

# Current Research in the Lamprey River Watershed

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# 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 Stream Flow

- Lamprey at Packers Falls – USGS July 1934 to present
- WHB in Lee – Matt Davis (UNH) 2006 to present
- North River in Lee (near Epping)
  - USGS from June 2004 to Oct 2006
  - Weekly measurements made by UNH since Oct 2006

# Well Fields

James Farm – Est. 1995

WHB – Est. 2004



# Precipitation Collection



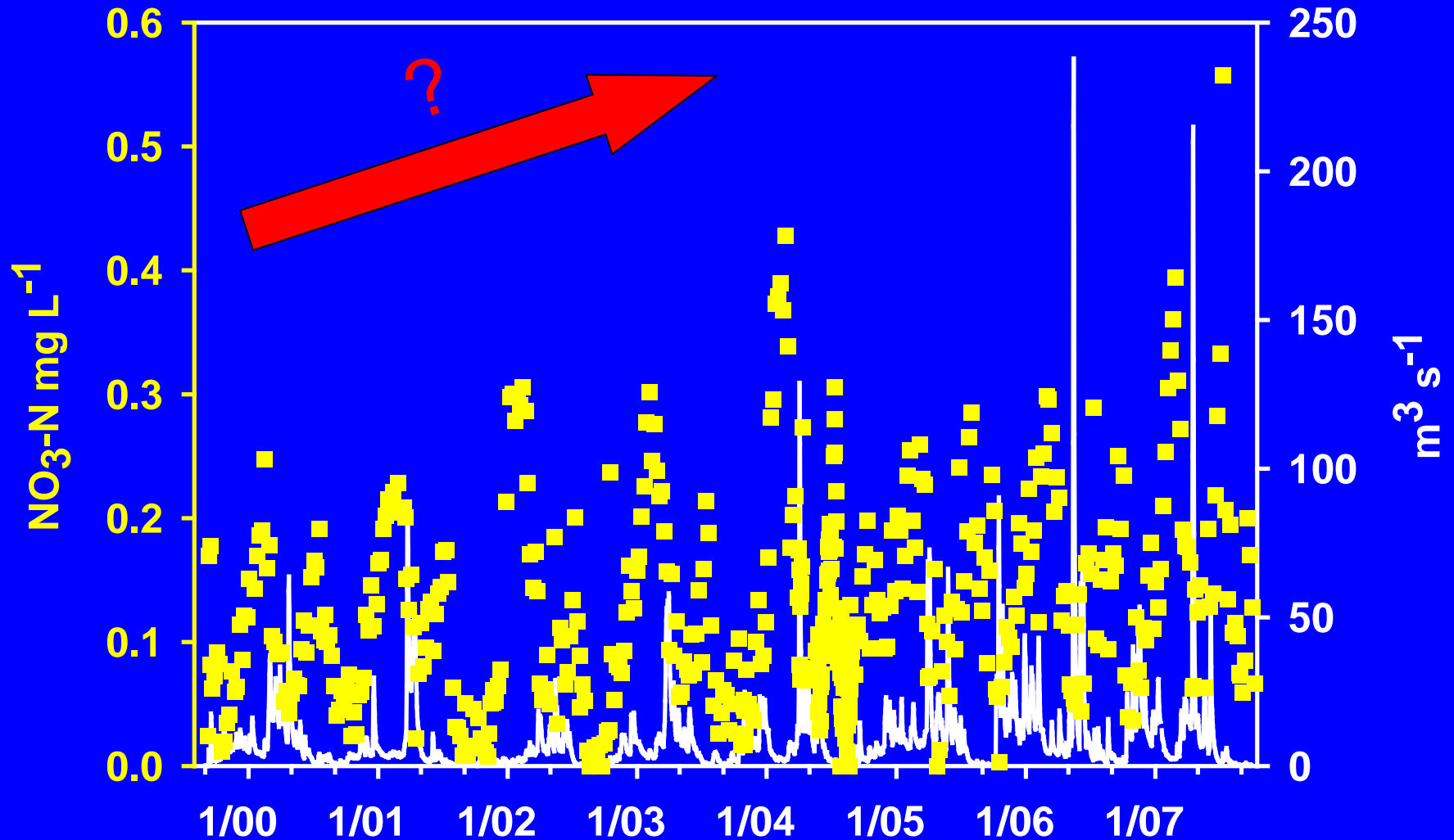
Volunteer Precipitation Monitoring  
Established October 2003



