Stream Chemistry and Sensitivity to Acid Deposition along the Appalachian Trail

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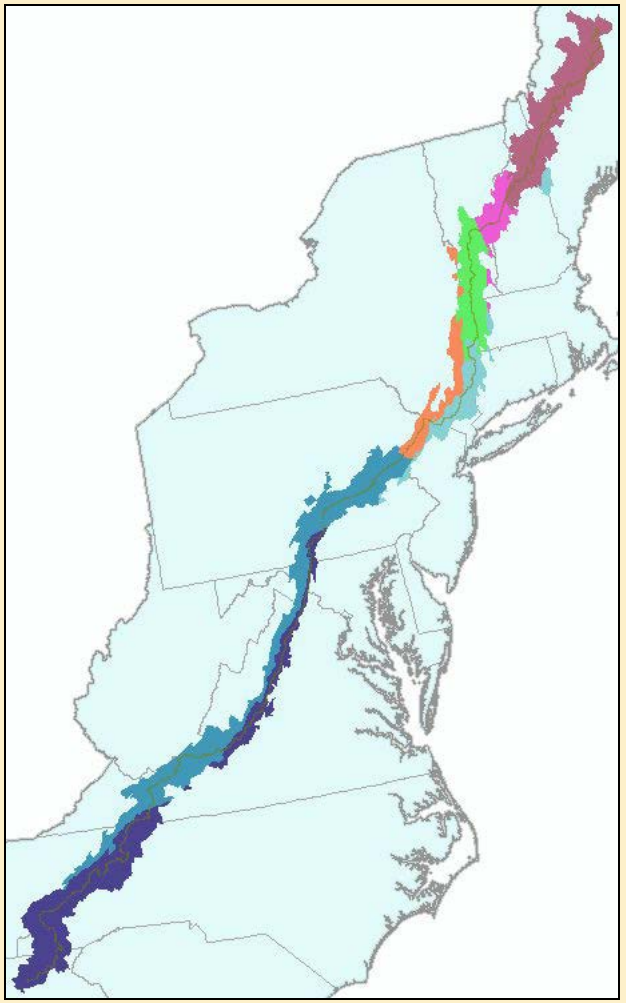
Goals of Presentation

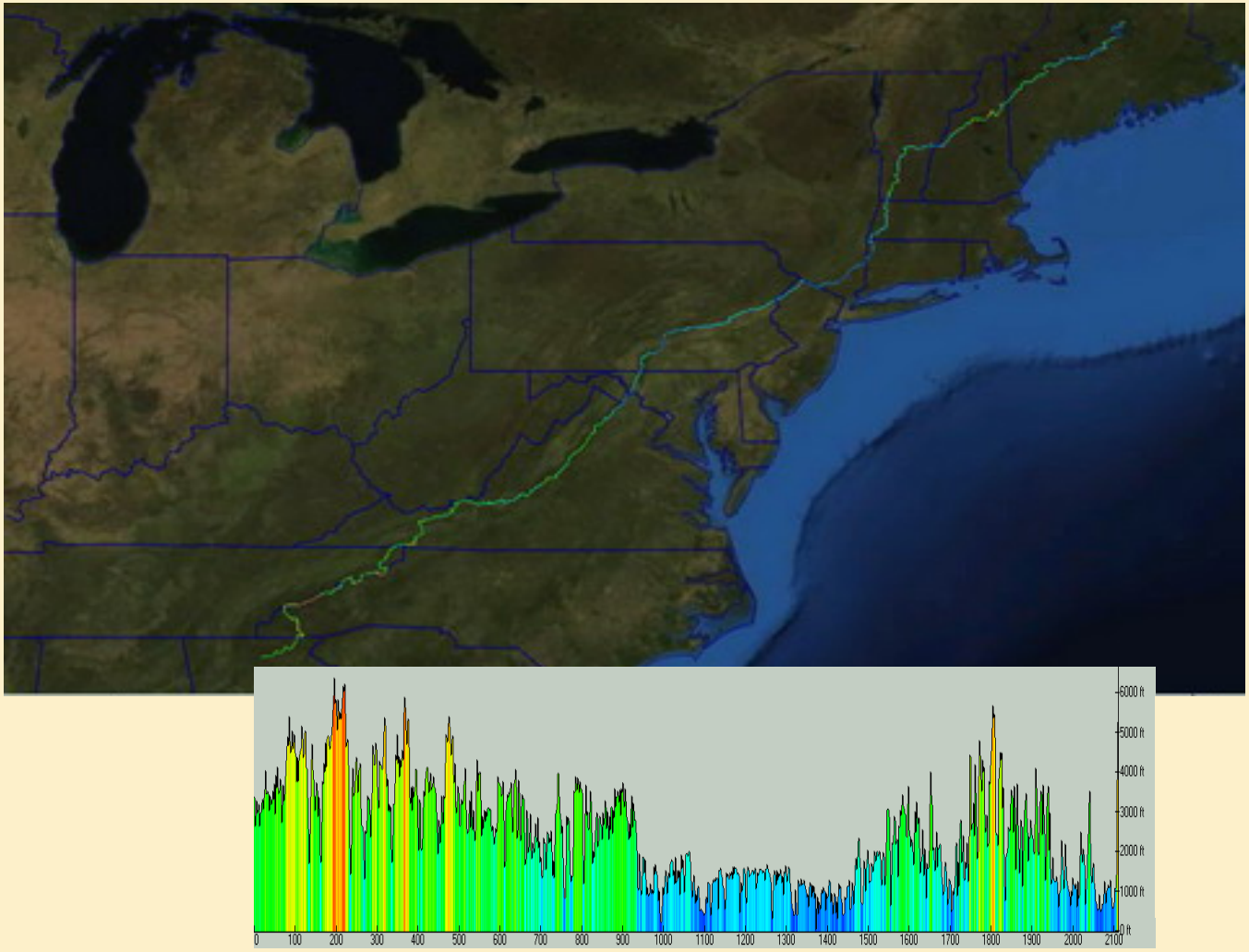
- Overview of AT Mega-Transect Atmospheric Deposition Effects Study
- Preliminary analyses of stream chemistry data
- Status of study and plans going forward

