

The RiverNet Program

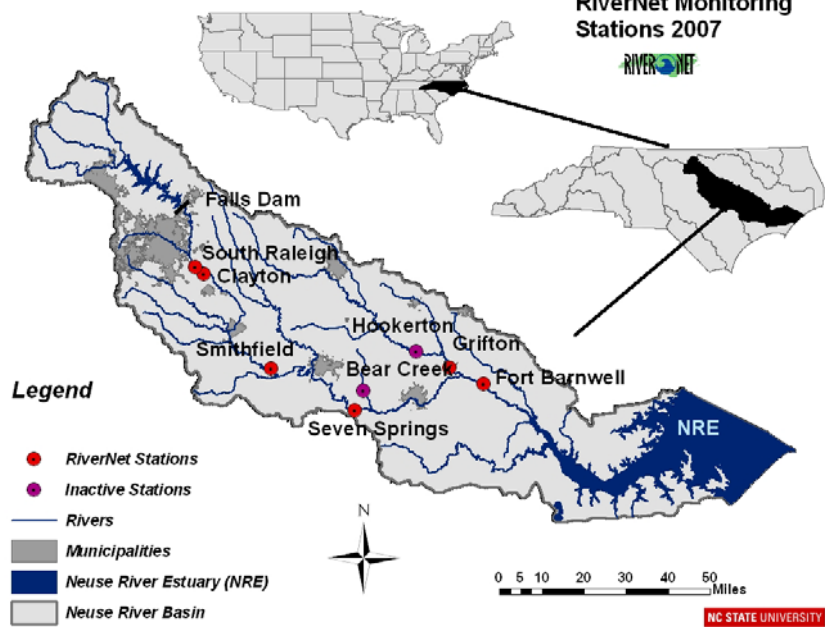
Environmental Review Commission Meeting

Tuesday March 18, 2008

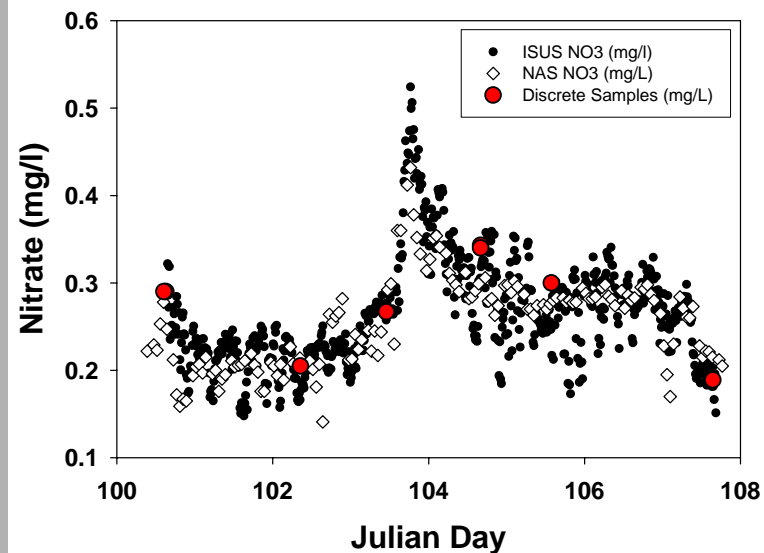


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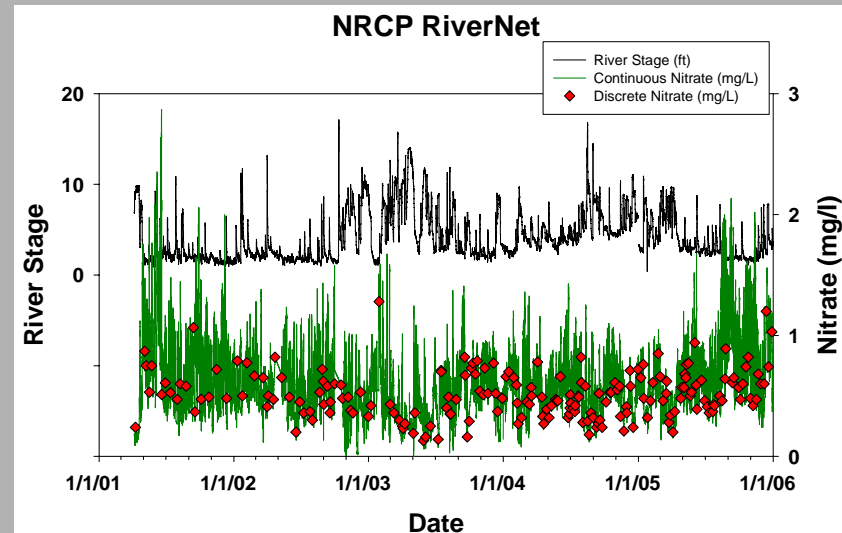
RiverNet Monitoring Stations 2007