Precipitation Chemistry  
Collection Established  
November 2003

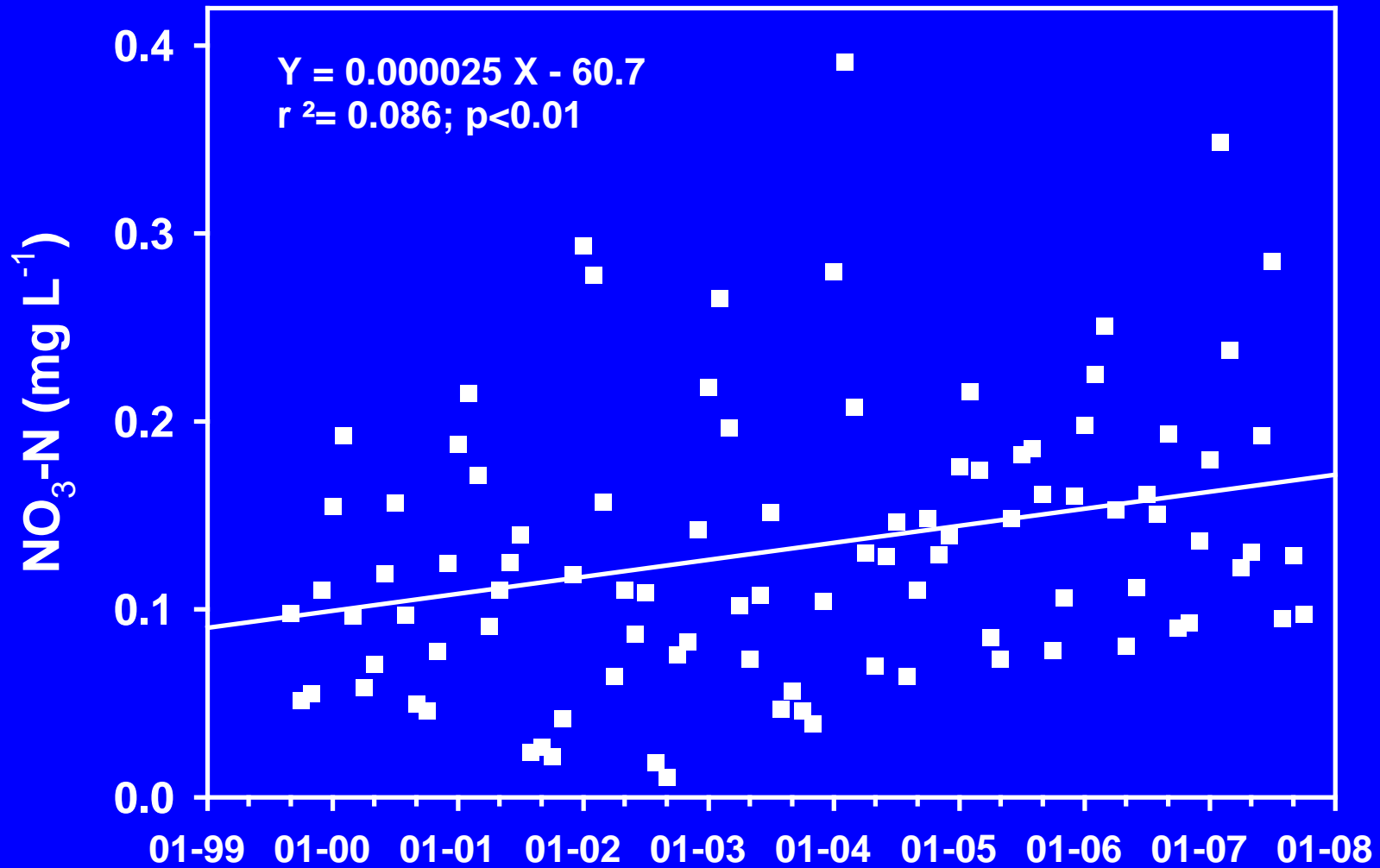
Sampling Category	Parameters Measured
3 Weekly Stream Sites (Lamprey since 9/99; WHB and North River since 2004)	DOC, DON, NO <sub>3</sub> , NH <sub>4</sub> , PO <sub>4</sub> , SiO <sub>2</sub> , Cl, SO <sub>4</sub> , Na, Mg, K, Ca, TP, TDP, pH, SC, DO
Additional Parameters for the Lamprey (since 10/02)	DIC, TSS, Particulate C and Particulate N
13 Monthly Stream Sites (weekly during 2004; monthly since 2005)	DOC, DON, NO <sub>3</sub> , NH <sub>4</sub> , PO <sub>4</sub> , SiO <sub>2</sub> , Cl, SO <sub>4</sub> , Na, Mg, K, Ca, pH, SC, DO
Precipitation Chemistry at Thompson Farm (event basis since 11/03)	DOC, DON, NO <sub>3</sub> , NH <sub>4</sub> , PO <sub>4</sub> , SiO <sub>2</sub> , Cl, SO <sub>4</sub> , Oxalate, Na, Mg, K, Ca, pH, SC
WHB and James Farm Well Fields (Monthly 0704 to 05/07; Quarterly since 5/07)	DOC, DON, NO <sub>3</sub> , NH <sub>4</sub> , PO <sub>4</sub> , SiO <sub>2</sub> , Cl, SO <sub>4</sub> , Na, Mg, K, Ca, pH, SC, DO

