

Managing Watershed N Export at the Local Level: Accounting for N Sinks

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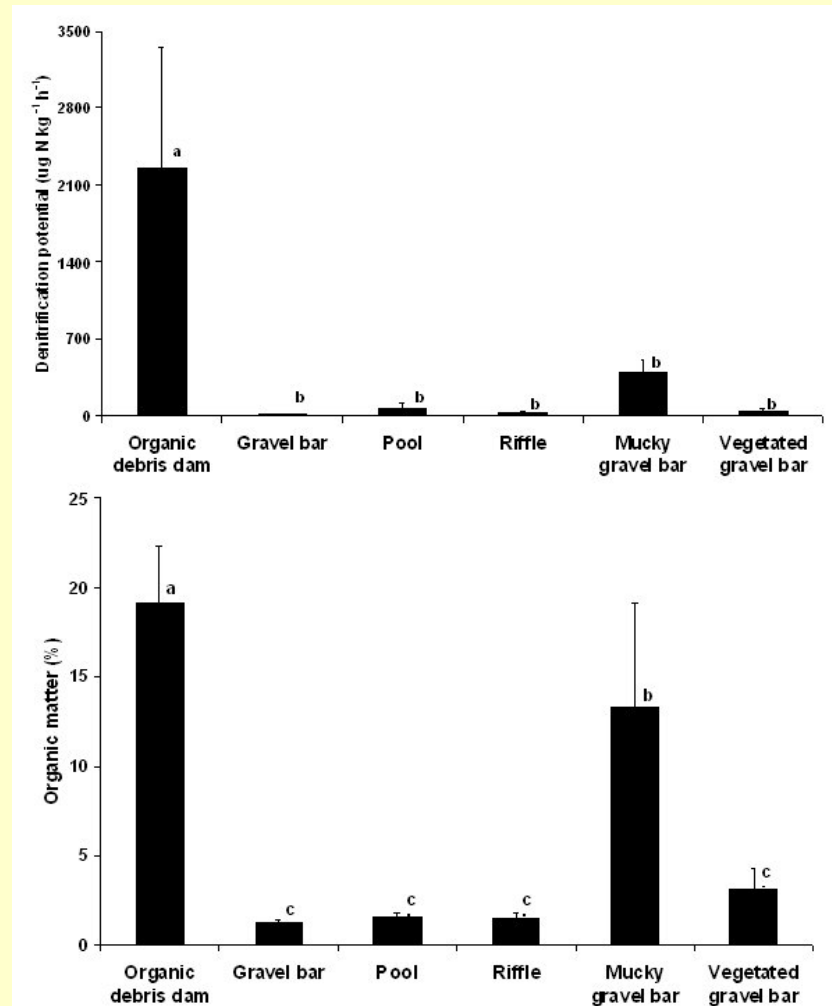


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Watershed Mass Balance Studies suggest considerable disappearance of N in landscape sinks

- Hot Spot Hypothesis: Denitrification focused in select, localized settings with:
 - Extended residence time
 - Pools of labile C
- Can we identify potential sinks along the flow path between source areas and large river systems?



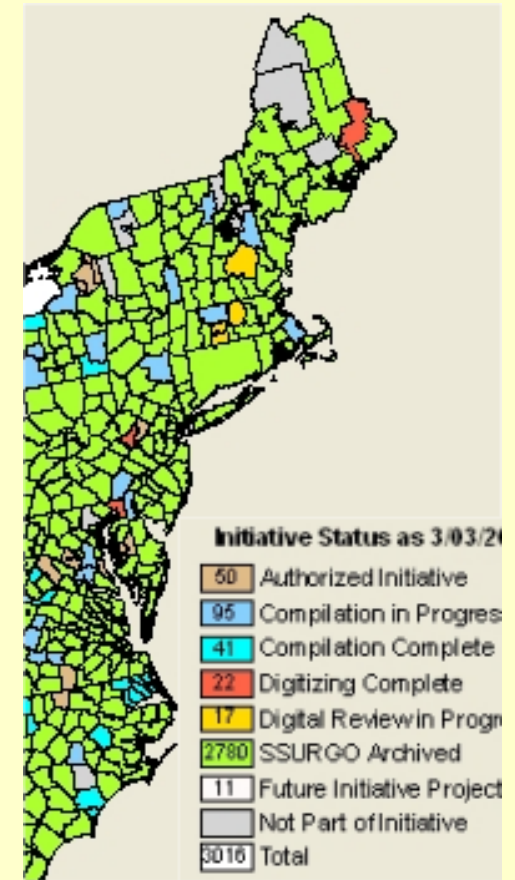
Potential Denitrification Hot Spots

- Wet soils
- Land-Water Interface
(riparian zones, shorelines)
- Zero order streams
- Headwater streams
- Reservoirs

