Vulnerability of groundwater and surface water to contamination by nitrate in New Jersey

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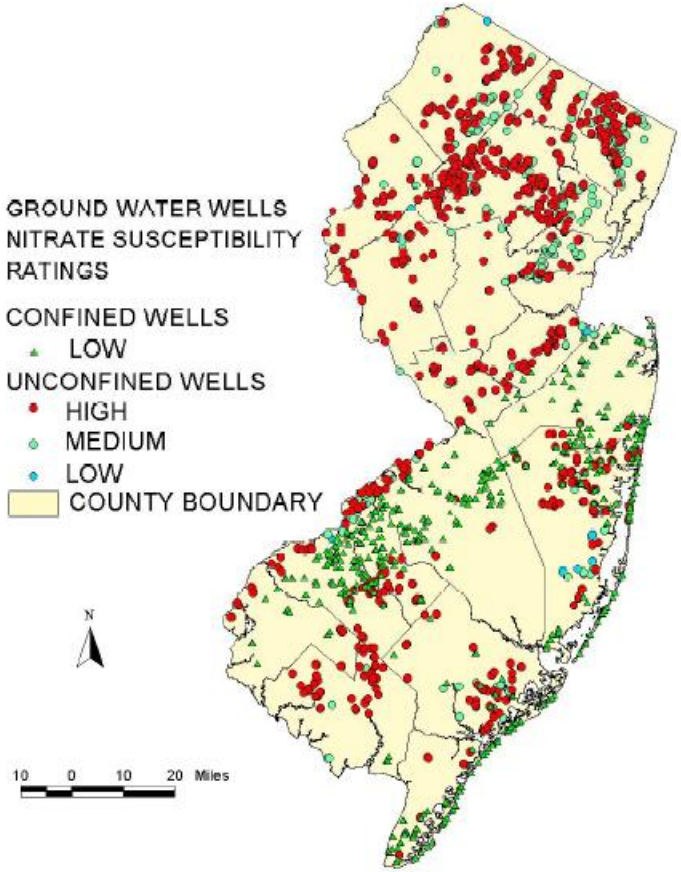
NJDEP SWAP Results for Nitrate

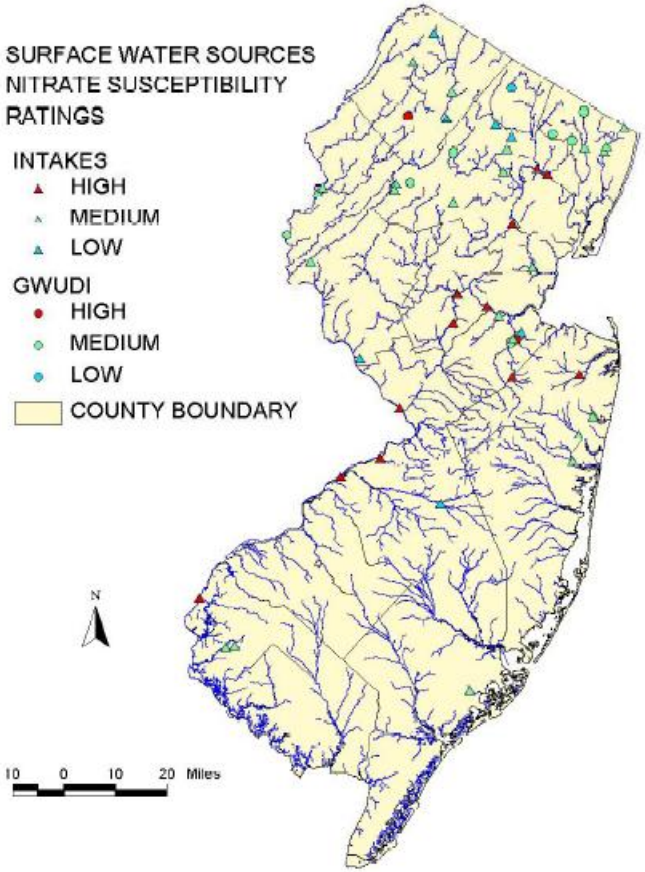
Community Supply Wells and GUISW



http://www.nj.gov/dep/swap/reports/gw_no3.pdf

Figure 1. Susceptibility of 2,237 community water supply wells in New Jersey to contamination by nitrate.

