

Stoney Creek Stakeholder Meeting

March 9, 2005

Water Quality Monitoring Results



Watershed Assessment Team
Division of Water Quality
Raleigh



Sampling Methods



- Field measurements were taken of:
 - Dissolved oxygen (percent and mg/L)
 - Specific conductance
 - pH
 - Temperature

Sampling Methods

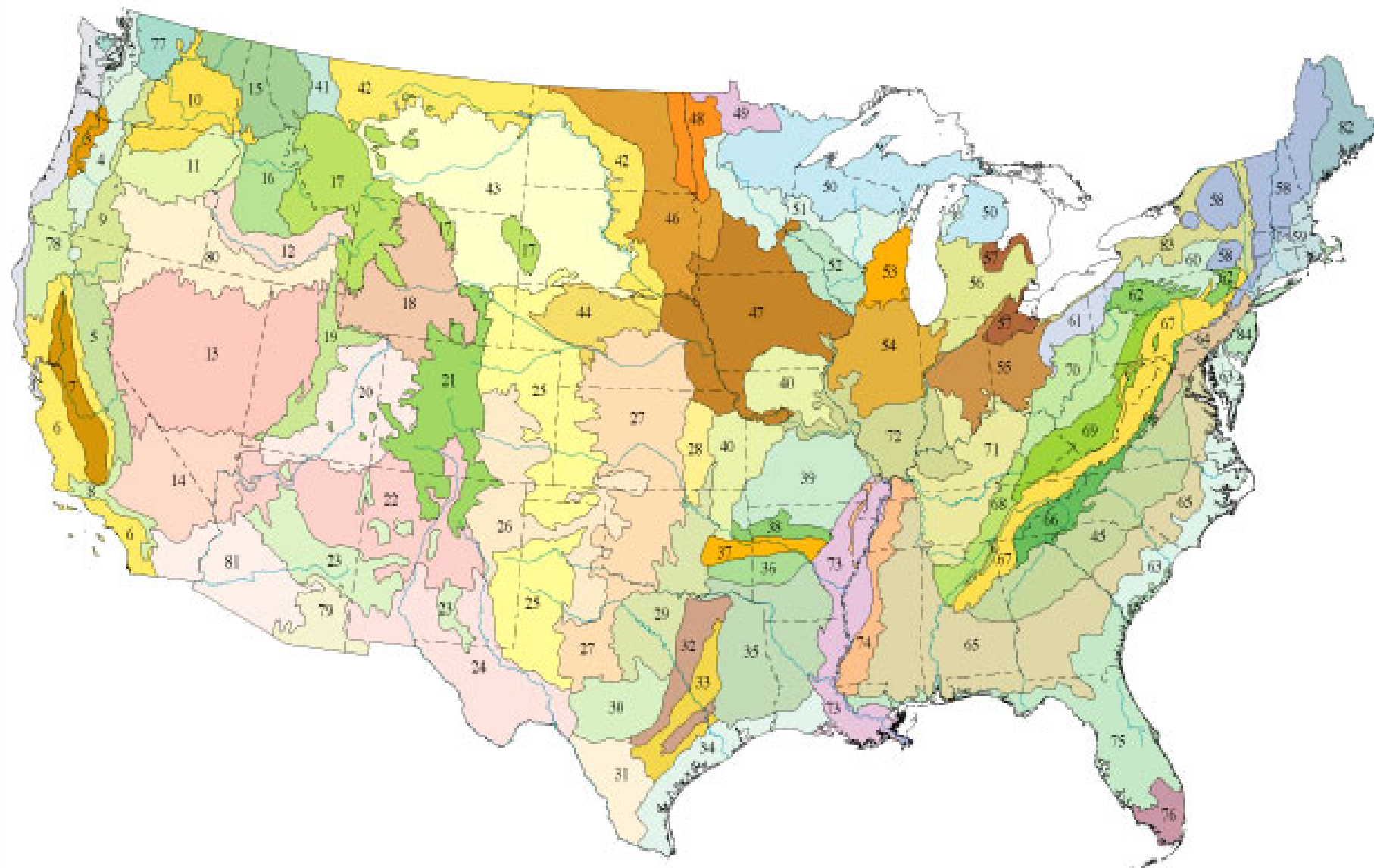


- Water samples were obtained in the field and analyzed in the laboratory for:
 - Nutrients
 - Metals
- All samples were obtained during baseflow (no precipitation for the prior 48 hours).
- Samples were taken from July 2004 to December 2004 (field measurements July 2004 through January 2005).