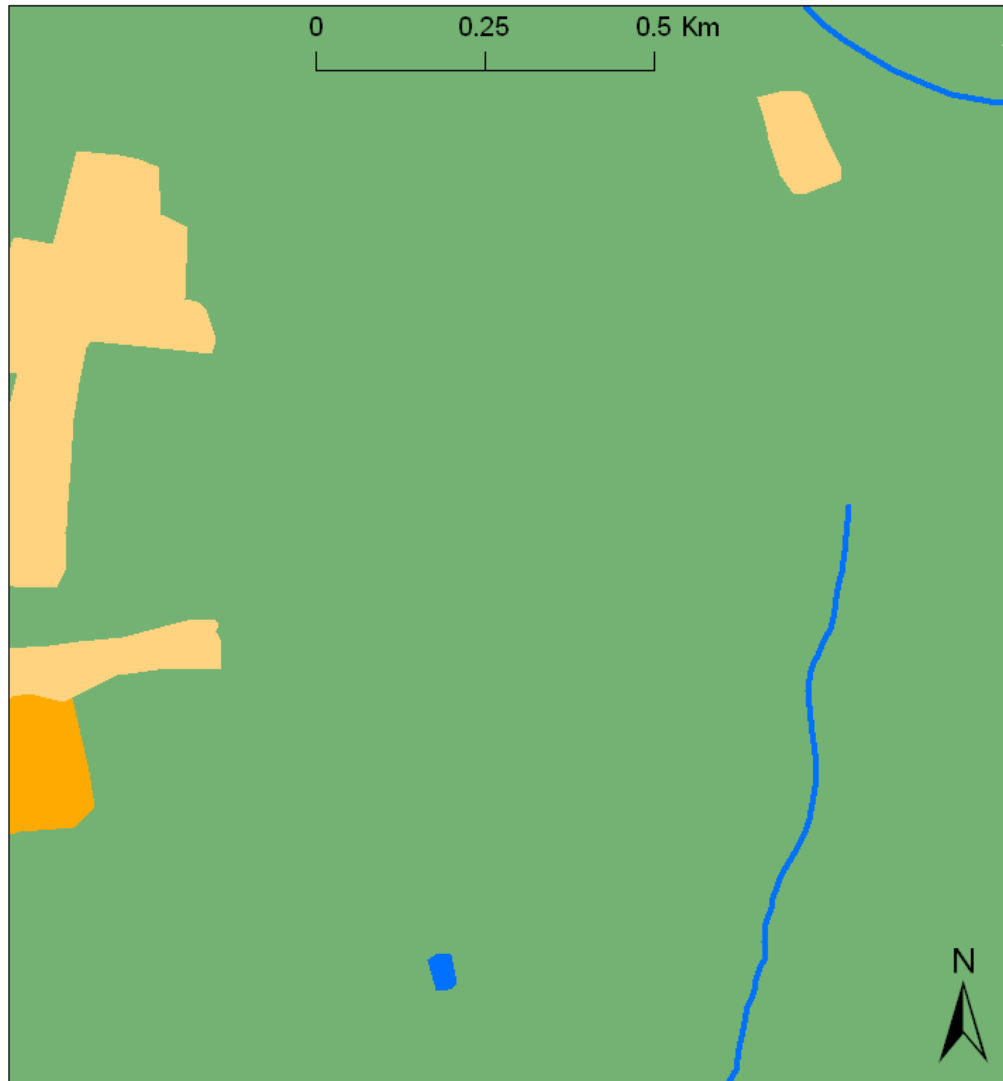
Premise: High resolution spatial data can improve identification, management and assessment of watershed N sinks

High resolution spatial data is increasingly available

- Nat'l Wetland Inventory: 1:24,000
- SSURGO County Scale Digital soil surveys: 1:15,840
 - Soil wetness (hydric soils)
 - Geomorphology
- Land use
 - 1995 Anderson Level III (1:24,000)
- Topography & hydrography (1:5,000 to 1:24,000)
 - Flow patterns, watershed boundaries
 - Stream Networks



SSURGO
Status:
NE U.S.
March 2007



Land Use and standard hydrography can mask potential pathways and sinks

(data from 5 km² area of Kingston Quad- RI)



Streams (1:24,000)