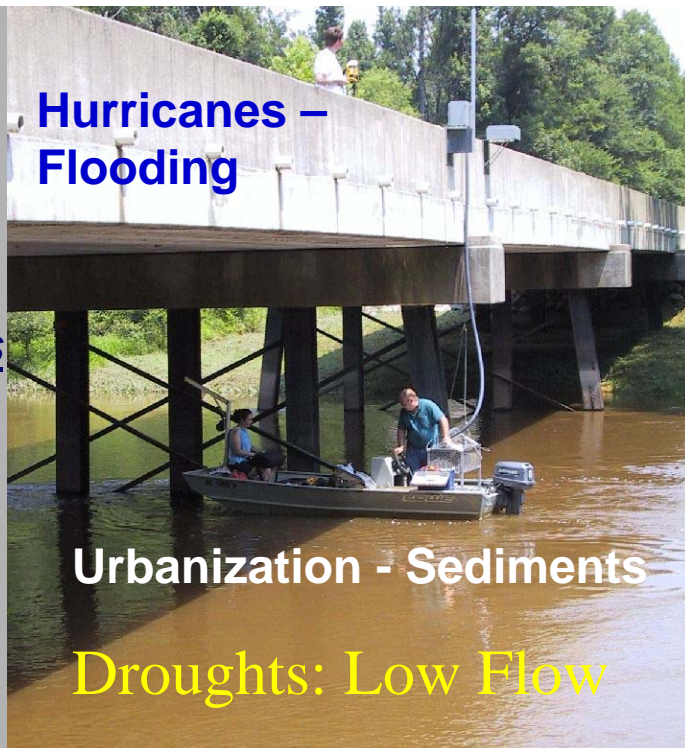
1) Significant Under-sampling Bias in Monitoring Networks



2) Significant Nitrate Concentration Variations in River Nitrate



Hurricanes – Flooding



Urbanization - Sediments

Droughts: Low Flow

Stations Attached To Bridges

Why are there Good and Bad Water Quality Years?

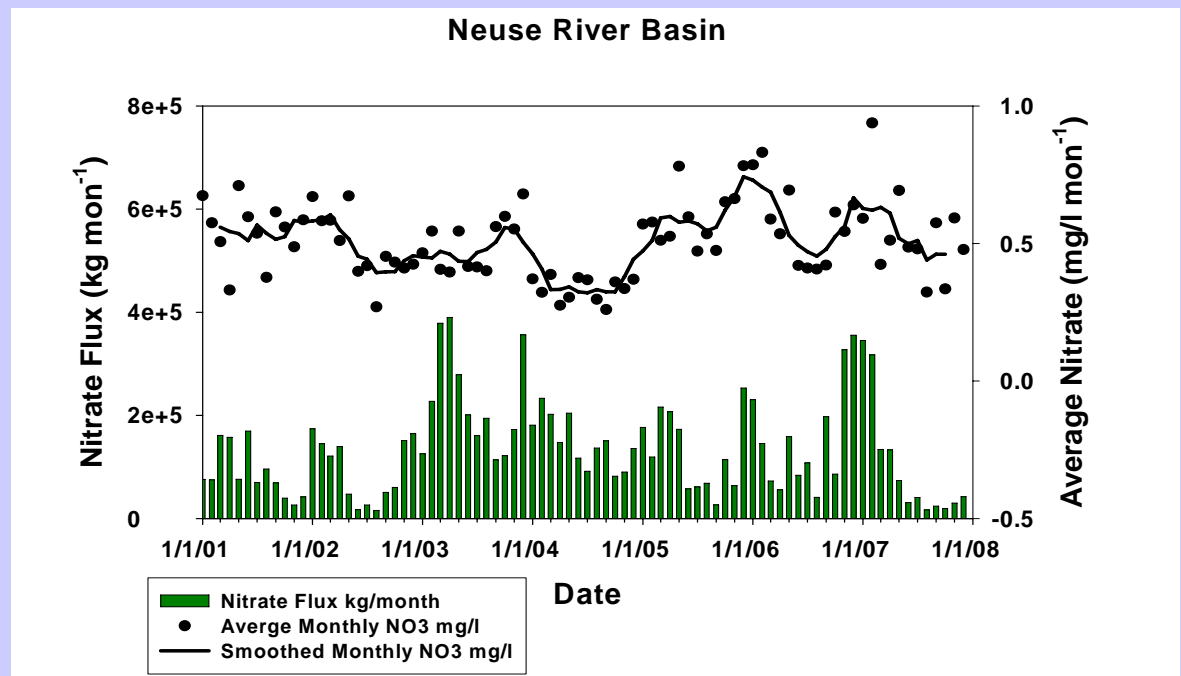


Water level at Falls Lake on Nov. 8 2005.