# Nitrate Over Time in the Lamprey River

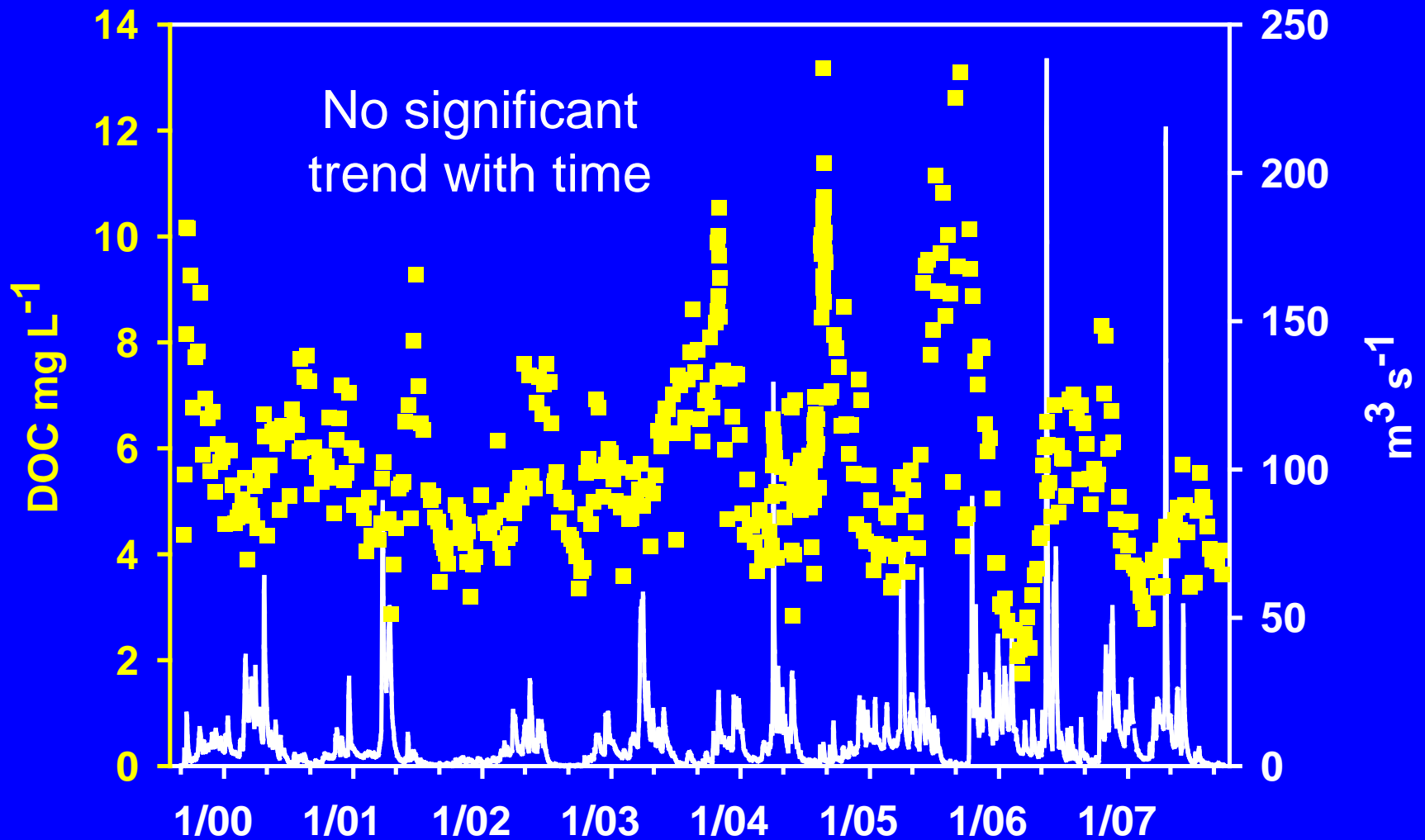




# Monthly Nitrate in the