Forest / Open Space



Water

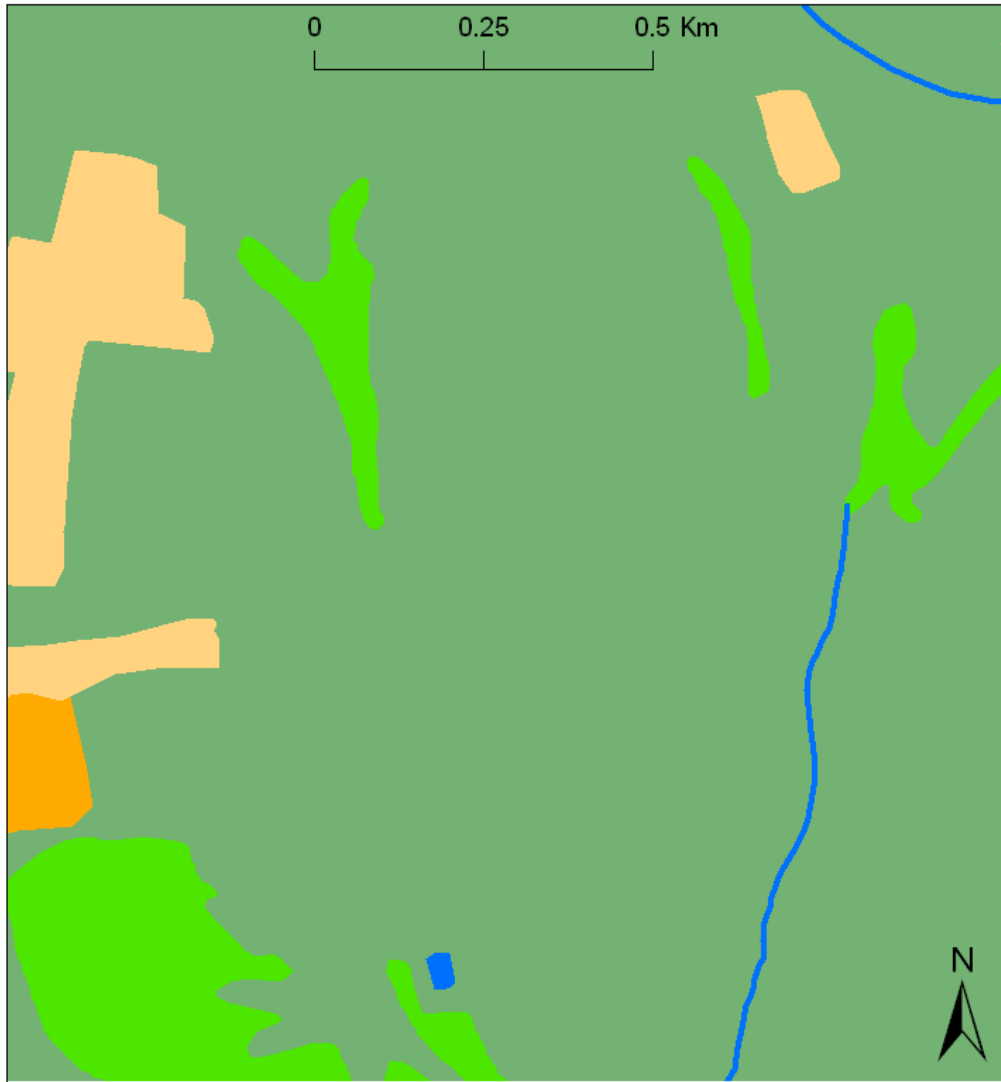


Residential (med density)



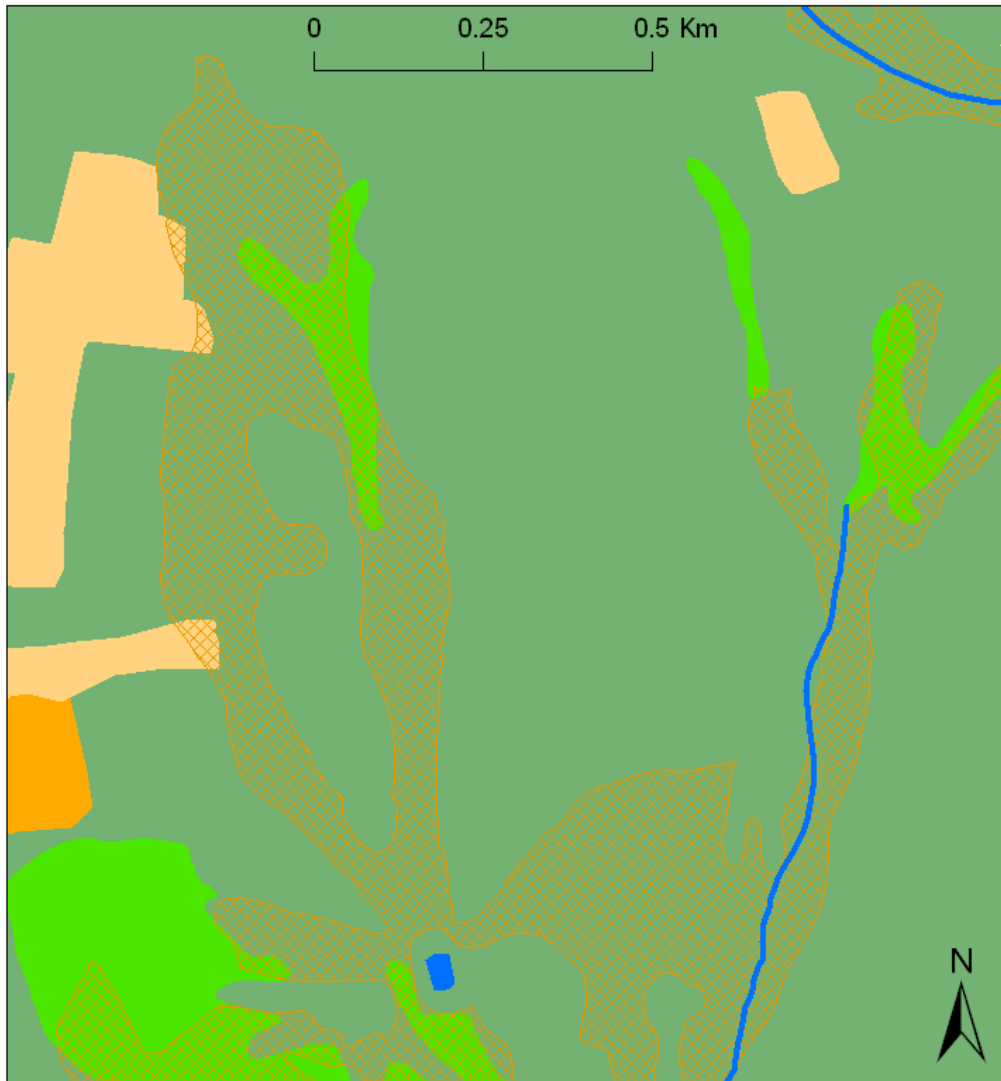
Residential (high density)