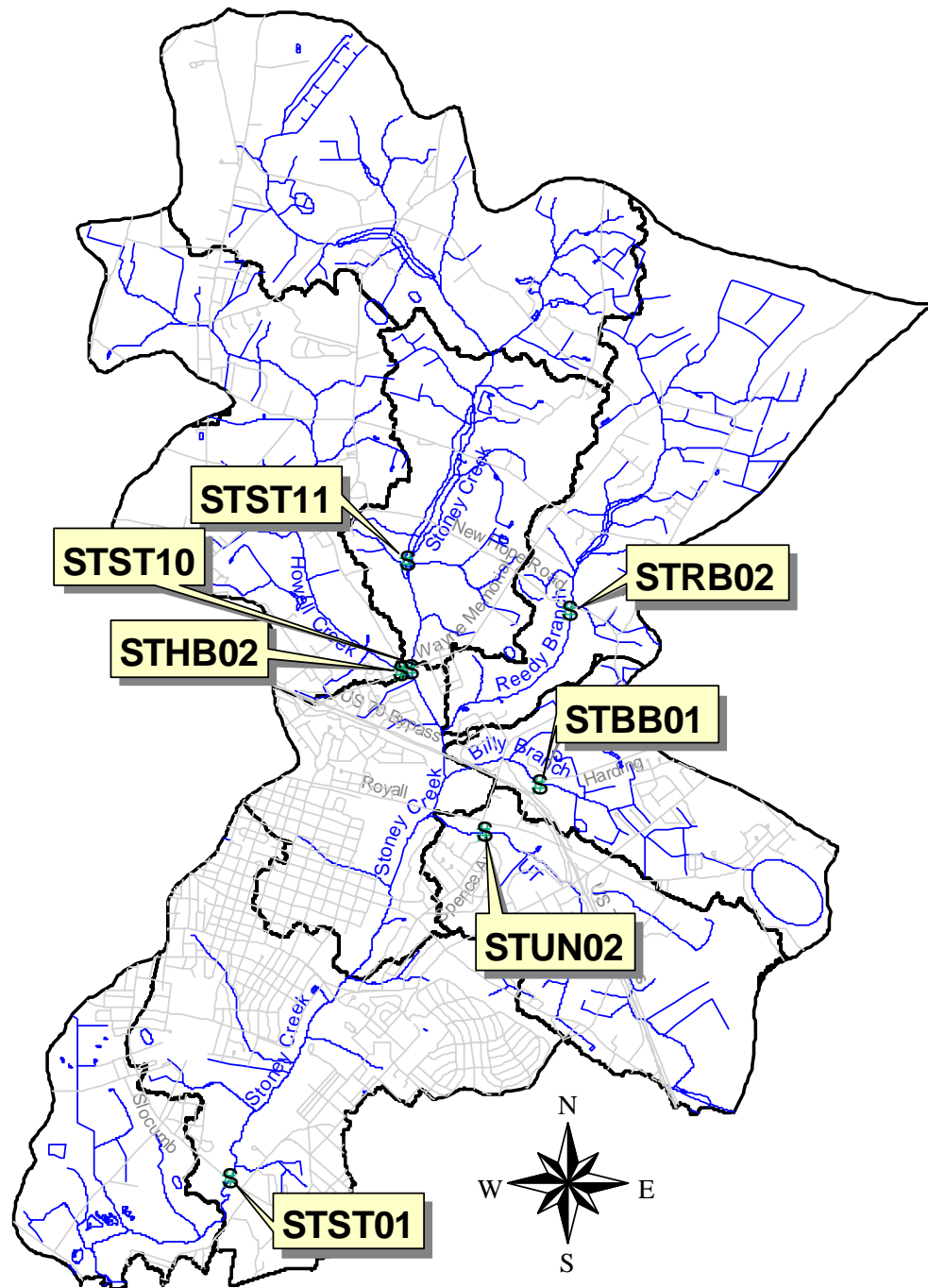
Sampling Methods

- Comparison with state and federal standards and “reference” areas.
 - Metals concentrations were compared with EPA’s National Ambient Water Quality Criteria concentrations and the Tier II criteria.
 - Nutrient concentrations were compared with reference values from EPA’s Level 3 Ecoregion 65 (inner coastal plain). These reference values are calculated as the twenty-fifth percentile from all of the streams sampled in the inner coastal plain ecoregion.

