TMDL Development for the Floyds Fork Watershed

Technical Advisory Committee
Meeting #6
Louisville, KY
April 24th, 2013

EPA United States Environmental Protection Agency

Region 4 serving the southeast

Overview of Updates Since TAC Meeting #3

- Incorporated miscellaneous comments from EPA, KDOW and Stakeholders into the watershed and instream reports
- Updated the point source assumption for individual family residences
- Updated the failing rate for septics in Oldham County
- Incorporated Jefferson County MSD's coverage for septics
- Updated the sinkhole coverage
- Updated land use loading rates
- Updated non-point source discharges

Overview of Updates Since TAC Meetings #3 and 4

- Updated watershed model calibration
  - Sent to EPA on January 31, 2013
- Updated watershed modeling report (REV5)
  - Sent to EPA on February 8, 2013
- Linked watershed outputs to instream model inputs
- Updated instream model calibration
  - Sent to EPA on February 28, 2013
- Updated instream modeling report (REV2)
  - Sent to EPA on March 15, 2013

Overview of Updates Since TAC Meeting #4

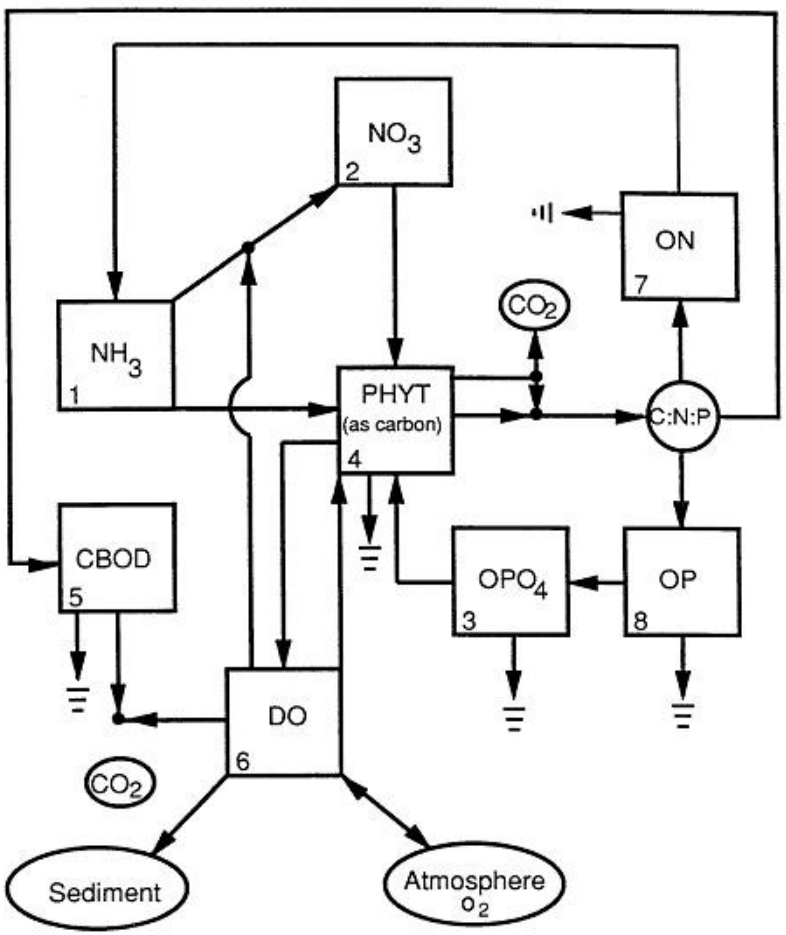
- Received Scenarios from KDOW
  - Compiled from KDOW, Subcommittee, TAC, EPA and Tt
  - 19 Total + 1 Baseline
- Prioritized Scenarios
- Setup, executed and processed the Scenarios
  - Evaluated by looking at entire Floyds Fork watershed
  - Used WASP segments as basis for comparison

Overview of Updates Since TAC Meeting #5

- **Updated Pastureland loading rates**
  - Worked with Dr. Lee and Dr. Grove
- Updated watershed model calibration
- Modified setup of WASP instream model
- Updated instream model calibration
- Began updating Watershed Modeling Report with more information to clarify aspects (REV6-Draft)
- Updated subset of Scenarios

Water Quality Model

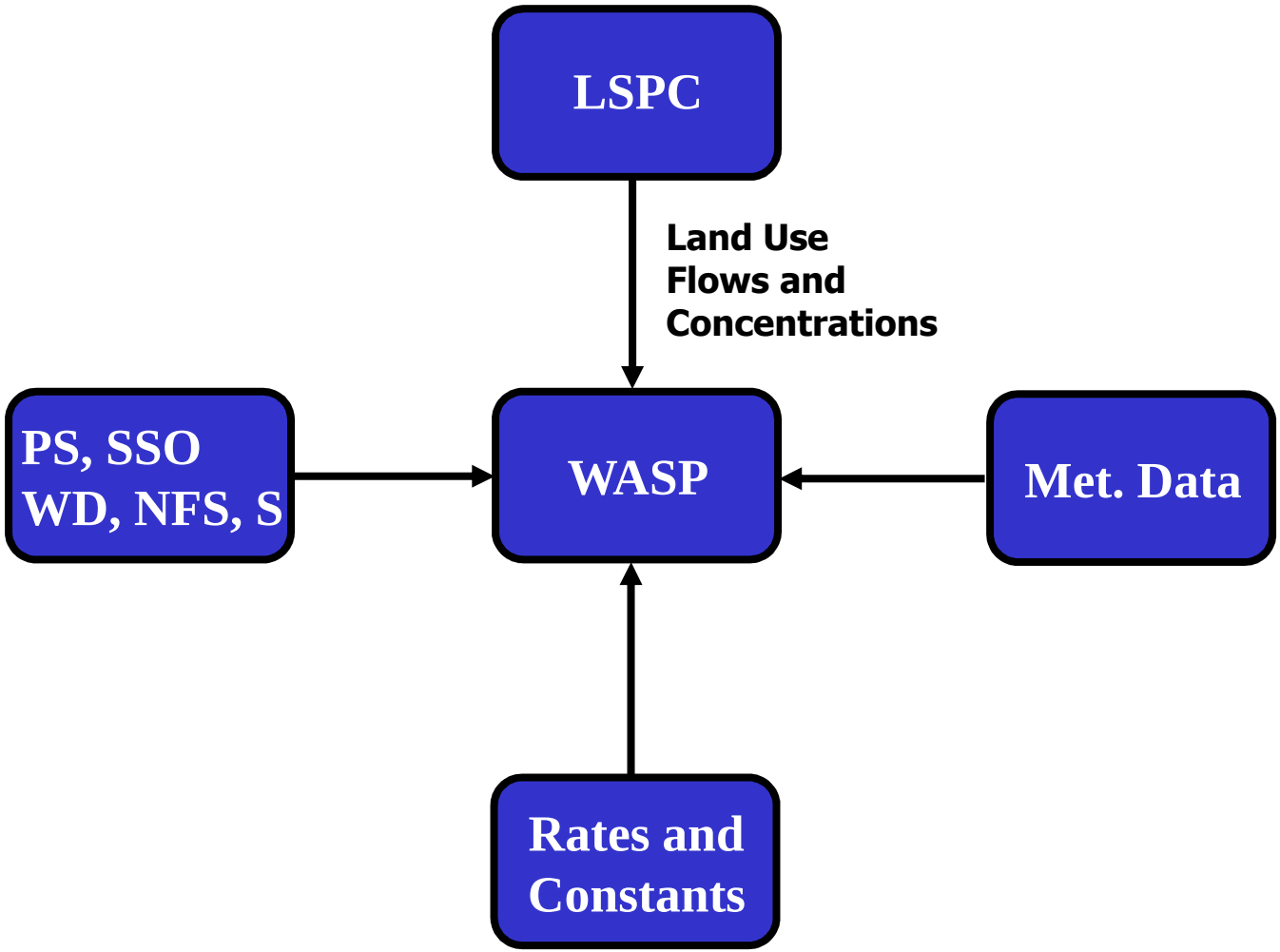
- Water Quality Analysis Simulation Program (WASP)
- Dynamic Simulation
- Full Eutrophication Kinetics
- Parameters simulated
  - DO
  - BOD
  - Ammonia
  - Nitrate-Nitrite
  - Organic Nitrogen
  - Organic Phosphorus
  - Ortho Phosphorus
  - Chlorophyll a
  - pH



Linkage to Water Quality Model

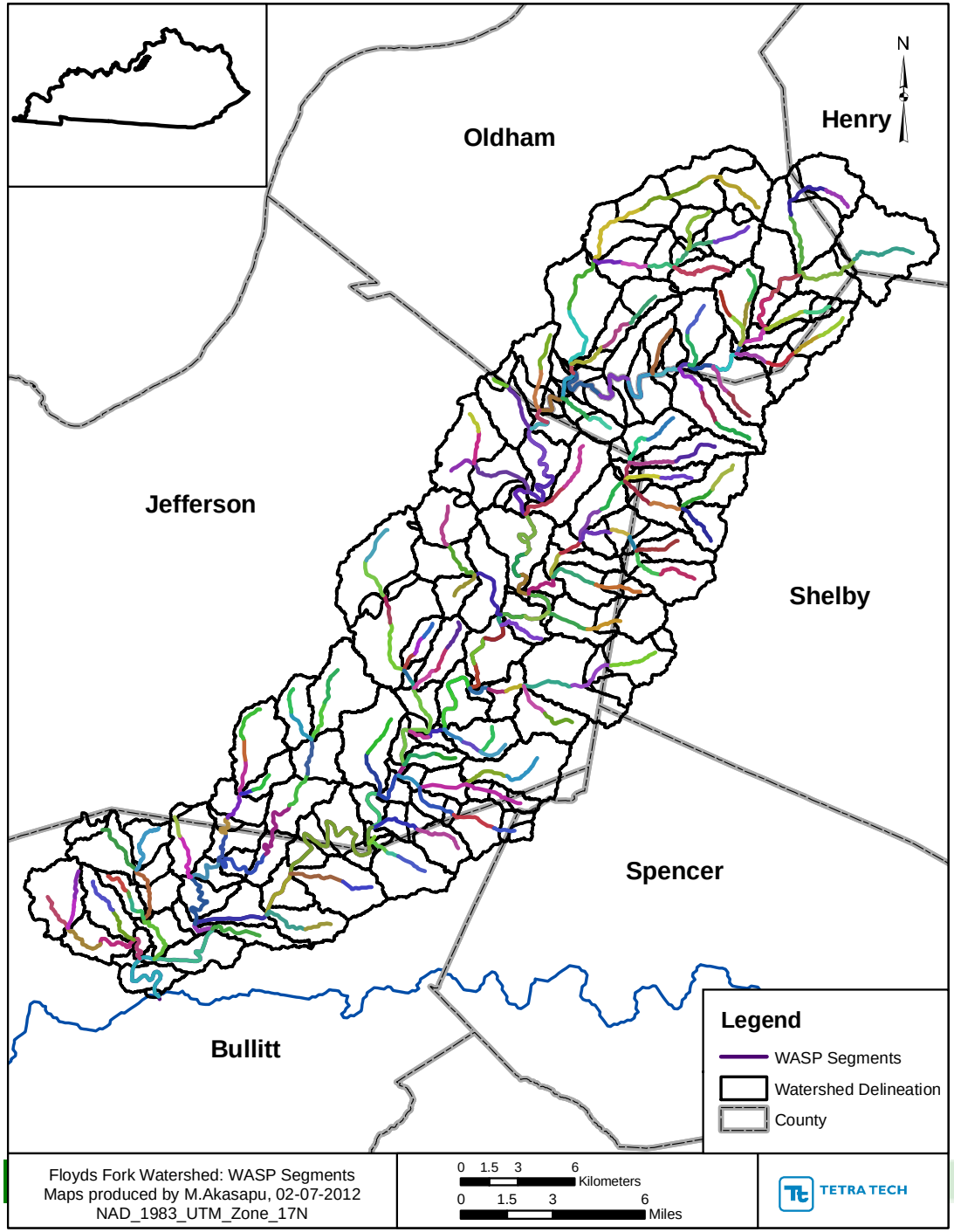
- Calibrate LSPC Watershed Model
- Removed Point Sources, SSO's, Water Withdrawals, Non-failing septics and Springs from the watershed model
- Run watershed model to get Land Use only outputs
- Use WRDB to process LSPC outputs into WASP inputs
- Processed Point Sources, SSO's, Water Withdrawals, Non-failing septics, and Springs to be input into WASP
- Create WASP input file
- Calibrate WASP model

