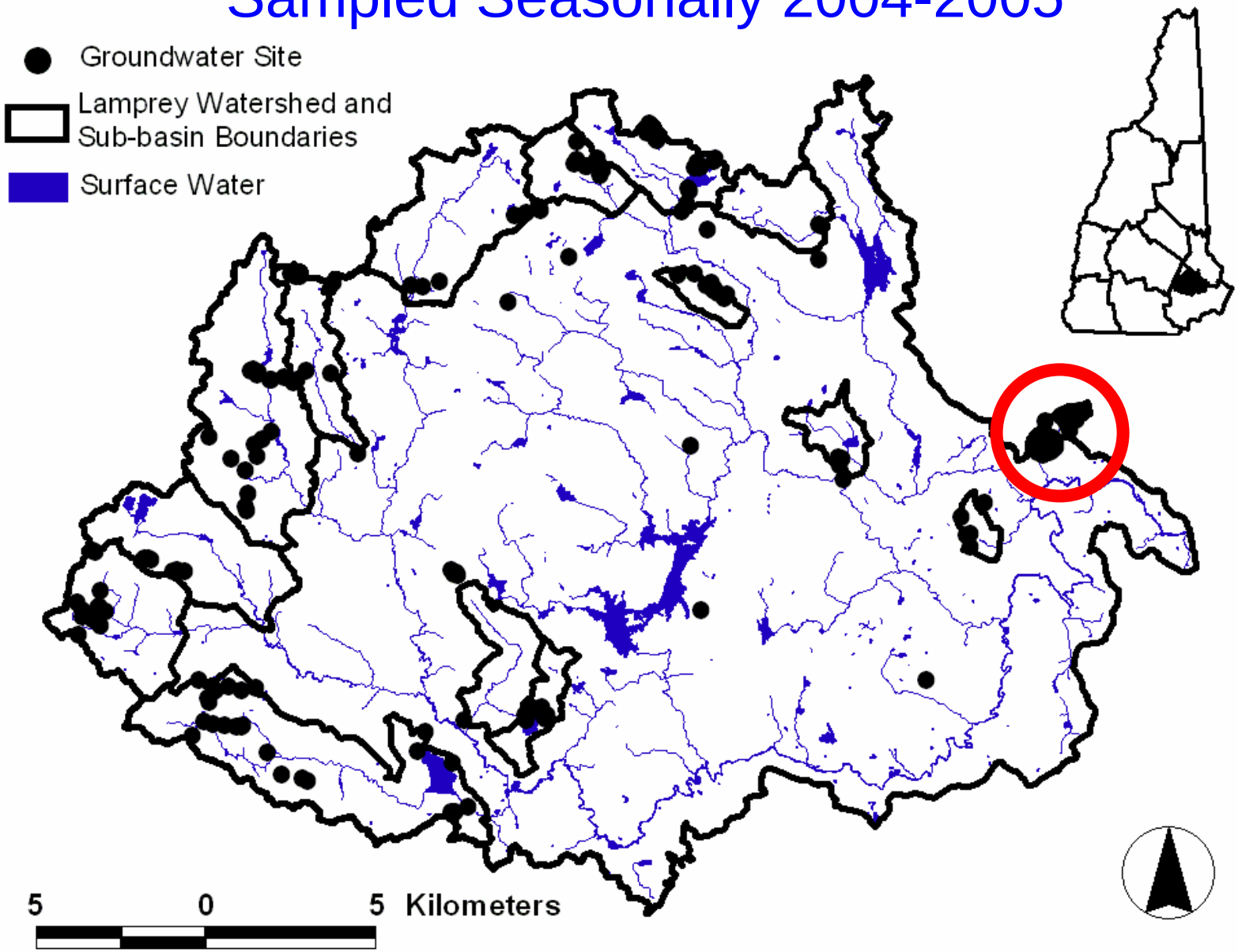
1. Determine if groundwater quality is driven by landscape characteristics using multiple regression analysis
2. Determine if sub-basin or well buffer characteristics are better at predicting water quality
3. Compare groundwater quality to surface water quality