Background on Appalachian Trail

- 3515 km long
- Transits 14 states
- Managed by NPS, ATC
- Corridor avg. width ~300 m
- Project grew from interest in AT as a mega environmental transect
- Much of AT follows ridgetops – orographically enhanced precipitation, thin soils



AT Transits High Elevation Corridor



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Acid Deposition Effects Study

- Evaluate the status and sensitivity of the AT corridor to acid deposition effects
- Establish baseline data against which future changes can be measured
- Develop wall-to-wall model of acidification sensitivity
- Phase I – collect stream, soil, vegetation, deposition model, spatial sensitivity model
- Phase II – MAGIC modeling, critical loads
- Currently near end of Phase I

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Stream Chemistry

- Led by Karen Rice and Doug Burns
- Goal to sample 260 streams twice (varying hydrologic conditions)
- Not a random sample – stratified design based on lithology, vegetation, broad spatial representation, road accessibility
- What did we get? 298 streams, most twice, 538 samples, captured high flow conditions well
- Finalizing geo-locations to enable modeling to move forward

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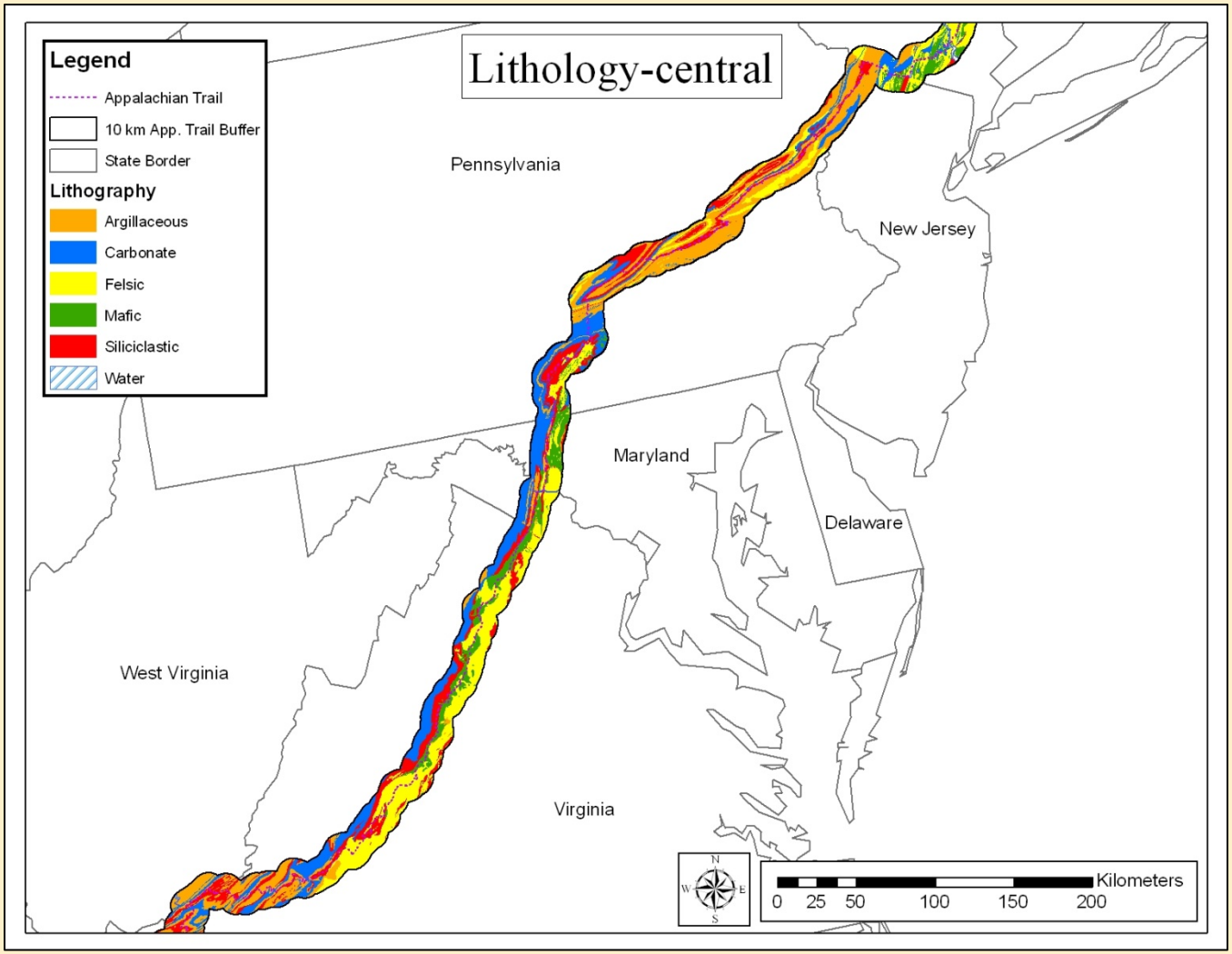
Example – Lithology Central AT