Linkage to Water Quality Model



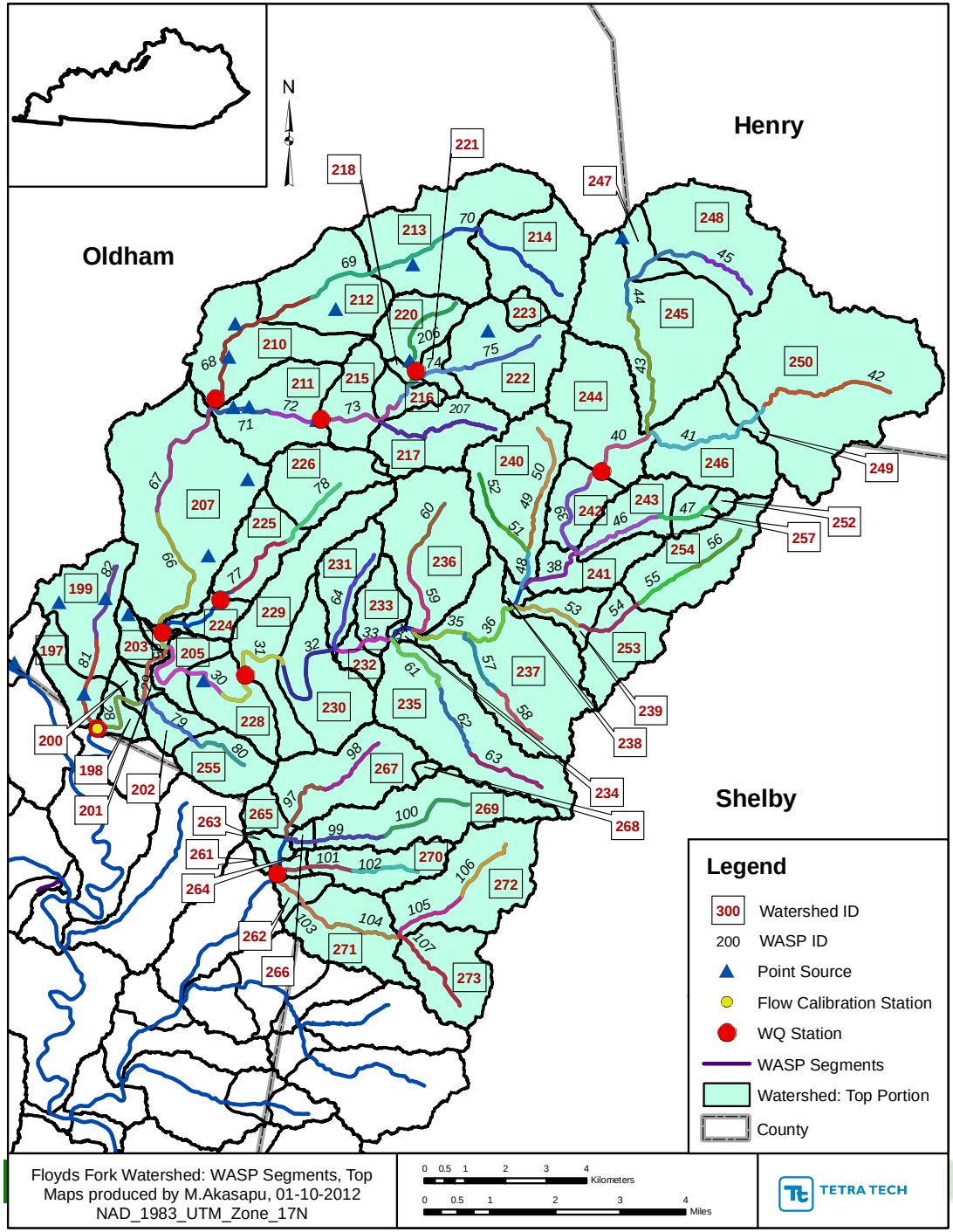
WASP Segmentation

- Floyds Fork and its tributaries were divided into a series of computational segments.
- A BASINS/WASP plug-in user interface was used to carry out the segmentation. Used NHDPlus flowlines.
- A maximum and minimum travel time was specified to divide the waterbody into segments of desirable length.
- Few segments were also aggregated or divided based on the location of the point sources, flow and water quality stations.
- Segments that were not included in the NHDPlus flowline coverage but included in the LSPC watershed model were added manually.



EPA United States Environmental Protection Agency

Region 4 serving the southeast

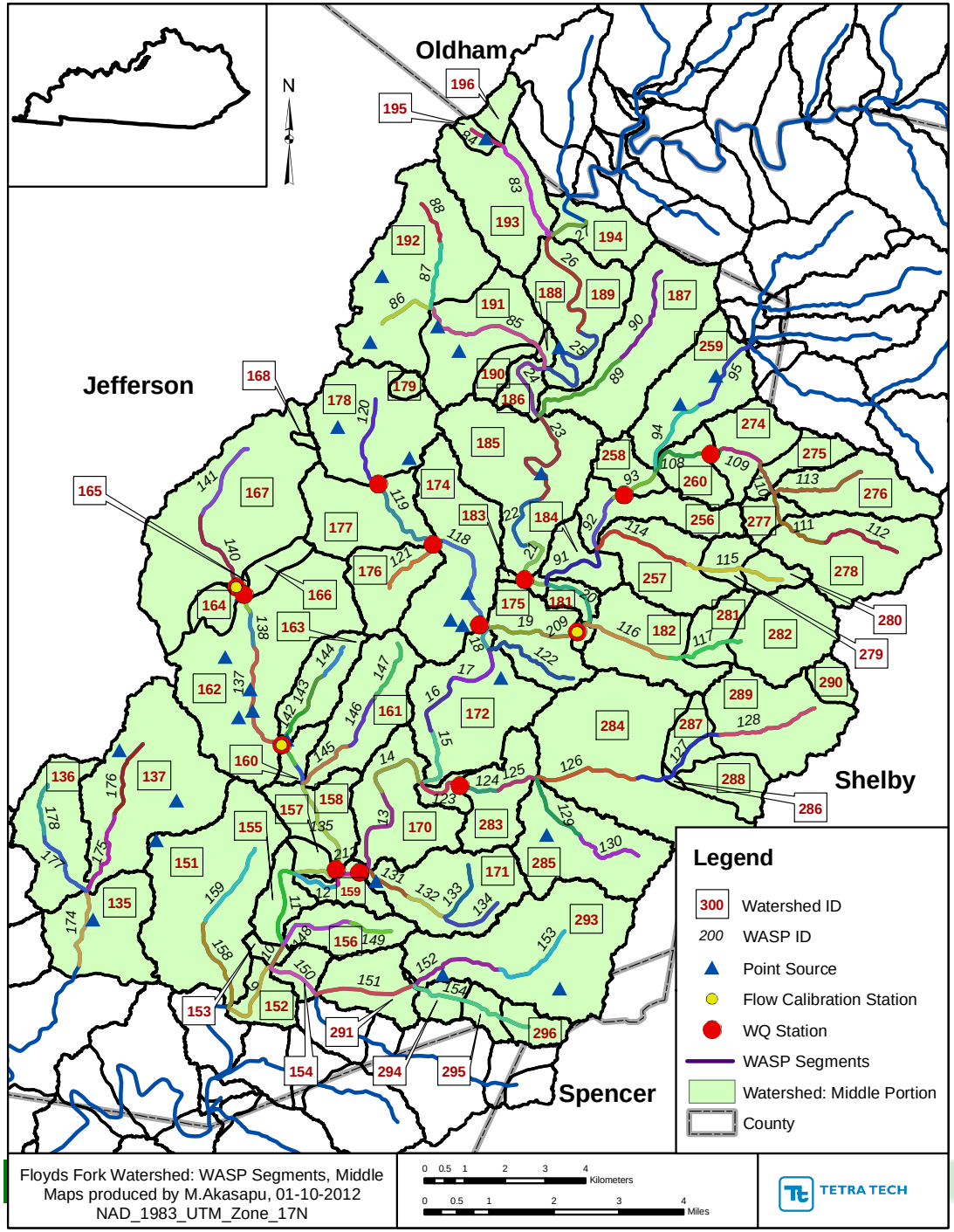


Floyds Fork Watershed: WASP Segments, Top
Maps produced by M.Akasapu, 01-10-2012
NAD_1983_UTM_Zone_17N

TETRA TECH

EPA United States Environmental Protection Agency

Region 4 serving the southeast

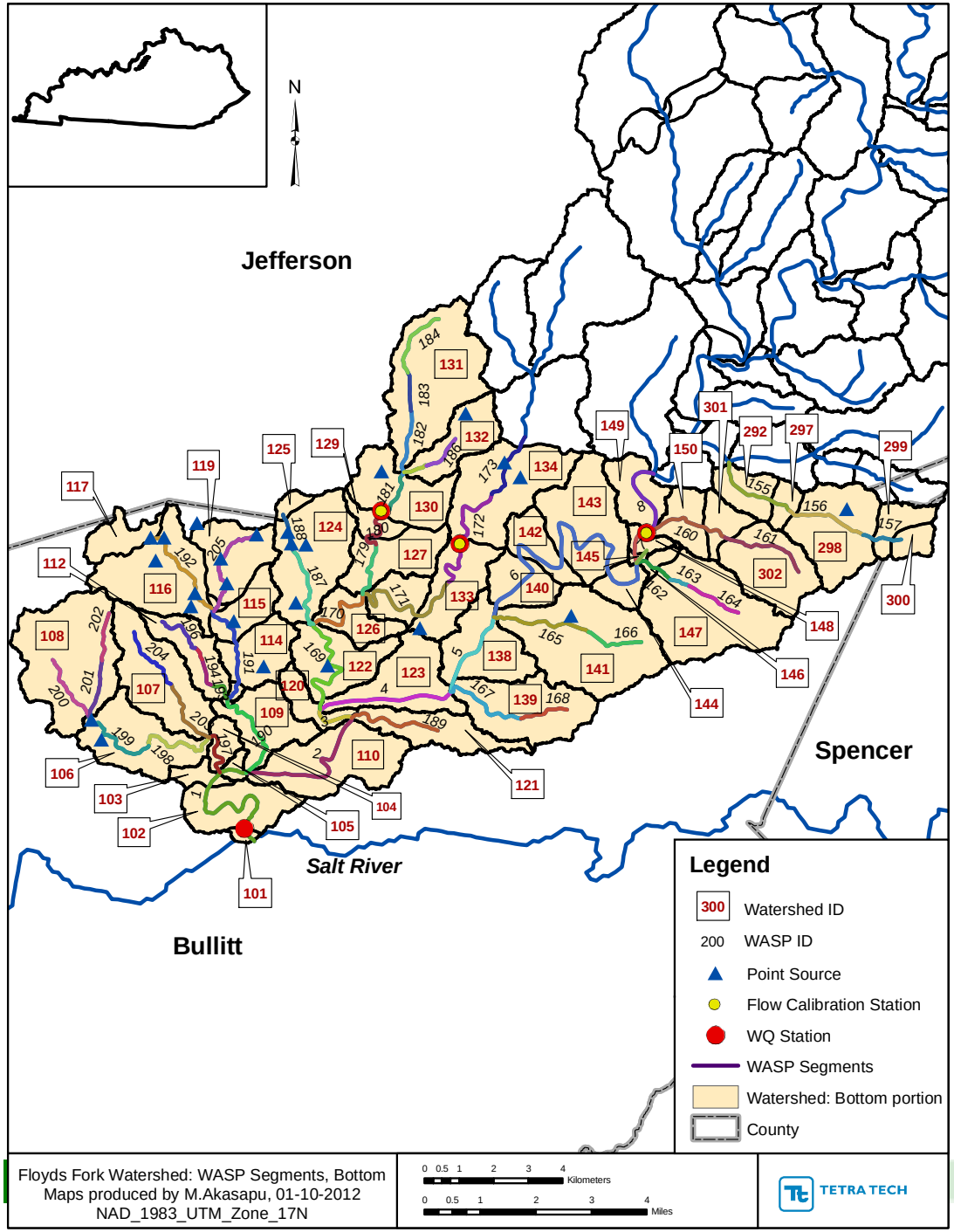


Floyds Fork Watershed: WASP Segments, Middle
Maps produced by M.Akasapu, 01-10-2012
NAD_1983_UTM_Zone_17N

TETRA TECH

EPA United States Environmental Protection Agency

Region4 serving the southeast



Floyds Fork Watershed: WASP Segments, Bottom
Maps produced by M.Akasapu, 01-10-2012
NAD_1983_UTM_Zone_17N

TETRA TECH

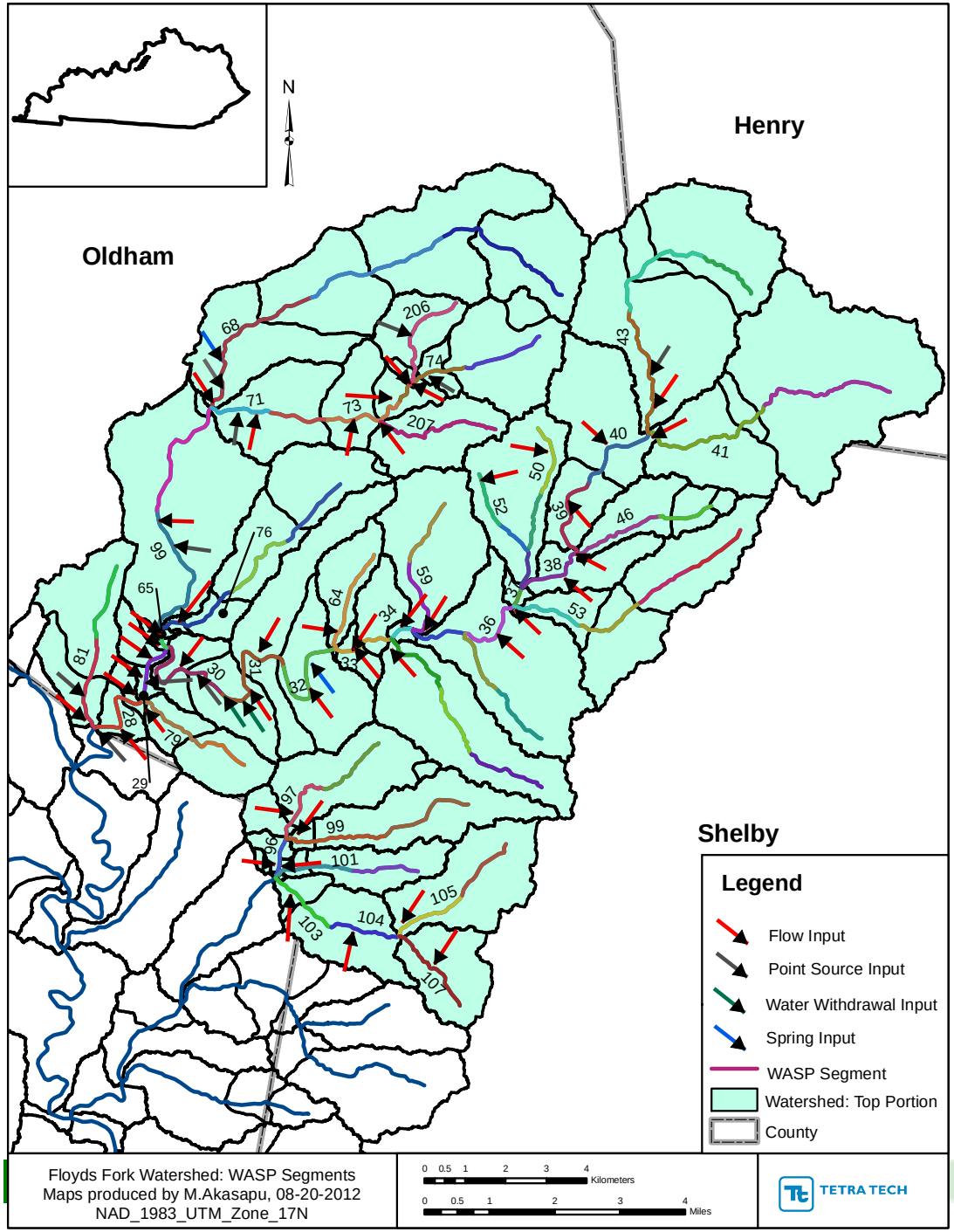
EPA United States Environmental Protection Agency