Level III Ecoregions of the Conterminous United States

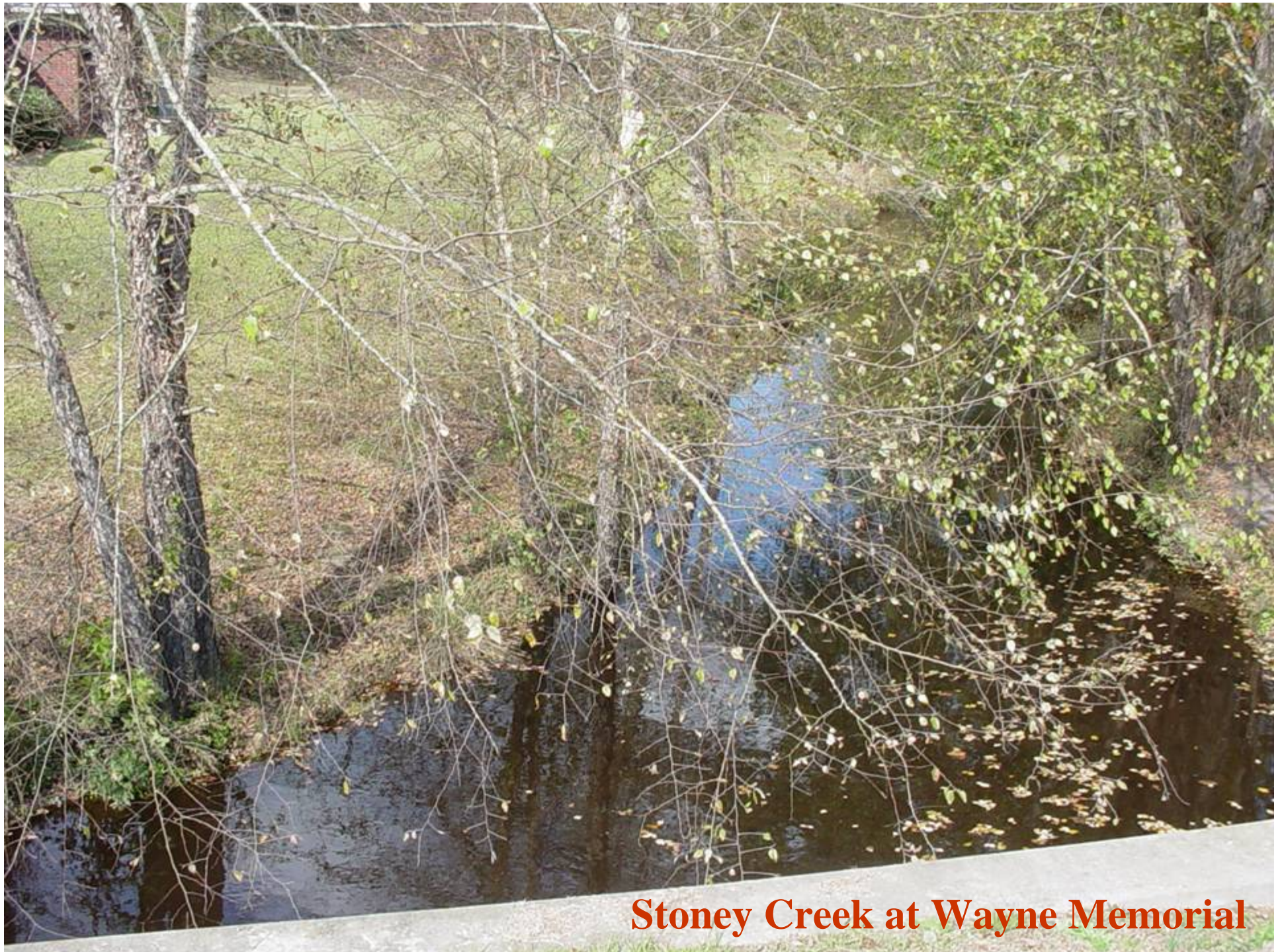


Map Source: USEPA, 2003





Reedy Branch at New Hope Road



Stoney Creek at Wayne Memorial

Billy Branch at Harding Drive



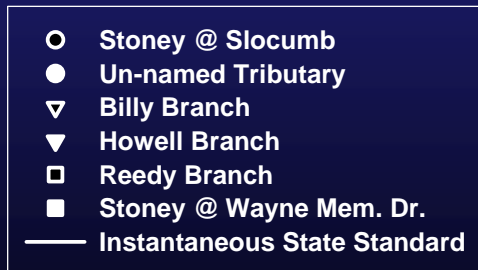
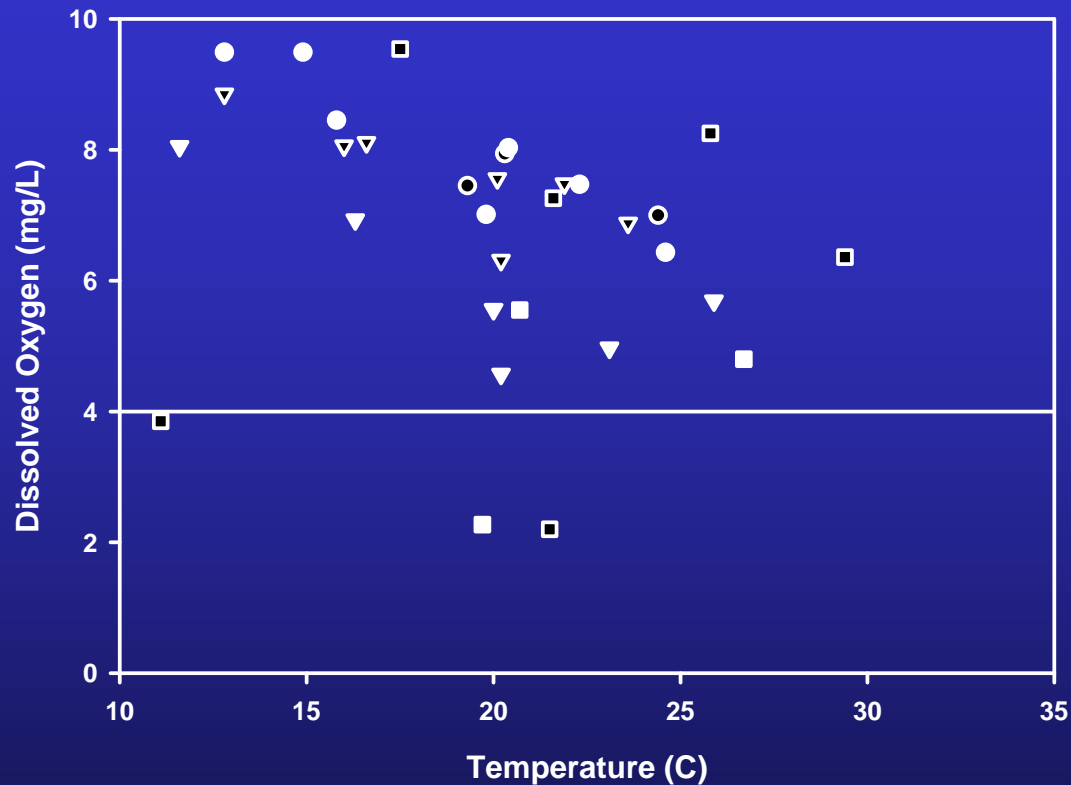
Un-named Tributary at Spence Avenue