Groundwater Constituents Measured to Characterize Groundwater Quality

- Nitrate (NO_3^-)
- Ammonium (NH_4^+)
- Dissolved Organic Nitrogen (DON)
- Dissolved Organic Carbon (DOC)

- Arsenic (As)
- Lead (Pb)
- Uranium (U)
- Sodium (Na^+)
- Chloride (Cl^-)
- Calcium (Ca^{2+})
- Magnesium (Mg^{2+})
- Sulfate (SO_4^{2-})

Lamprey River Groundwater Sites and Sub-basins Sampled Seasonally 2004-2005

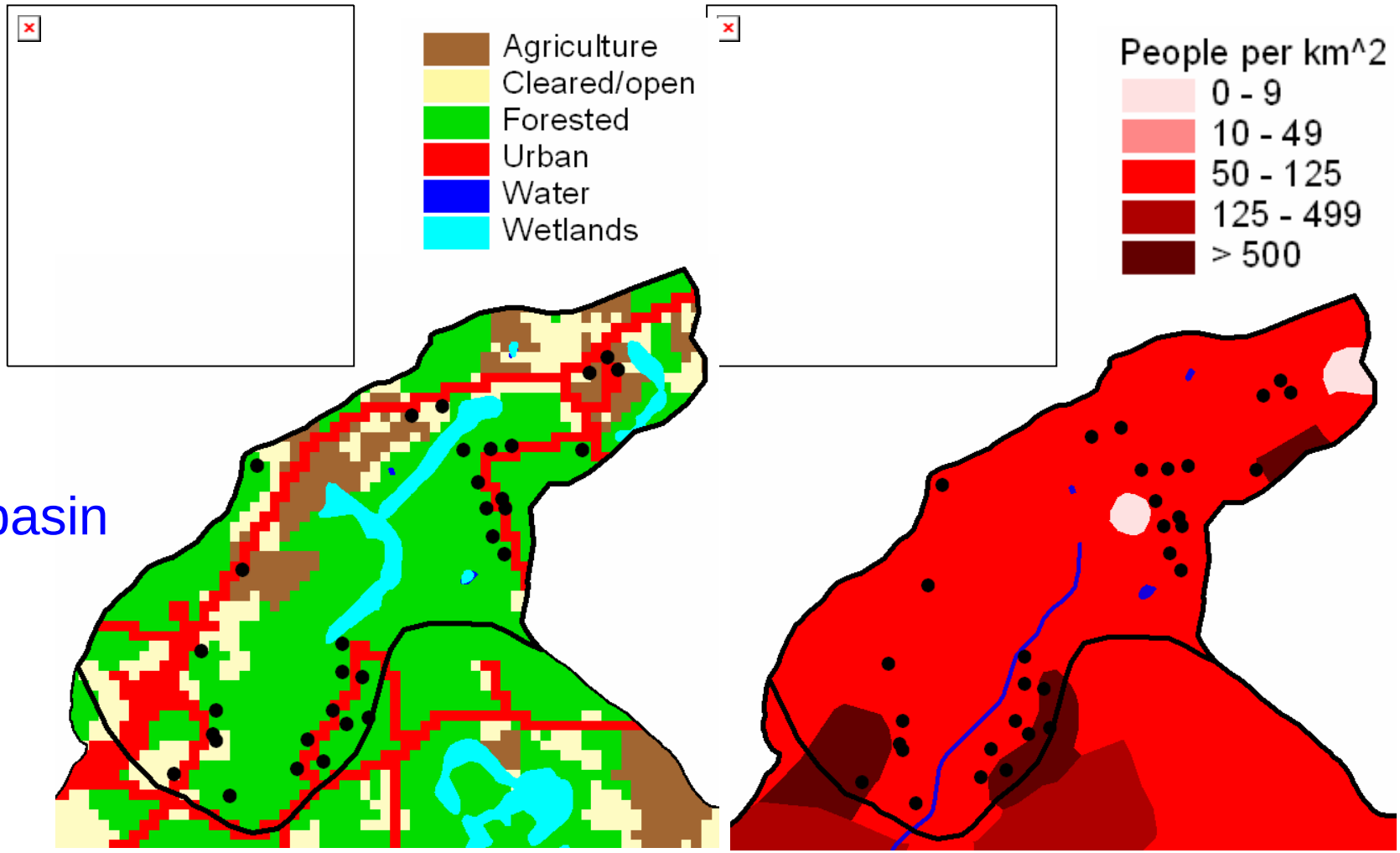


Land Use

Population Density

Well Buffer

Sub-basin

