The Use of Coal Ash in the Slippery Rock Creek Watershed

June 12, 2012

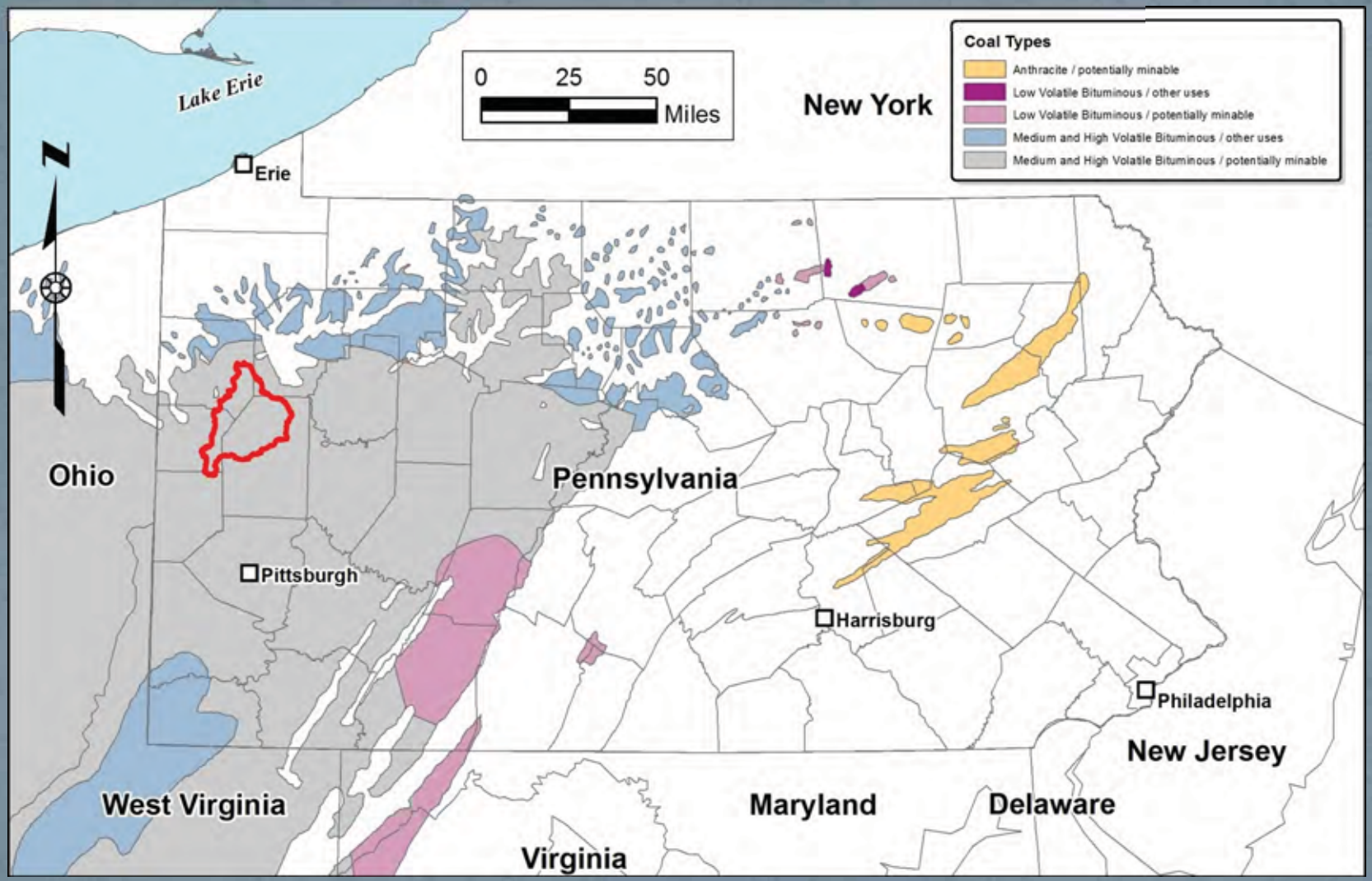
Shaun Busler, GISP

Stream Restoration Incorporated

501(c)(3) Non-Profit

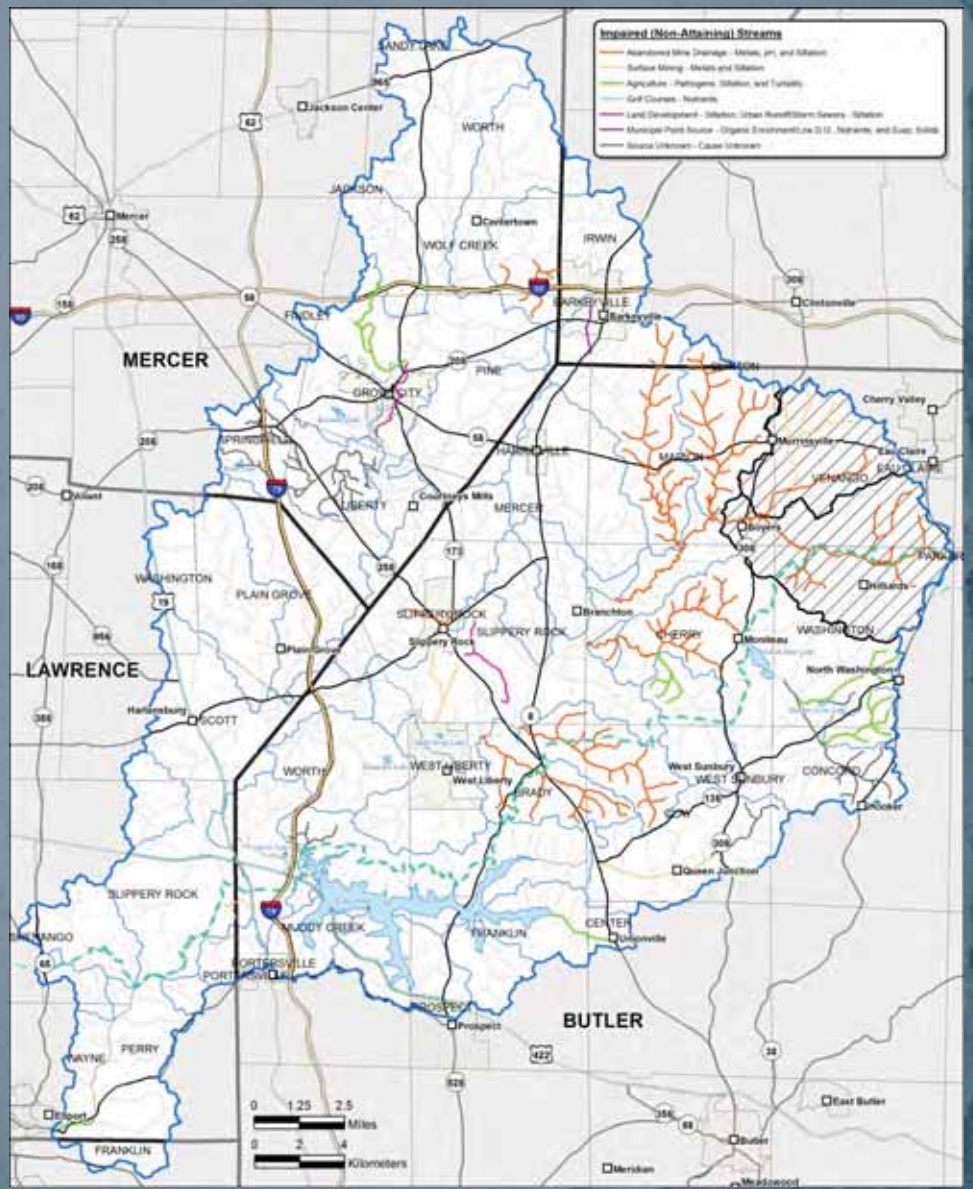
Location Map

Pennsylvania Coal Fields



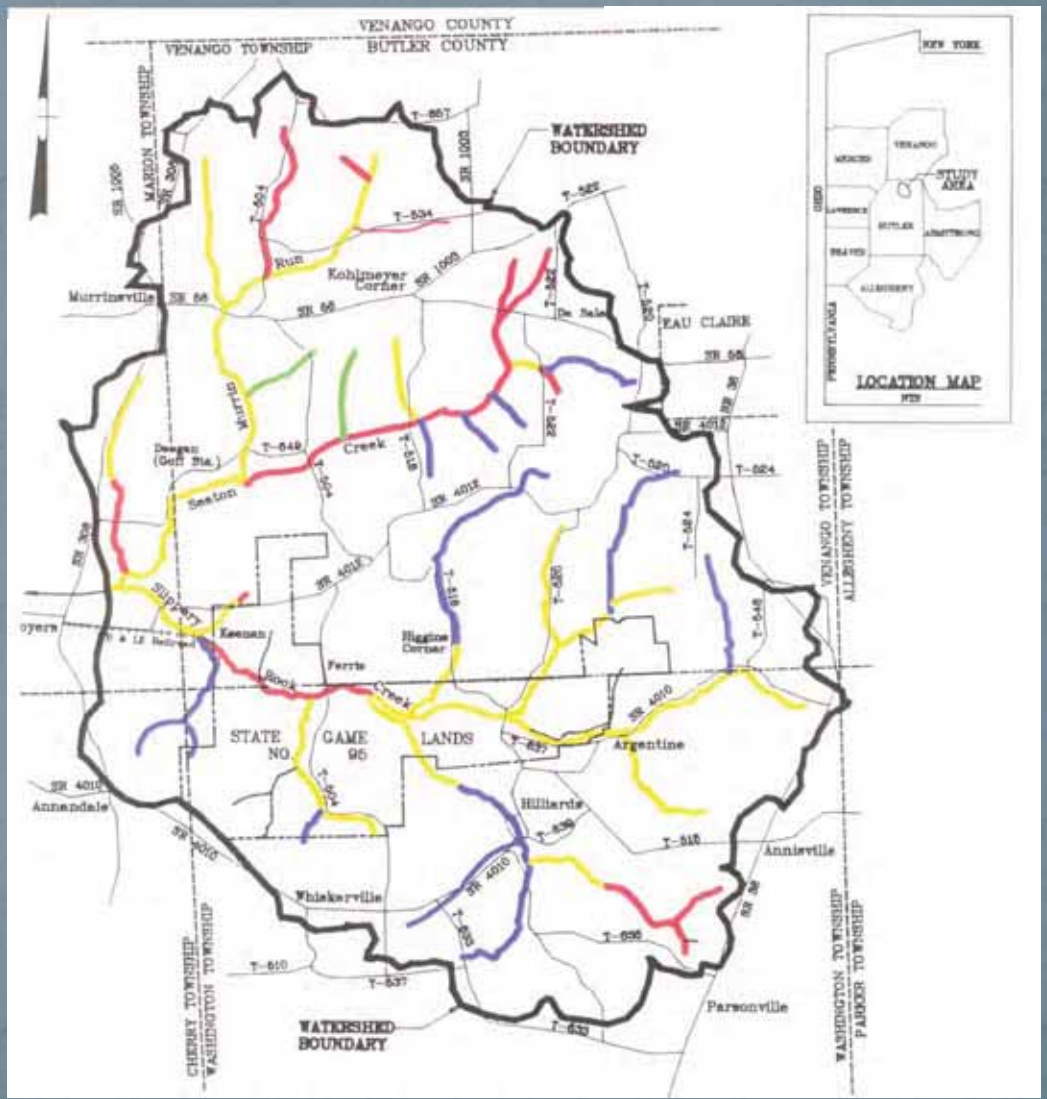
Slippery Rock Creek Watershed

- Entire watershed is 408 square miles
- Focused on 27-square mile headwaters area due to severity of AMD
  - 15% PA Game Lands 95
  - 85% private property
- 130 miles of streams impaired by AMD
  - 65% of impairment



SRWC Headwaters Area

- 27-square miles
  - 4000 acres with underground mine workings
  - 8000 acres permitted for surface mining
- Color Code:
  - Blue - Good
  - Green - Acid Sensitive
  - Yellow - AMD impacted
  - Red - Polluted



AMD Treated

750 million gallons per year of AMD are being treated by passive systems in SRCW. That is enough to fill over 9 million typical 5-foot long bath tubs.

Iron Removed from Slippery Rock Creek

Over 200 tons/year of iron removed from Slippery Rock Creek, equal to amount of iron in 200 trucks!!!

Aluminum Removed from Slippery Rock Creek

- Over 8 tons of aluminum no longer enters Slippery Rock Creek every year.

- This is equal to the Al in 273,000 soda cans.

Acidity Removed

- Over 335 tons per year of acidity is removed, equal to about 15 tri-axle loads.

Stream Miles Improved

- Over 11 miles of Slippery Rock Creek have been significantly improved in only 10 years!