Region 4 serving the southeast

Boundary Conditions

- LSPC Flows and Concentrations (Land Use only)
  - Instream
  - Overland
- Water Temperature Functions
- Meteorological Data
  - Wind - Fraction of Daylight
  - Solar Radiation
  - Light
- Point Source Dischargers
- Water Withdrawals
- SSOs
- Non-Failing Septics
- Springs

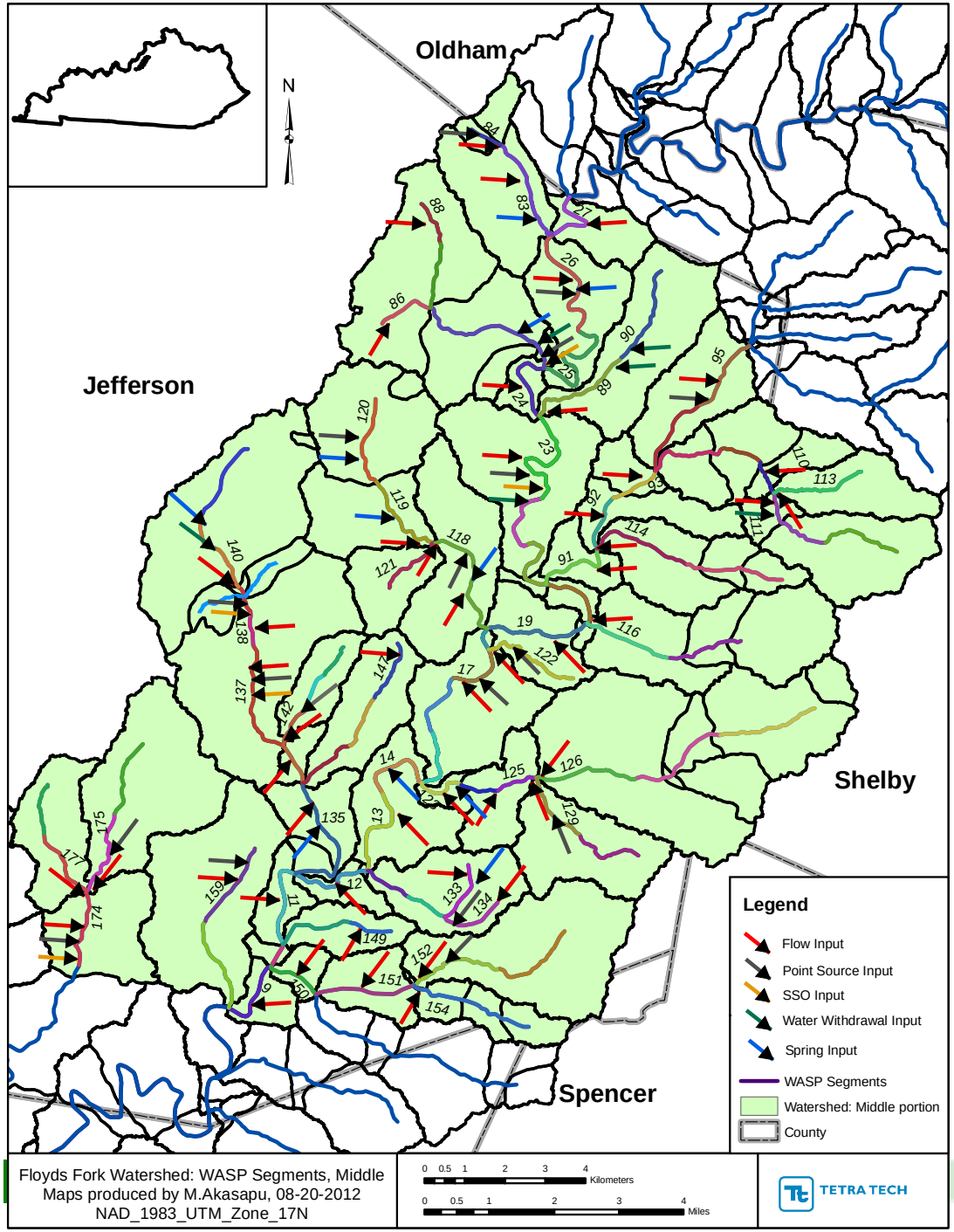
→ Same inputs as watershed model



Floyds Fork Watershed: WASP Segments
Maps produced by M.Akasapu, 08-20-2012
NAD_1983_UTM_Zone_17N

EPA United States Environmental Protection Agency

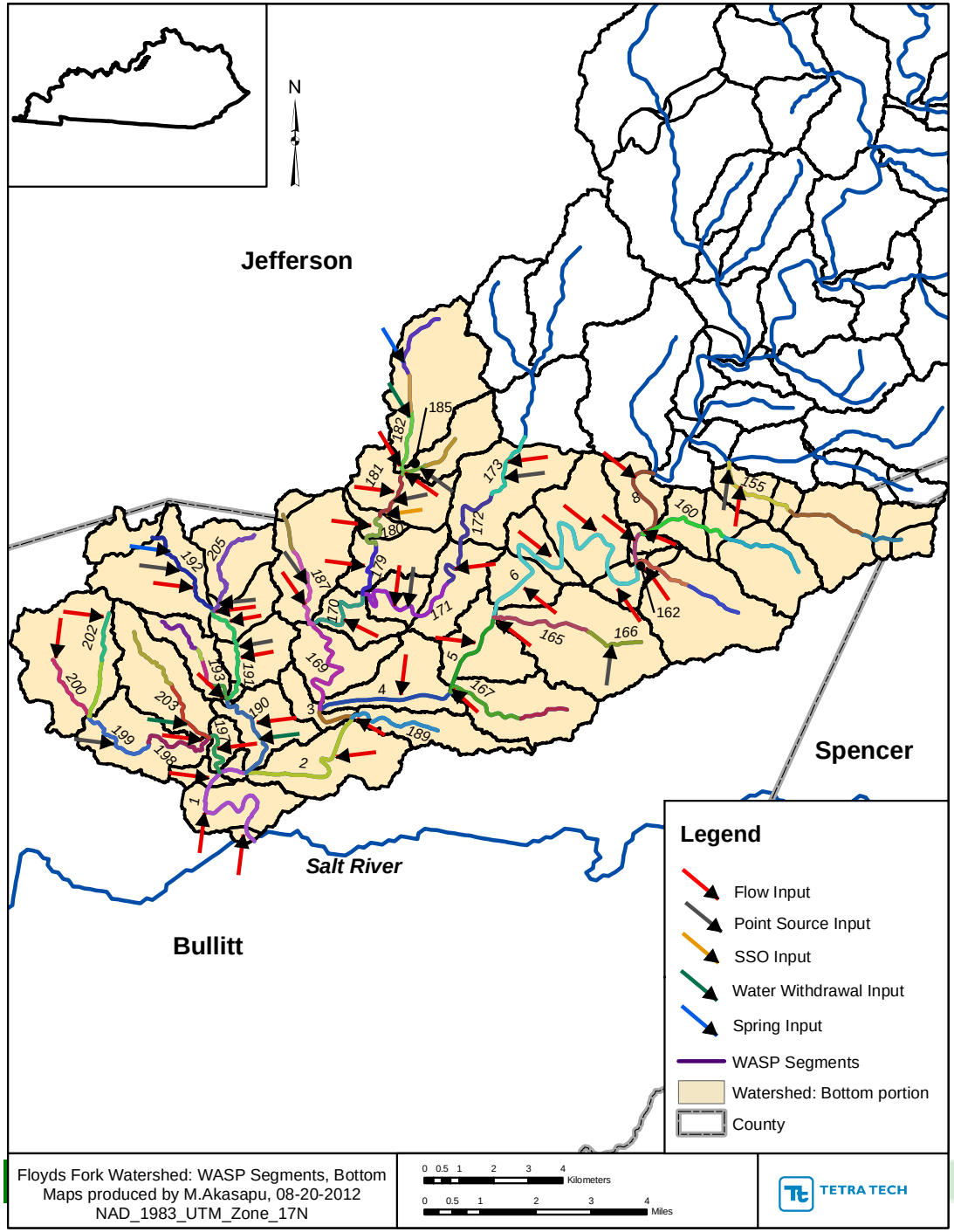
Region 4 serving the southeast



Floyds Fork Watershed: WASP Segments, Middle
Maps produced by M.Akasapu, 08-20-2012
NAD_1983_UTM_Zone_17N

EPA United States Environmental Protection Agency

Region4 serving the southeast



Floyds Fork Watershed: WASP Segments, Bottom
Maps produced by M.Akasapu, 08-20-2012
NAD_1983_UTM_Zone_17N

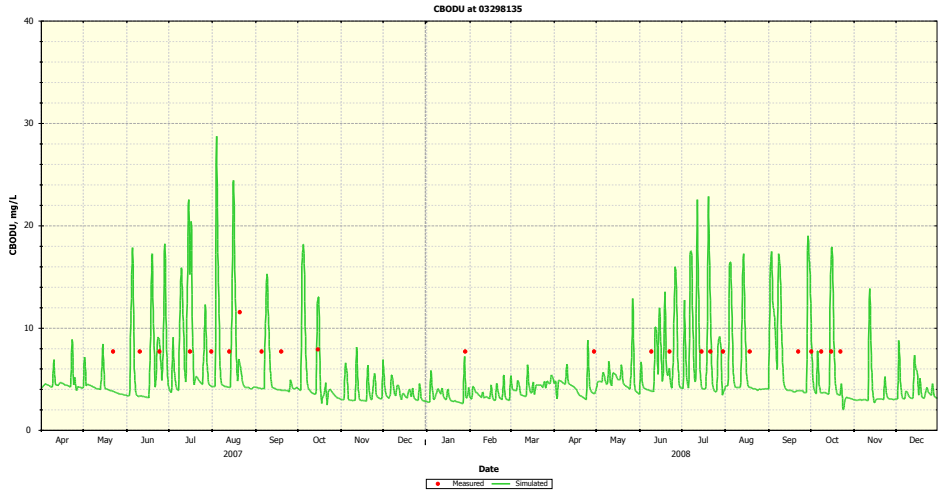
EPA United States Environmental Protection Agency