Community Supply Intakes

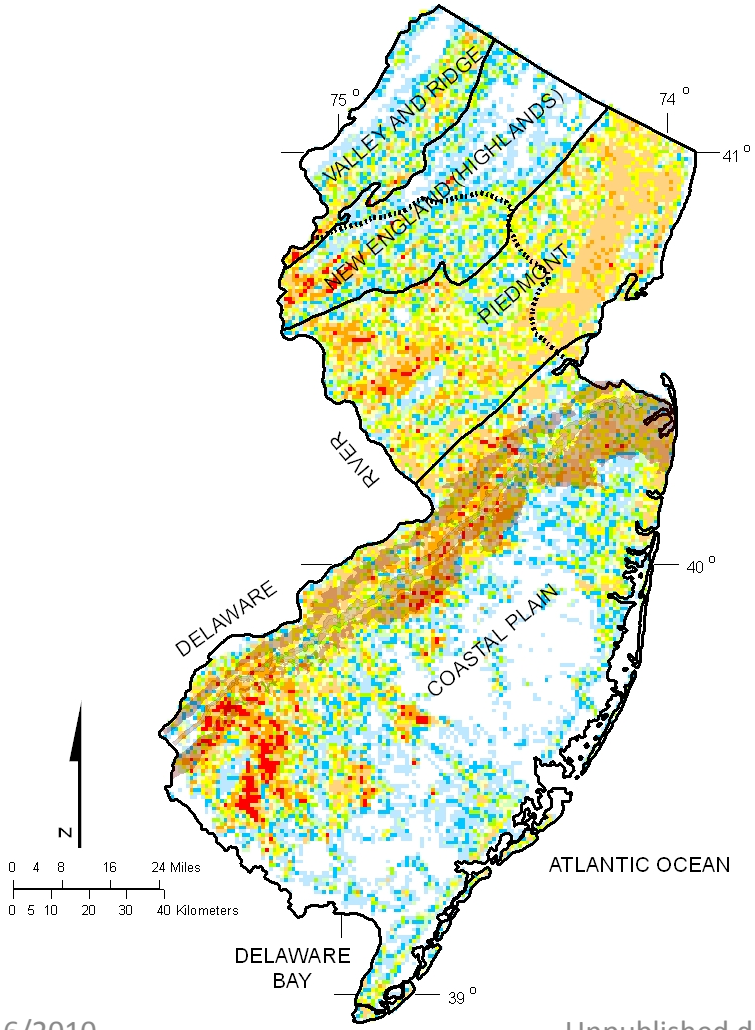


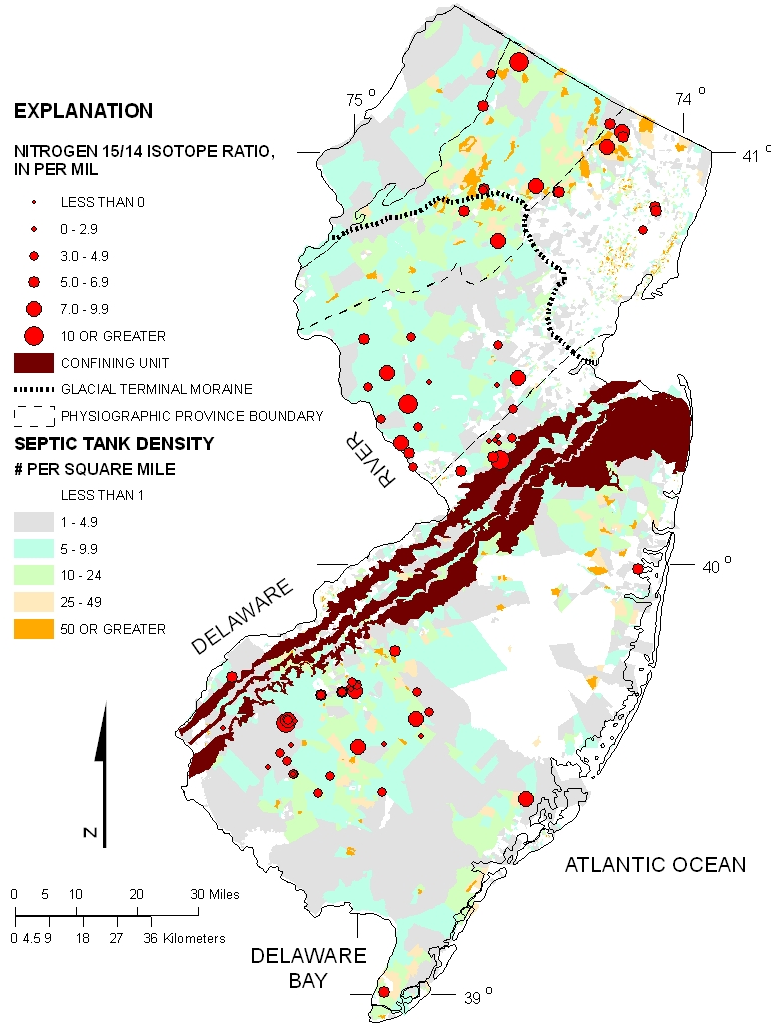
http://www.nj.gov/dep/swap/reports/sw_no3.pdf

Figure 1. Susceptibility of 49 public surface-water intakes and 11 public community supply wells under the direct influence of surface water to contamination by nitrate.

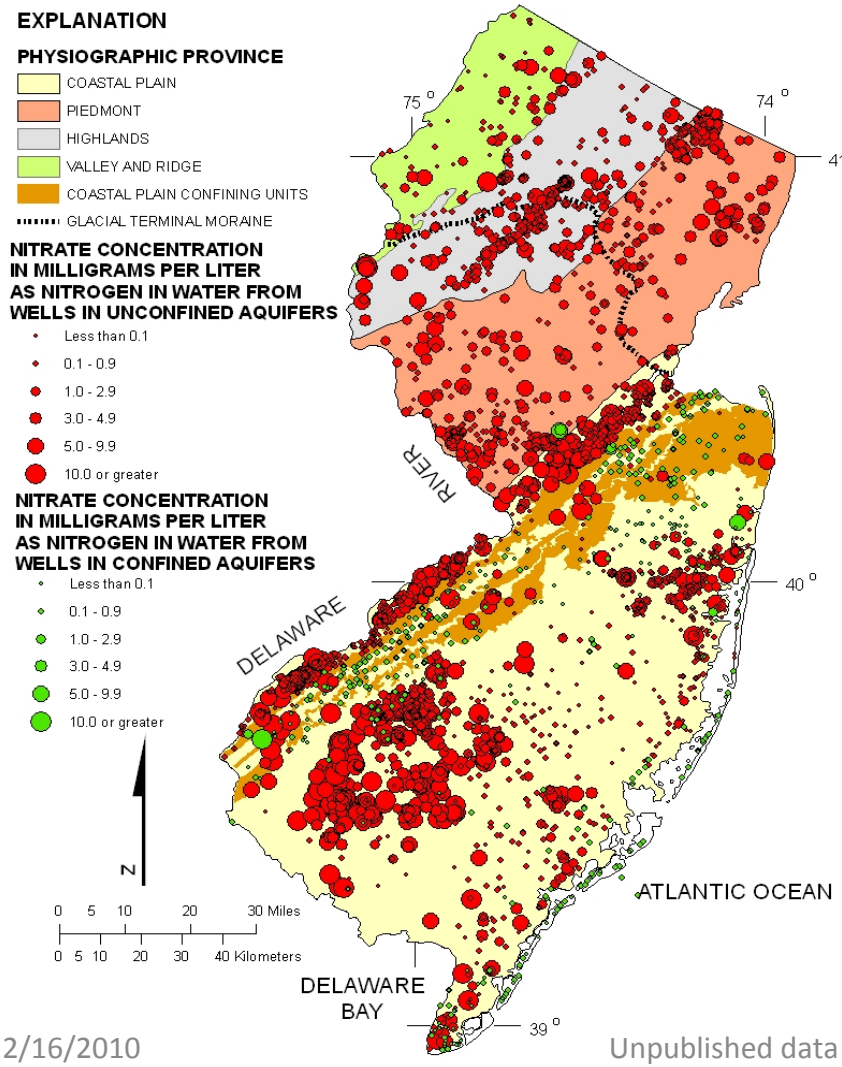
Unpublished data subject to revision

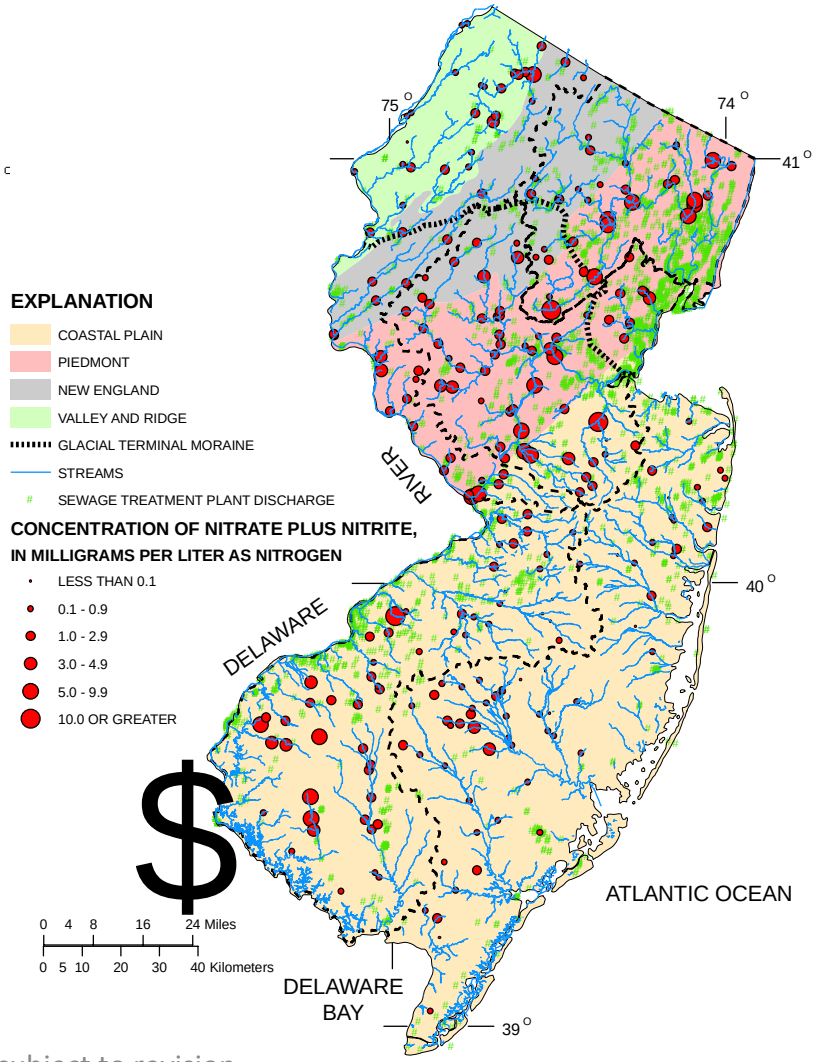
Land use, septic system density and physiographic provinces in New Jersey