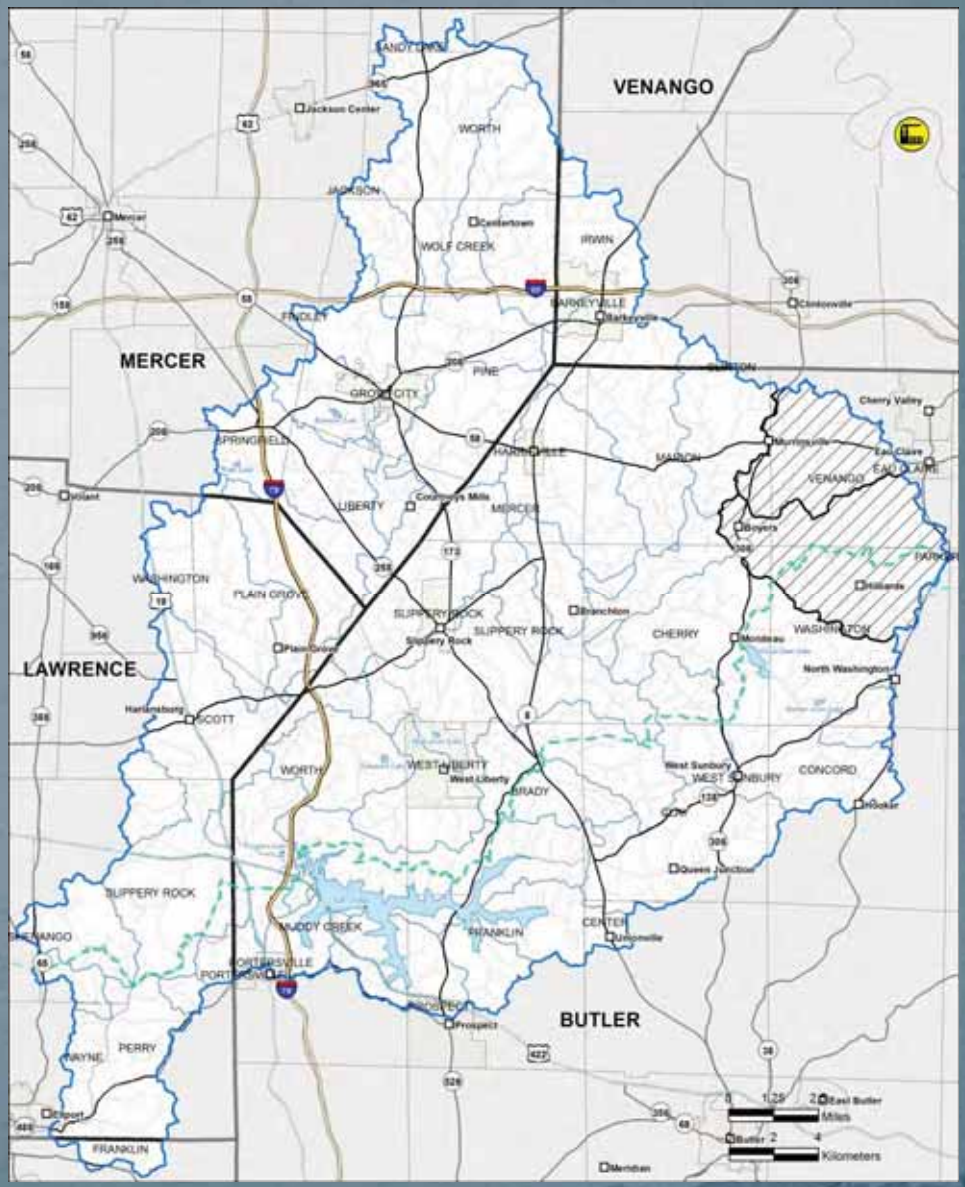

Fish Returning

CFB Ash Projects in Watershed

Project Name	Date Completed
Sunbeam Tipple	1995
Chernicky (Abel-Dreshman)	1998
De Sale Phase I	2000
Brookville Pit	2002
• Gob Station Gob Pile	2000
• Erico Bridge Gob Pile	2002
De Sale North	2006

Scrubgrass Generating Plant

- Starting generating electricity in 1993.
  - Produces 85 MW of electricity
    - Enough electricity to supply 80,000 homes
- Estimated to eliminate 15 million tons of waste coal in first 25 years of operation
  - No cost to the state
- Within 10 miles of Slippery Rock Creek headwaters area