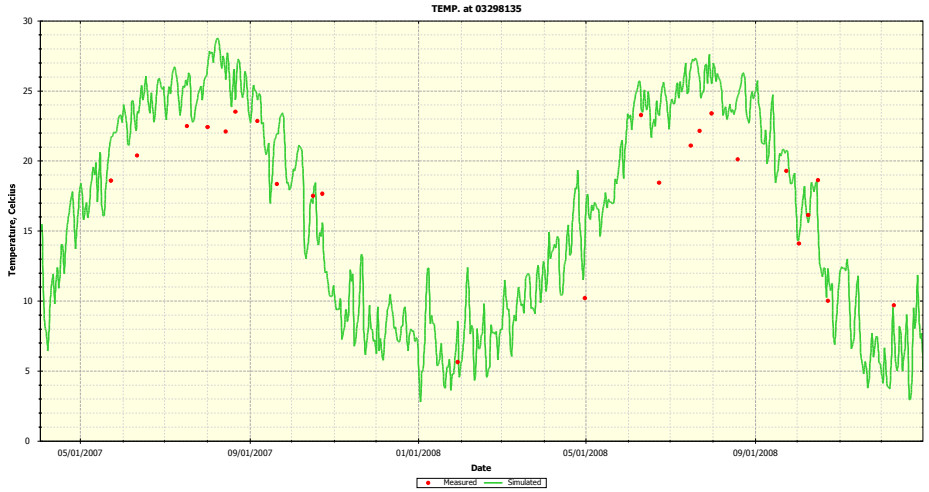
Region 4 serving the southeast

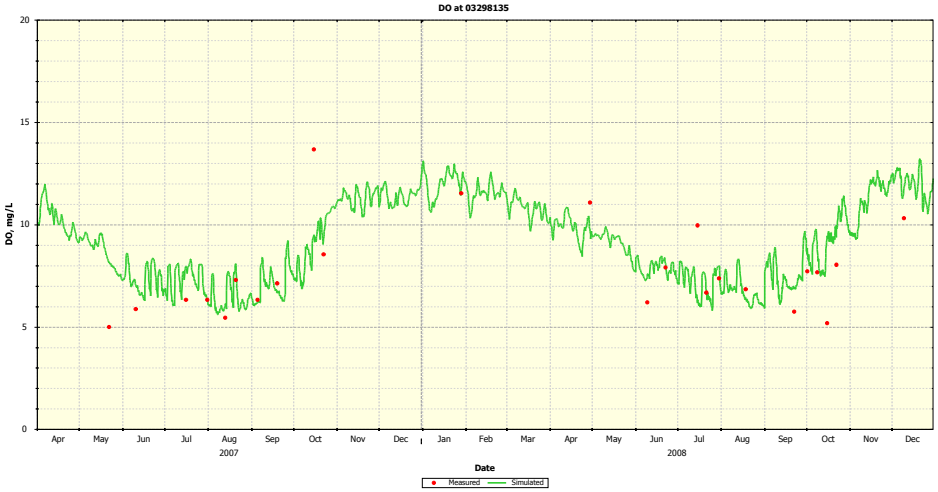
Water Quality Calibration

- Calibration period
  - January 1, 2001 through December 31, 2010
- 26 USGS Stations
  - Primary period of data – 2007 and 2008
  - 8 Main Stem
  - 18 Tributaries
- 5 MSD
  - 3 Main Stem
  - 2 Tributaries (Lower Chenoweth Run)
- Quantitative Calibration
- Qualitative Calibration
- Focusing on Nutrient Species and Chlorophyll-a

WASP Calibration



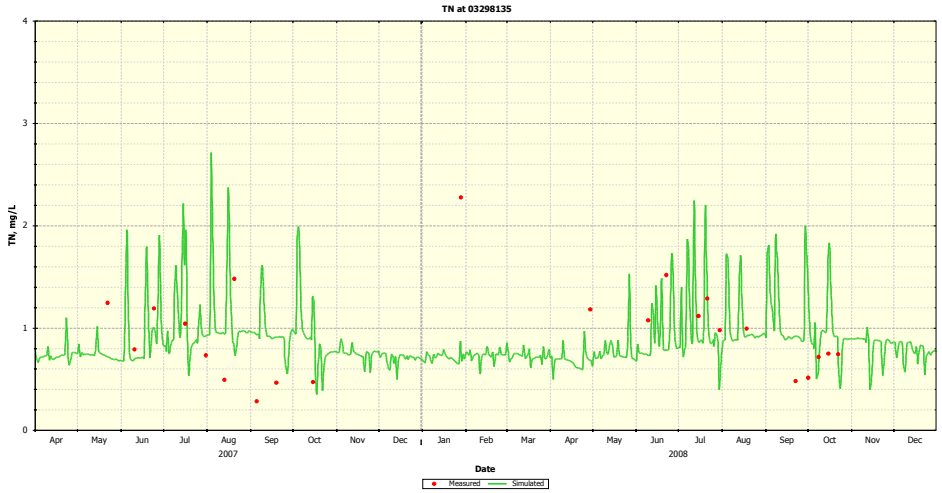


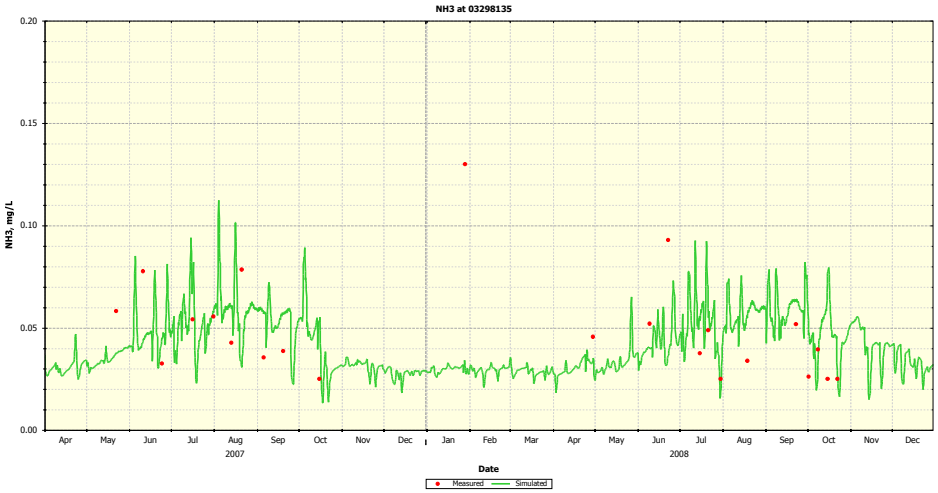


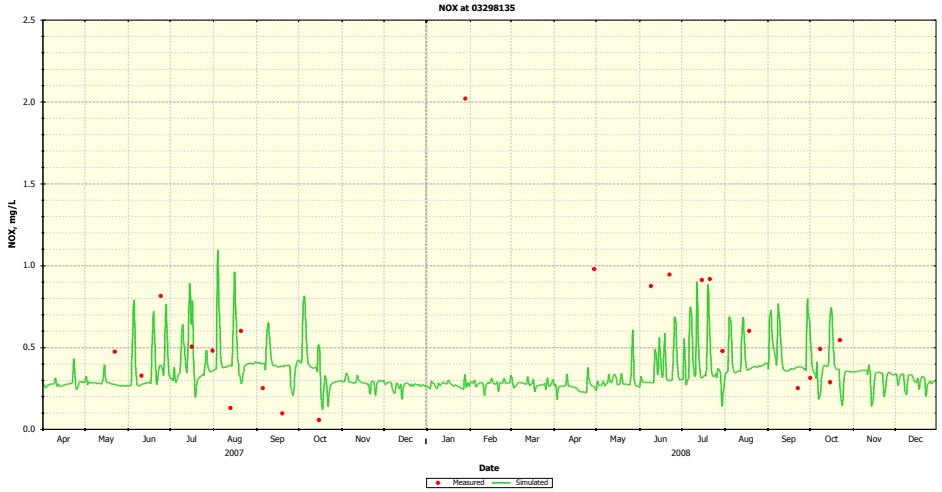
EPA United States Environmental Protection Agency

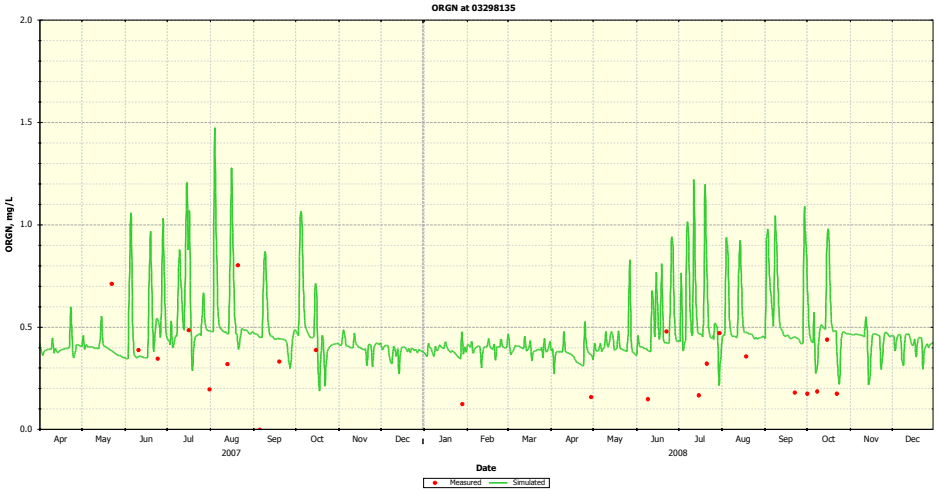
Region 4 serving the southeast

WASP Calibration





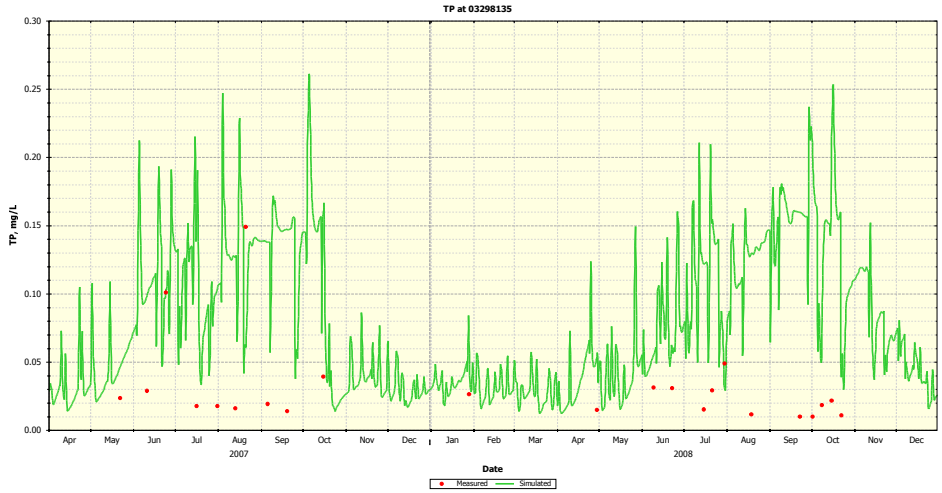


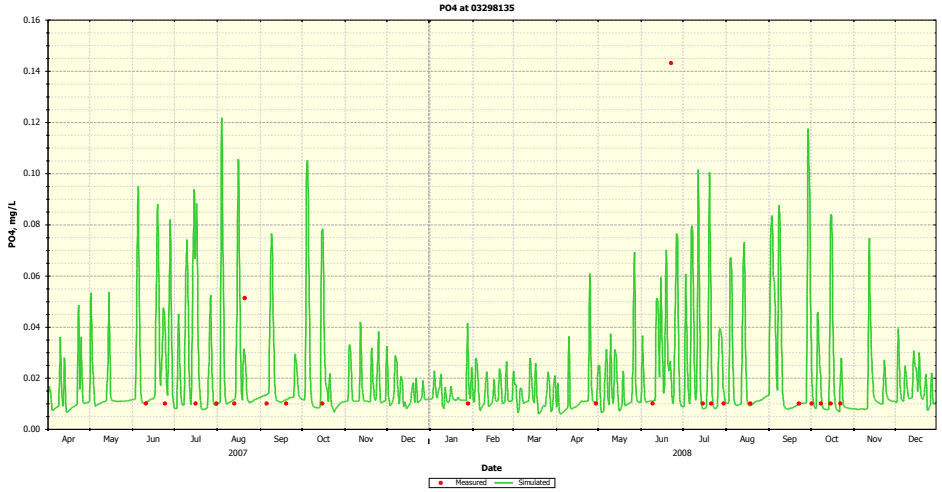


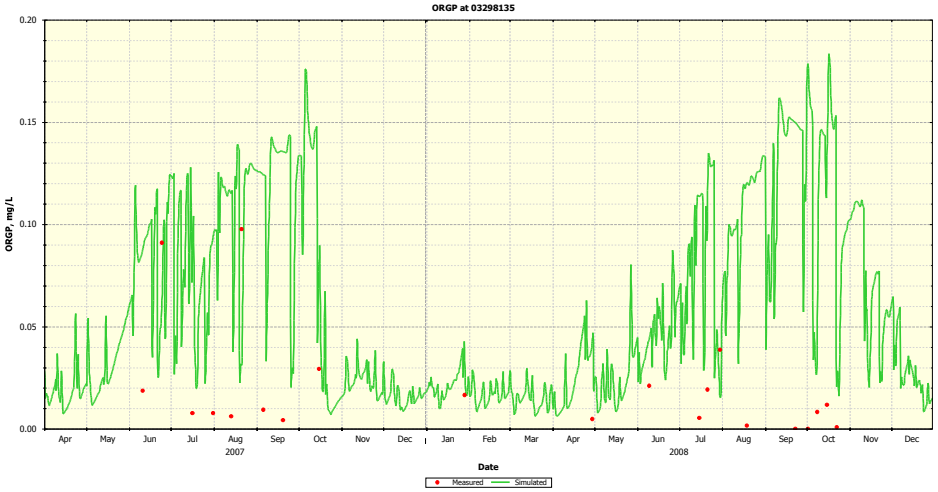
EPA United States Environmental Protection Agency