Lamprey River

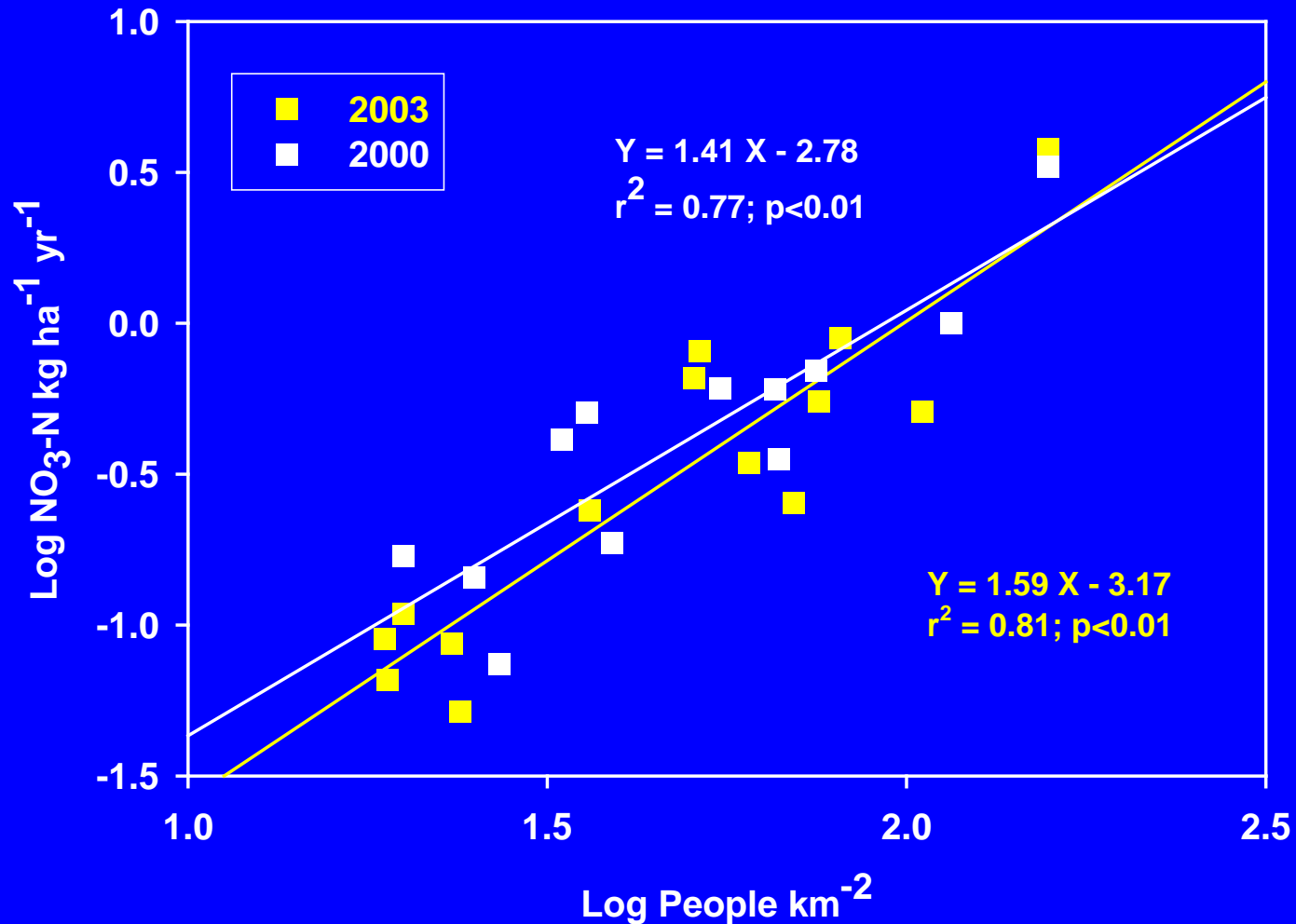


# Dissolved Organic Carbon Over Time in the Lamprey River