Field Measurements

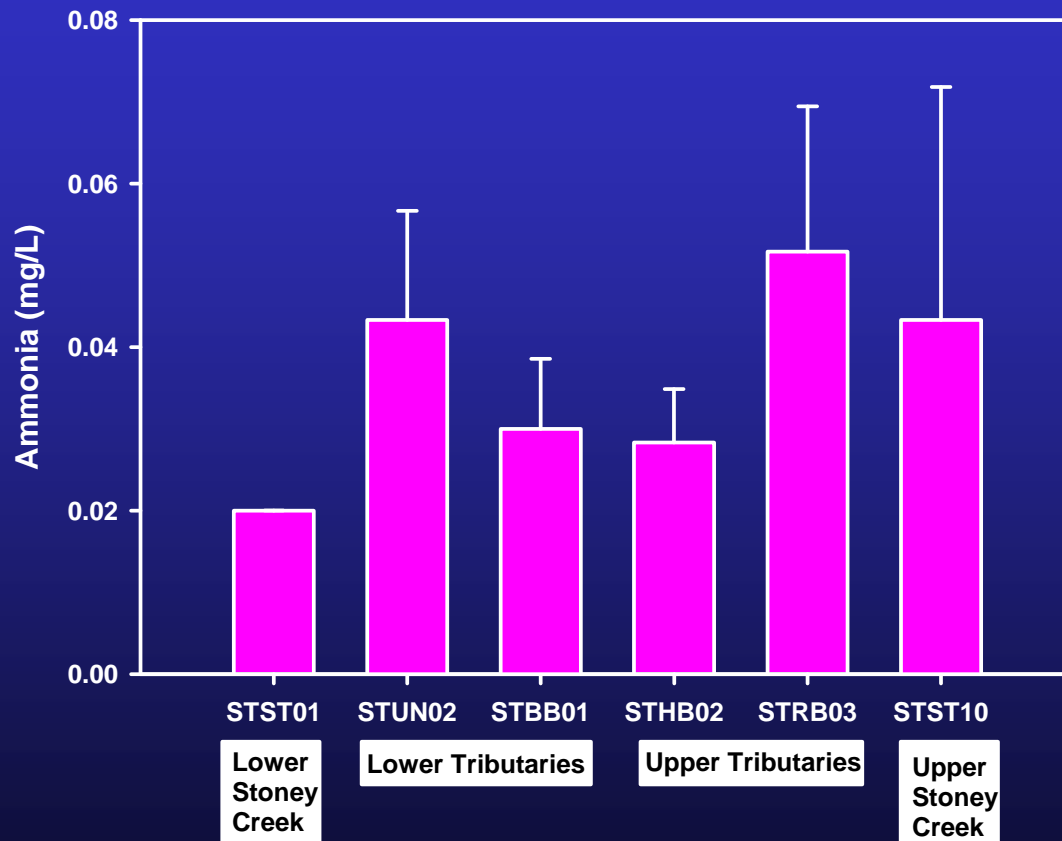
- Temperature ranged from 11.6° C to 25.9° C.
- pH was near neutral at all sites, ranging from 5.9 – 6.8.
- Specific conductance ranged from 54 uS/cm in Billy Branch (12/13) to 141 uS/cm in the Un-named tributary (9/24) and Reedy Branch (12/13).
Average specific conductance was lowest in Billy Branch and highest in the Un-named Tributary and Reedy Branch.
 - High specific conductance indicates high quantities of dissolved solids in the water.