Surveying in Low Flow Conditions

Nitrate Flux to Estuary

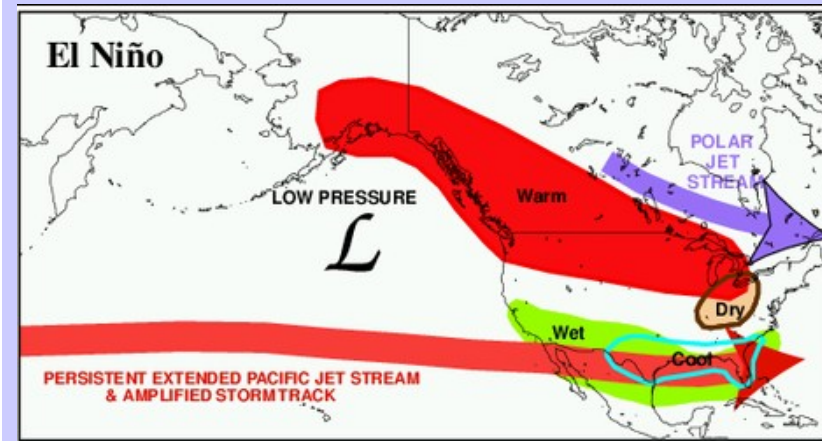
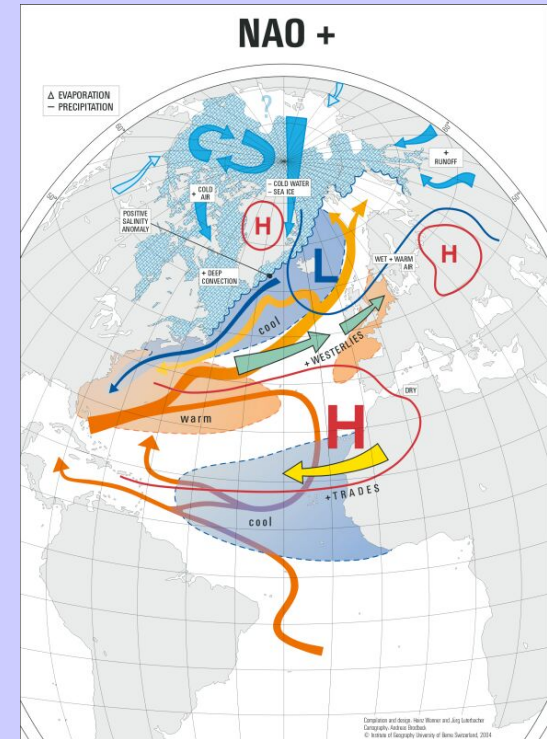
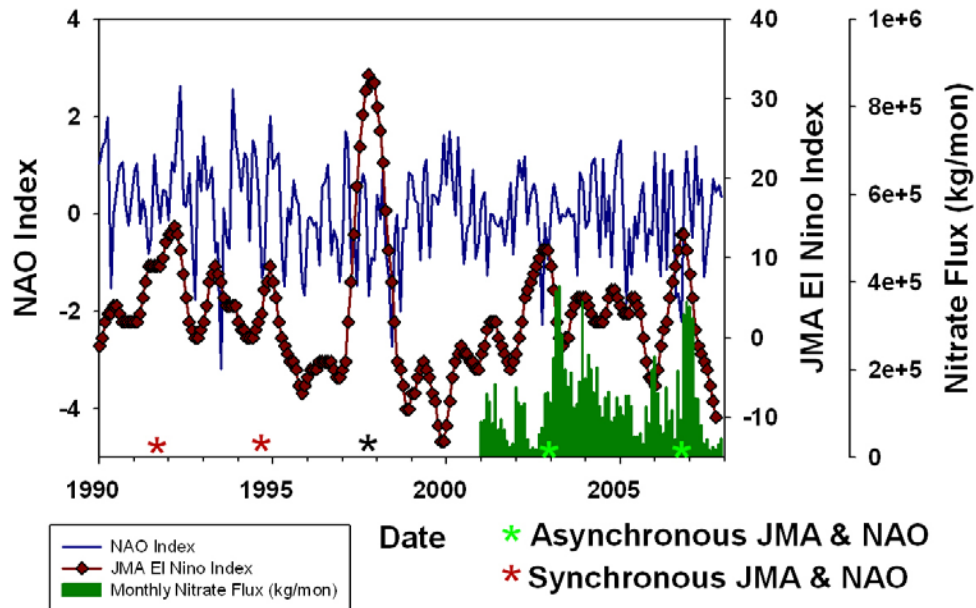
- Variable on a 3-5 Year Cycle
- Nitrate Concentration is a poor predictor of Nitrate Flux



Global Climate Oscillations Control Water Quality and Availability in NC

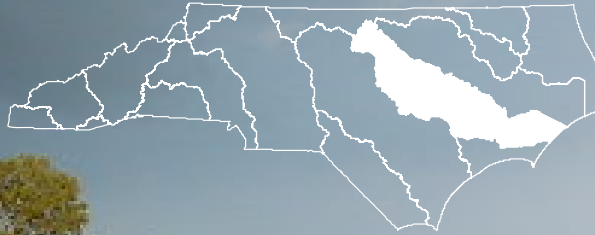
- El Nino influences Souther Jet Stream
- NAO Controls Sea Surface Temperature
- High Nitrate Flux when both are synchronous