National Wetland Inventory (1:24,000) displays potential sinks



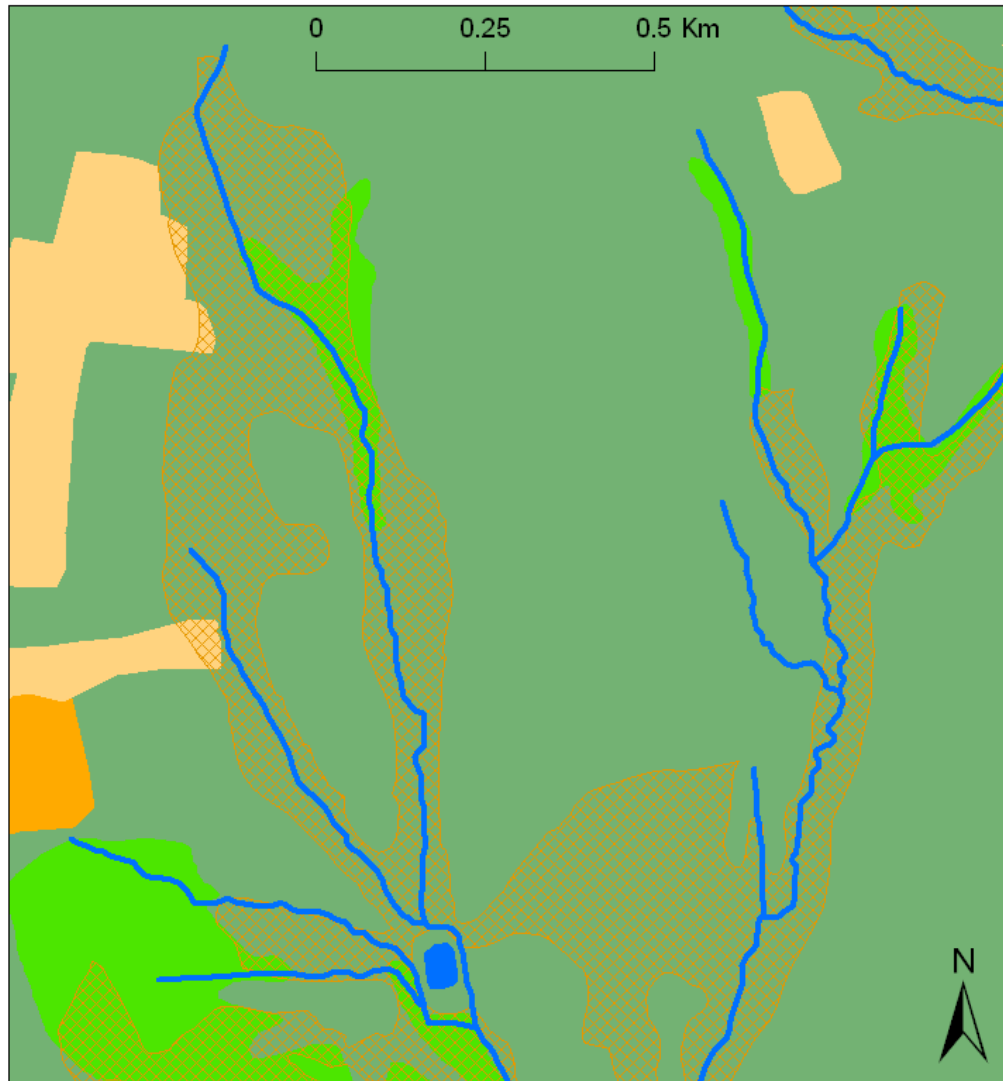
- HD Residential
- MD Residential
- Forest / Open Space
- NWI Wetlands**
- Water
- Streams (1:24,000)