Region 4 serving the southeast

WASP Calibration

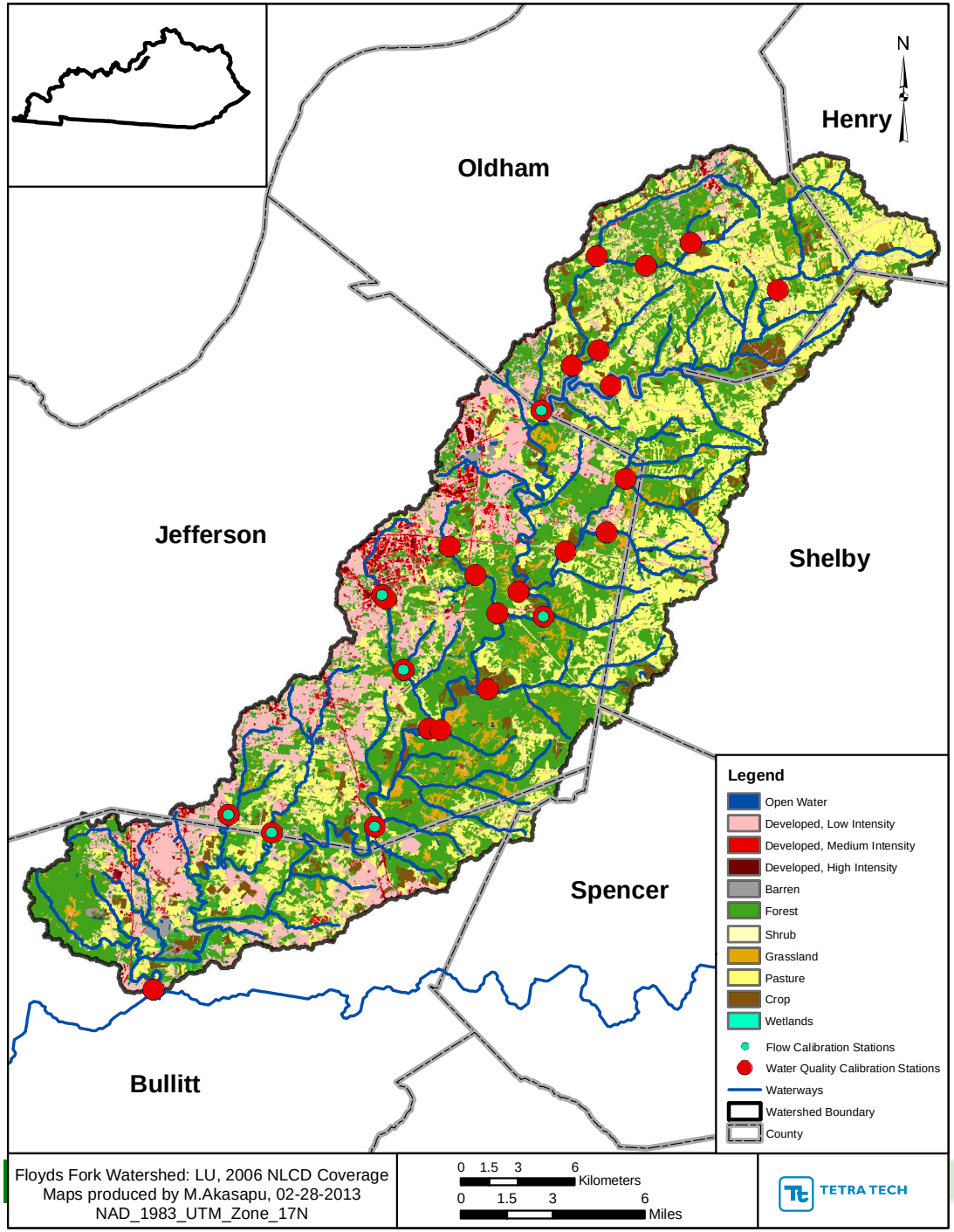






United States Environmental Protection Agency

Region 4 serving the southeast

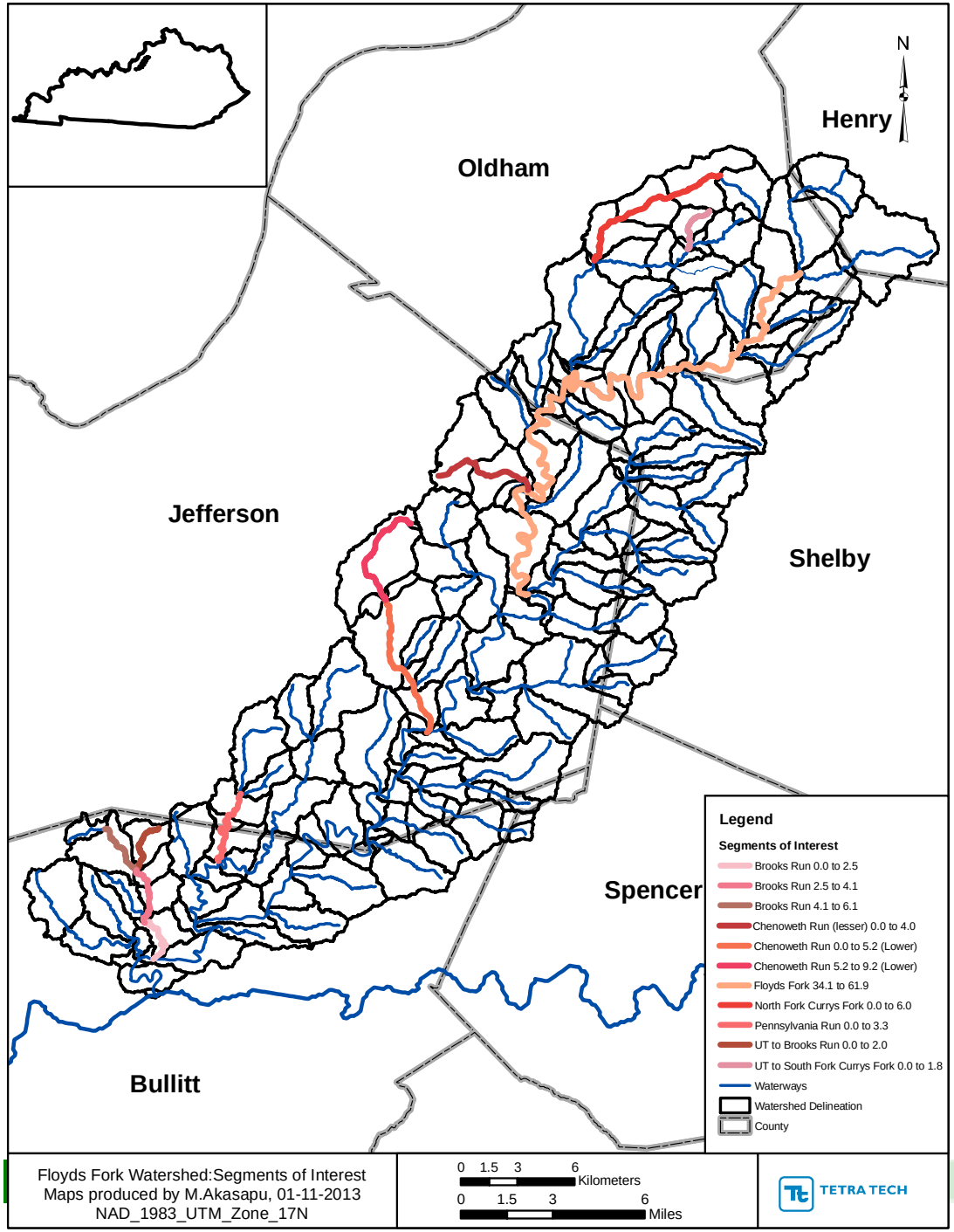


Floyds Fork Watershed: LU, 2006 NLCD Coverage
Maps produced by M.Akasapu, 02-28-2013
NAD_1983_UTM_Zone_17N

EPA United States Environmental Protection Agency

Region 4 serving the southeast

Scenarios



Floyds Fork Watershed:Segments of Interest
Maps produced by M.Akasapu, 01-11-2013
NAD_1983_UTM_Zone_17N

EPA United States Environmental Protection Agency

Region4 serving the southeast

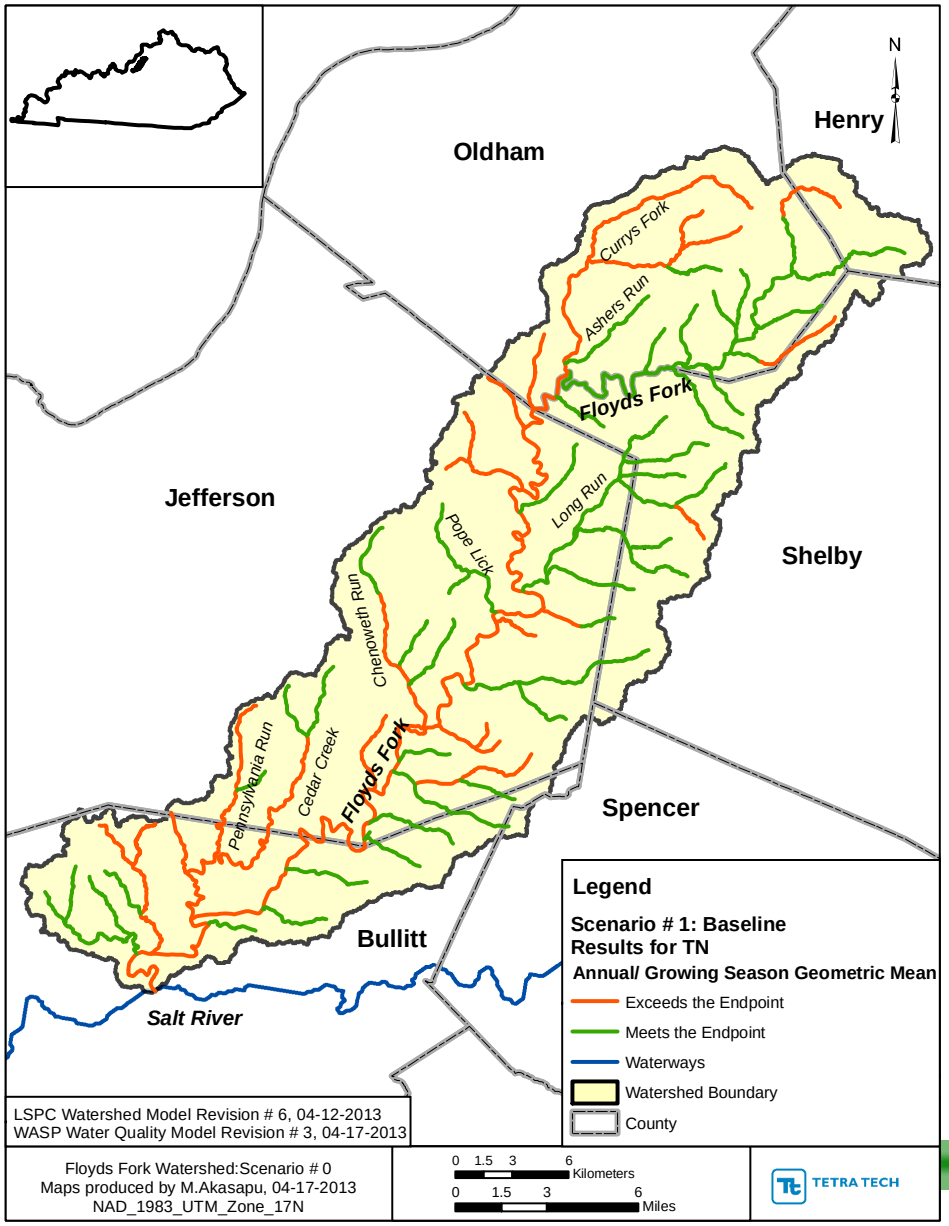
Scenarios Evaluated

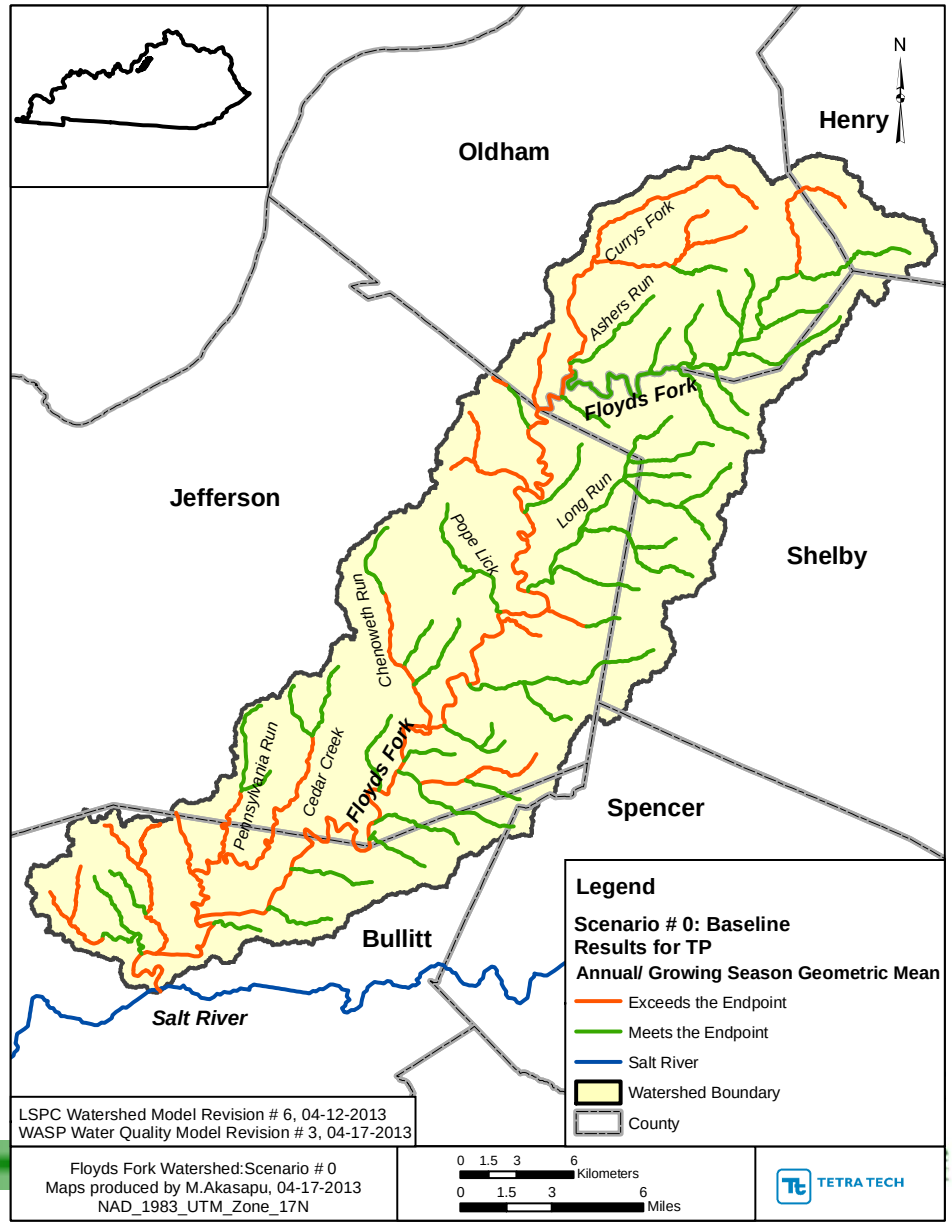
Scenario Number	Scenario Name
0	**Baseline (Calibrated Model)**
1	**All Forested**
2	**Point Sources Removed**
3	Septics Removed
4	**SSOs Removed**
5	**Current Permit Condition for the NPDES facilities**
6	Agricultural to Low Intensity Residential Land Use Change
7	Increase in Agricultural Animals by 50%
8	Direct Discharge of Septic Systems
9	Directing Septic Load to NPDES facilities
10	Removal of Septic Systems from Small Watersheds
11	Increase of Urban Land Use by 25%
12	Removal of all NPDES facilities
13	Removal of all NPDES facilities except Lagrange
14	Half the Current Permit Limits
15	Specified Permit Limits
16	Future Diversion/Elimination of the NPDES facilities
17	Septic Decay Rate decreased from 60 to 6 days
18	**KDOW's Diversion/Elimination of the NPDES facilities**
19	50 foot Buffer around the streams