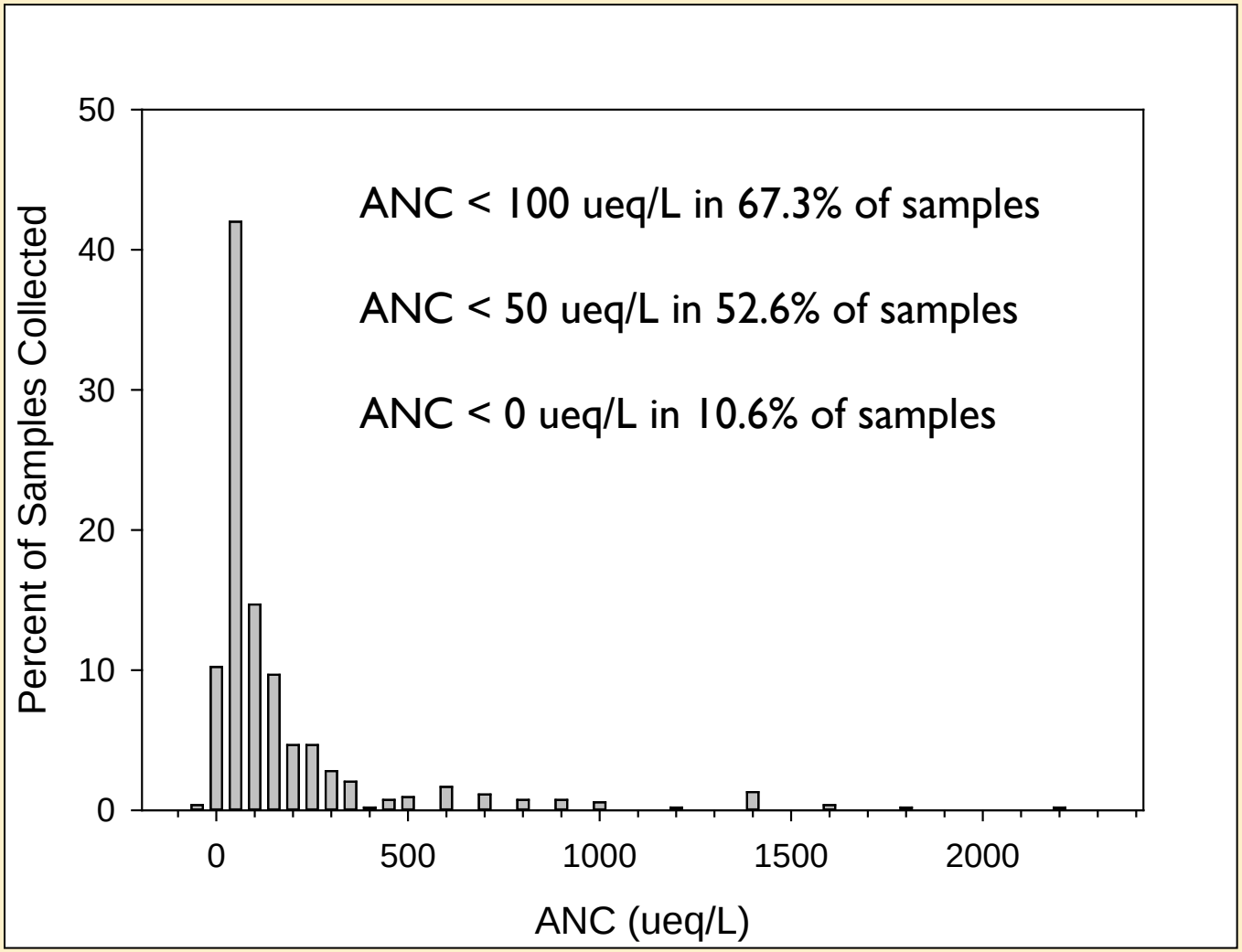
Stream Characteristics

- Small headwater streams – 1st and 2nd order, forested watersheds, divide often AT corridor, ridgeline
- Minimize direct human influence – roads, homes