SSURGO Hydric Soils suggest wetlands and zero order streams connect source to stream



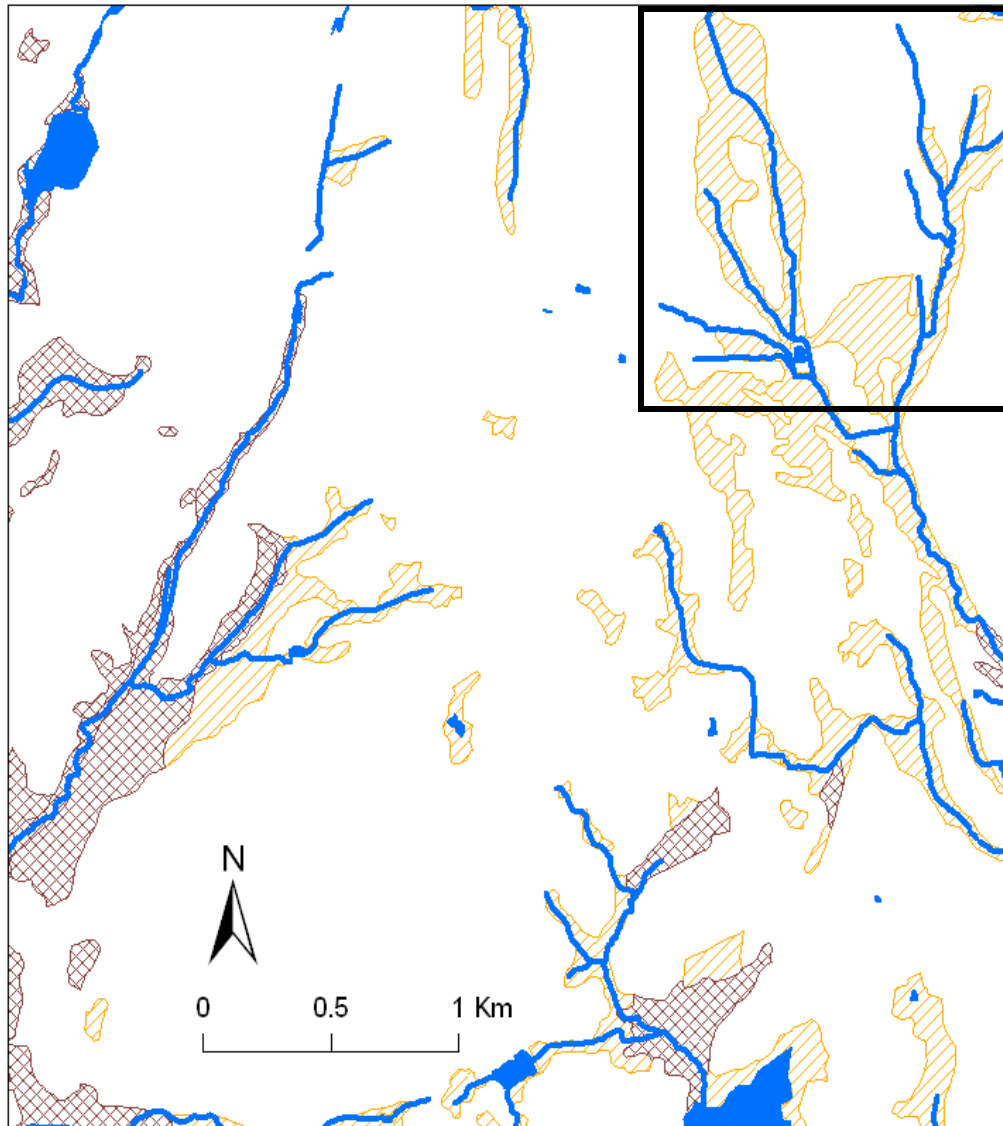
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
High resolution stream data and hydric soils display an active biogeochemical landscape



- HD Residential
- MD Residential
- Forest / Open Space
- NWI Wetlands
- Hydric Soils (SSURGO)
- Water
- Streams (1:5,000)

SSURGO geomorphology
refines riparian N sink:
Longer groundwater
retention (more N removal)
in hydric alluvial and
outwash settings