Climate Variations and Nitrate Flux

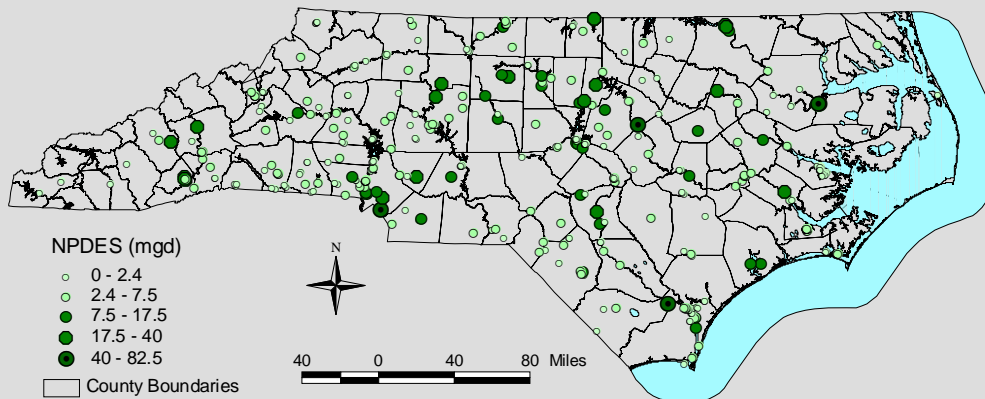


Sustainable Biosolid Land Applications

Neuse River Basin

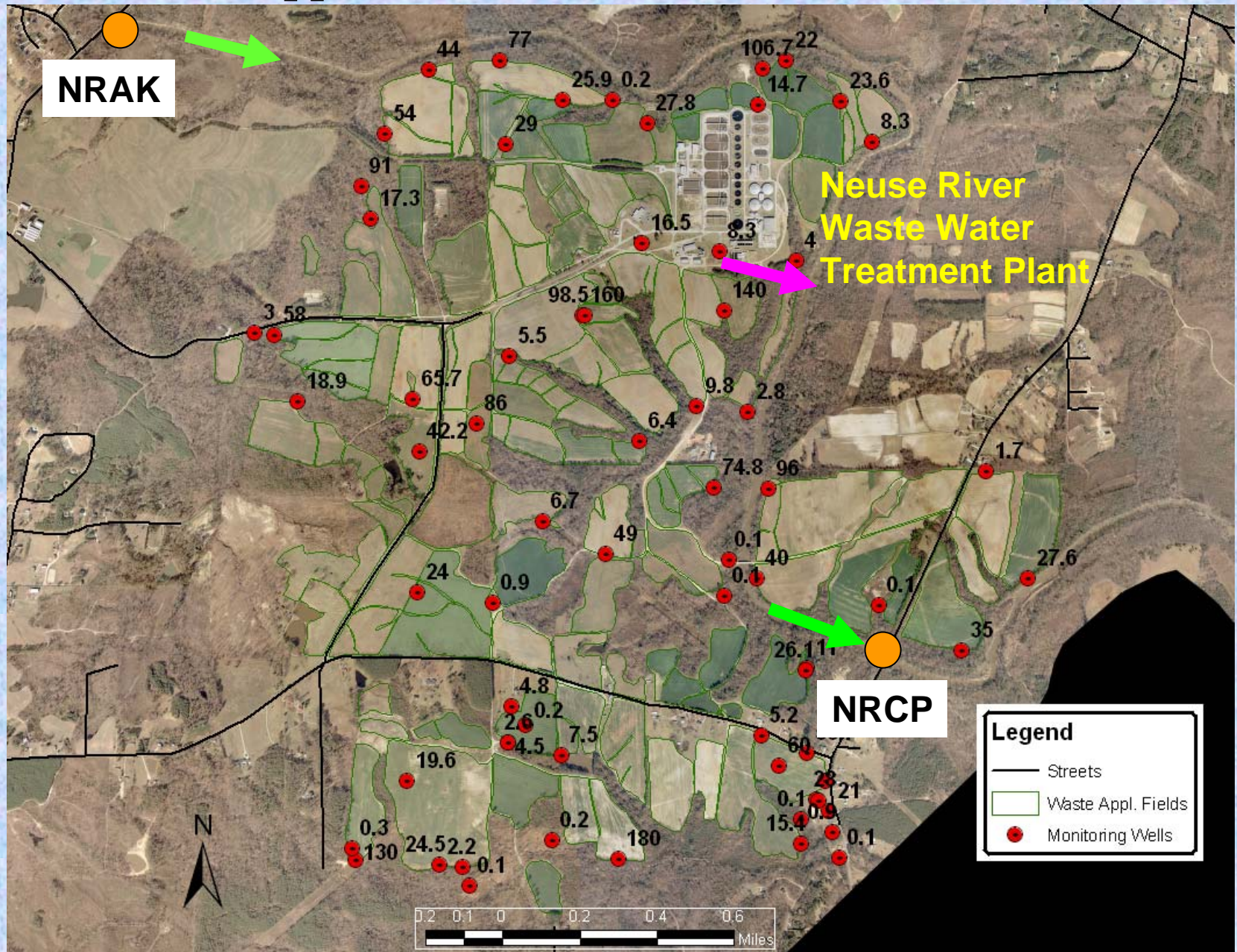


Large NPDES Dischargers



Measuring NPS Nitrate in Rivers

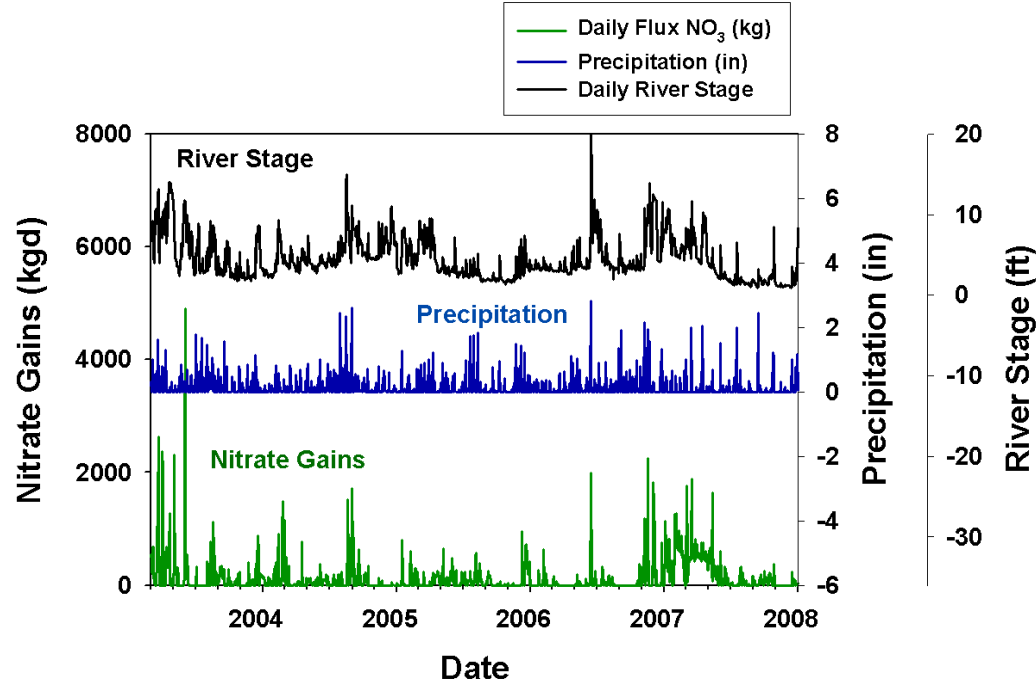
Biosolid Application Fields Nitrate Transferred to River?