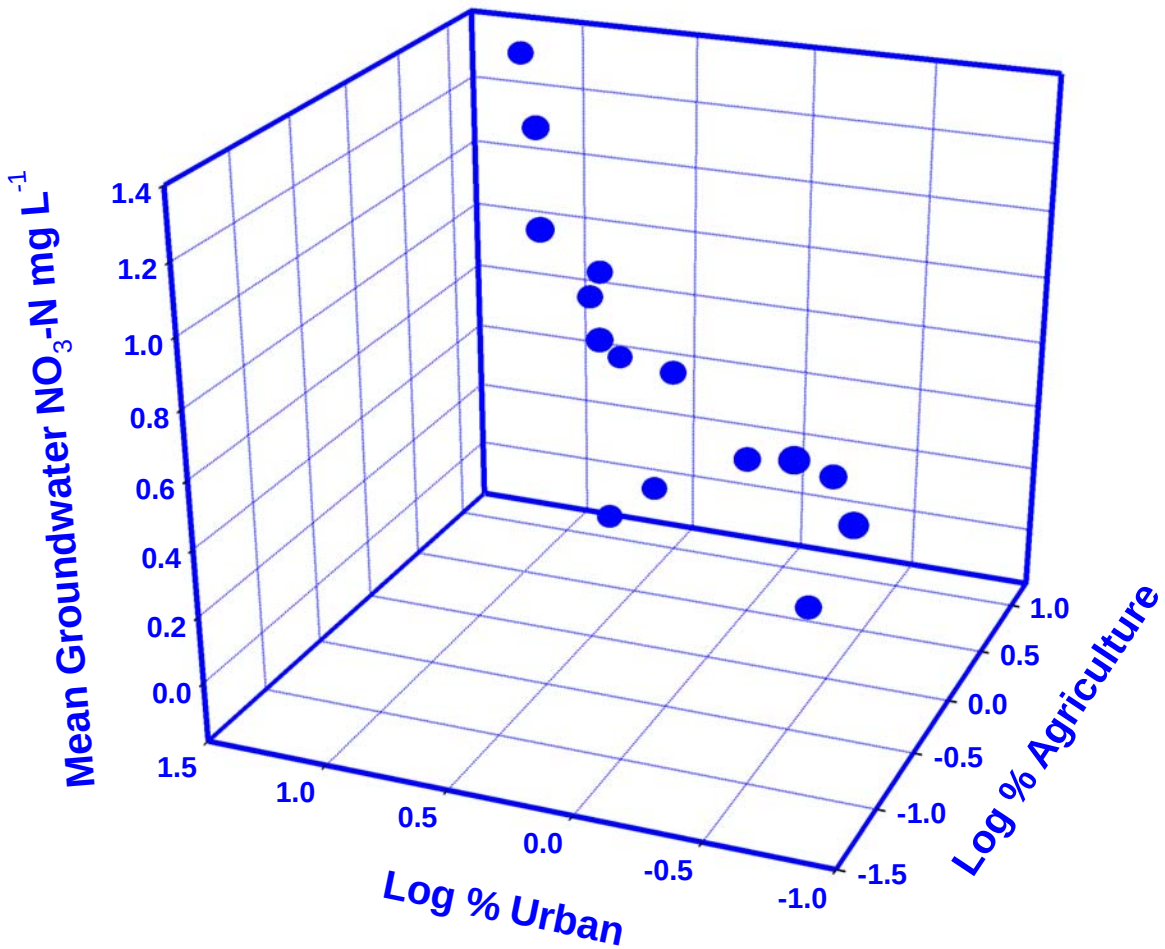


Backwards Step-wise Regression for Mean Groundwater Nitrate

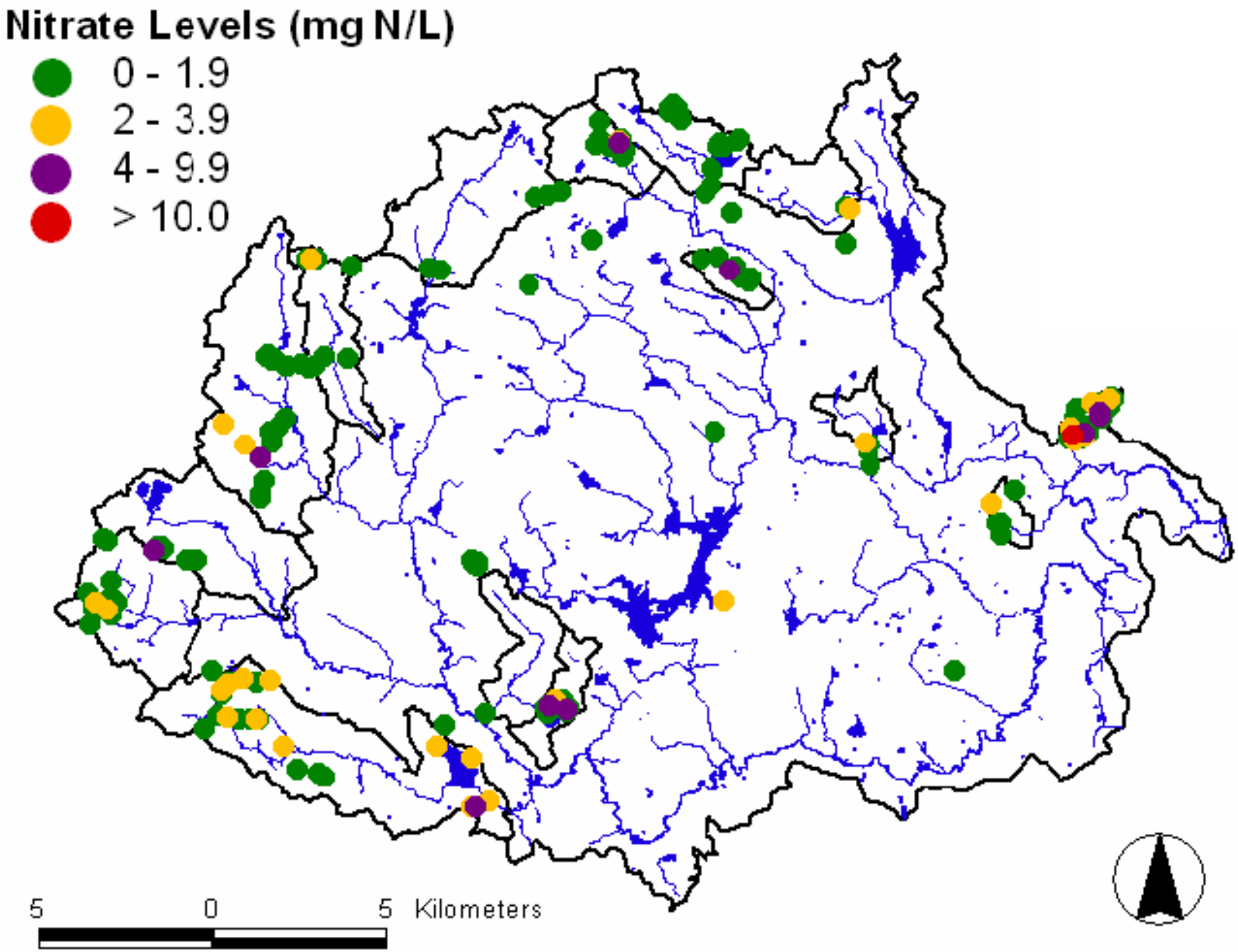
Nitrate	Sub-basin	50m Well Buffer	500m Well Buffer
p value	.01	.00	.00
Model R^2	.55	.07	.09
N	15	189	189