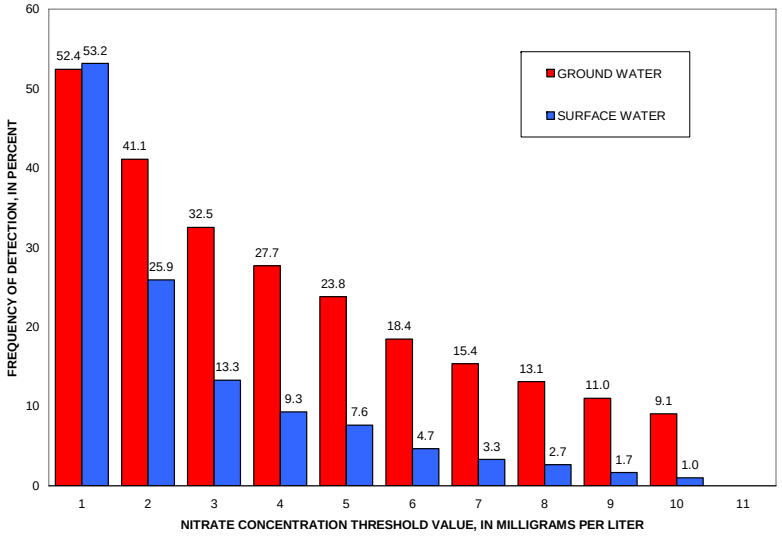


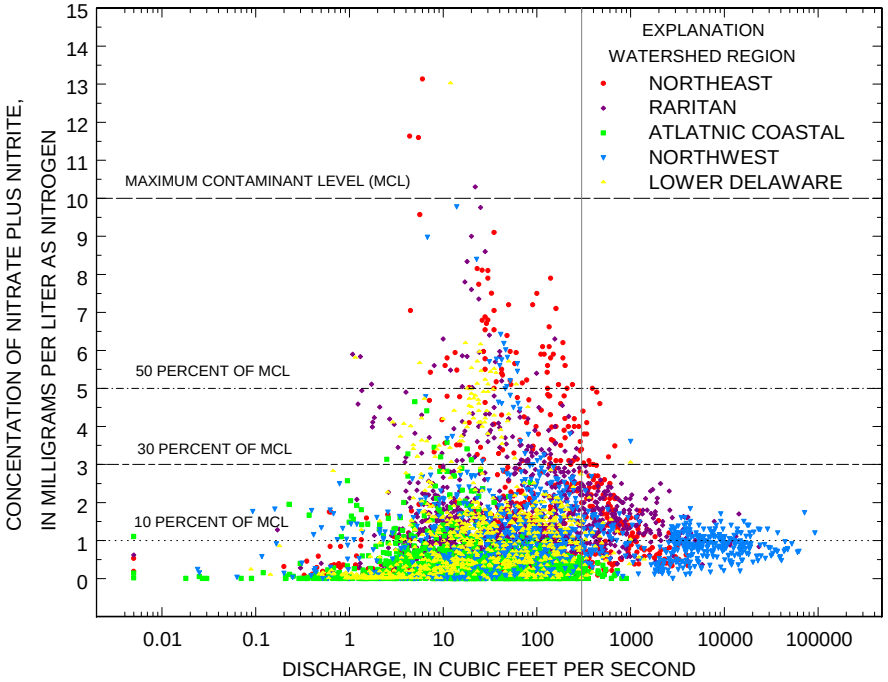
Maps of nitrate concentrations in (A) most recent groundwater and (B) largest concentration surface water





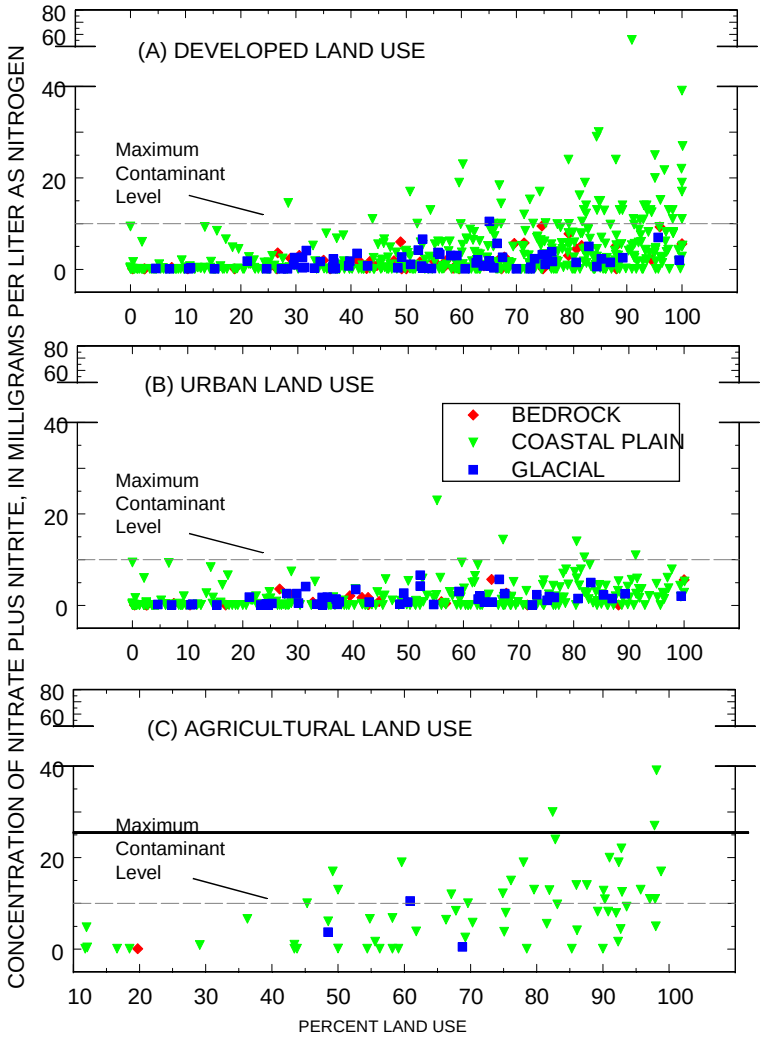
Frequency of detection of nitrate in water from (A) wells and surface water sites (B) relation of nitrate concentration to discharge