Dissolved Oxygen



- Low concentrations of dissolved oxygen can negatively affect benthic macroinvertebrates and fish.
- Dissolved oxygen concentrations were below state standards twice in Reedy Branch and once in Stoney Creek at Wayne Memorial Drive. This was not directly a result of high temperatures.
- Both of these sites receive drainage from standing water directly upstream (beaver impoundment and swamp). When flow is low through these areas the dissolved oxygen tends to

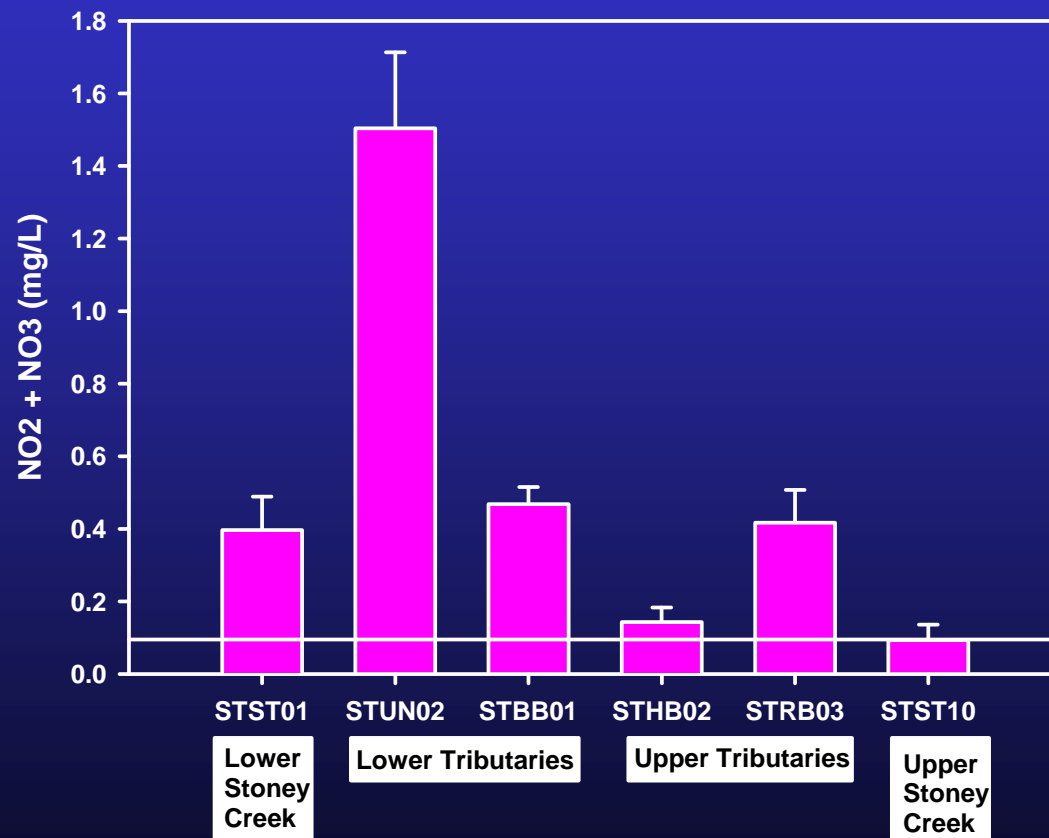
Nutrients – Ammonia Nitrogen



- Ammonia is toxic to fish and benthic macroinvertebrates at high concentrations.
- Ammonia is commonly from wastes (human or animal) or fertilizers.
- Ammonia concentrations greater than 0.1 mg/L are a cause for concern.
- Average concentrations did not exceed 0.1 mg/L.