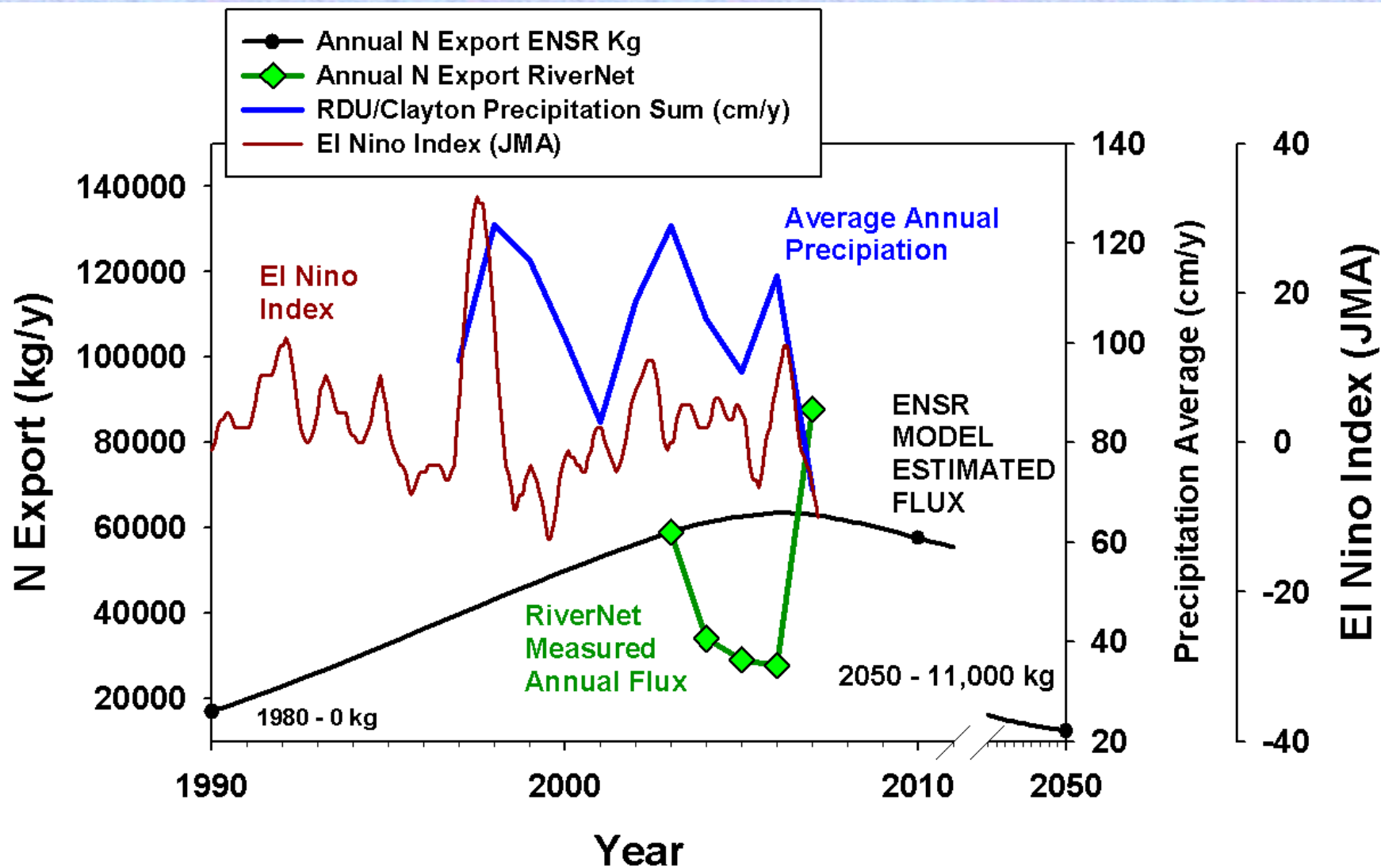
Event Driven Fluxes

•*Effluent N Flux Decreasing*

•*Waste Application Field Runoff Variable*



Calender Year	Daily Integrated NO3 Gains	% Total NO3 Output NRWTP	% Total NO3 Output NRCP	Clayton & RDU Precipitation Average (in)	NRWWTP Flux NO3 kg/yr	NRWWTP Flux Total N kg/yr