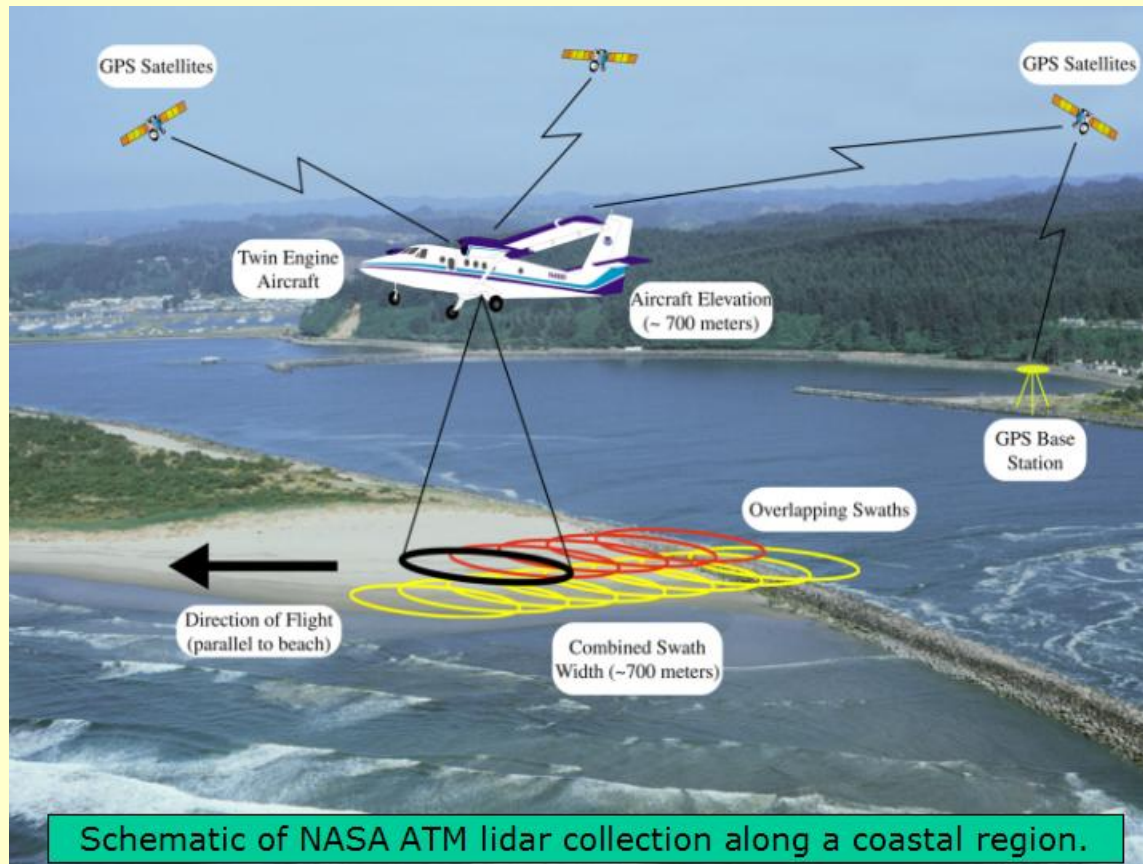


-  Hydric Till
-  **Hydric Alluvial & Outwash**
-  Water
-  Streams (1:5,000)

High Resolution Hydrography displays a marked increase in potential landscape sinks:
State of RI (2,600 km²)