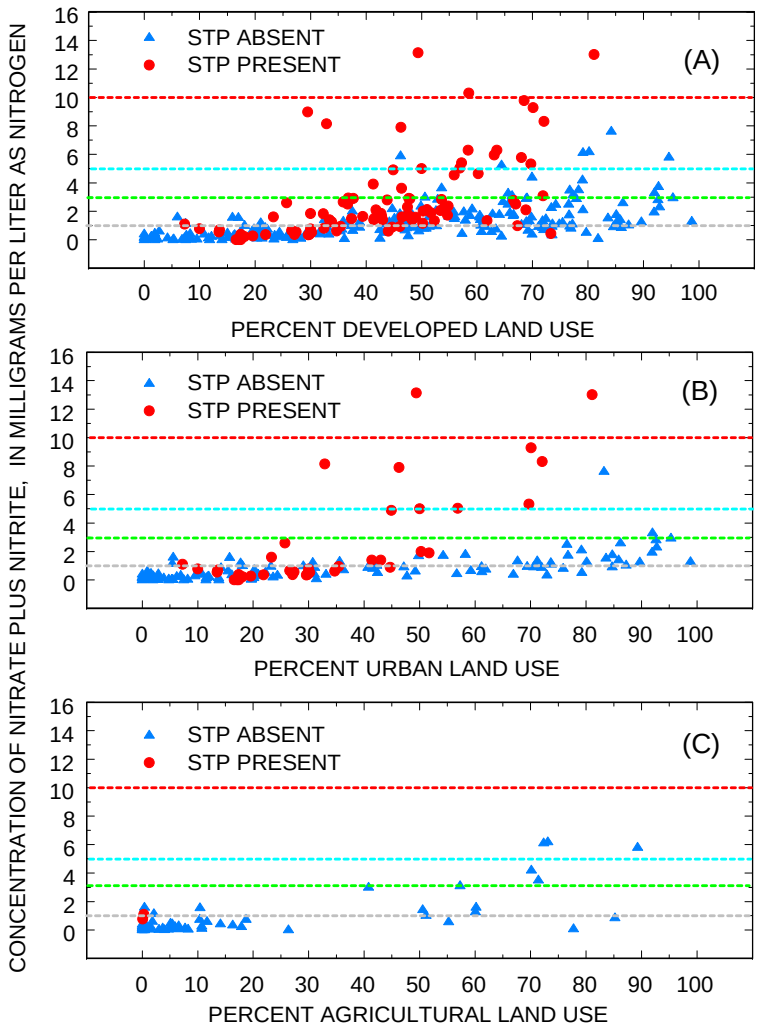


Relation to land use

Groundwater

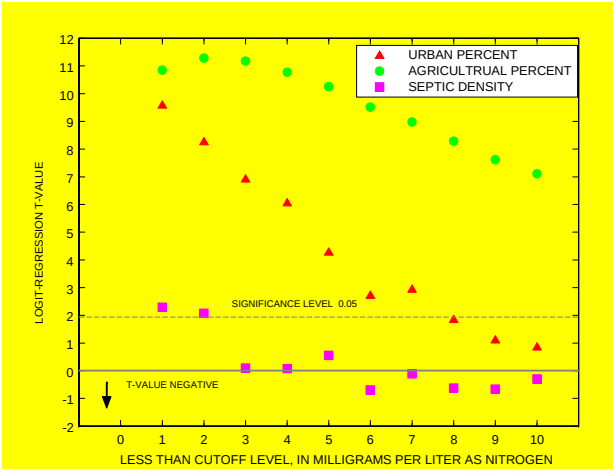


Surface water

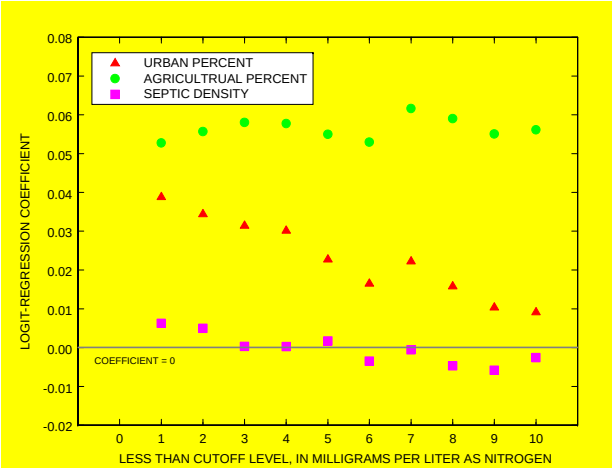


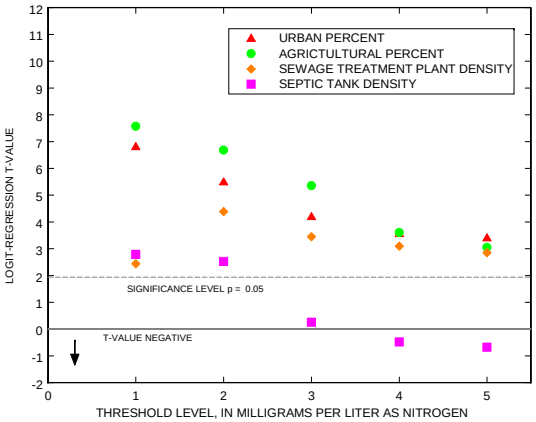
Relation of explanatory variables in logistic regression models for nitrate contamination to nitrate plus nitrite concentration threshold levels :