Nutrients – Nitrogen

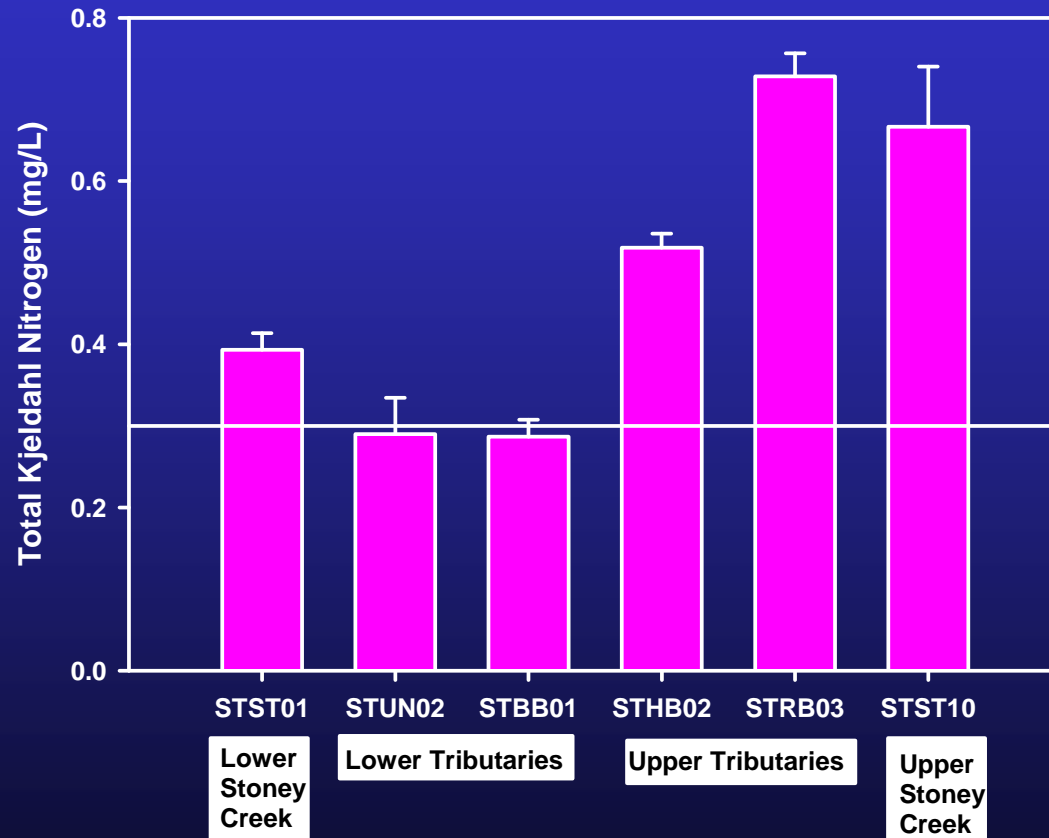
Nitrite + Nitrate



- Ammonia is reduced to nitrite and then nitrate by bacteria.
- Nitrate can also come from lightning, meteor strikes, or more commonly pesticides, fertilizers, explosives, or breakdown of wastes.
- Nitrite + nitrate concentrations are very high in the un-named tributary.
- Nitrite + nitrate concentrations exceed the EPA reference values in Reedy Branch and all of the lower tributaries and lower Stoney Creek.

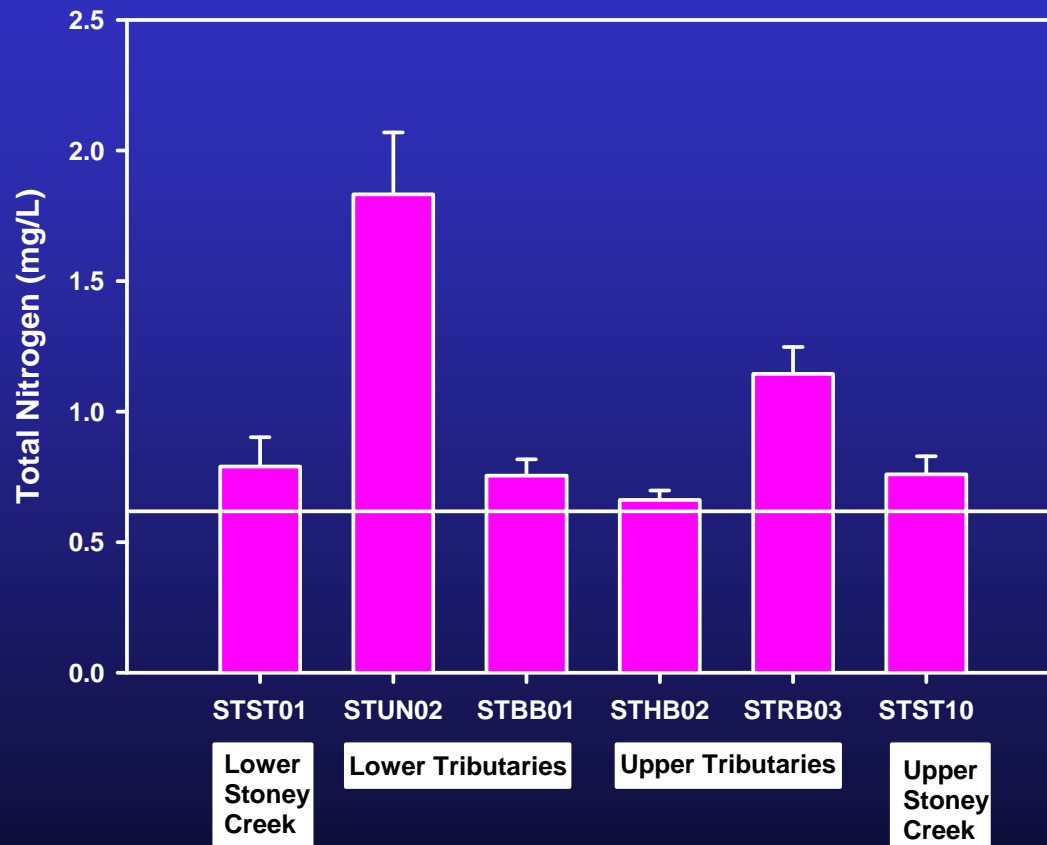
Nutrients – Nitrogen

Total Kjeldahl Nitrogen



- TKN is the sum of free ammonia and organic nitrogen based compounds.
- The upper tributaries and upper Stoney Creek has concentrations of TKN that exceed the EPA's reference values.