Stream Chemistry Summary

Constituent	Mean	Std Dev.	Median	Max.	Min.
ANC (µeq/L)	136.4	260.7	44.5	2173.1	-69.7
pH (units)	6.28	0.79	6.38	8.28	4.22
Al_{IM} (µmol/L)	0.98	1.95	0.24	17.0	0
Ca^{2+} (µmol/L)	75.4	120.0	35.7	1123.3	3.5
DOC (µmol/L)	172.3	223.6	96.1	2085.2	7.5

ANC


ANC < 100 ueq/L in 67.3% of samples
ANC < 50 ueq/L in 52.6% of samples
ANC < 0 ueq/L in 10.6% of samples
Percent of Samples Collected
50
40
30
20
10
0
0
500
1000
1500
2000
ANC (ueq/L)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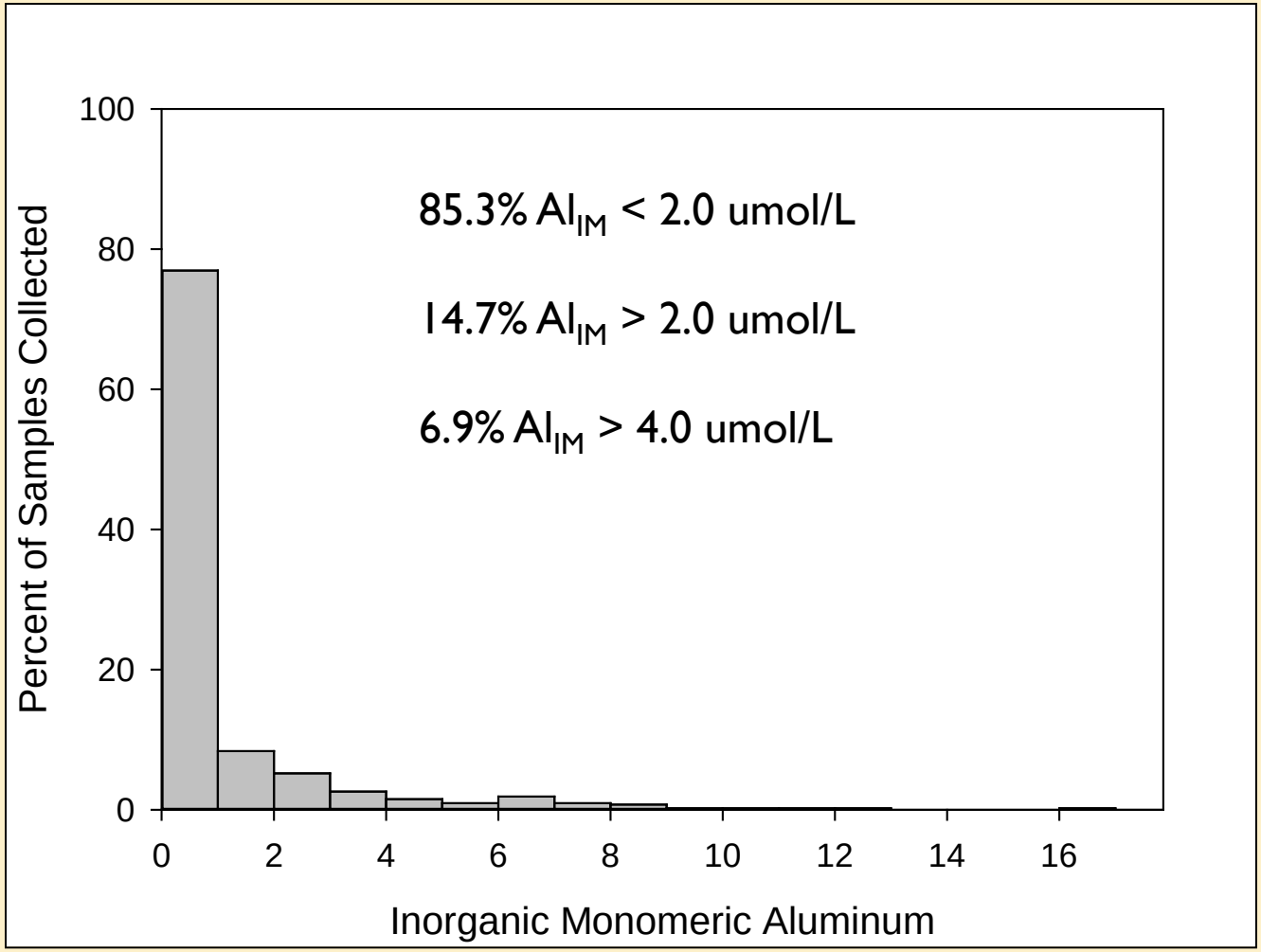
Inorganic Monomeric Aluminum