(A) statistical significance (t-value) (B) logistic-regression coefficient

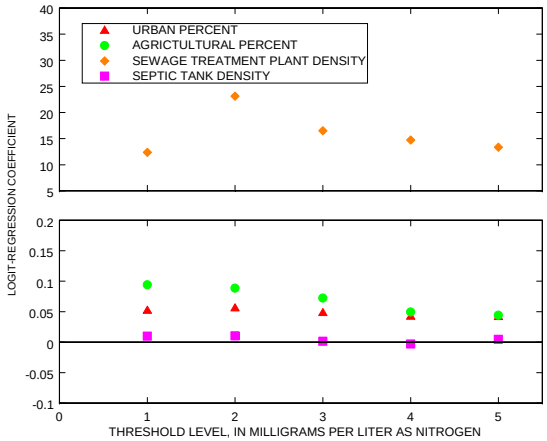


Groundwater



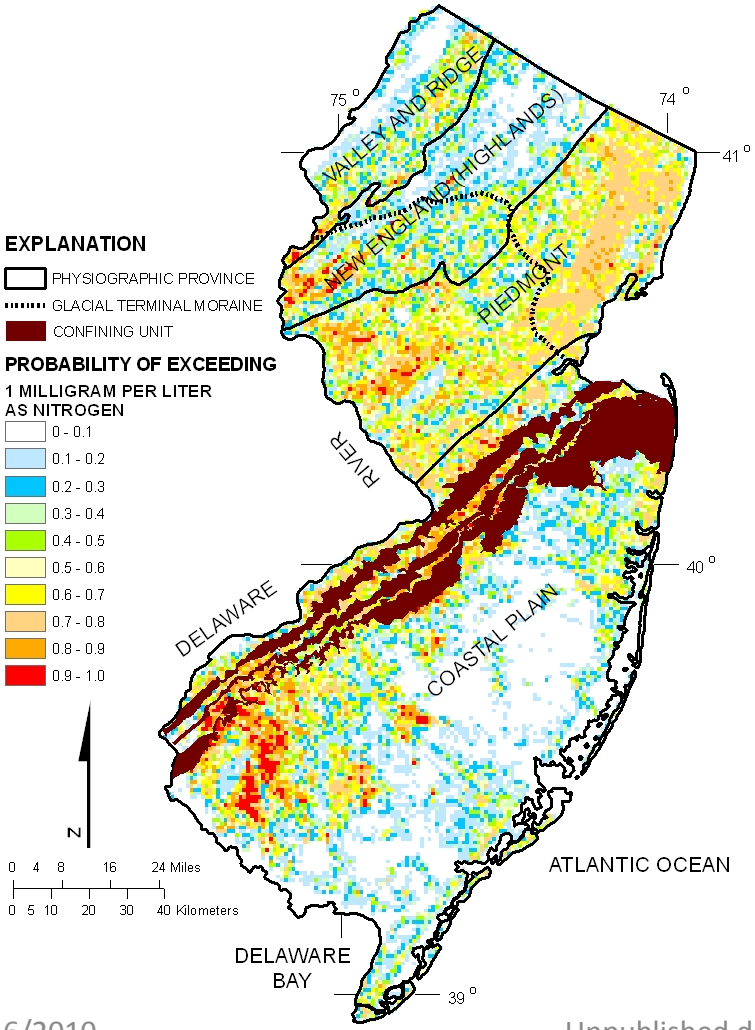


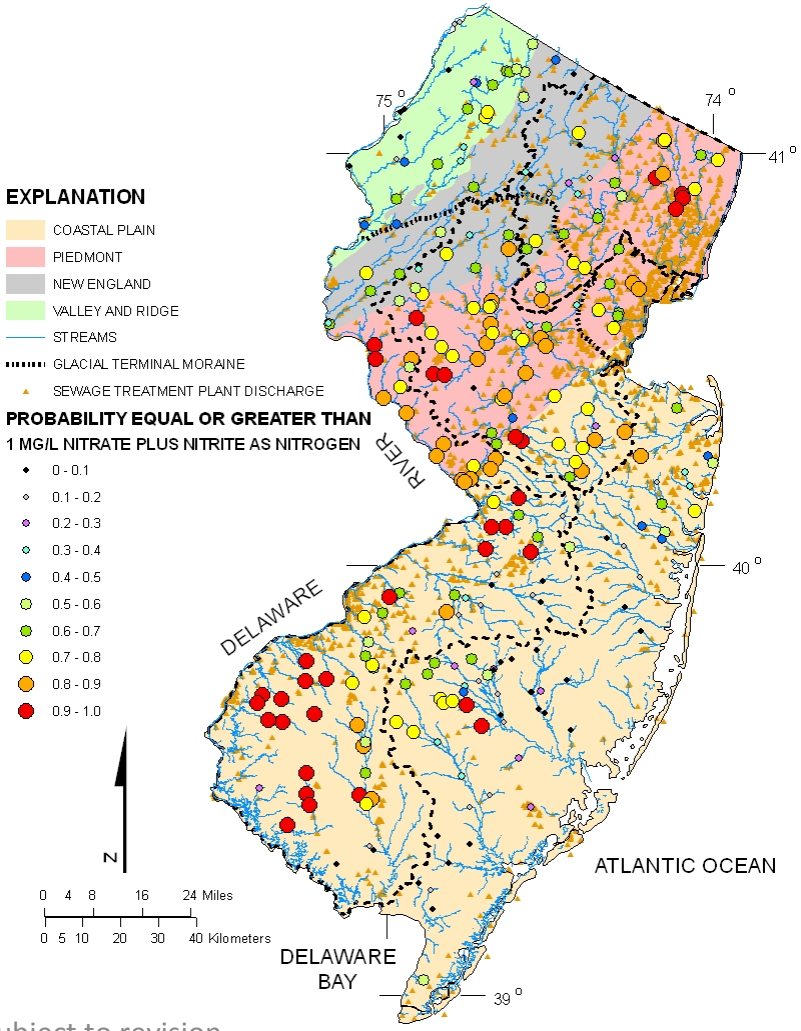
Surface water



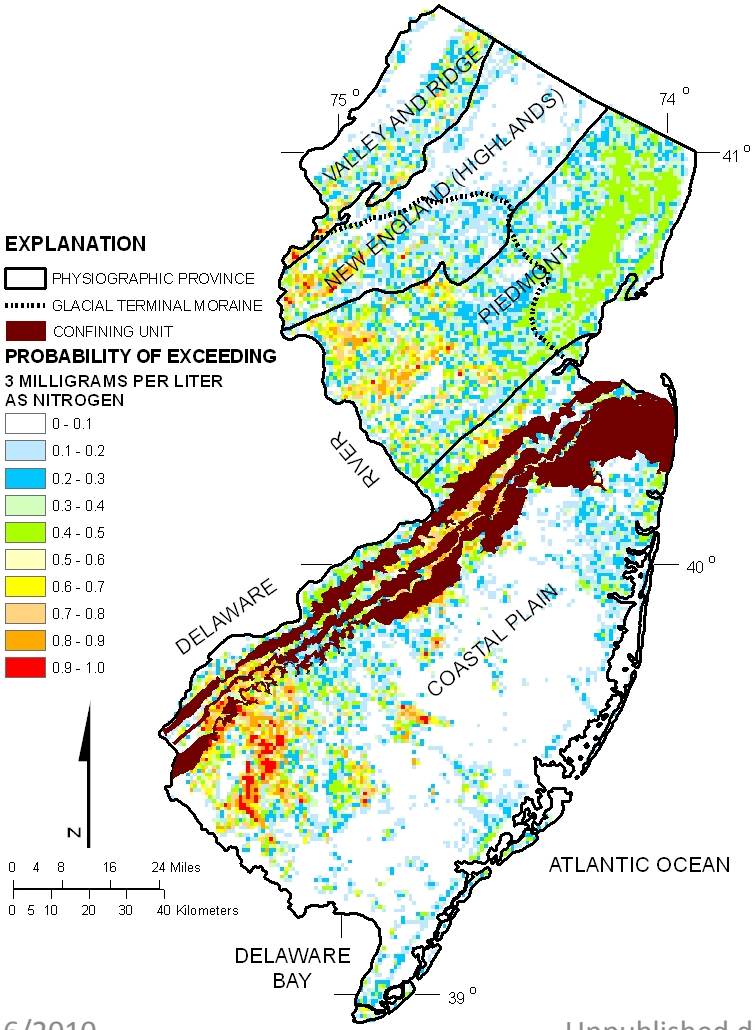
Nitrate vulnerability—1 mg/L as N

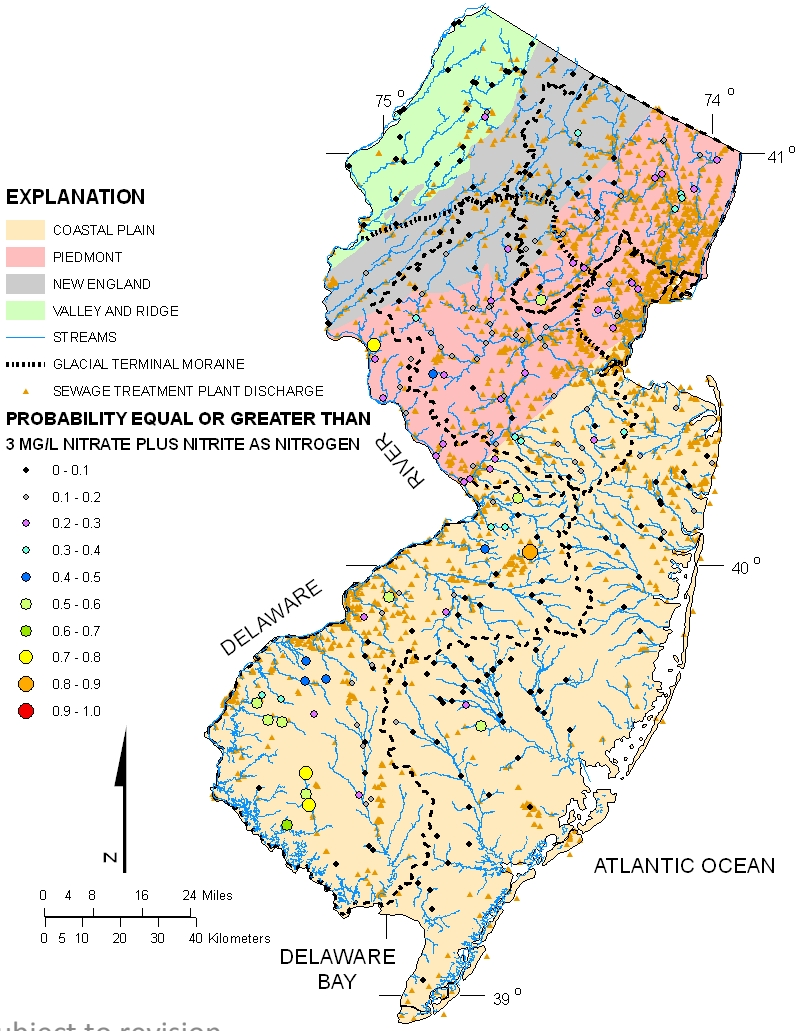
ln(p/(1-p) = a + bY + cZ …



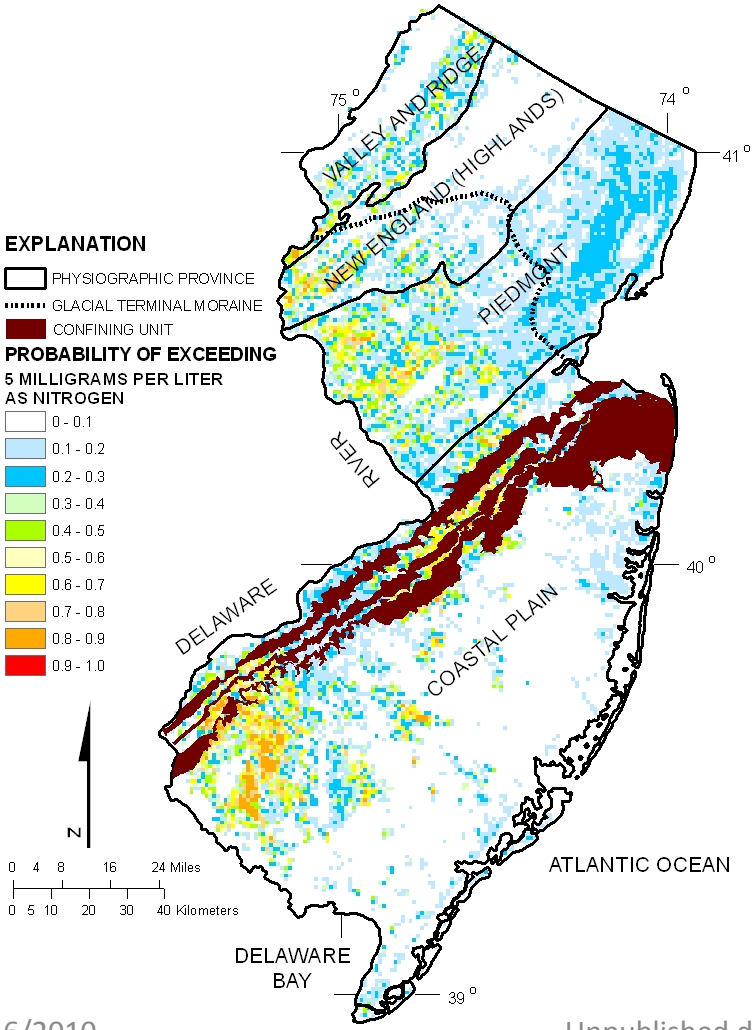


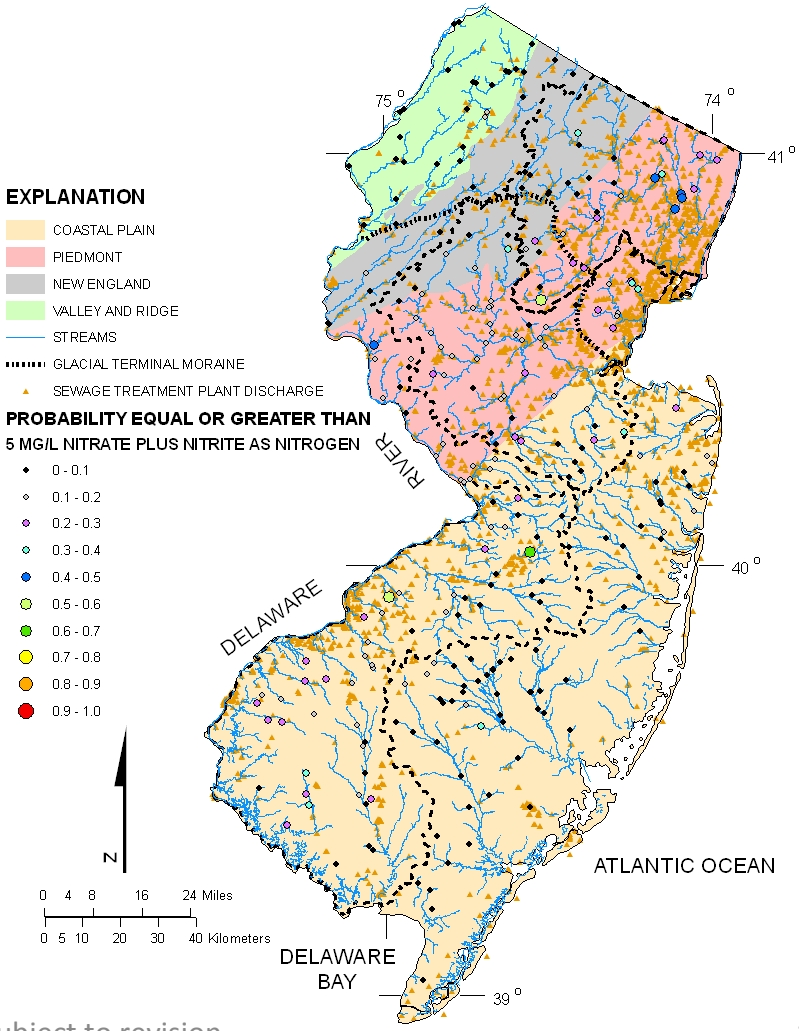
Nitrate vulnerability—3 mg/L as N



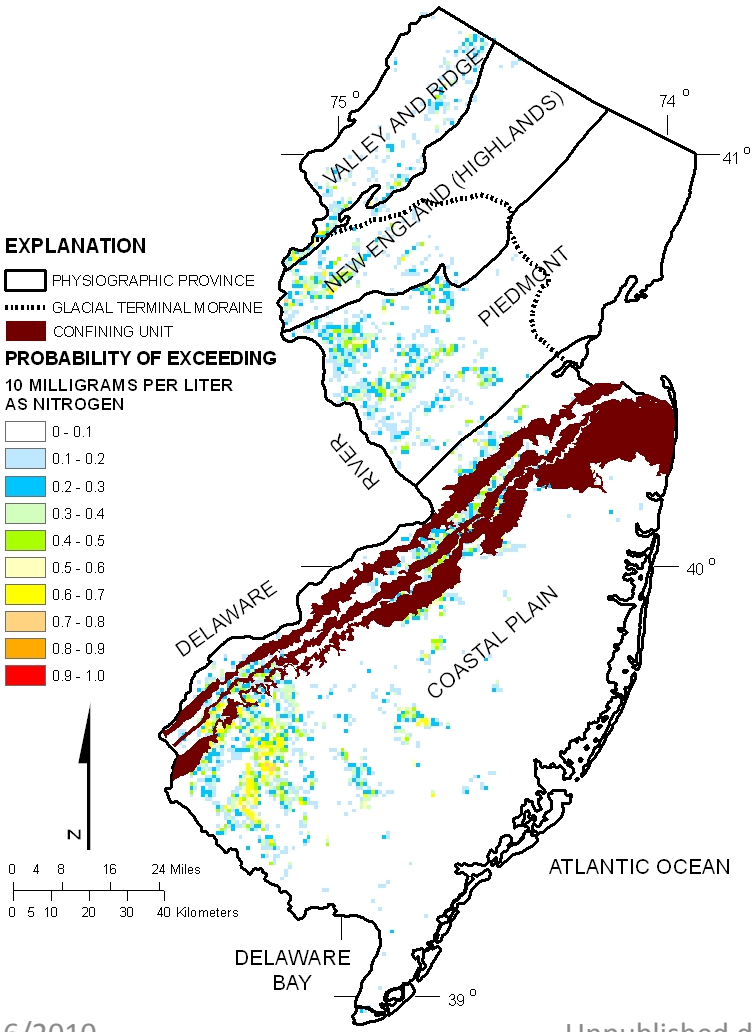


Nitrate vulnerability—5 mg/L as N