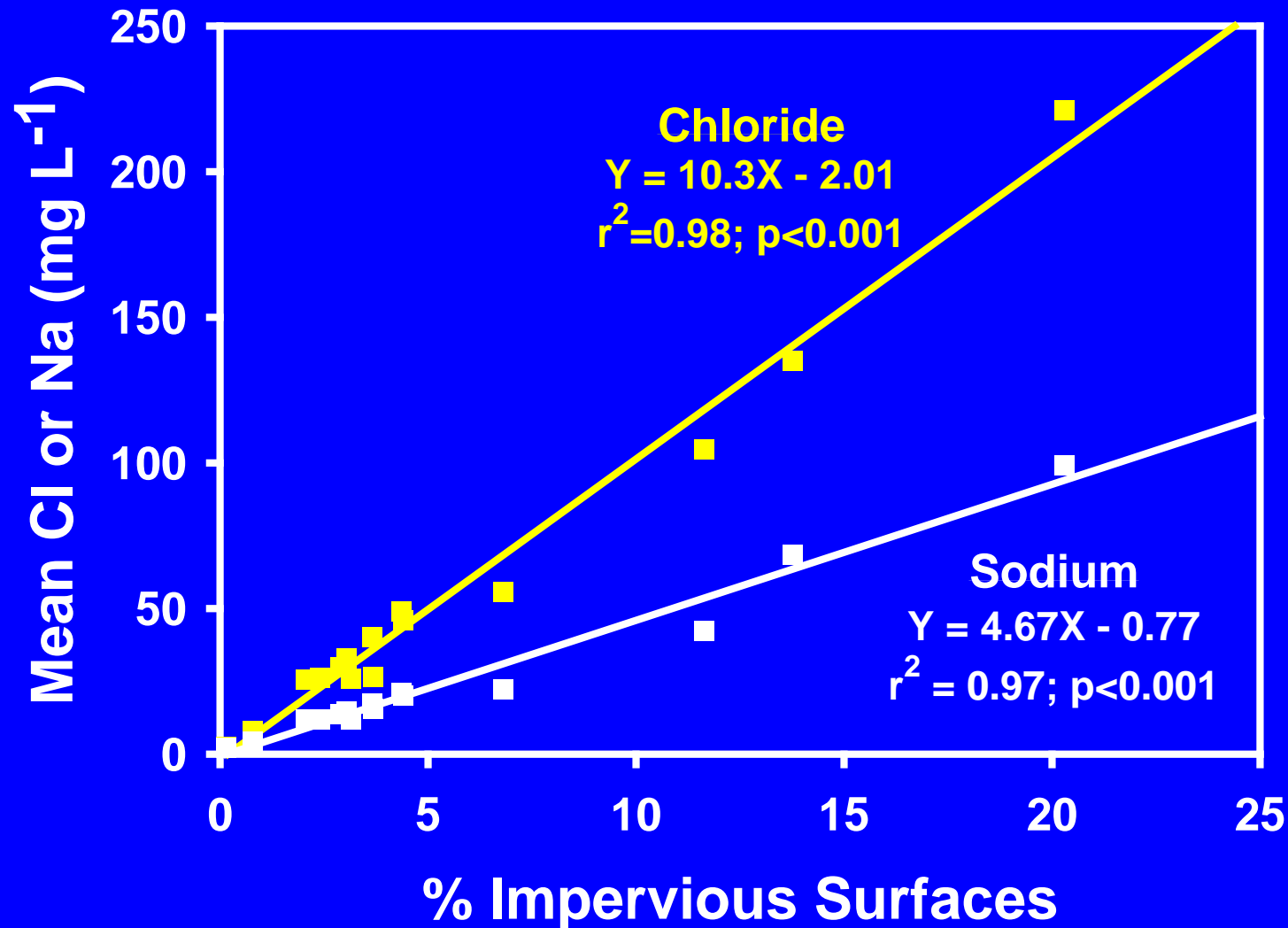
# Surface water nitrate is best predicted by human population density