	Variables Retained		
Population	N	N	N
Urban	Y	Y	Y
Ag	Y	N	N
Wetlands	N	N	N

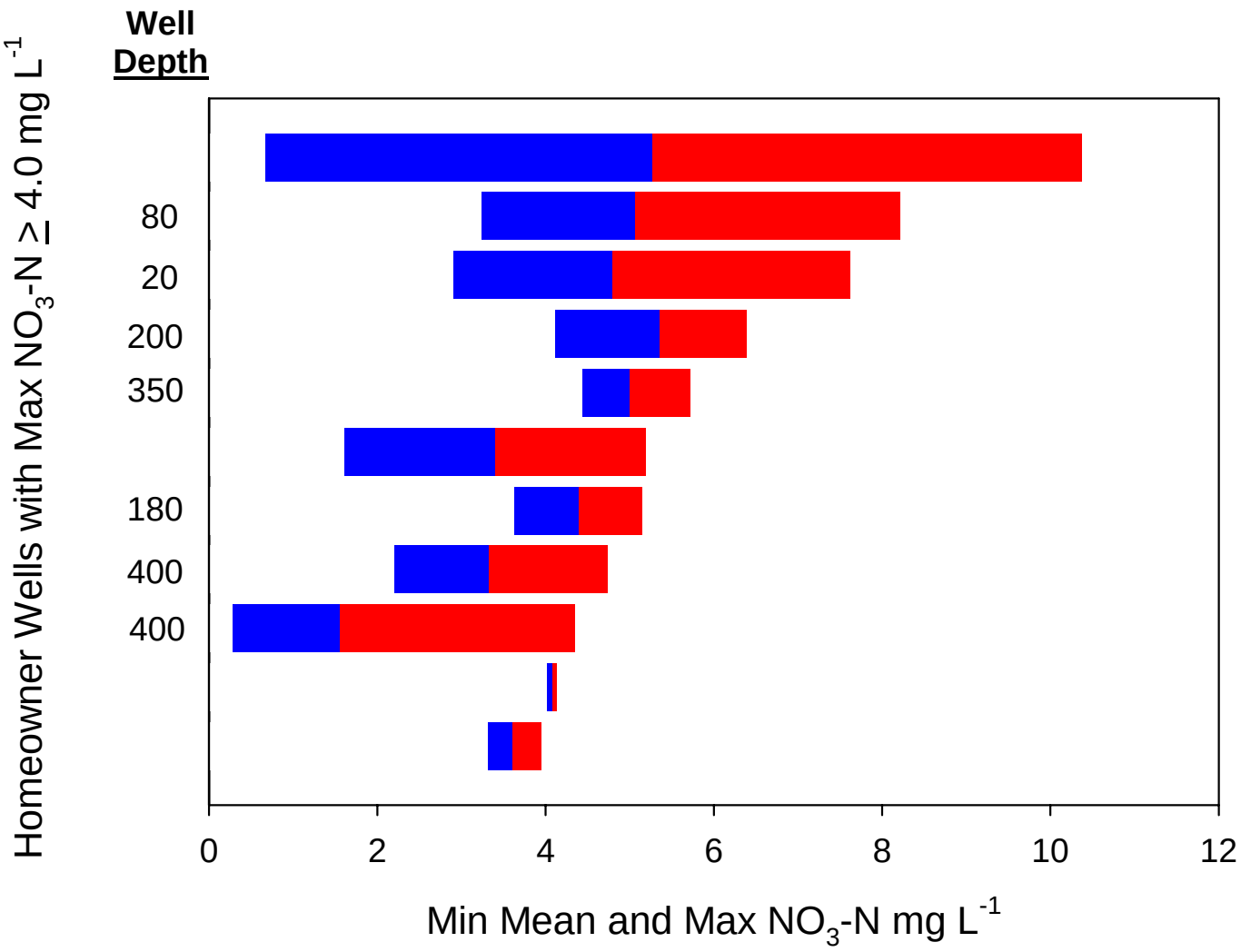
Sub-basin Regression Model for Mean Groundwater Nitrate