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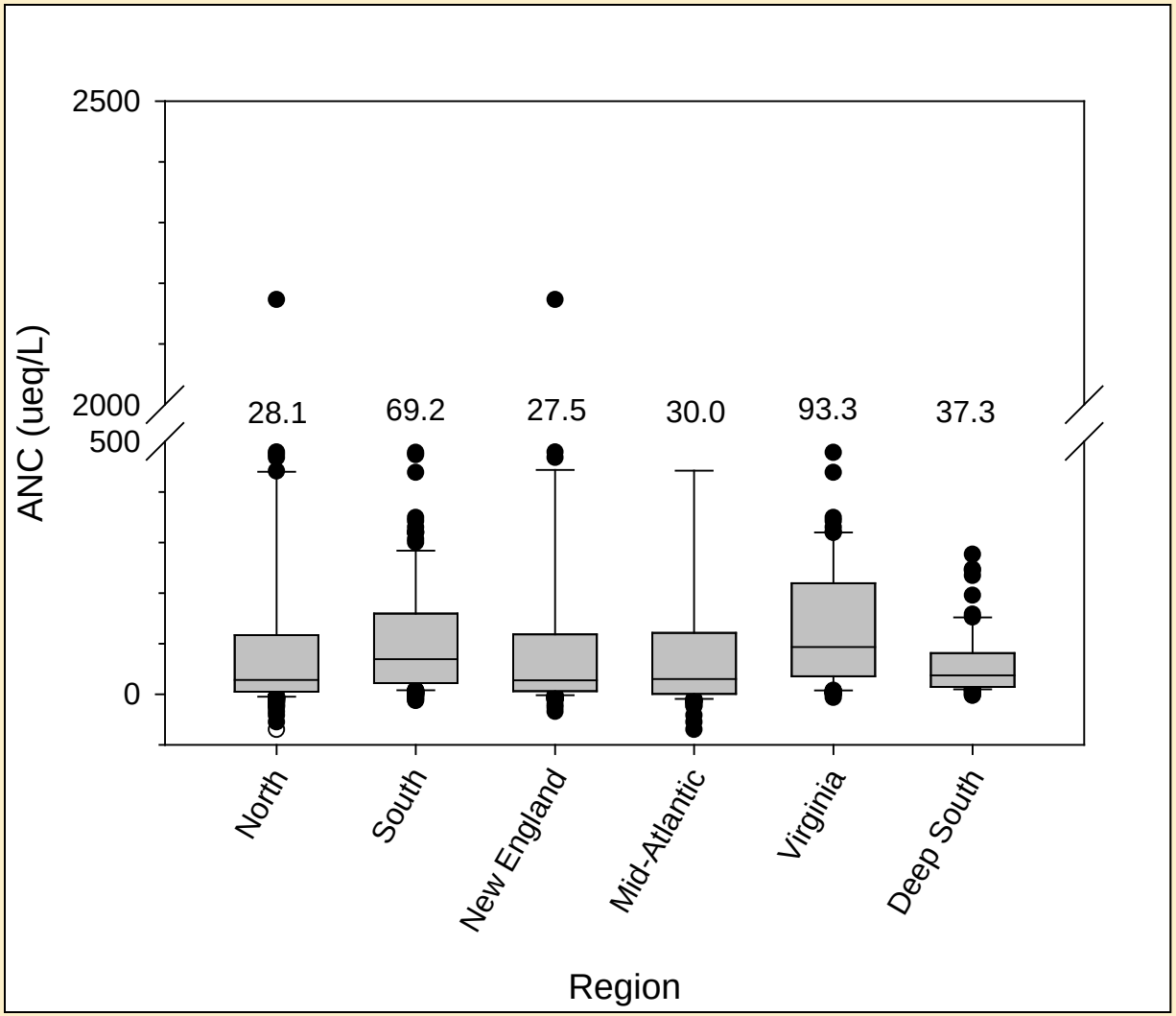