## Lamprey Sub-basins



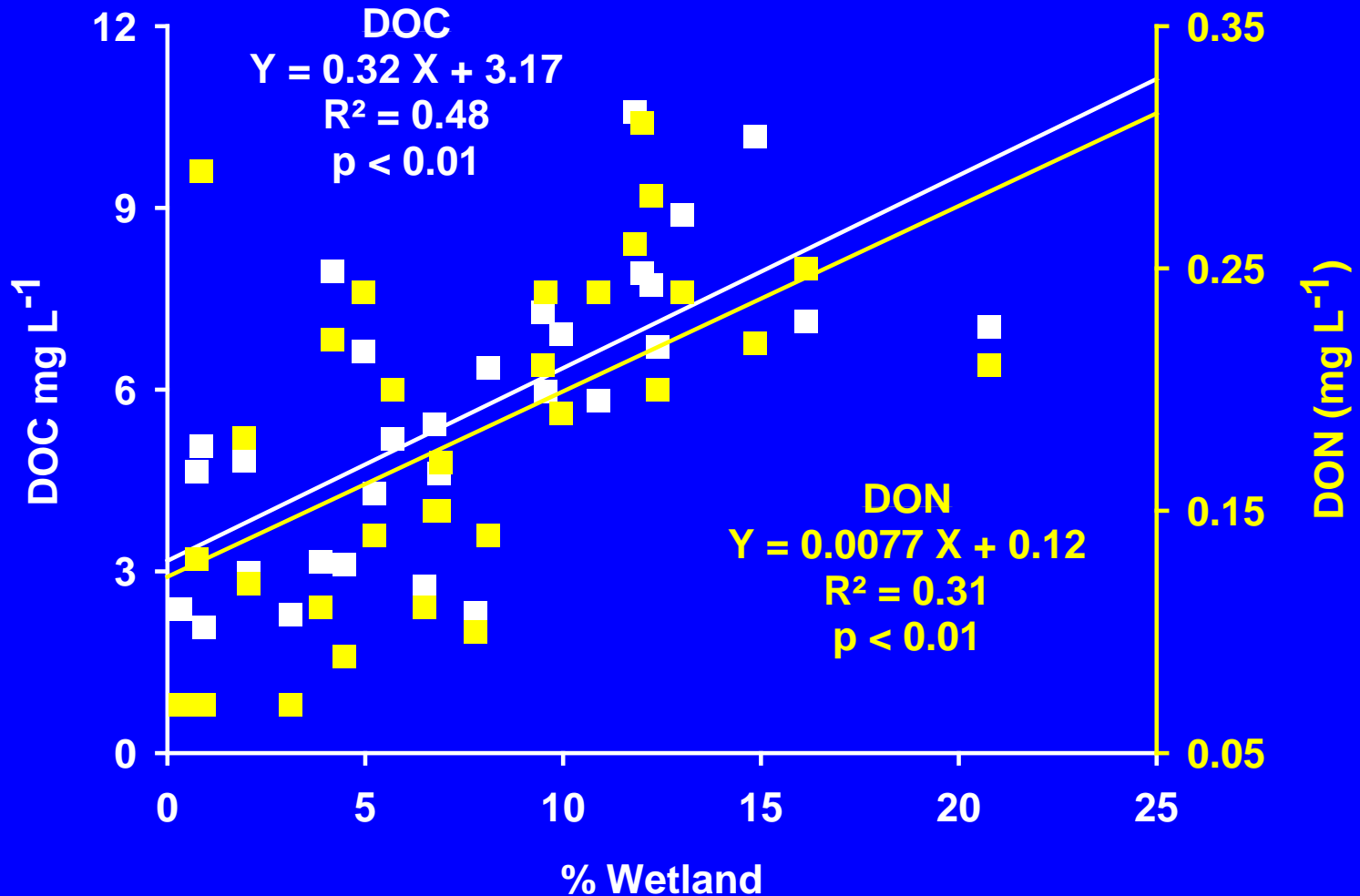
# Cl and Na are related to Impervious Surfaces