Sunbeam Tipple

- Completed in 1995 by Kerry Coal Co. and the PA DEP, Knox DMO through a reclamation agreement
- Construction:
  - Alkaline addition (175,000 Tons CFB Ash)
  - Mixed with 100,000 Tons Coal Refuse
  - Regraded site to AOC
- 21 acres reclaimed


NOV
88
BEFORE


BEFORE


1 YEAR LATER- 1997


2012

Chernicky (Abel-Dreshman)

- Completed in 1998 by Amerikohl Mining, Fike Associates, Butler County Conservation District, and PA DEP
- Construction:
  - Alkaline addition (140,000 Tons CFB Ash)
  - Regraded site to AOC
  - Reclaimed 56 acres
- Joe Schueck, retired engineer with BAMR, wrote a paper on effectiveness of coal ash at Chernicky
  - Monitoring indicates reduced flows, increase in alkalinity, and lower metal concentrations


DURING


DURING


2012

Brookville Pit

- Completed in 2002 by Quality Aggregates Inc., BioMost, Inc., and PA DEP
- Construction:
  - Alkaline addition (~200,000 Tons of CFB Ash)
  - Regraded 20 acre site to AOC
  - Incorporated two additional sites:
    - Goff Station
    - Erico Bridge
- Reduced flows from an average of 16 gpm to <1 gpm


2012

Goff Station Restoration Area

- Completed in 2000 by Quality Aggregates Inc., Stream Restoration Inc., BioMost, Inc. and PA DEP
- Construction:
  - Placement area less than 1000 feet away
  - Removed 78,000 CY of Coal Refuse
    - Originally estimated 20,000 CY
    - Uncovered original stream channel
  - ~2 AC wetland and riparian area constructed within footprint of refuse pile


BEFORE


DURING
5/5/2000


DURING


2012

Erico Bridge Restoration Area

- Completed in 2002 by Quality Aggregates Inc., Stream Restoration Inc., BioMost, Inc., and PA DEP
- Construction:
  - Removed 40,000 CY of Coal Refuse
    - Originally estimated 15,000 CY of refuse in Operation Scarlift
  - ~1 AC of wetlands constructed within footprint of refuse pile


BEFORE
9/26/20


BEFORE
11/15/2001 09:08


2012


2012

De Sale Phase I

- Completed in 2000 by Amerikohl Mining, Stream Restoration Inc., BioMost, Inc., and PA DEP
  - Reclaim PA Grant
- Construction:
  - Reclaimed 8 acre site
  - Alkaline addition (~60,000 Tons)
  - Passive Treatment System Installation
    - 2 VFPs, Settling Pond/Wetland, and HFLB
    - Added Forebay


BEFORE


2012


2012


2012

De Sale North

- Completed in 2006 by Quality Aggregates Inc., Stream Restoration Inc., BioMost, Inc., and PA DEP
- Construction:
  - Alkaline addition (~60,000 Tons)
  - Soil lining (40,000 Tons):
    - Lower permeability
    - Add alkalinity
  - Regraded 21 acre site to AOC

Date	Flow (gpm)	Fe (mg/L)	Mn (mg/L)	Al (mg/L)
Before Construction	43.3	8	28	18
After Construction	5.5	6	24	16