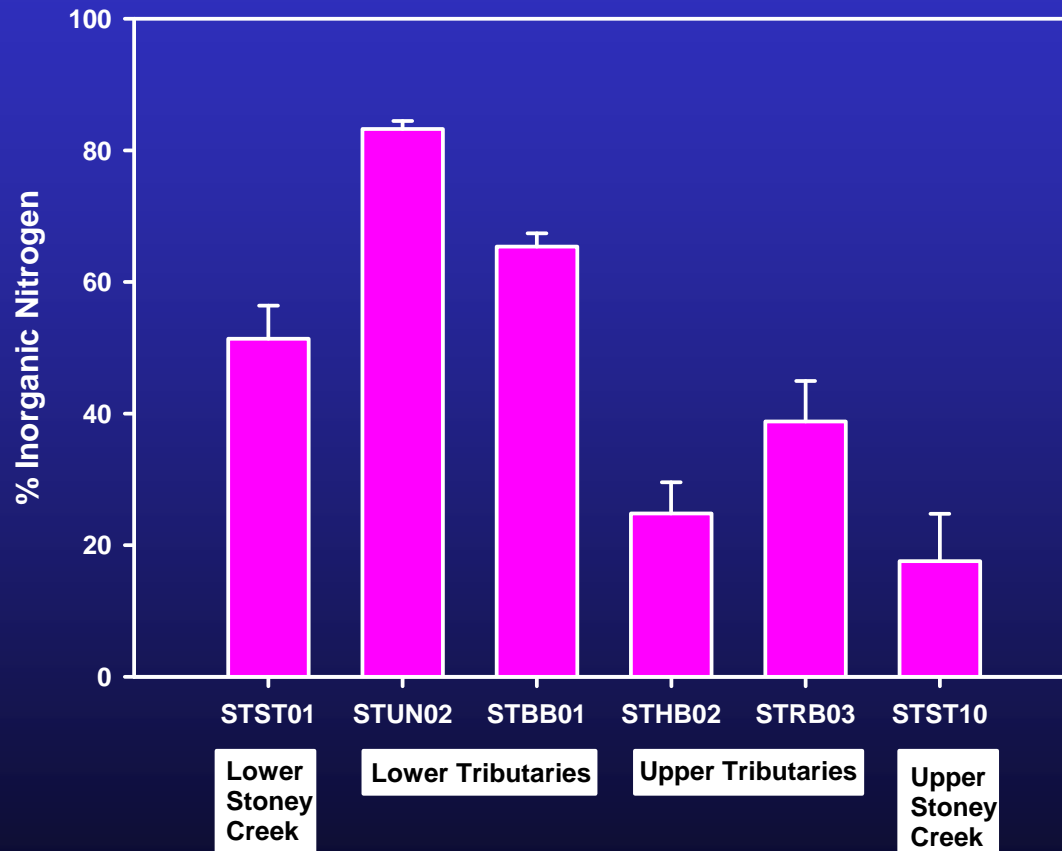
Nutrients – Total Nitrogen



- Total nitrogen is the sum of TKN and nitrate + nitrite.
- Total nitrogen concentrations exceeded the EPA values for reference streams in the unnamed tributary and Reedy Branch. This is primarily due to high concentrations of nitrite + nitrate.