Nitrate vulnerability—10 mg/L as N



Frequency of detection of nitrate in surface water too low to develop vulnerability map.

Summary

- SWAP mapping very successful--similar to a DRASTIC index for both hydrogeology and land use
- Groundwater and surface-water vulnerability mapping getting more information into GIS and more statistically complex using probabilities
- USGS surface water network sites are typically ambient sites so vulnerability only generated at sampling site and not upstream or downstream
- Need to take into account nearness to a sewage treatment plants (STPs) to improve model.
- Need to incorporate USEPA and NJDEP point source data

(A.) Map showing septic-system density in 1990 and the distributions of concentrations of nitrogen $^{15/14}$ isotope ratios in water from 82 wells in New Jersey.
(B) Relation of $N^{15/14}$ to percent urban, percent agricultural, and septic-system density

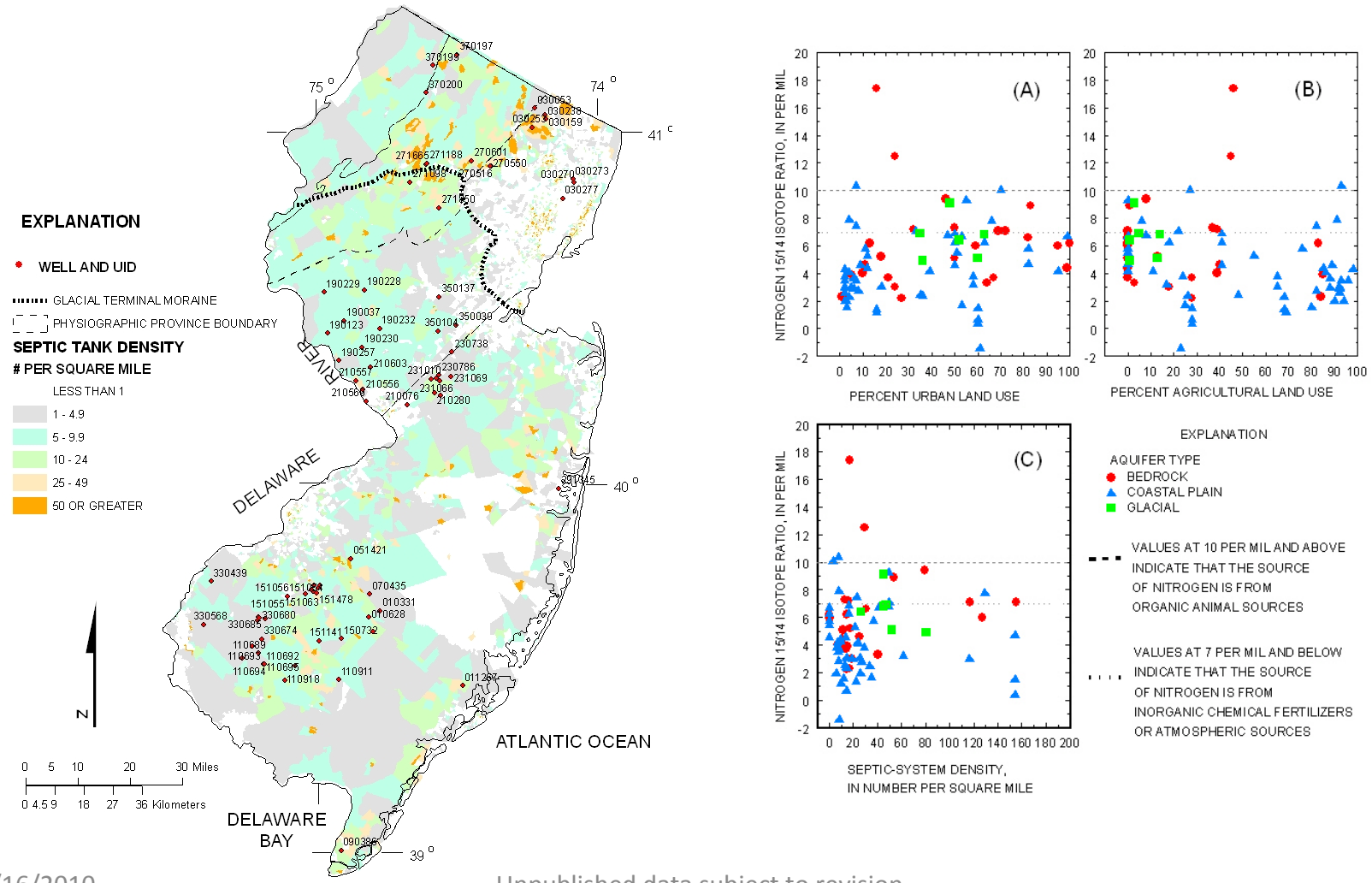


Figure 8. Distributions on concentrations of nitrate water from wells open to unconfined aquifers in New Jersey by well-construction characteristics and by aquifer type: (A) well depth; (B) depth to top of open interval, and (C) length of open interval.

