Draft UNRBA Monitoring Plan Review

May 21, Board Of Directors Meeting

May 21, 2014

Falls Lake Rules

The Commission may consider revisions to the requirements of Stage II based on the results of such modeling as follows:

(i) A person **shall obtain Division review and approval of any monitoring study plan and description of the modeling framework** to be used prior to commencement of such a study. The study plan and modeling framework shall meet any Division requirements for data quality and model support or design in place at that time. Within 180 days of receipt, the division shall either approve the plan and modeling framework or notify the person seeking to perform the supplemental modeling of changes to the plan and modeling framework required by the Division;

(ii) **Supplemental modeling shall include a minimum of three years of lake water quality data** unless the person performing the modeling can provide information to the Division demonstrating that a shorter time span is sufficient;

Cardno ENTRIX
Shaping the Future

Cardno ENTRIX

Shaping the Future

Description of Modeling Framework

Description of Modeling Framework

- Developed with input from PFC and sent to DWR for review in February 2014
- Received DWR comments mid April 2014
- DWR's Primary Comments
  - Re-title Document as a Description of a Modeling Framework
  - Add exact Falls Lake Rules language to document
  - Identify lake model parameters targeted for re-calibration
  - Update wording of model performance targets
  - Revise schedule to include DWR review of QAPP and full model framework (developed in a future year)
- Revised draft sent to PFC May 15

Cardno ENTRIX
Shaping the Future

UNRBA
Monitoring Plan

UNRBA Monitoring Plan Development Process

- Developed jointly by Cardno ENTRIX and the UNRBA
- Significant input was provided by the PFC, individual UNRBA members, the Executive Director, and technical advisors
- Multiple meetings were held with the PFC to discuss and revise the monitoring plan
- The monitoring plan is also based on a compilation of supporting work conducted by Cardno ENTRIX under contract with the UNRBA over the last three years

Cardno ENTRIX
Shaping the Future

Supporting Technical Work

Task 1 TM (2013): Framework for a Re-examination of Stage II of the Falls Nutrient Strategy Support of Long Term Planning and Regulatory Nutrient Activities.

Task 2 TM (2012): Review Existing Data and Reports for Falls Lake and the Watershed

Task 3 TM (2013): Estimation of Nutrient Loading to Falls Lake

Task 4 TM (2013): Review of Existing Models and Recommendations for Future Studies

2014 TM1: Description of the Water Quality Model Framework Document Under the Re-examination Provision of the Falls Lake Rules.

2014 TM2: Evaluation of the Sensitivity of the Falls Lake Nutrient Response Model

2014 TM3: Comparison of Flow Estimation Methods.

2014 TM4: Water Quality Estimation and Monitoring Optimization.

Cardno ENTRIX
Shaping the Future

UNRBA Monitoring Plan Development Process

- Review of draft monitoring plan with PFC
  - Updated special studies priorities
  - Added more jurisdictional boundary monitoring stations
  - Discussion of water quality parameters to monitor at JB and LL stations
  - UNRBA members to initiate discussions in FY 2015 with EPA regarding future regulatory options
- Review of revised draft monitoring plan with PFC Working Group
  - Increased frequency of monitoring at JB sites
  - Increased frequency of monitoring at LL sites
  - Request for DWR to add additional Lake monitoring station as well as new parameters at all stations
  - Adjusted implementation year for certain special studies