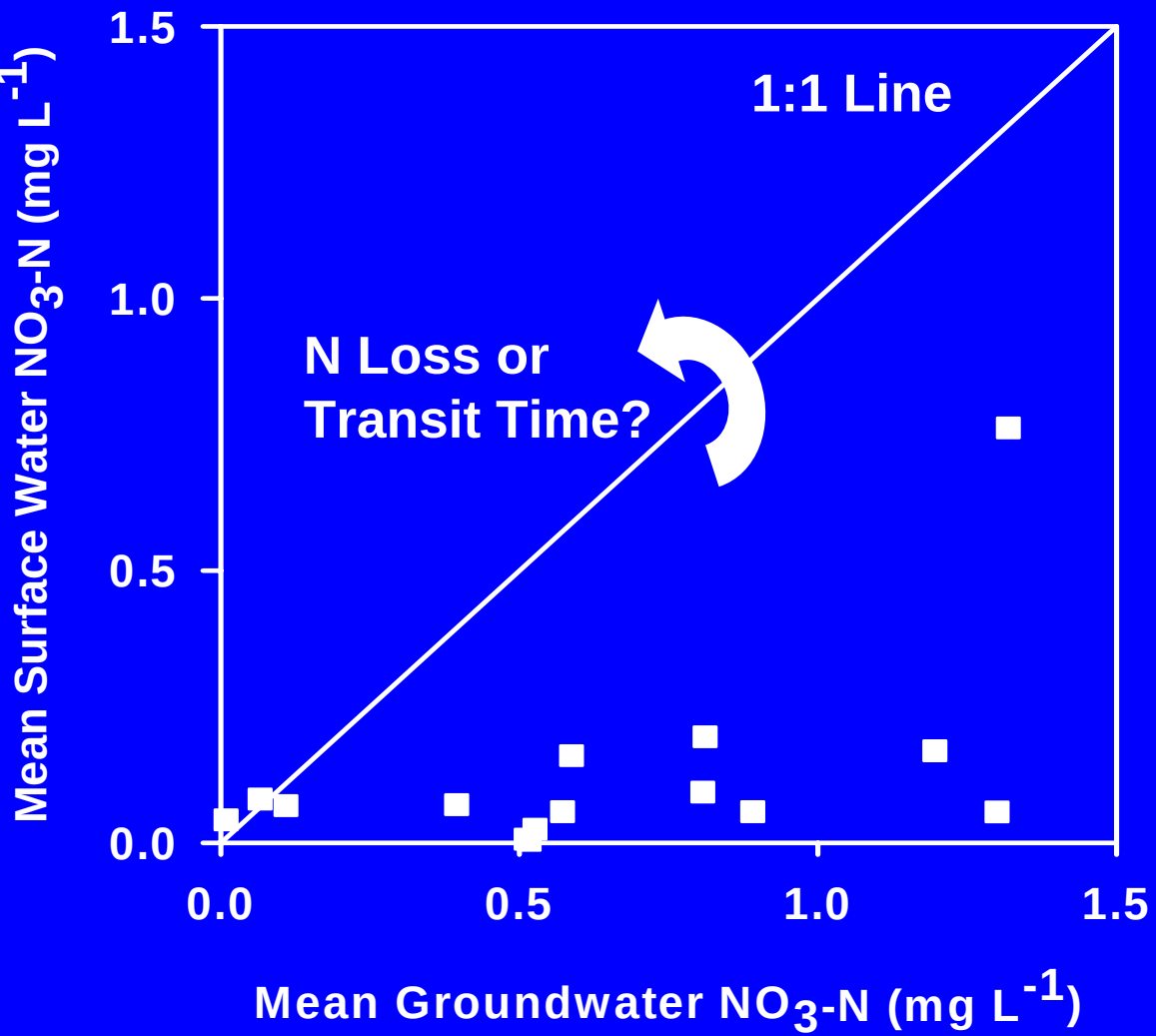
Maximum Nitrate Concentration in Homeowner Wells