2003	58950	59	13	43	140,082	202253
2004	34072	32	11	41	107,262	182390
2005	29065	30	8	38	96,390	163178
2006	27819	33	8	44	84,579	143066
2007	87806	134	30	32	65,610	106514
Average	47543	58	14	40	98785	159480

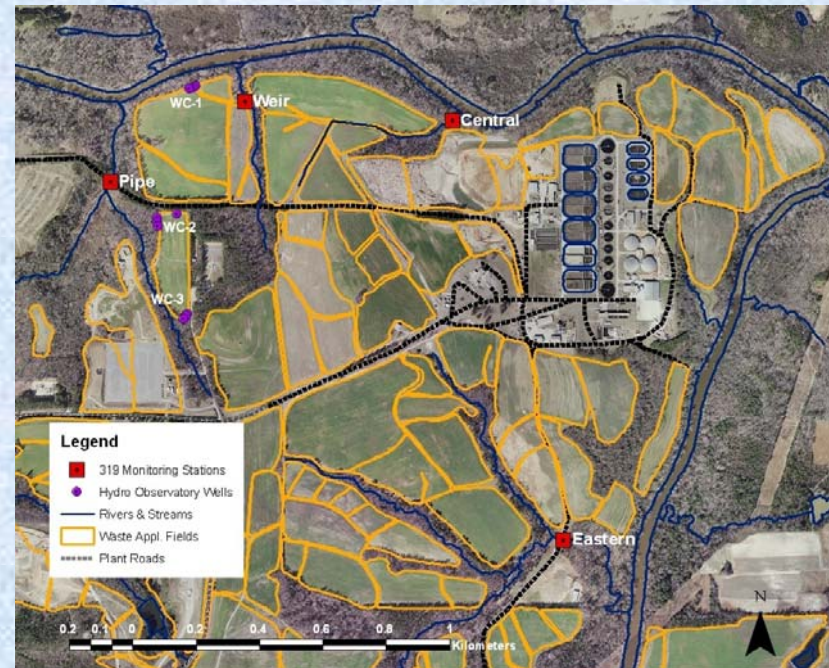
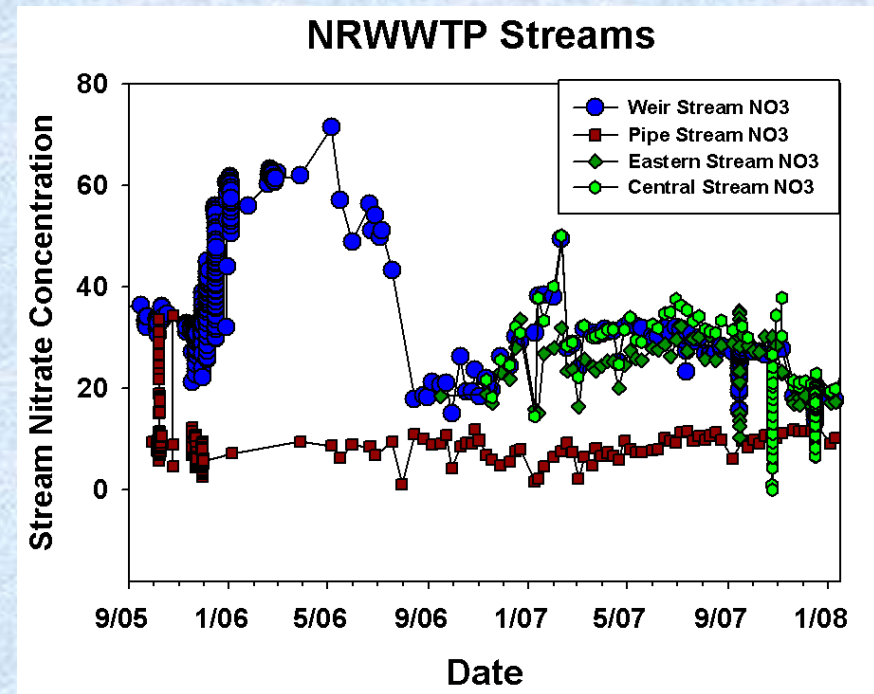