Nutrient Targets

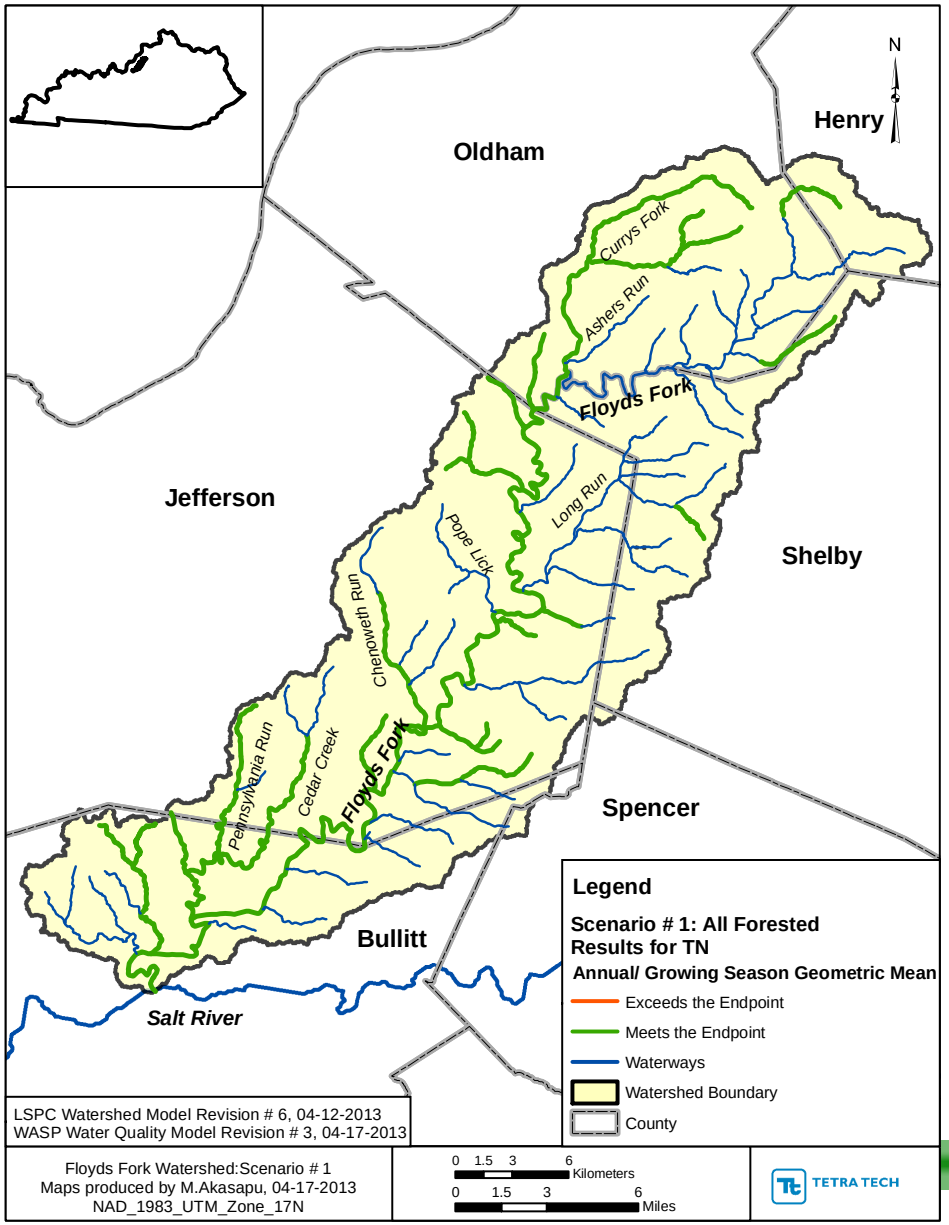
Size category	TN target	TN max	TP target	TP max
Headwater (<5 sq mi)	0.7	1.0	0.09	0.12
Wadeable (5-100 sq mi)*	1.1	1.6	0.15	0.25
Transitional/Boatable (>100 sq mi)**	2.2	2.4	0.20	0.66

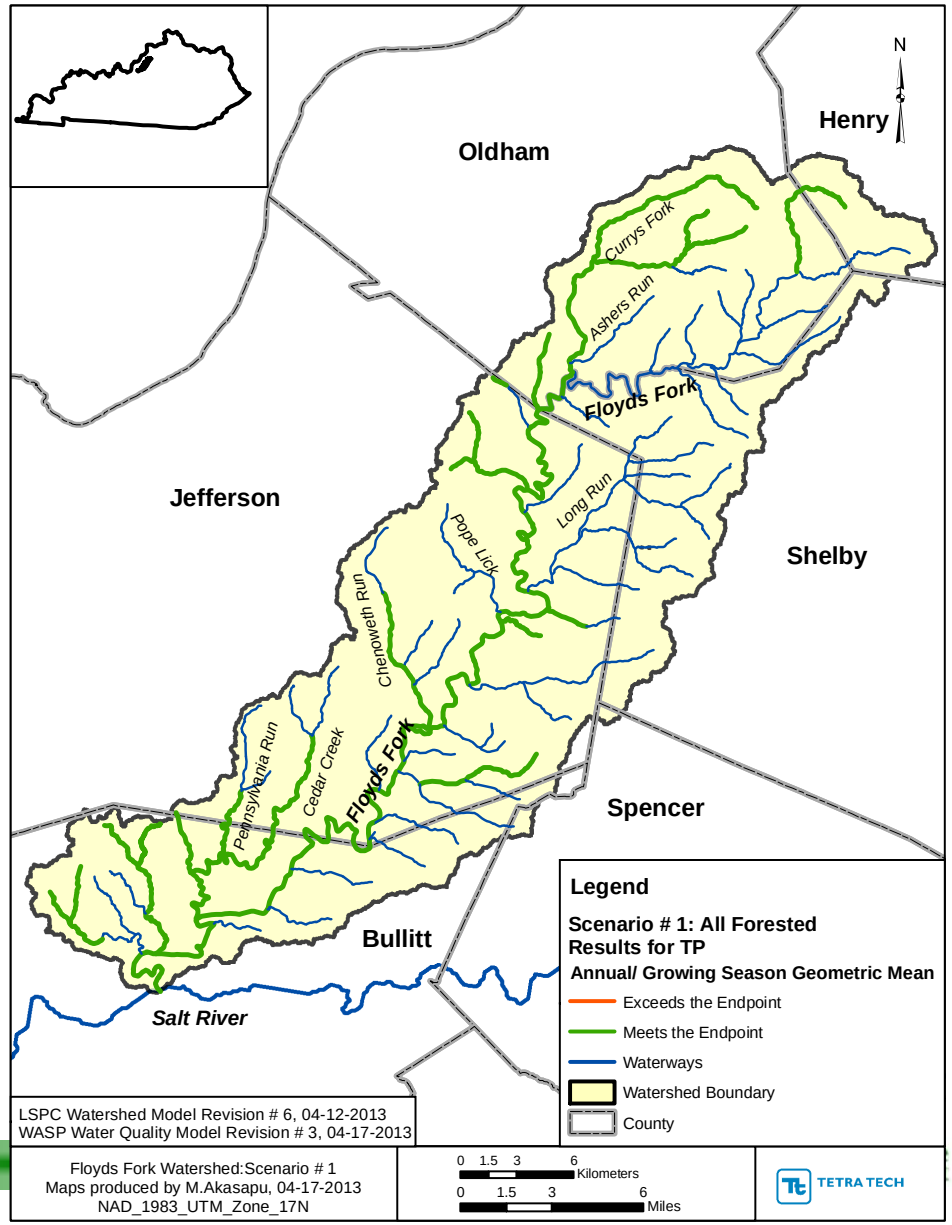
Scenario 0 – Baseline (Calibration)