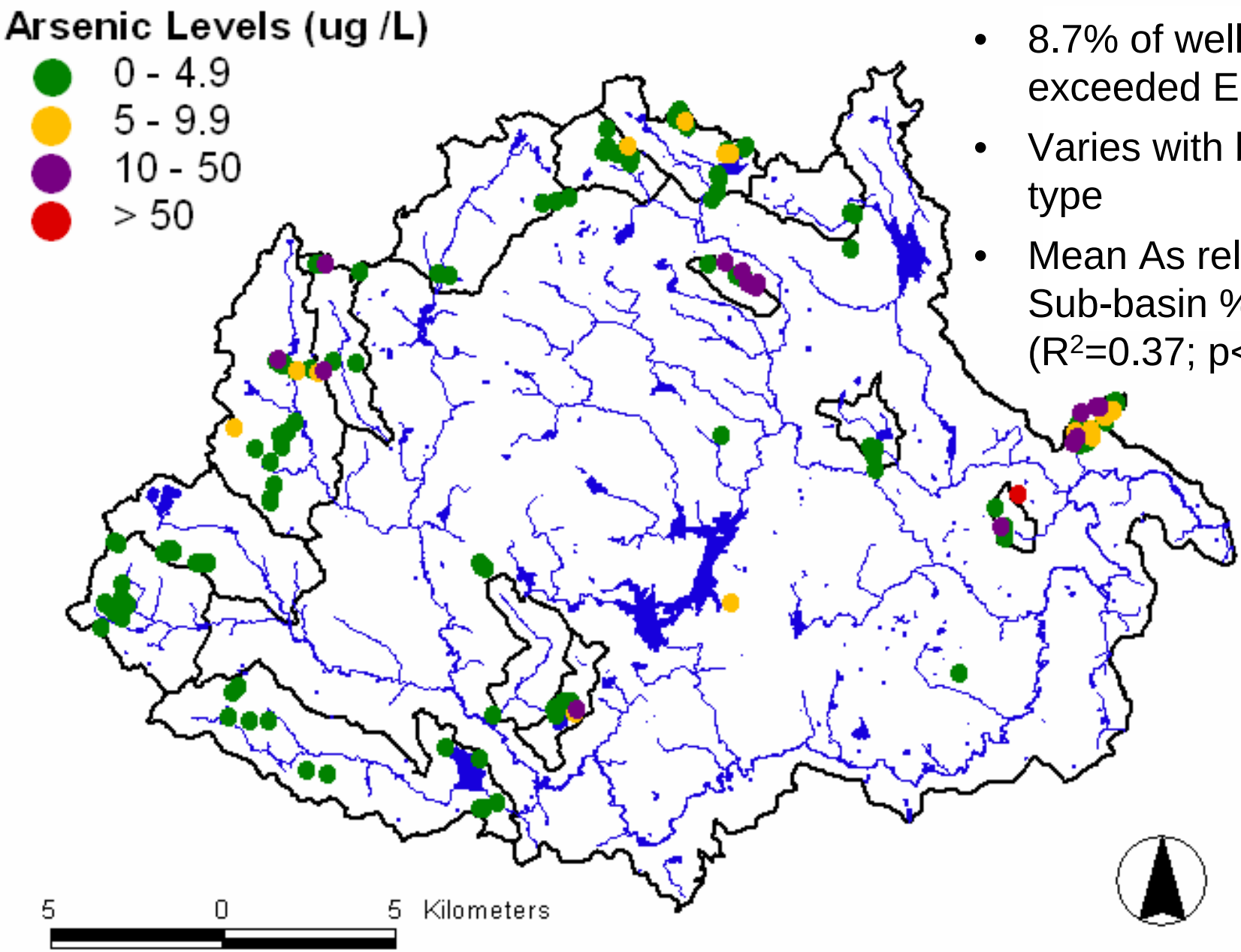
Variability in Nitrate in Homeowner Wells



Surface Water Nitrate vs. Groundwater Nitrate (by sub-basin)