Lamprey and Oyster Sub-basins



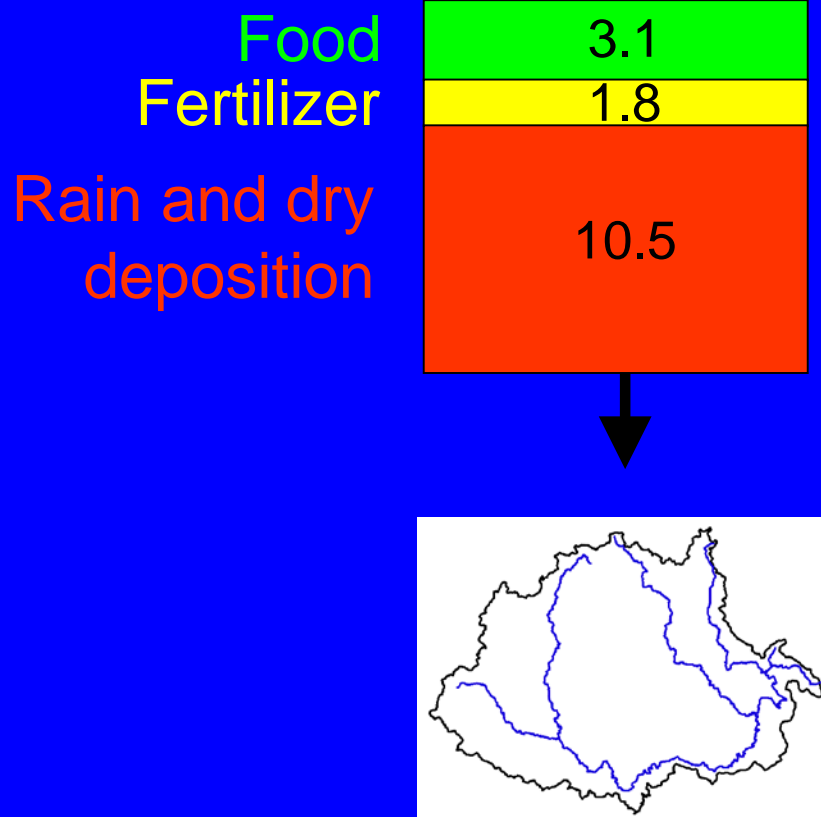
# Dissolved Organic Matter is Related to Wetland Cover