Cardno ENTRIX
Shaping the Future

UNRBA Monitoring Plan Development Process

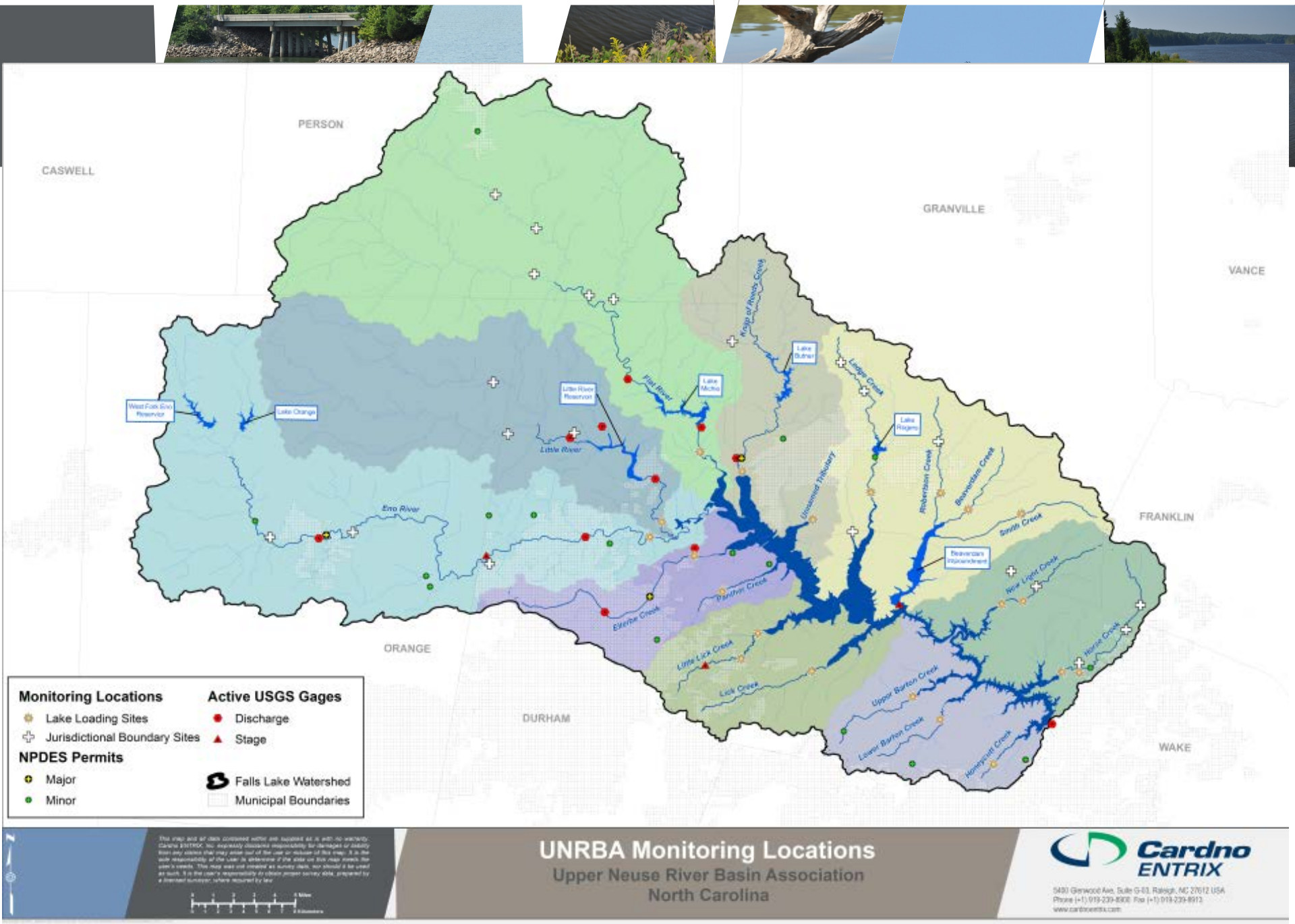
- Created version of monitoring plan for DWR review and approval
  - No cost information
  - Contains less background material

Cardno ENTRIX
Shaping the Future

UNRBA Monitoring Plan Summary

- 18 Lake Loading Stations
- 20 Jurisdictional Boundary Sites
- Special Studies each year in Falls Lake and the Watershed
  - Assist with revised model calibration and measurement of internal lake loading
  - ID most accurate method for estimating tributary loading
  - Provide data needed to support future regulatory options if pursued

