Nutrient Transport in Southern Delaware Streams: Lessons Learned

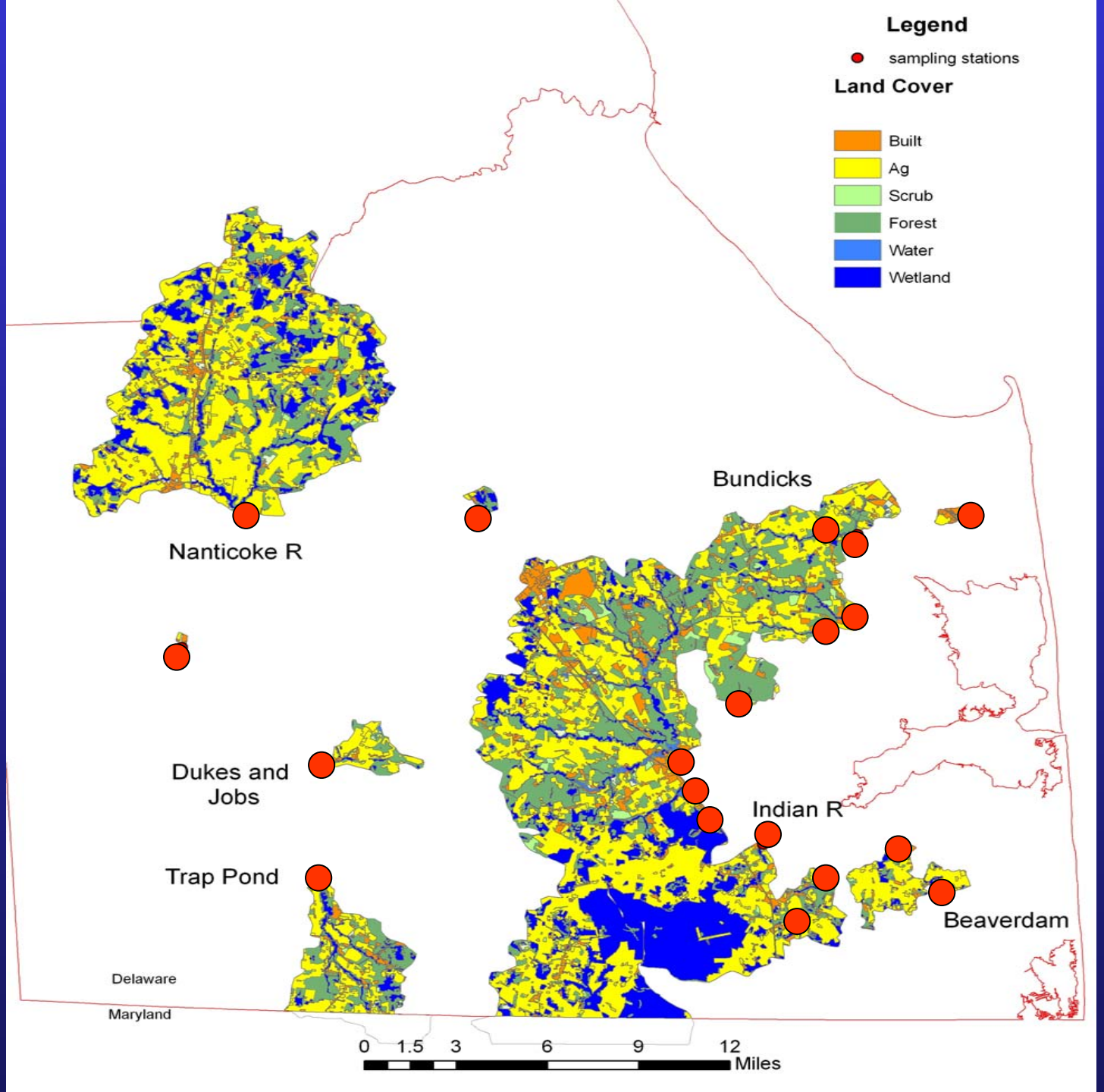
A. Scott Andres	Delaware Geological Survey
William Ullman Karen Savidge Joe Scudlark	College of Marine Studies, University of Delaware
Jennifer Volk	Delaware Department of Natural Resources and Environmental Control

SPONSORS

- US EPA – Coastal Intensive Site Network
- Delaware Department of Natural Resources and Environmental Control
- College of Marine Studies, UofD
- Delaware Geological Survey
- Delaware Water Resources Center , UofD
- Center for the Inland Bays

OVERVIEW

- Second (Inland Bays) and third (Nanticoke) highest priority watersheds for TMDL goals
- Flow and chemistry sampled in 19 streams between 1998 and 2004
- 14 streams in Inland Bays watershed, 5 streams in Nanticoke watershed
- Watersheds range in size from < 1 sq mile to about 70 sq miles


Legend
sampling stations
Land Cover
Built
Ag
Scrub
Forest
Water
Wetland
Nanticoke R
Bundicks
Dukes and
Jobs
Indian R
Trap Pond
Beaverdam
Delaware
Maryland
0 1.5 3 6 9 12
Miles

SOURCES OF NUTRIENTS
Nitrogen & Phosphorus

- Land use - agriculture, rural residential, municipalities, industry
- Waste disposal practices
- Atmosphere - long distance and near field sources
- Geologic materials - Sink and Source of P; long term reservoir of nitrate

NUTRIENT TRANSPORT AND LOADS

- Load = Concentration * Flow rate
- Concentrations vary by a factor of 2 to 4
- Flow rates vary by 2 to 3 orders of magnitude
- Load more dependent on flow than concentration
- Less flow → less transport → smaller load
- Greater flow → greater transport → greater load

NUTRIENT TRANSPORT IN STREAMS DEPENDS ON FLOW OF WATER… SO:

- Measure flow accurately and frequently
- Flow predictions are more certain for larger streams than for smaller (< 2nd order) streams
- Underflow is an issue

LOADING TO BAYS IS DEPENDENT ON FLOW PATHWAYS DELIVERING NUTRIENTS TO STREAM

- Sample hydrologic events (baseflow and storm events, but not random sampling)
- Baseflow every 4 weeks and interpolation in between
- 2 to 3 storm events per season (to determine average storm concentrations with some precision), sampling every 1 to 3 hours at beginning, less frequently later