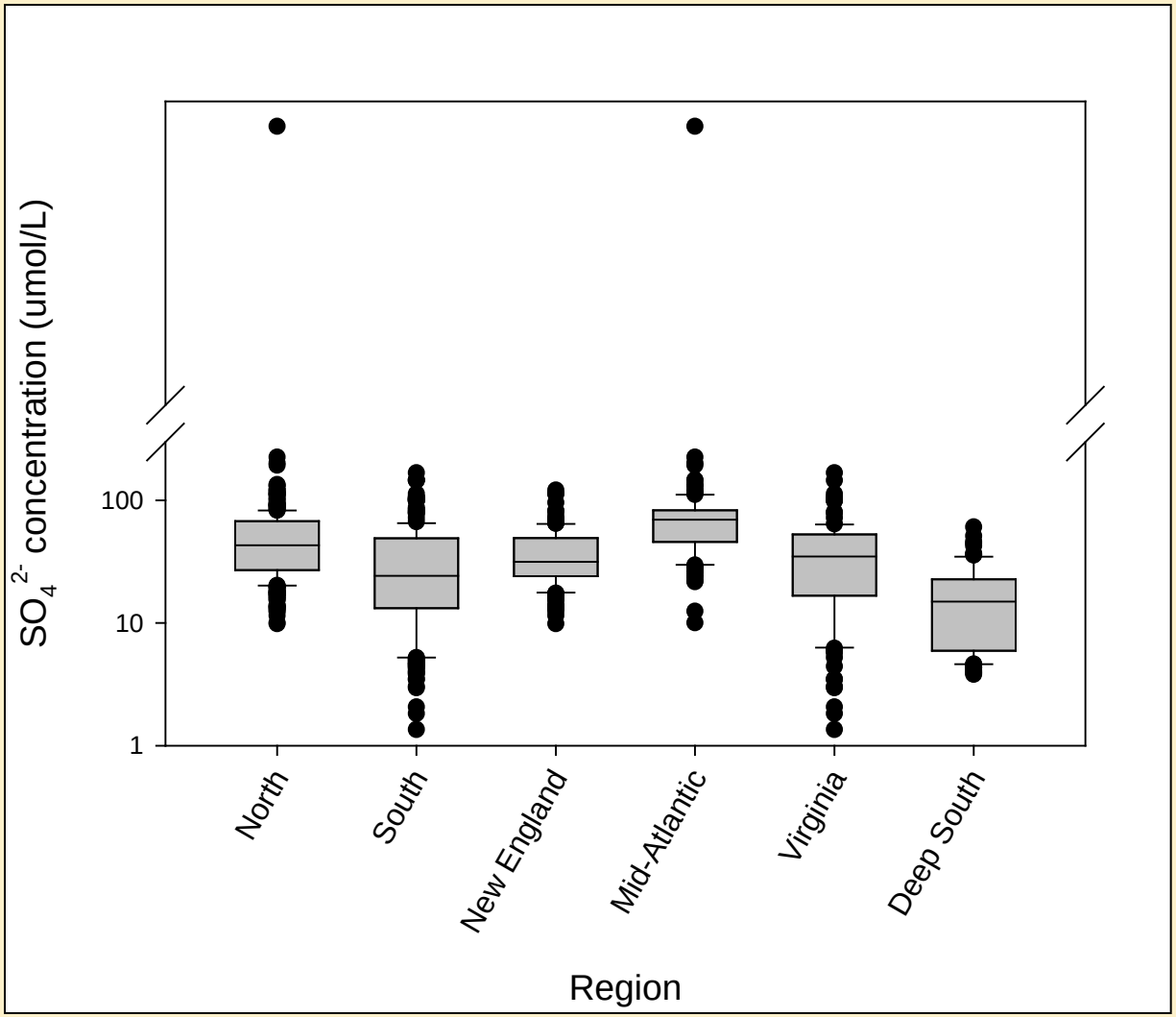
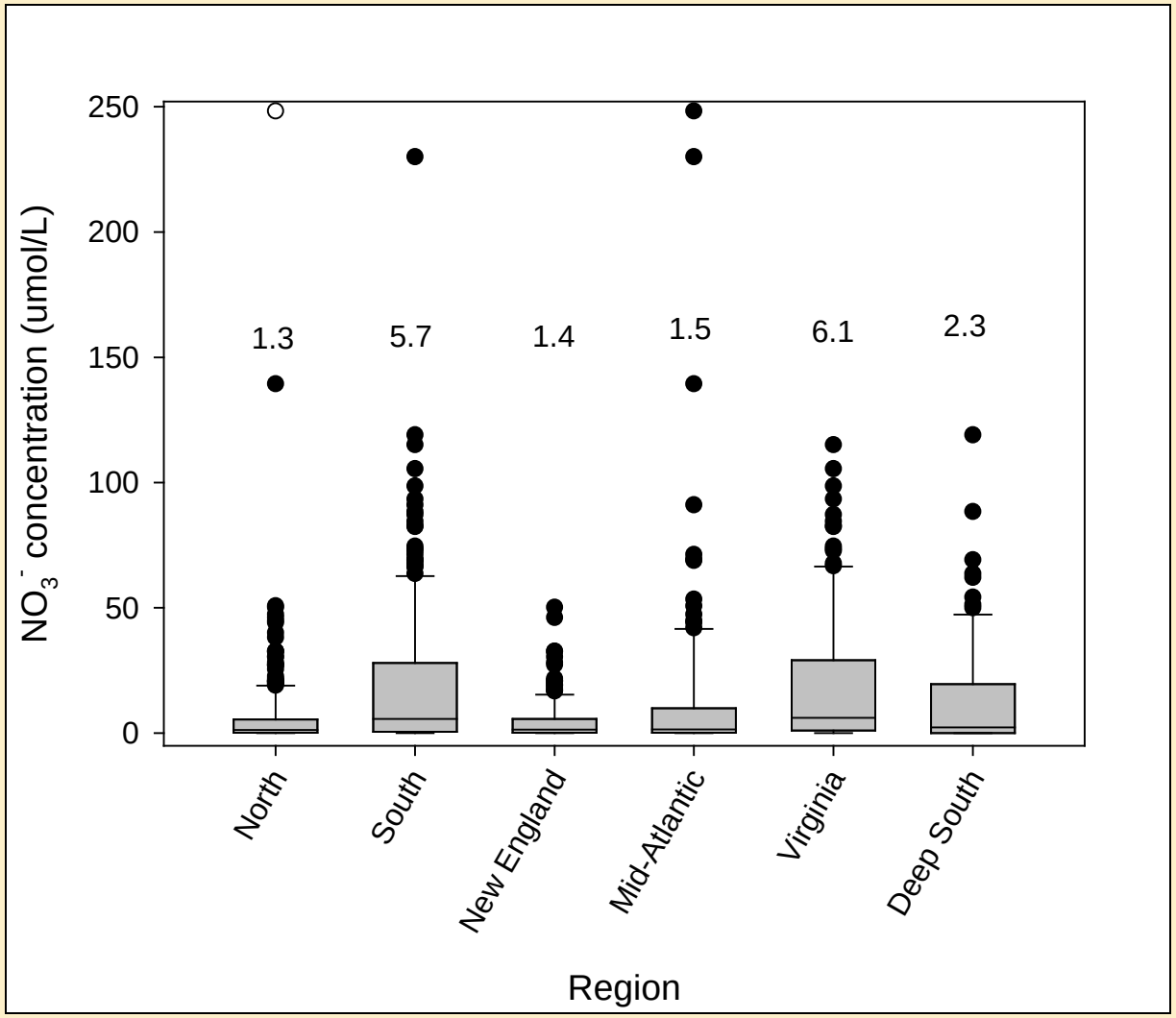
ANC by Region