Stream Monitoring:

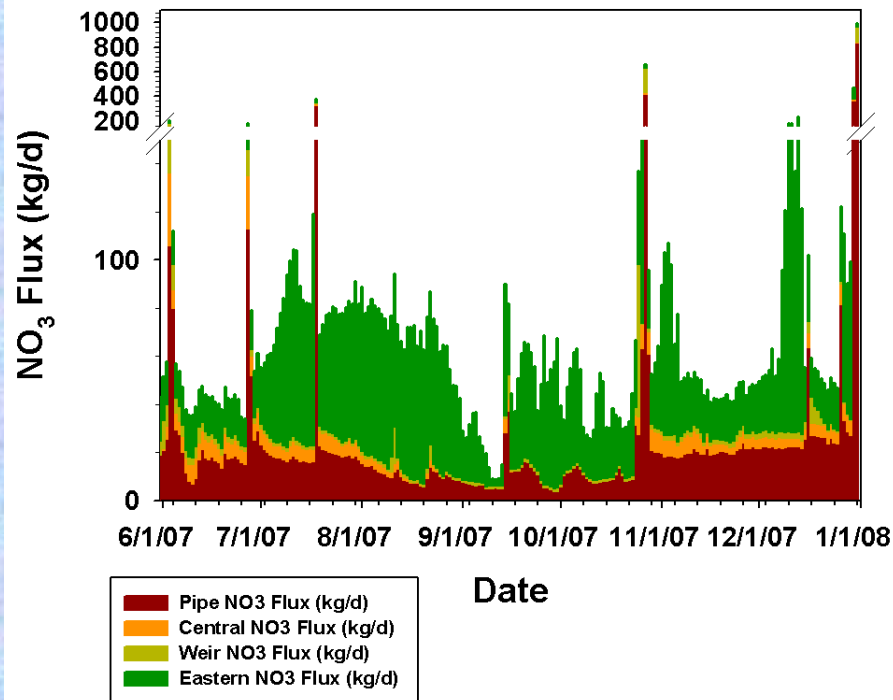
Nitrate flux from Biosolid Waste Application Fields

- *Streams Have High Nitrate concentrations*
- *Cut Across Buffers to River*
- *Flow is controlled by Groundwater Elevation*

Stream	Nitrate kg/6 mon	Discharge cf/6 mon	% NO3 Flux	N Flux Ave kgd	Discharge Average cfd
Weir	717	1325523	5.50	7	8816
Central	645	908463	4.95	4	5447
Eastern	6686	8041442	51.34	39	51494
Pipe	4975	16487331	38.20	37	137022
Total	13023	26762760			