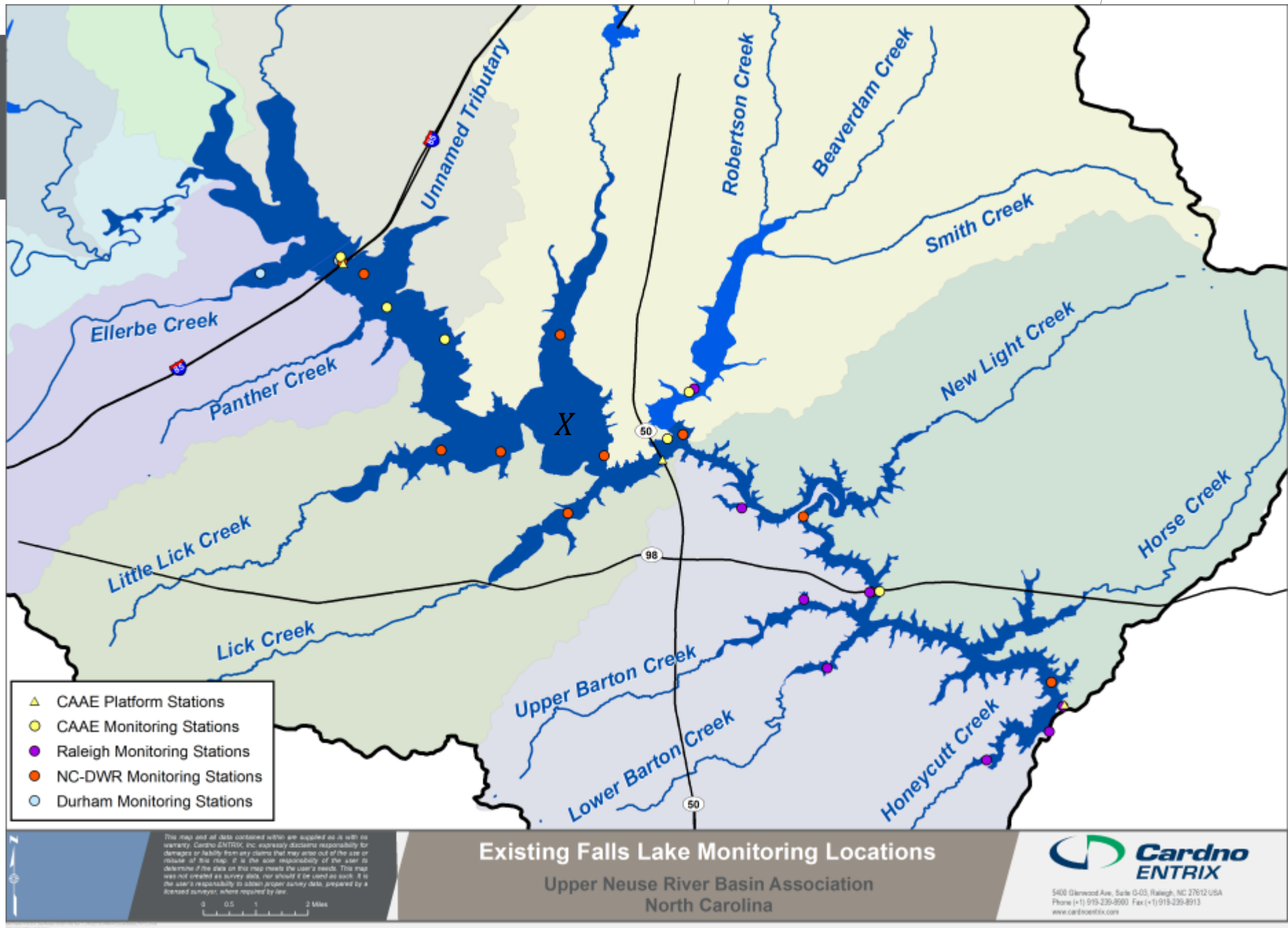
Cardno ENTRIX
Shaping the Future



UNRBA Monitoring Locations

Upper Neuse River Basin Association
North Carolina

Cardno ENTRIX
5400 Glenwood Ave, Suite G-03, Raleigh, NC 27612 USA
Phone (+1) 919-239-8000 Fax (+1) 919-239-8913
www.cardnoentrix.com


Unnamed Tributary
Robertson Creek
Beaverdam Creek
Smith Creek
New Light Creek
Horse Creek
Ellerbe Creek
Panther Creek
Little Lick Creek
Lick Creek
Upper Barton Creek
Lower Barton Creek
Honeycutt Creek
X
50
98
50
CAAE Platform Stations
CAAE Monitoring Stations
Raleigh Monitoring Stations
NC-DWR Monitoring Stations
Durham Monitoring Stations
This map and all data contained within are supplied as is with no warranty. Cardno ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.
0 0.5 1 2 Miles
Existing Falls Lake Monitoring Locations
Upper Neuse River Basin Association
North Carolina
Cardno ENTRIX
5400 Glenwood Ave, Suite G-03, Raleigh, NC 27612 USA
Phone (+1) 919-239-8680 Fax (+1) 919-239-8913
www.cardnoentrix.com