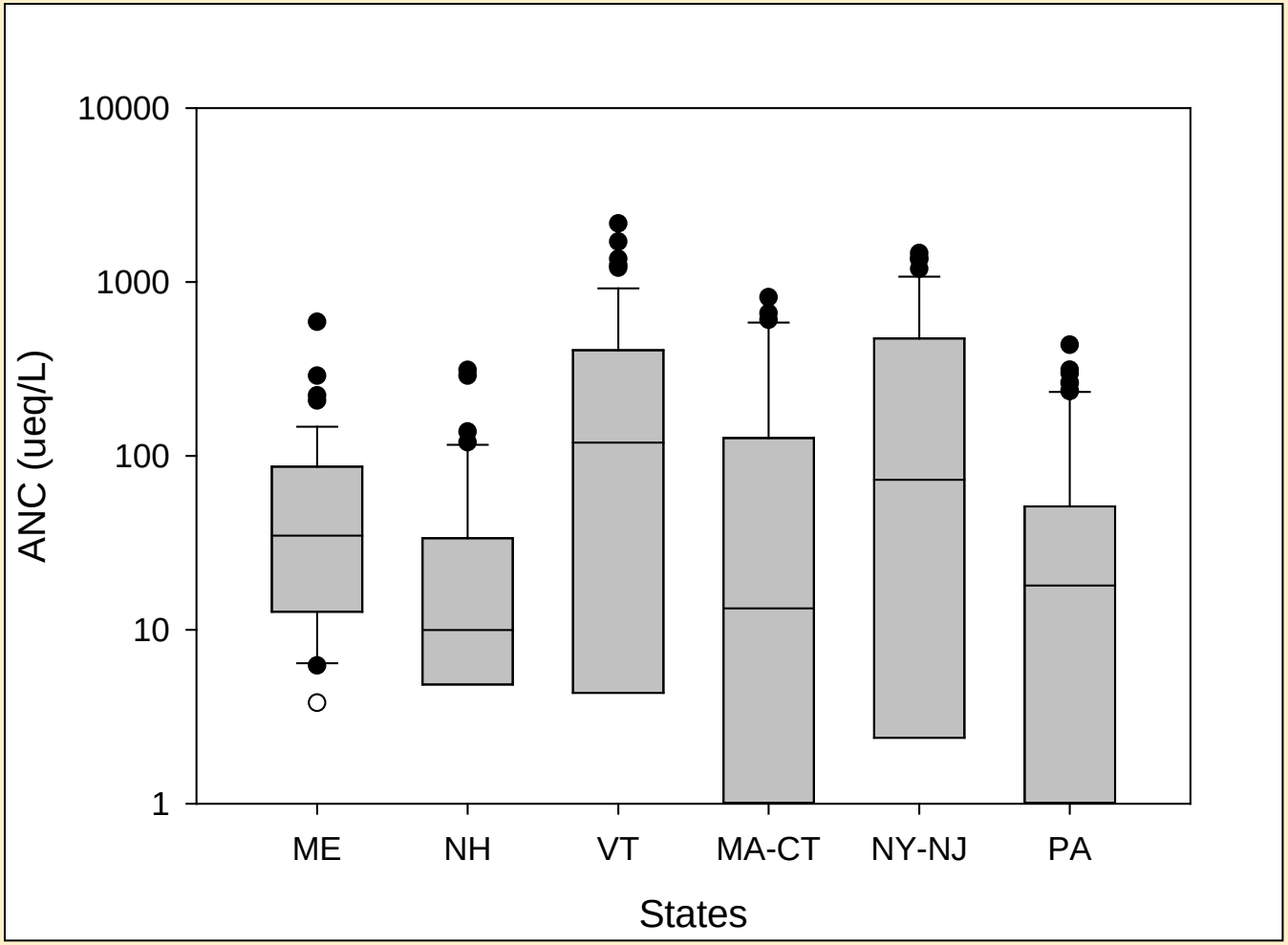
Sulfate by Region



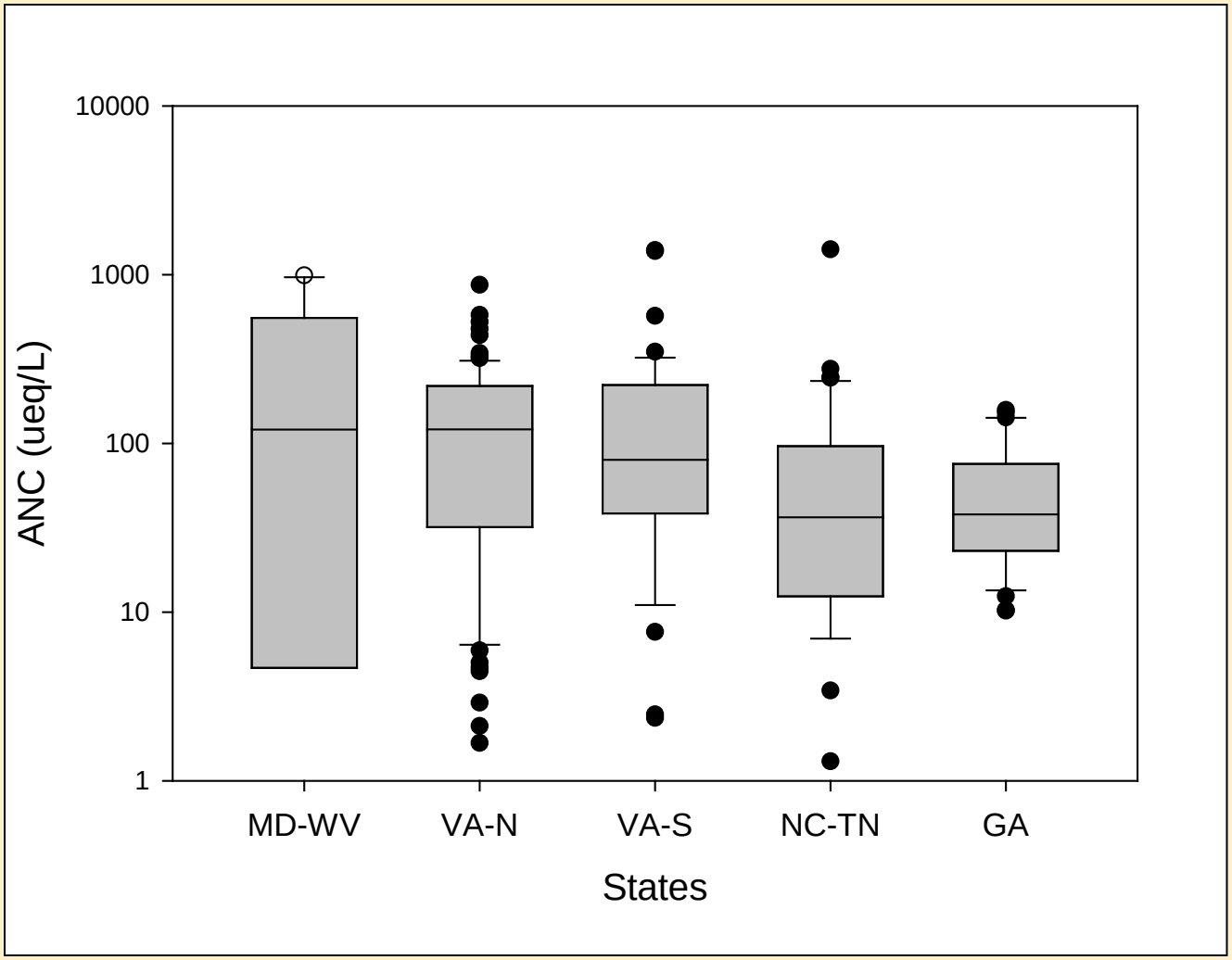
Nitrate by Region



ANC – Northern States



ANC – Southern States



Summary

- About 300 streams have been sampled (most twice) along AT corridor
- Many streams sensitive to acid deposition - 53% of samples have ANC < 50 ueq/L
- About 15% of samples indicate stress to brook trout (Al_{IM} > 2 umol/L)
- Median ANC greater in southern samples
- Some regions/states not well studied have low ANC streams – Berkshires, northern Georgia

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Next Steps

- Finalize locations – close to completion
- Develop statistical model of acid sensitivity for entire AT corridor – final report and one or more papers
- Phase II of study – MAGIC modeling, critical loads