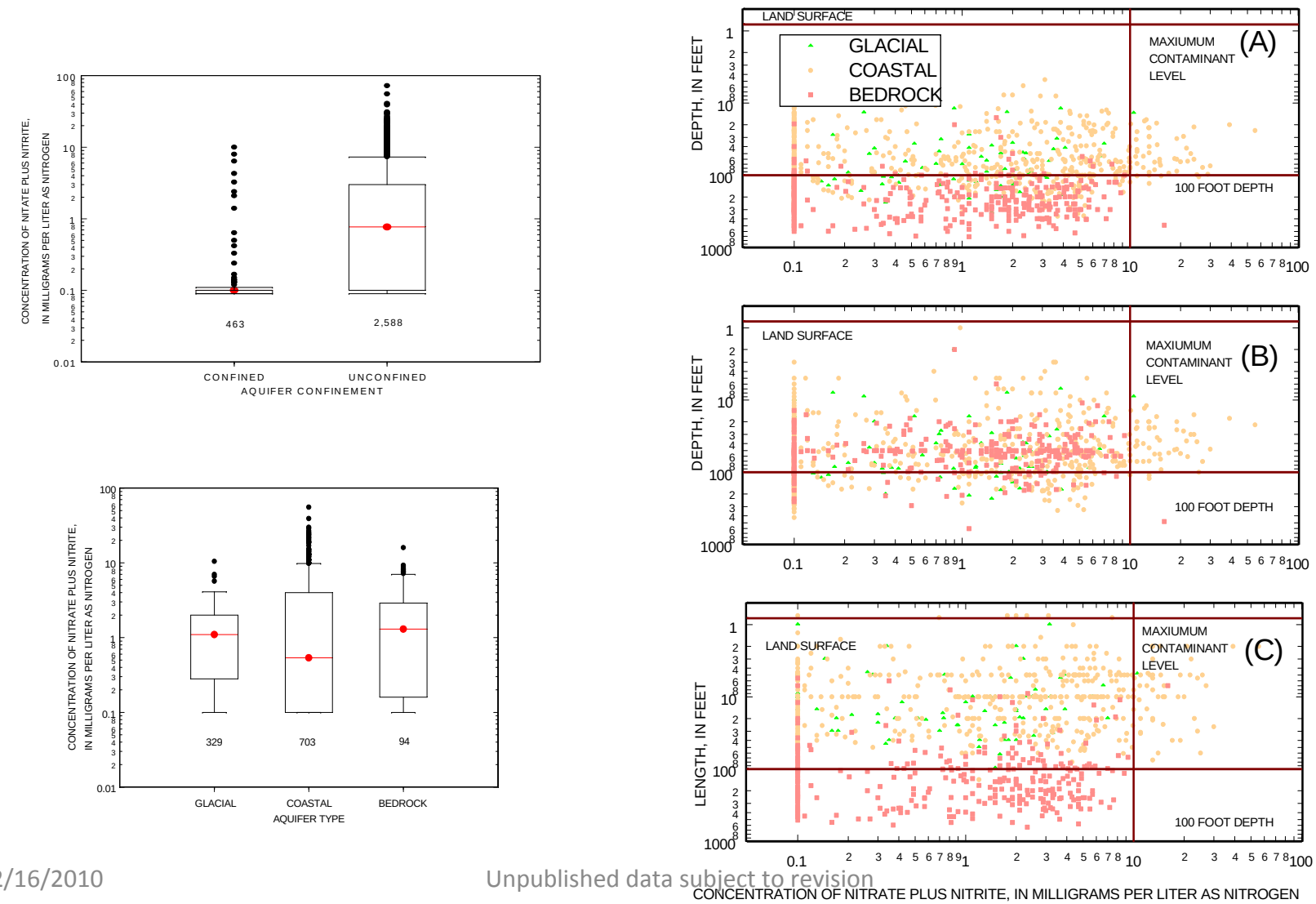
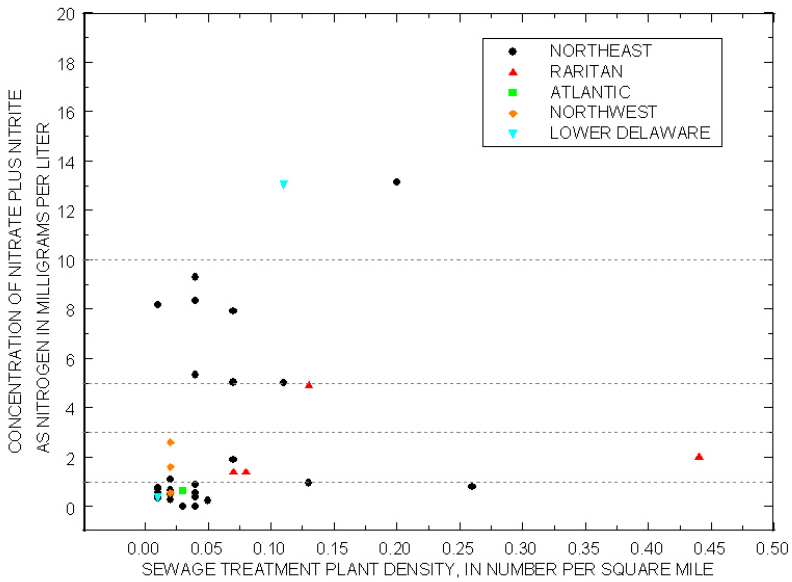
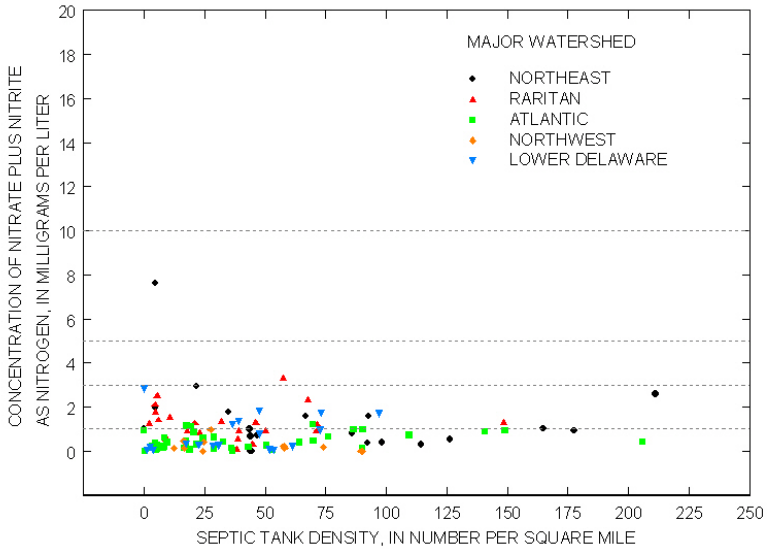


Figure 20. Relation of concentration of nitrate in surface water to sewage-treatment-plant density for sites where agricultural land is equal to or less than 10 percent and STPs are present.

Relation of concentration of nitrate in surface water to sewage-treatment-plant density for sites where agricultural land is equal to or less than 10 percent and STPs are present.