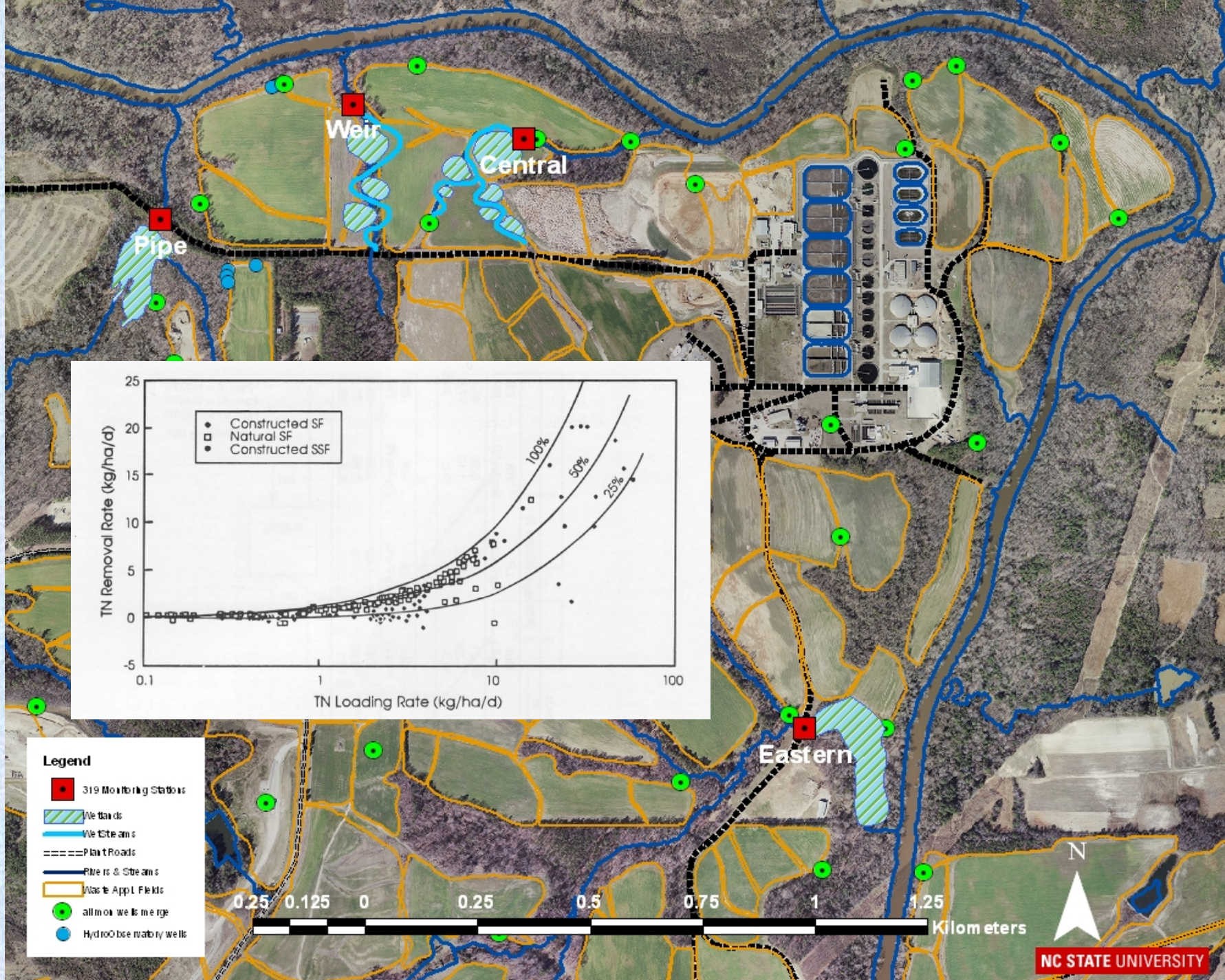
NRWWTP Streams



Stream	N Flux Ave kgd	Q Average cfd	NO ₃ Flux kg/d Max
Pipe	37	137022	833
Central	4	5447	30
Weir	7	8816	199
Eastern	39	51494	206

River Nitrate Gains Under-Estimate Stream N Flux





Sustainable Water Use: Climate Oscillations and Water Resources?



Surface Water

NC Water Quality Workgroup Initiative

Last Funding \$45K Jan 2004

2000-2004

19 Projects Funded - \$1,102,285

UNC-CH - 3

NCSU - 11

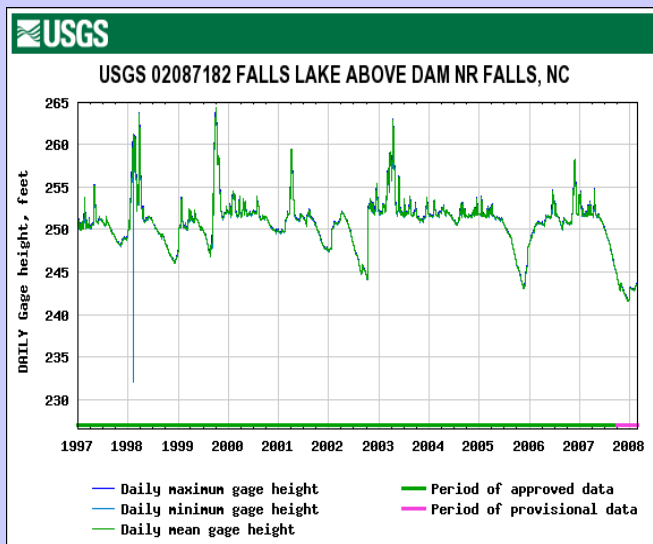
UNCW - 2

UNCC - 1

UNCG - 1

For More Information:

<http://www.ncsu.edu/wrri/>



Water Resources Research Institute
of The University of North Carolina