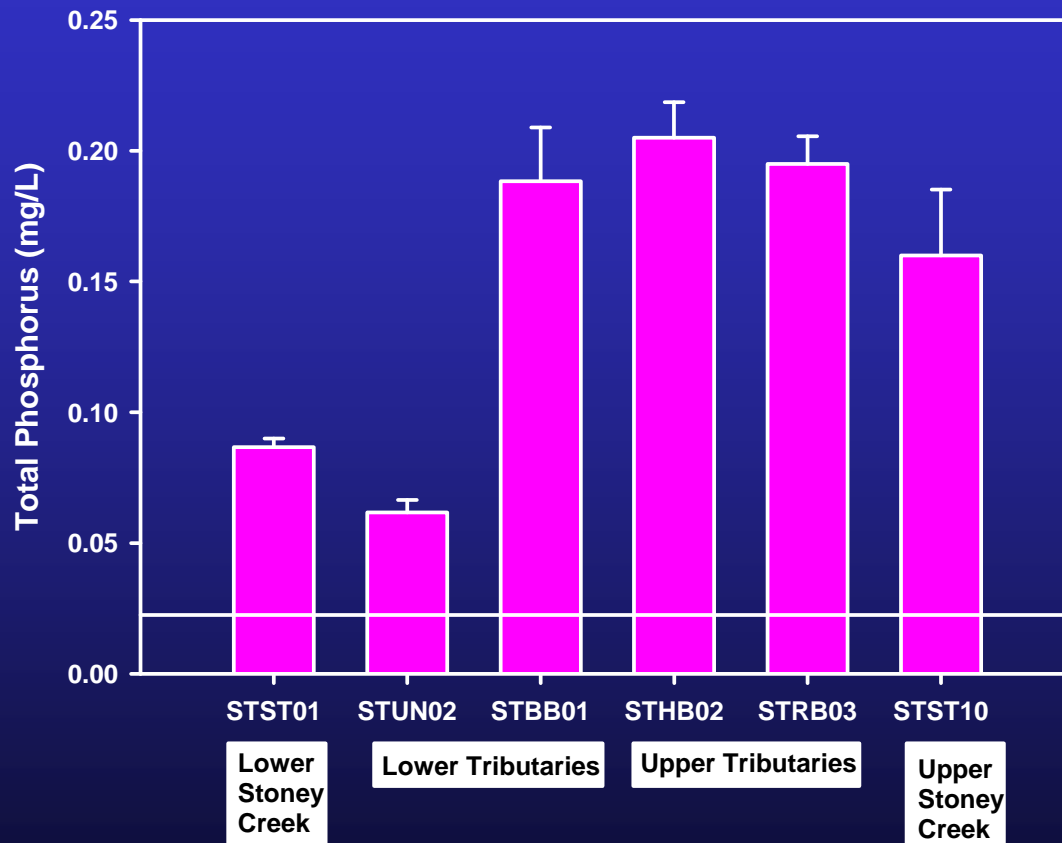
Nutrients – Nitrogen

Percentage of Inorganic N



- Inorganic nitrogen is the nitrogen that is not bound up in organic material such as algae or detritus. It can indicate fertilizer inputs into the stream.
- The upper portions of the Stoney Creek watershed are relatively low in inorganic nitrogen. However, they do have large populations of algae and aquatic weeds.
- The lower tributaries have the highest percentage of inorganic nitrogen.

Nutrients -- Phosphorus



- Phosphorus is usually the limiting nutrient for algae and aquatic plants in freshwater.
- Phosphorus is bound tightly to the soils particles and enters the water from erosion.
- Phosphorus is used in fertilizers and is also found in urban runoff and sewage.
- All sites in the Stoney Creek watershed exceeded EPA reference values for total phosphorus.
- The upper tributaries, upper Stoney Creek and Billy Branch all have exceptionally high phosphorus concentrations (up to 10X the reference value).

Metals

- **Copper** was only detected at one site on one date. Billy Branch on September 24, 2004. It was detected at 10 ug/L exceeding the benchmark (NAWQC) of 2.8 ug/L.
- **Manganese** exceeded the Tier II benchmark in Stoney Creek at Wayne Memorial Drive in 2 out of 3 samples (July 22, 2004 and November 2, 2004). The Tier II benchmark is 150 ug/L.
- **Zinc** exceeded its benchmark (NAWQC) once. Samples from Billy Branch taken on September 24, 2004 had a zinc concentration of 49 ug/L with a benchmark of 36 ug/L.
- **Aluminum** and **iron** were found in high concentrations throughout the Stoney Creek watershed. This is typical of coastal plains streams.

Conclusions

- Low dissolved oxygen concentrations occurred occasionally in areas with impoundments or immediately downstream of a wetland.
- Initial findings of high specific conductance in the Un-named Tributary and Reedy Branch indicate the possibility of more pollutants in these streams than in the others sampled.

Conclusions

- Excessive concentrations of nutrients, both nitrogen and phosphorus, are common through out the Stoney Creek watershed.
- Total nitrogen exceeded the reference values in the Un-named Tributary and Reedy Branch.
- The upper sites (Howell Creek, Reedy Branch, and Stoney Creek) all exceeded the reference values for TKN.
- The lower sites (Un-named Tributary, Billy Branch, and Stoney Creek) and Reedy Branch exceeded the reference values for nitrite + nitrate.
- The upper sites receive water from wetlands or impoundments and have a low percentage of inorganic nitrogen.
- The lower sites are partially urbanized with some agricultural areas and have a high percentage of inorganic nitrogen.

Conclusion

- Copper and zinc exceeded the EPA benchmark (NAWQC) in Billy Branch.
- Manganese exceeded Tier II criteria in Stoney Creek at Wayne Memorial Drive.
- Due to urbanization in the lower half of the watershed, metals may exceed their criteria more frequently during storms.
- Sediment toxicity results still to come.