Falls Lake at Cheek Road
May 16, 2014
Lake Level +2.5 ft in previous 24 hrs

Lake Loading Monitoring Locations

	Waterbody	Road Crossing	Latitude	Longitude	Drainage Area (mi^2)	Recommended Frequency
LL01	Knap of Reeds Creek	~~access off of Brickhouse Rd~~ Access from SGWASA WWTP	~~36.118226~~	~~-78.798476~~	~~44.7~~	Every other week
LL02	Flat River	at Old Oxford Hwy	36.131900	-78.827981	169	Every other week
LL03	Little River	at Old Oxford Road	36.081667	-78.854722	104	Every other week
LL04	Eno River	at Old Oxford Hwy	36.072642	-78.862700	149	Every other week
LL05	Ellerbe Creek	at Glenn Rd	36.059583	-78.832200	21.9	Every other week
LL06	Panther Creek	At pump station dns of Burton Rd.	36.033593	-78.812568	2.60	Monthly
LL07a	Little Lick Creek	at Patterson Road	36.004633	-78.787502	13.8	Monthly
LL07b	Little Lick Creek	at Stallings Rd	35.986681	-78.799173	10.1	Monthly
LL08	Lick Creek	at Southview Rd south of Hwy 98	35.977936	-78.749565	10.8	Monthly
LL09	Unnamed Tributary	at Northside Road	36.084307	-78.748911	3.43	Monthly
LL10	Ledge Creek	at Northside Road	36.103426	-78.708157	20.9	Monthly
LL11	Robertson Creek	at Brassfield Road	36.102984	-78.659167	12.0	Monthly
LL12	Beaverdam Creek	at Horseshoe Road	36.091260	-78.639854	12.7	Monthly
LL13	Smith Creek	at Lawrence Road	36.088429	-78.602448	6.30	Monthly
LL14a	New Light Creek	at Woodlief Road	36.024974	-78.616262	17.1	Monthly
LL14b	New Light Creek	at Mangum Dairy Rd	36.027012	-78.601325	12.3	Monthly
~~**LL15a**~~	~~Horse Creek~~	~~at Hwy 98 (Durham Road)~~	~~35.977288~~	~~-78.574052~~	~~14.8~~	~~Monthly~~
LL15b	Horse Creek	at Thompson Mill Rd	35.979137	-78.561741	11.9	Monthly
LL16	Upper Barton Creek	at Mt Vernon Church Road	35.959915	-78.678645	8.26	Monthly
LL17	Lower Barton Creek	at State Rd 1834 aka Norwood Rd	35.943928	-78.659621	10.4	Monthly
LL18	Honeycutt Creek	at Honeycutt Road	35.912558	-78.622060	2.76	Monthly