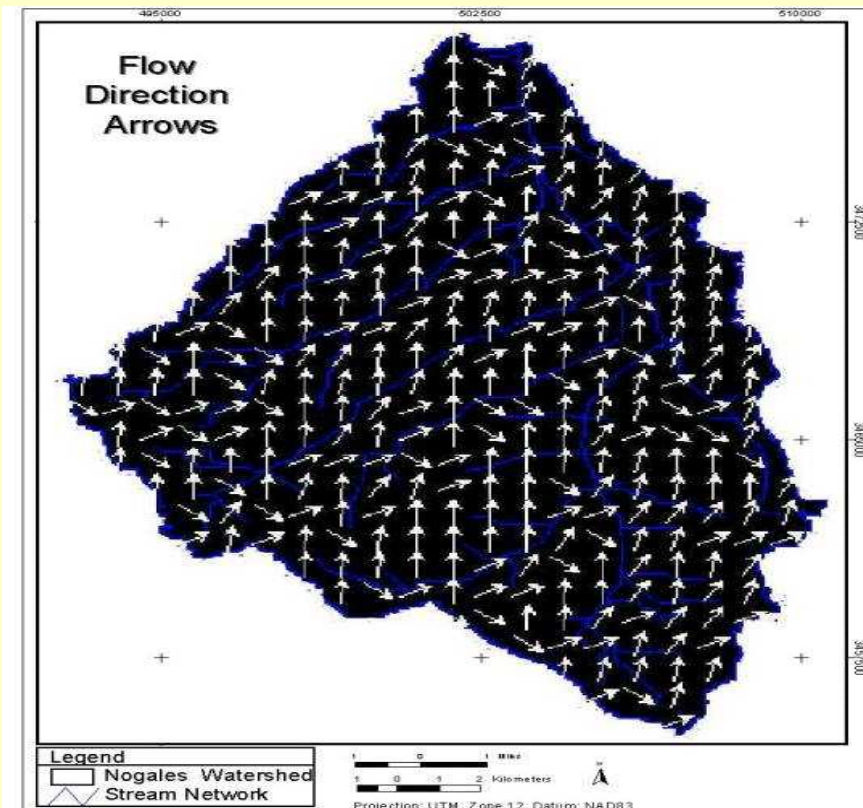
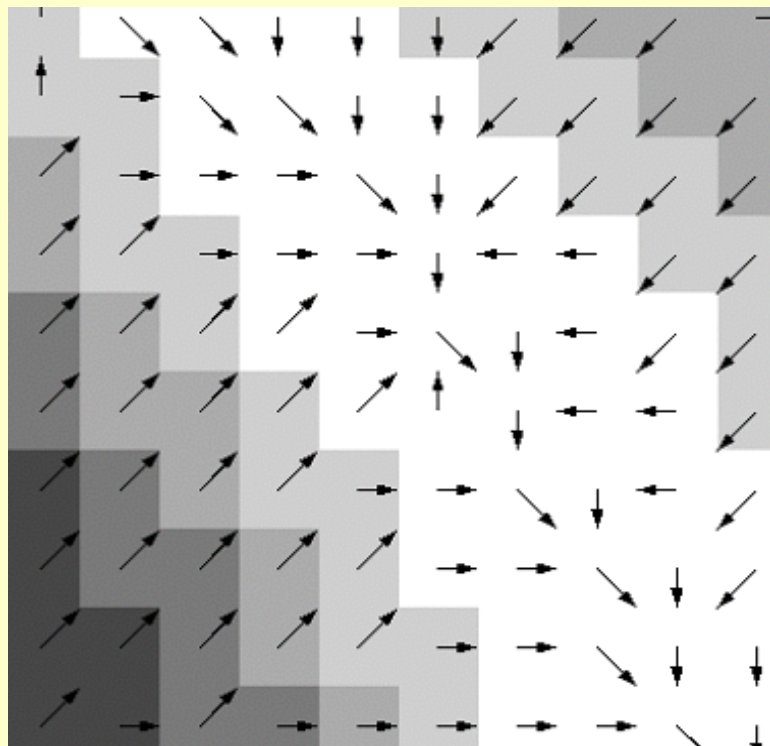
	1:5,000	1:24,000
Stream Length (km)	4850	1819
Drainage Density	1.19	0.45
Number of Water Bodies	3600	3100
Area (km ²)	130	100

Generating High Resolution Topography and Hydrography: *LIDAR* = Light Detection And Ranging