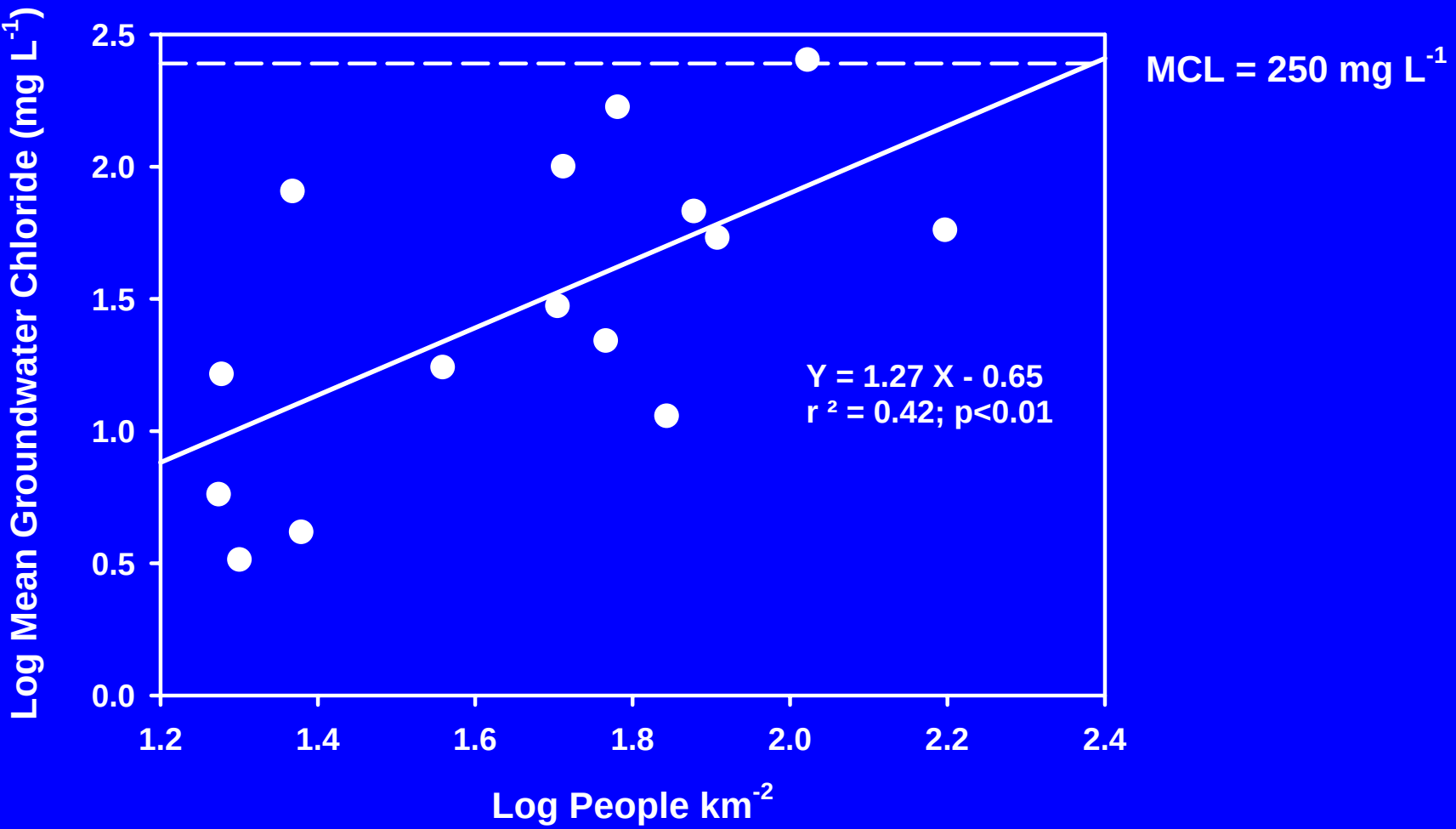


Maximum Arsenic Concentration in Homeowner Wells



- 8.7% of wells exceeded EPA limit
- Varies with bedrock type
- Mean As related to Sub-basin %Ag (R^2=0.37; p< 0.05)

Mean Groundwater Chloride vs. Population Density (by sub-basin)



Conclusions

- Activities on the land surface are impacting our groundwater quality
- Sub-basin landscape characteristics are better predictors of groundwater quality than buffer zones around wells
- Groundwater concentrations can vary over time and space…..you can’t always rely on one sample result or your neighbor’s analysis