Cardno ENTRIX
Shaping the Future



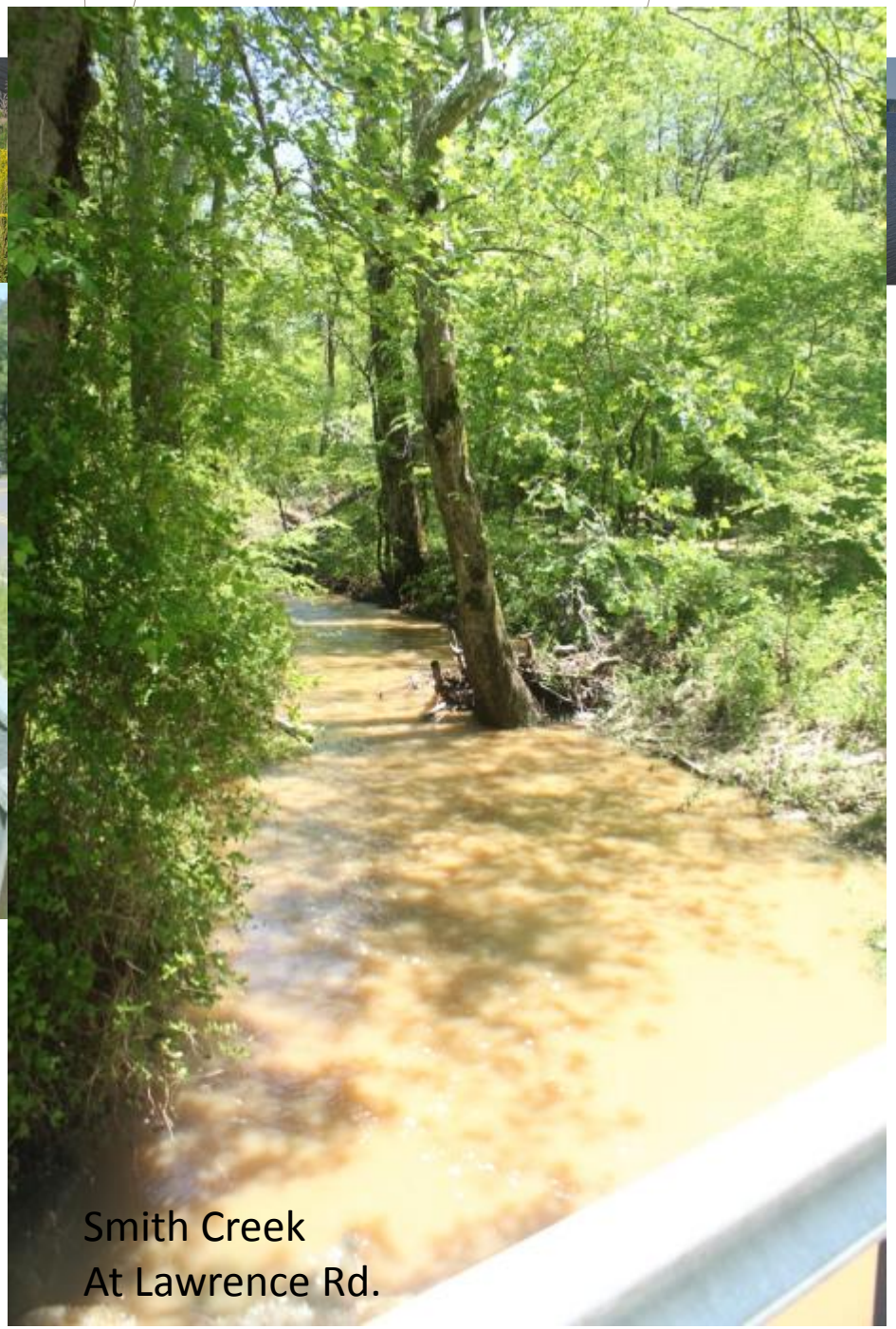




Flat River – May 16, 2014
At Old Oxford Highway
Storm Flow

Horse Creek
At Kearney Rd.

May 16, 2014
High Flow Conditions



Smith Creek
At Lawrence Rd.