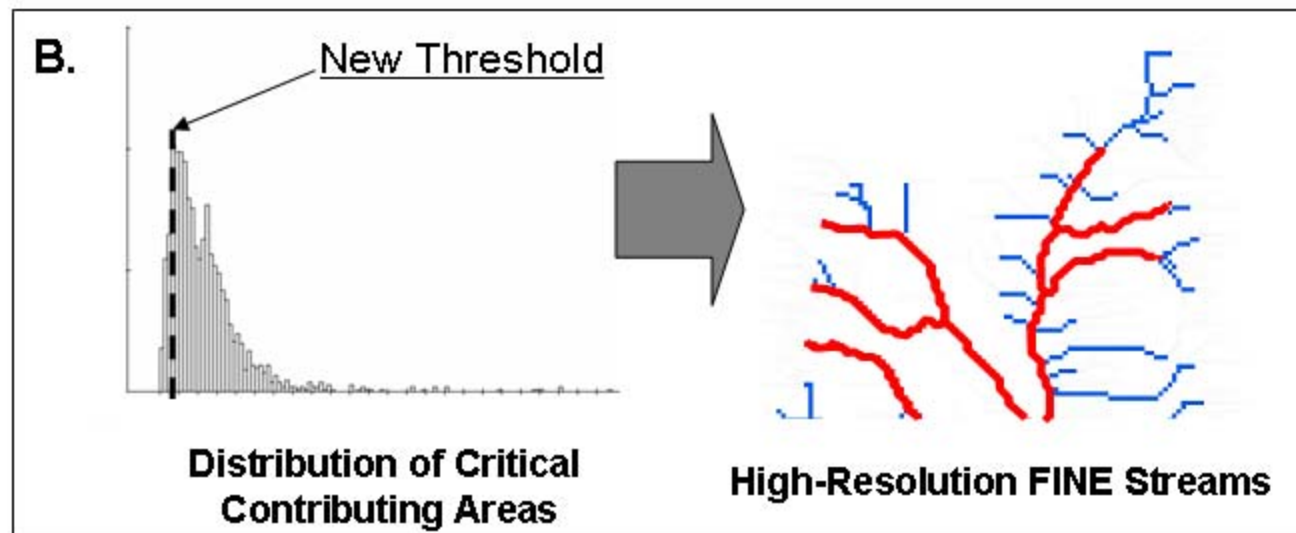
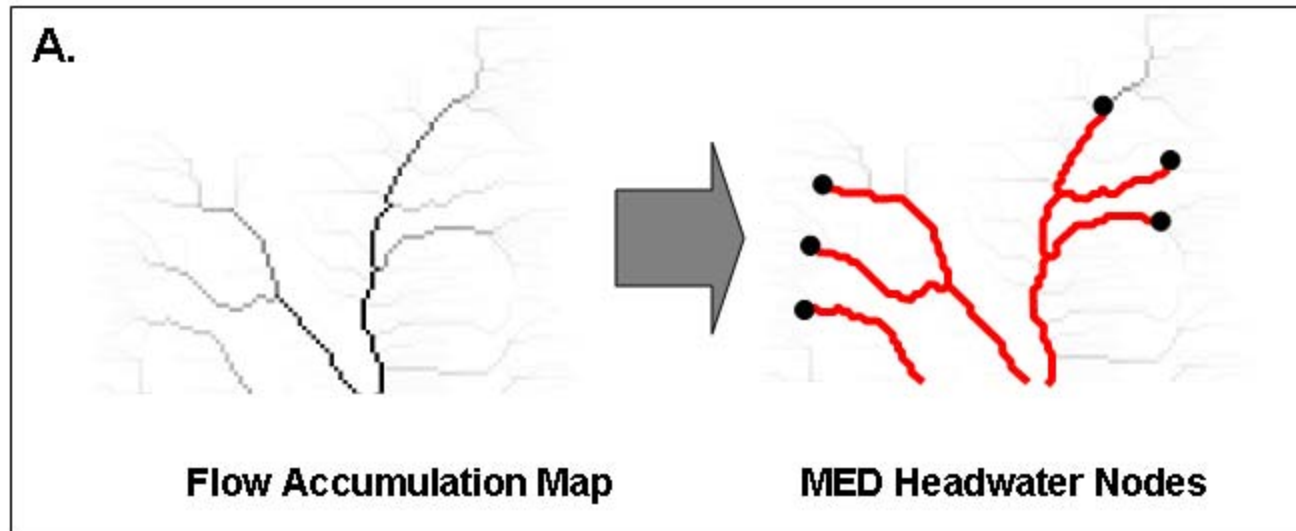


- LIDAR can't "see" through dense vegetation. Requires skilled set up and processing.
- Great potential for future – not widely available now.

1:24,000 Topographic data (Digital Elevation Models) Can Now Extend Stream Networks Via **Flow Accumulation Grids – GIS Tool**



Flow accumulation for a given DEM point: The number of DEM points whose flow paths eventually pass through that point



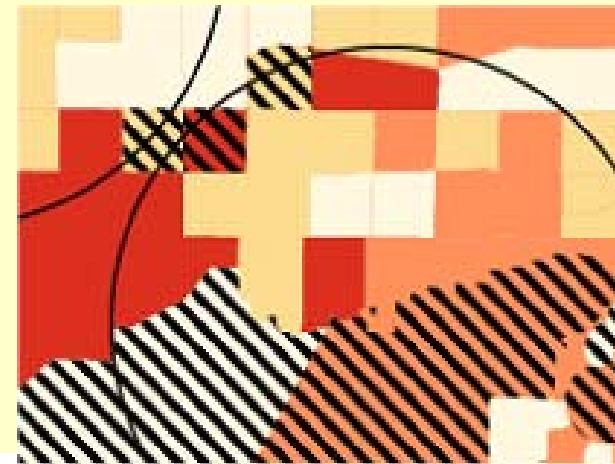
Baker et al. 2007. Land. Ecol. 22: 973-992.

Questions:

- Can we regularly employ a suite of spatial data and GIS tools to guide local decisions regarding:
 - Source controls
 - Protection
 - Restoration?
- Can we extend high resolution studies to other areas with similar geomorphic/landscape complexes?

Challenges: Can we provide decision makers with estimates of N export **and** uncertainty for future development?

Can we translate uncertainty into risk management?



Risk of N delivery	Degree of Certainty		
	95%	75%	>65%
251% or more			
151 - 250%			
76 - 150%			
0 - 75%			

Acknowledgements

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