Lamprey, Ossipee and Oyster Sub-basins



# Nitrogen Inputs and Outputs from the Lamprey River Watershed (2005)

Total N Input  
 $15.4 \text{ kg N ha}^{-1} \text{ yr}^{-1}$

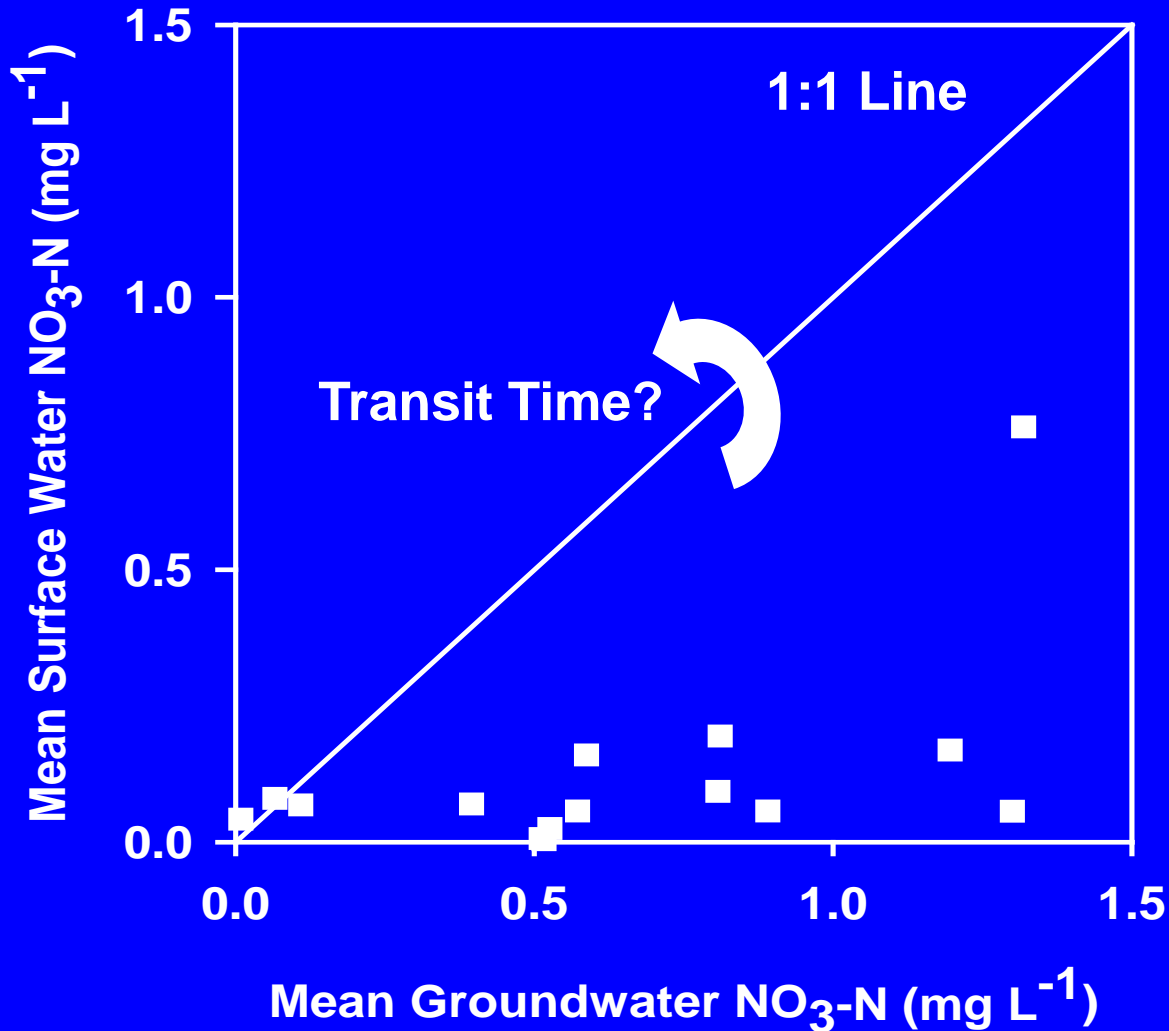


Total N Retention  
84% (or  $13.0 \text{ kg N ha}^{-1} \text{ yr}^{-1}$ )  
Stored or lost to atmosphere?

Total N Output  
 $2.4 \text{ kg N ha}^{-1} \text{ yr}^{-1}$

$0.82 \text{ kg DIN ha}^{-1} \text{ yr}^{-1}$   
(5 % of N Inputs)

# Mean Surface Water Nitrate Much Lower than Mean Groundwater Nitrate in Homeowner Wells



6 % of homeowner wells sampled reached or exceeded 4 mg NO<sub>3</sub>-N L<sup>-1</sup> at least once during quarterly sampling regime