May 14, 2014
Lower and Upper Barton
“Average” flow

Beaverdam Ck. at
Horseshoe Rd.
May 16, 2014

Ledge Ck. at Old
Weaver Trail Rd.
May 16, 2014



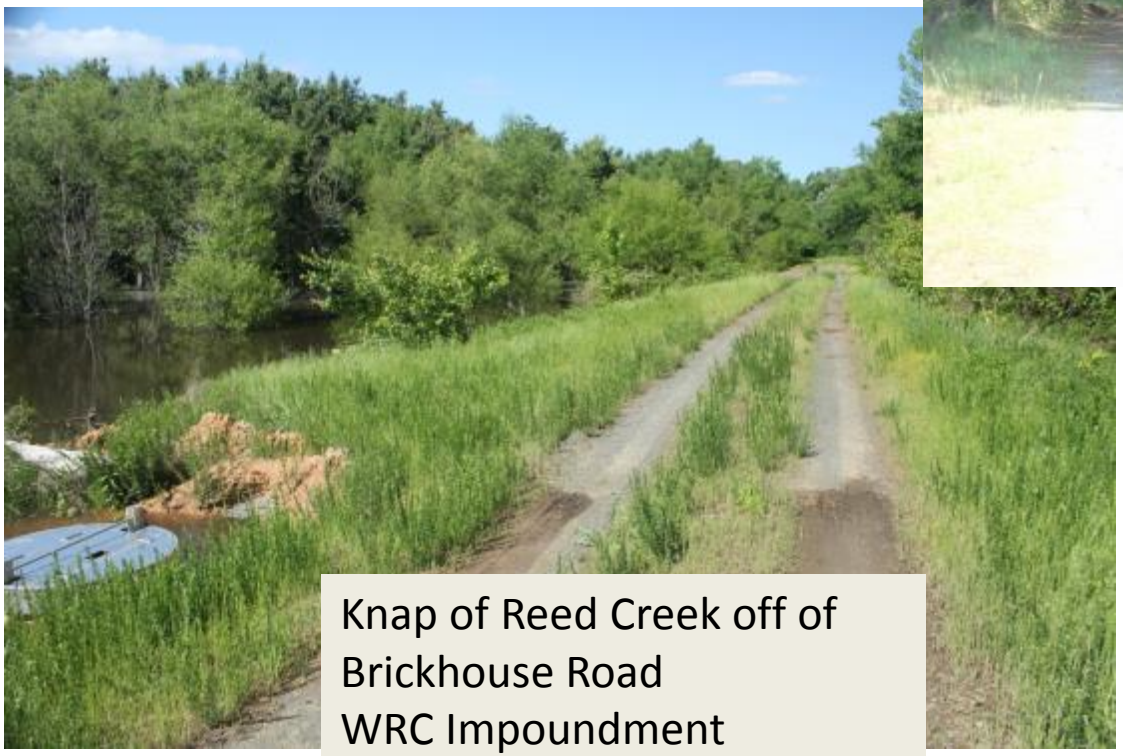



Ledge Creek at Northside Road, May 16, 2014


Little Lick Creek at
Patterson Road
May 16, 2014


© 2014 Google
Google

Road to Camp Creek
Crossing about 1 mile
Within Camp Butner



Knap of Reed Creek off of
Brickhouse Road
WRC Impoundment

Cardno ENTRIX
Shaping the Future

	Waterbody	Road Crossing	Boundary	Latitude	Longitude	Drainage Area (mi^2)	Monitoring Frequency
JB01	Eno River	at Dimmocks Mill Road	upstream of Hillsborough	36.070127	-79.129530	60.5	6 times/yr
JB02	Eno River	at Hwy 70 and Riverside Drive	downstream of Hillsborough	36.075417	-79.071636	73.2	6 times/yr
JB03	Eno River	at Cole Mill Road	downstream of Orange County	36.059290	-78.978042	121	6 times/yr
JB04	North Fork Little River	at New Sharon Church Road	between Orange and Durham Counties	36.180164	-78.975432	21.9	6 times/yr
JB05	South Fork Little River	at Guess Road (Hwy 157)	between Orange and Durham Counties	36.145465	-78.962187	37.4	6 times/yr
JB06	Little River	at Johnson Mill Rd	upstream of City of Durham	36.141643	-78.919265	78.3	6 times/yr
JB07	North Flat River	at Highway 57	downstream of Roxboro	36.310638	-78.969420	15.8	6 times/yr
JB08	North Flat River	at Helena-Moriah Road	Person Co. before confluence with South Flat	36.288983	-78.942891	32.8	6 times/yr
JB09	South Flat River	at Highway 57	Person Co. before confluence with North Flat River	36.256842	-78.944337	54.4	6 times/yr
JB10	Flat River	at Moores Mill Rd	downstream of Person county	36.241864	-78.905769	102	6 times/yr
JB11	Deep Creek	at Smith Rd	downstream of Person County	36.240278	-78.888885	32.1	6 times/yr
~~JB12~~	~~Camp Creek~~	~~at Camp Butner~~	~~between Durham and Granville Counties~~	~~36.209510~~	~~-78.805304~~	~~4.99~~	~~6 times/yr~~
JB13	Little Ledge Creek	at Old Weaver Trail	downstream of Granville	36.075904	-78.720953	3.74	6 times/yr
JB14	Ledge Creek	at Old Route 75	downstream of Stem	36.194856	-78.729220	1.79	6 times/yr
JB15	Ledge Creek	at W Lyon Station Rd	upstream of Butner	36.176079	-78.714097	3.49	6 times/yr
JB16	Robertson Creek	at Sam Moss Hayes Road	upstream of Creedmoor	36.139193	-78.660785	4.43	6 times/yr
JB17	Buckhorn Creek	at Buckhorn Lane	between Granville and Wake Counties	36.048080	-78.609717	1.21	6 times/yr
JB18	New Light Creek	at Bold Run Hill Road	between Granville and Wake Counties	36.037485	-78.592078	9.90	6 times/yr
JB19	Horse Creek	at Holden Road	between Franklin and Wake Counties	36.024301	-78.518988	4.78	6 times/yr
JB20	Horse Creek	at Purnell Road	upstream of Wake Forest	36.007058	-78.529087	7.11	6 times/yr
~~JB21~~	~~Horse Creek~~	~~at Thompson Mill Rd~~	~~downstream of Wake Forest~~	~~35.979137~~	~~-78.561741~~	~~11.9~~	~~6 times/yr~~