BEFORE


BEFORE
11/5/2001 11:25


AFTER
8/8/2006 09:02

Slippery Rock Creek Study Area

WATERSHED BOUNDARY

PRIORITY 8: THOMAS

PRIORITY 7: ACT 43

PRIORITY 5: DU SALE

PRIORITY 10: LUCAS

PRIORITY 9: GOFF STATION

PRIORITY 6: ERICO BRIDGE

PRIORITY 4: FERRIS

PRIORITY 3: HIGGINS CORNER

PRIORITY 1: ARGENTINE

PRIORITY 2: HOLLABAUGH

State Game Lands 95

SCALE: 1 " = 2000 FEET

Pennsylvania Department of Environmental Protection

RECLAMATION/REMEDIATION PLAN PRIORITY ORDER

RECLAMATION/REMEDIATION PLAN – MAP 4

PA COMPREHENSIVE MINE RECLAMATION STRATEGY

STREAM CLASSIFICATION: SLIPPERY ROCK WATERSHED PROJECT

PA DEPARTMENT OF ENVIRONMENTAL PROTECTION – KNOX DMO

Non-Polluted Alkaline (BLUE): alkalinity > acidity; pH > 6.0 Iron < 1.5 mg/l

Marginal, AMD Impacted (YELLOW): pH 5.0 ⇒ 6.0; Sulfates > 50 mg/l

Marginal, Acid Sensitive (GREEN): pH 5.0 ⇒ 6.0; Sulfates < 50.0 mg/l

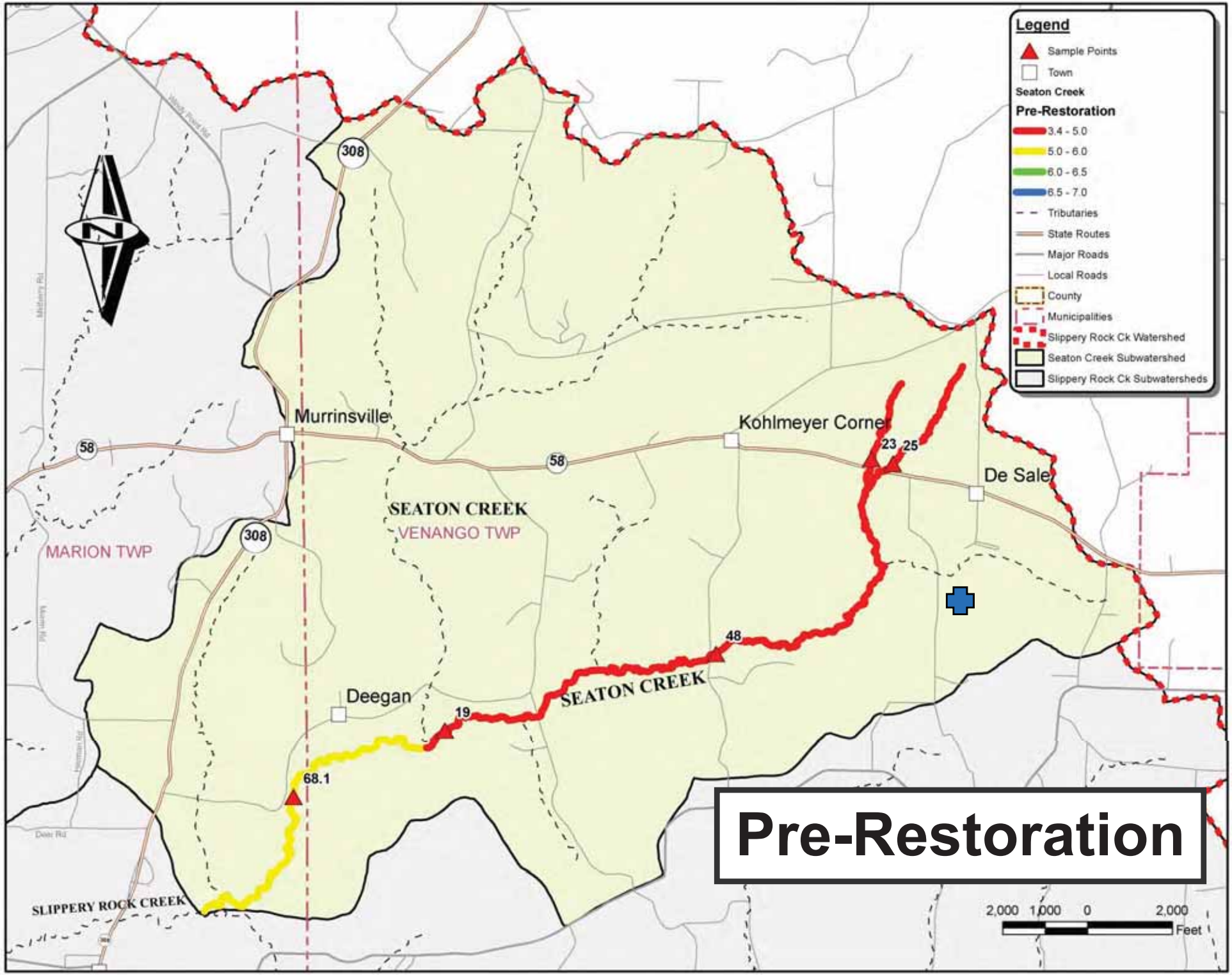
Polluted (RED): acidity > alkalinity; pH < 5.0, Iron > 1.5 mg/l; Sulfates > 50 mg/l