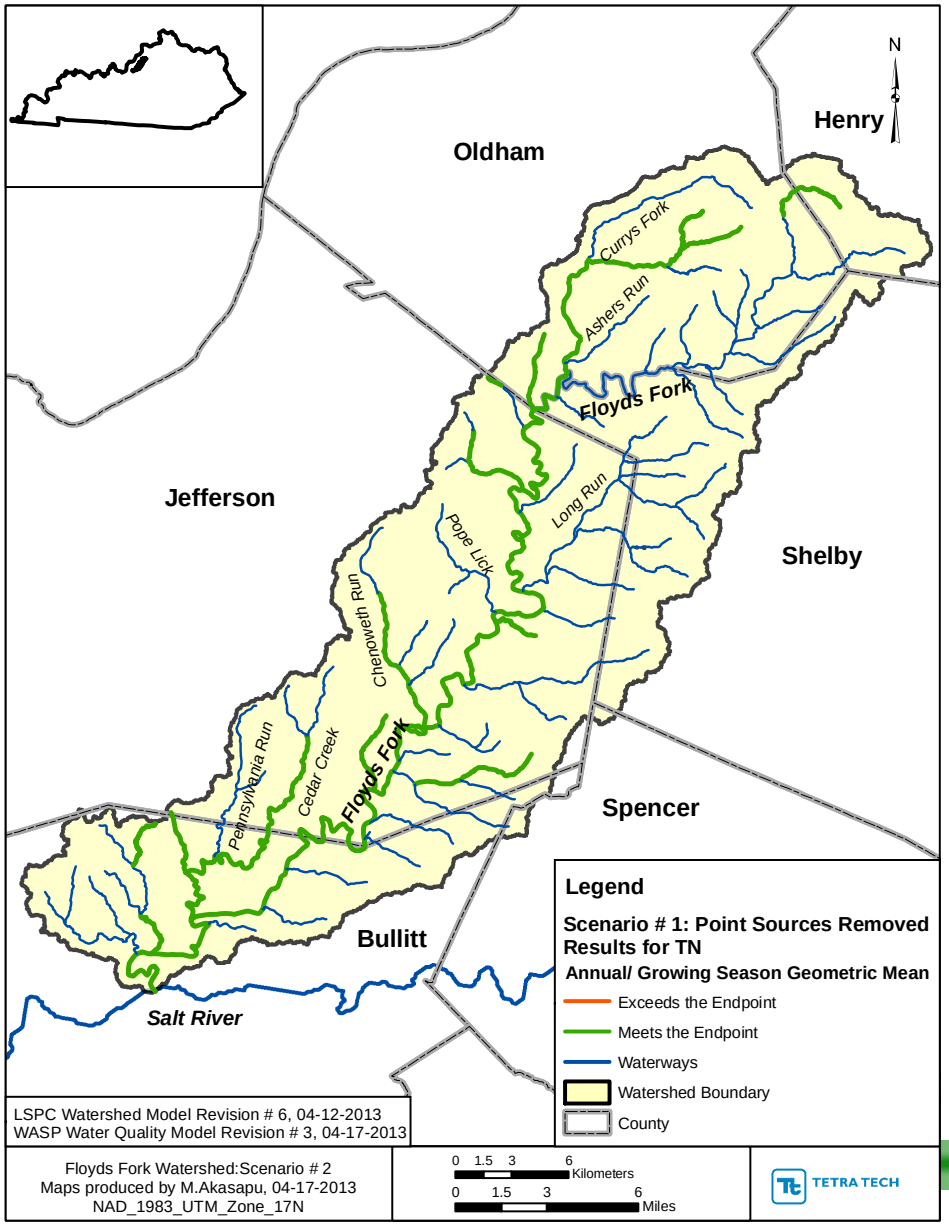


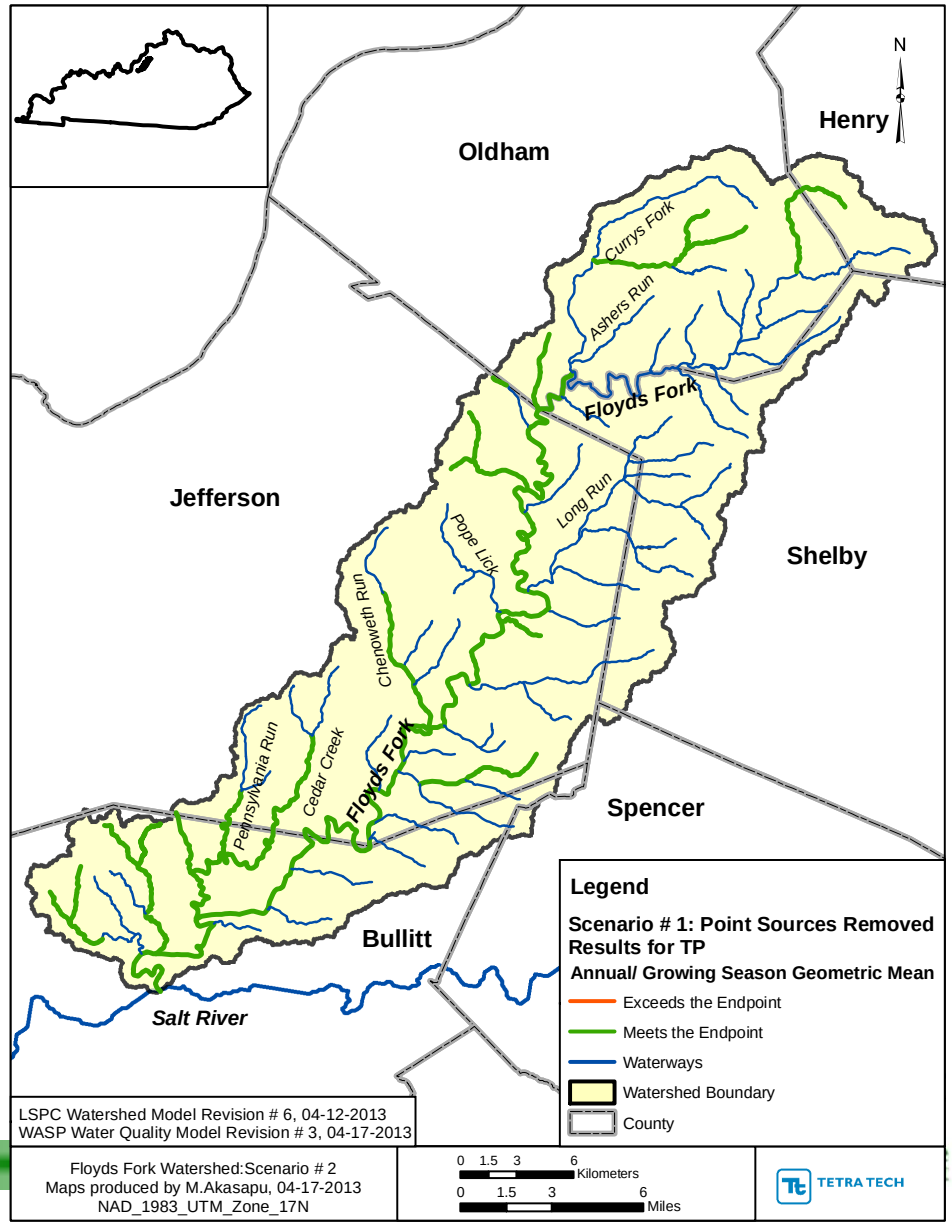
Scenario 1 – All Forested



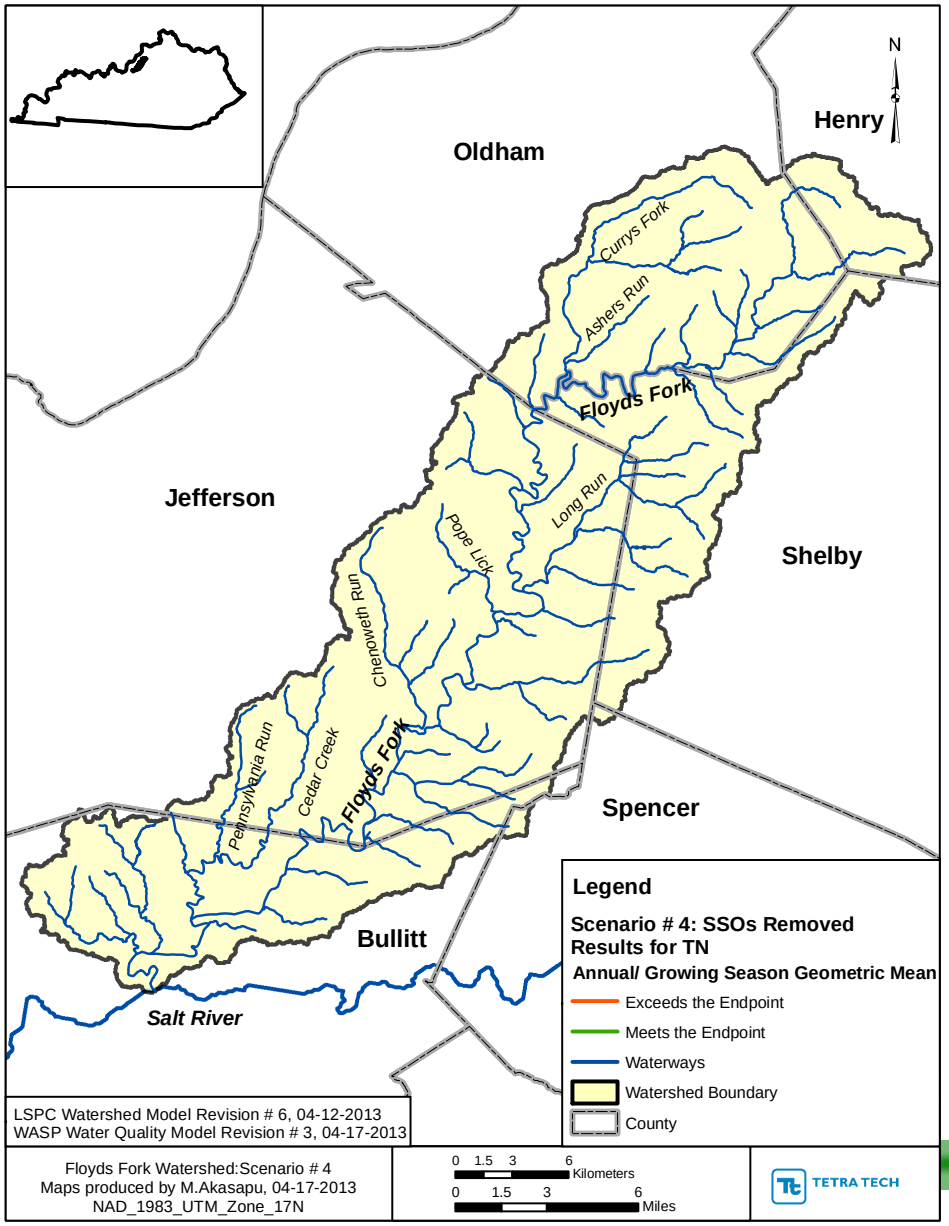


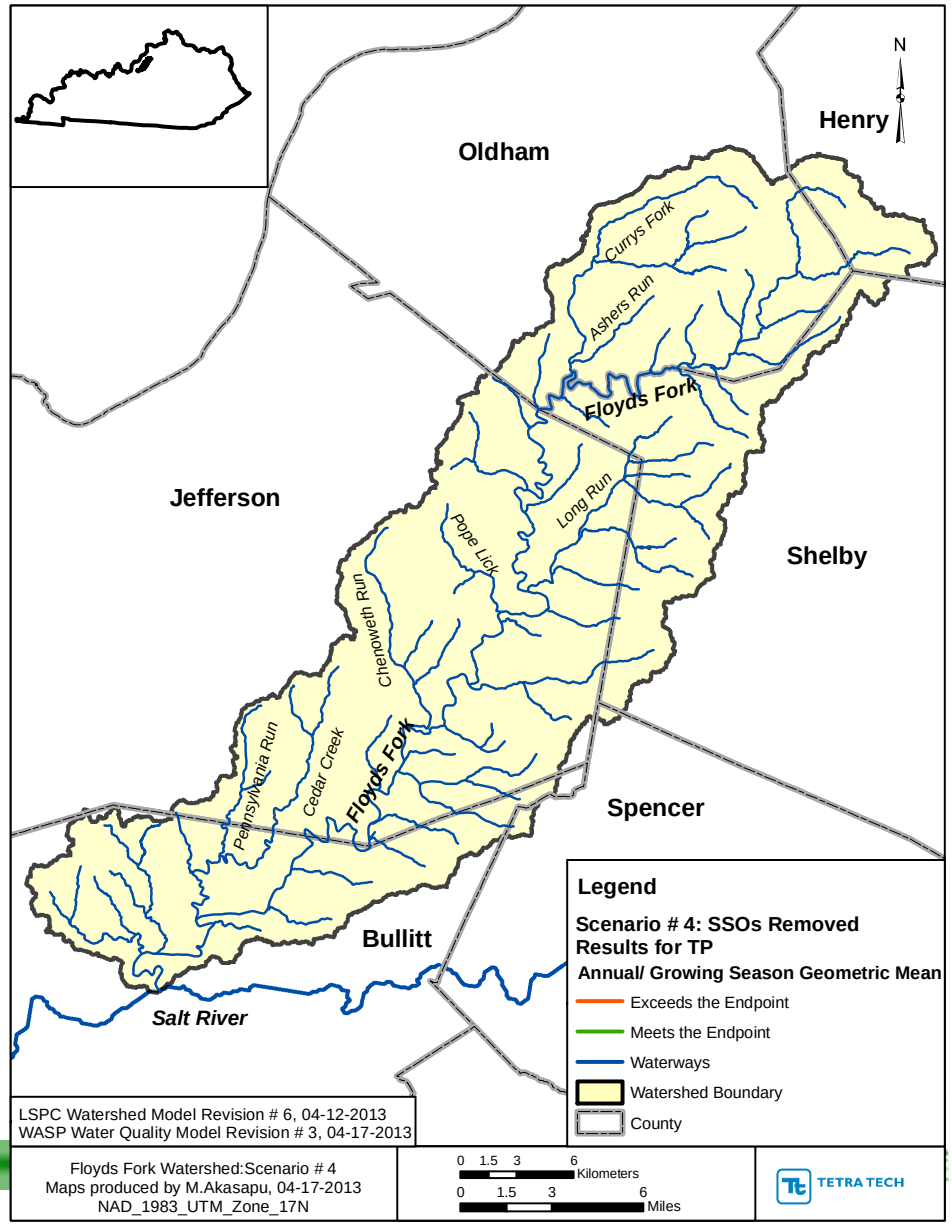
Scenario 2 – Point Sources Removed



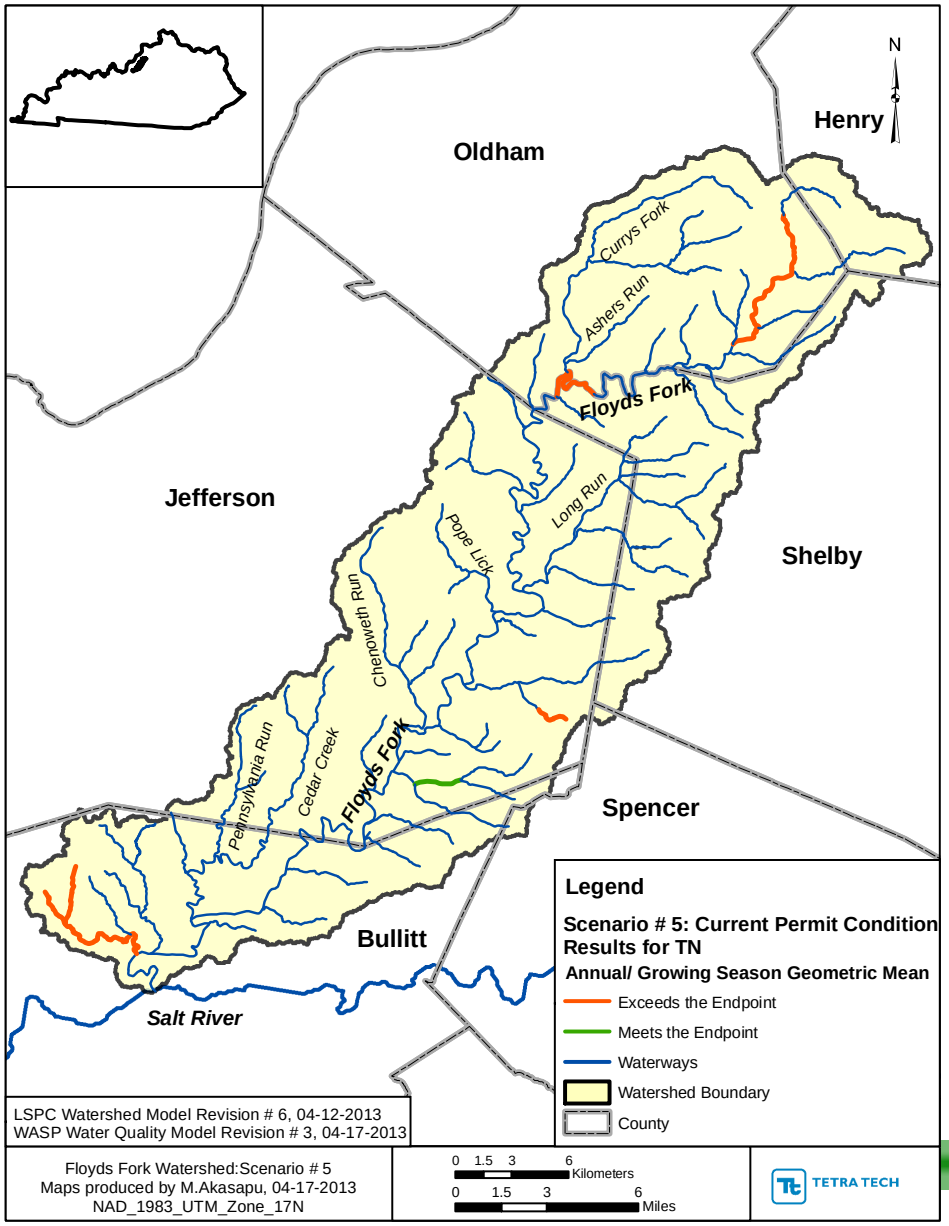


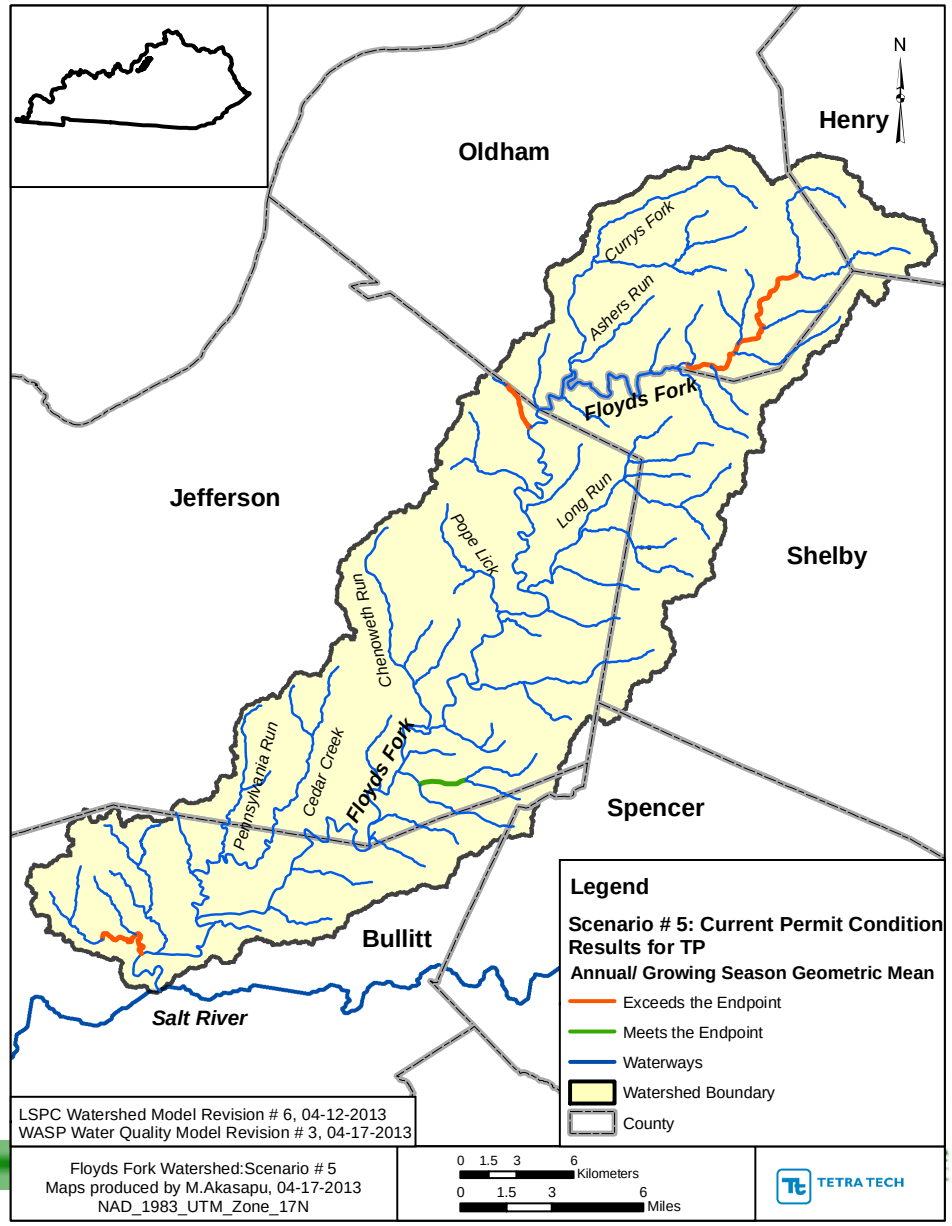
Scenario 4 – SSOs Removed



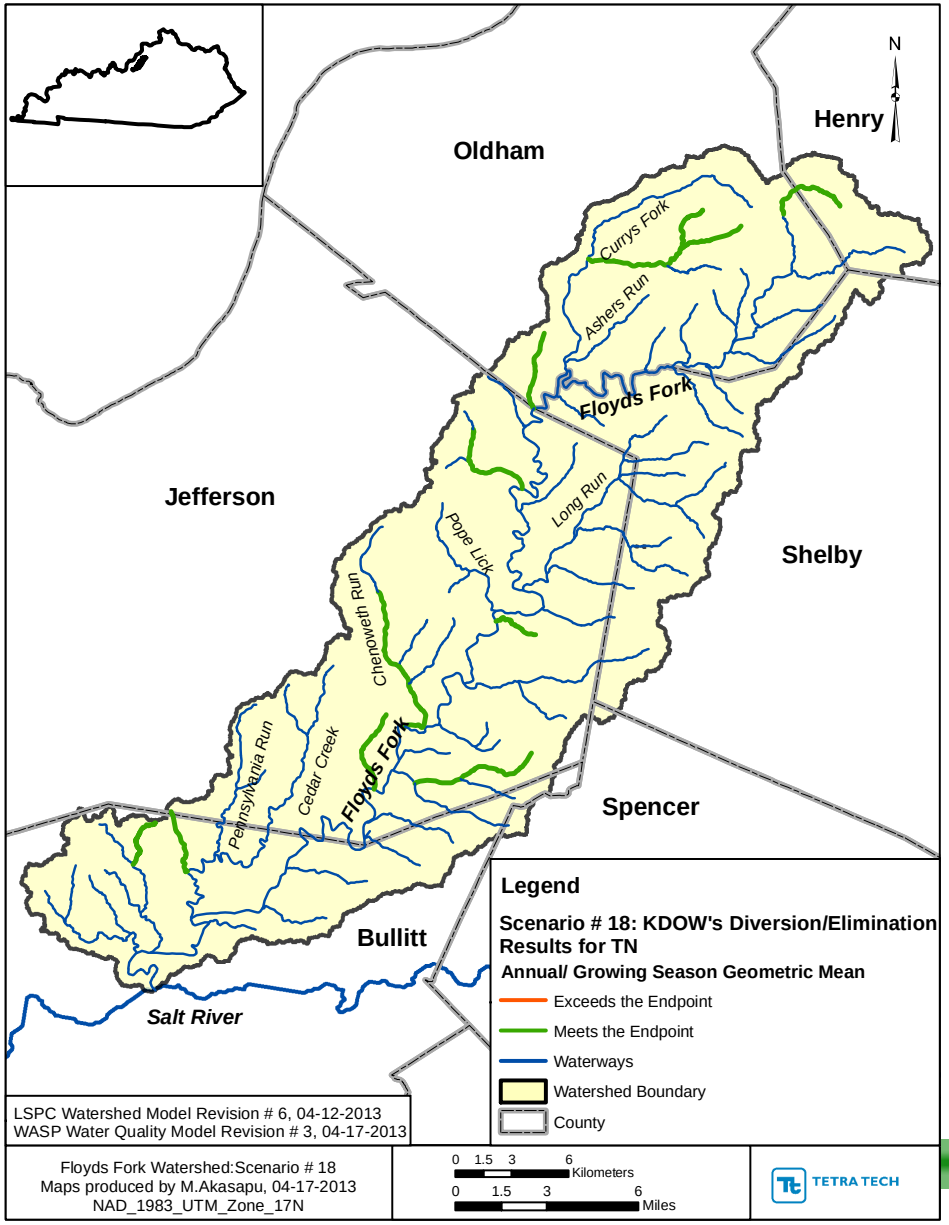


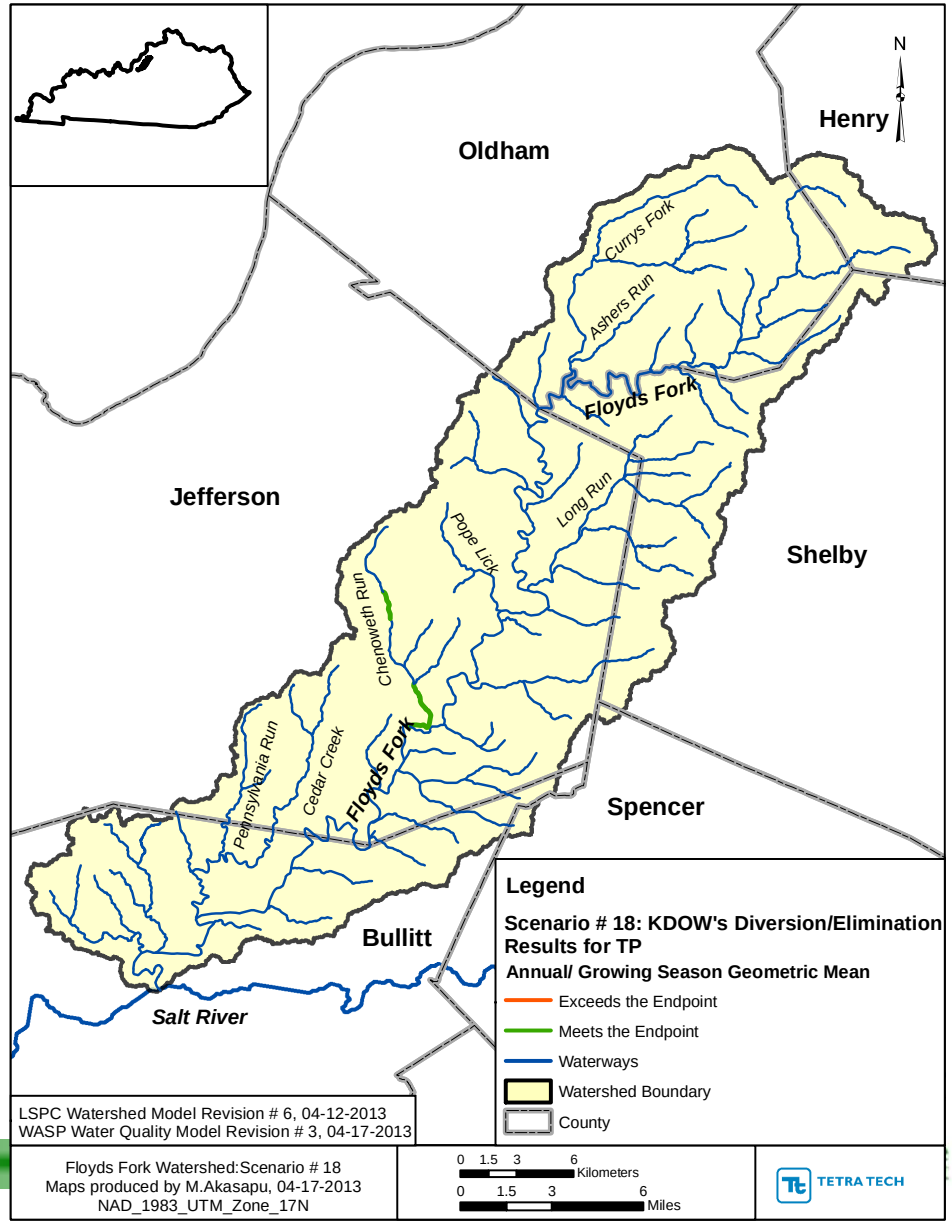
Scenario 5 – Current Permit Limits





Scenario 18 – KDOW Div/Elim of NPDES





Total Nitrogen							
Scenario Number	Scenario Description	Annual/ Growing Season GM			Maximum GM		
		Size Category			Size Category		
		Headwater	Wadeable	Boatable	Headwater	Wadeable	Boatable
0	Baseline	🔴	🔴	🔴	🔴	🔴	🔴
1	All Forested	🟢	🟢	🟢	🟢	🟢	🟢
2	Point Sources Removed	🔴	🔴	🟢	🔴	🟢	🟢
4	SSOs Removed	🔴	🔴	🔴	🔴	🔴	🔴
5	Current Permit Condition for the NPDES facilities	🔴	🔴	🔴	🔴	🔴	🔴
18	KDOW's Diversion/Elimination of the NPDES fcailities	🔴	🔴	🔴	🔴	🔴	🔴

Total Phosphorus							
Scenario Number	Scenario Description	Annual/ Growing Season GM			Maximum GM		
		Size Category			Size Category		
		Headwater	Wadeable	Boatable	Headwater	Wadeable	Boatable
0	Baseline	🔴	🔴	🔴	🔴	🔴	🟢
1	All Forested	🟢	🟢	🟢	🟢	🟢	🟢
2	Point Sources Removed	🔴	🔴	🟢	🔴	🔴	🟢
4	SSOs Removed	🔴	🔴	🔴	🔴	🔴	🟢
5	Current Permit Condition for the NPDES facilities	🔴	🔴	🔴	🔴	🔴	🔴
18	KDOW's Diversion/Elimination of the NPDES fcailities	🔴	🔴	🔴	🔴	🔴	🟢

Next Steps

- Update watershed model report with any comments
- Update instream model report with any comments
- Update/Run Scenarios
- Next TAC Meeting (???)

Questions?