STREAM MONITORING POINT: ▲ DISCHARGE: ⅄

♦ COMPLETED PROJECT * PROPOSED PROJECT

⇒ PROPOSED PROJECT UPGRADE

SCALE: 1 " = 2000 FEET JUNE 1998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Pre-Restoration
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5.0 - 6.0
6.0 - 6.5
6.5 - 7.0
Tributaries
State Routes
Major Roads
Local Roads
County
Municipalities
Slippery Rock Ck Watershed
Seaton Creek Subwatershed
Slippery Rock Ck Subwatersheds
Murrinsville
Kohlmeyer Corner
De Sale
SEATON CREEK
VENANGO TWP
MARION TWP
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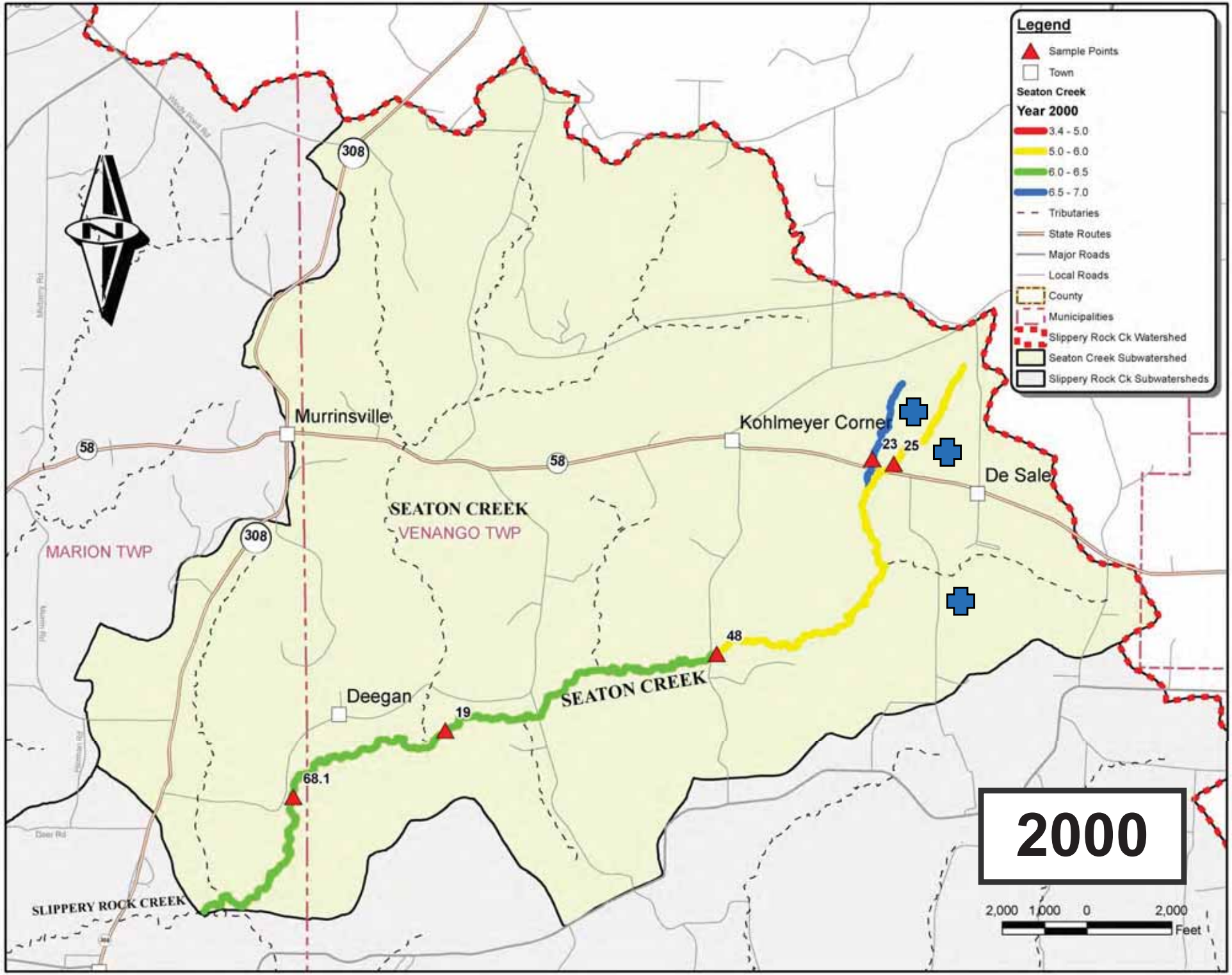
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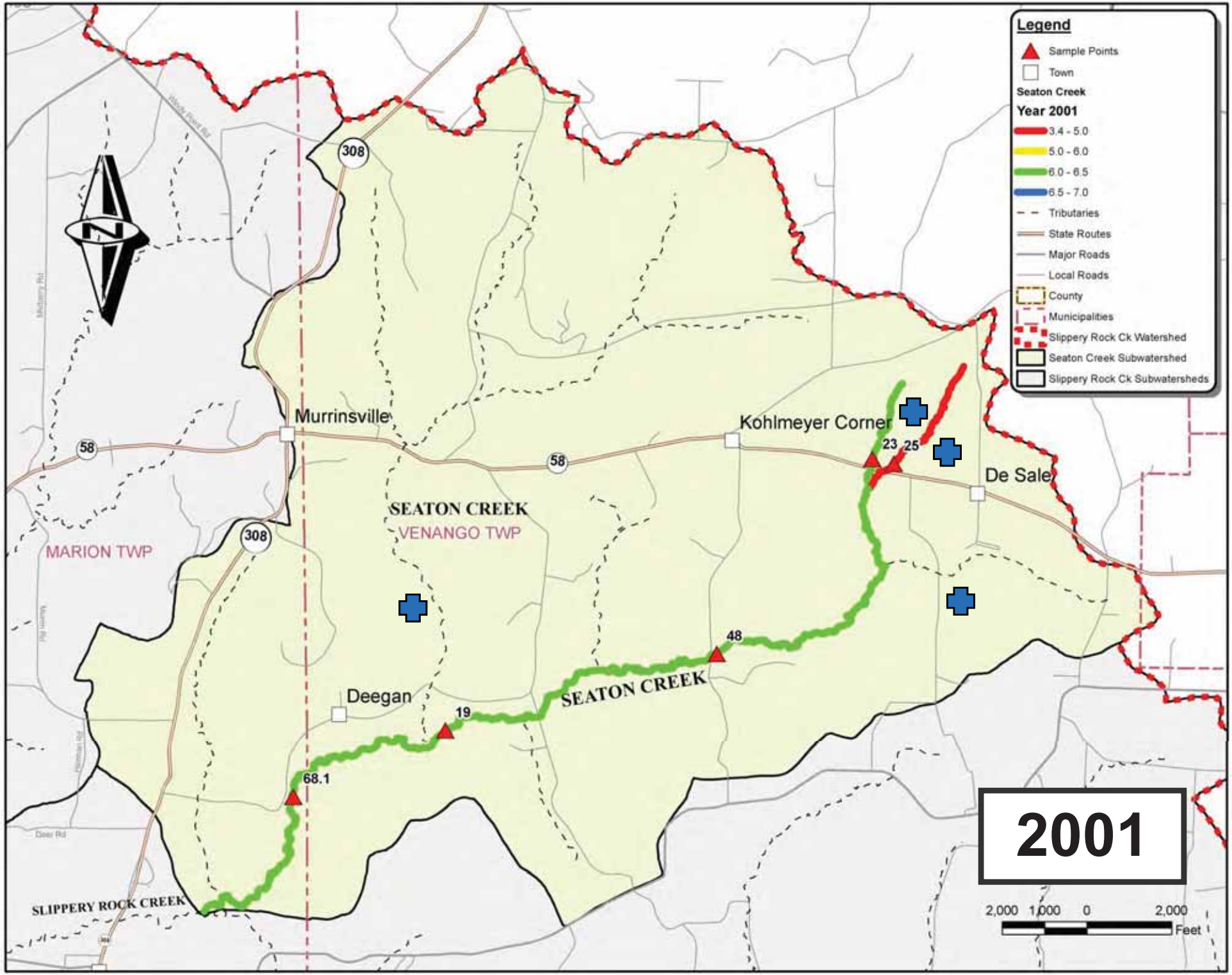
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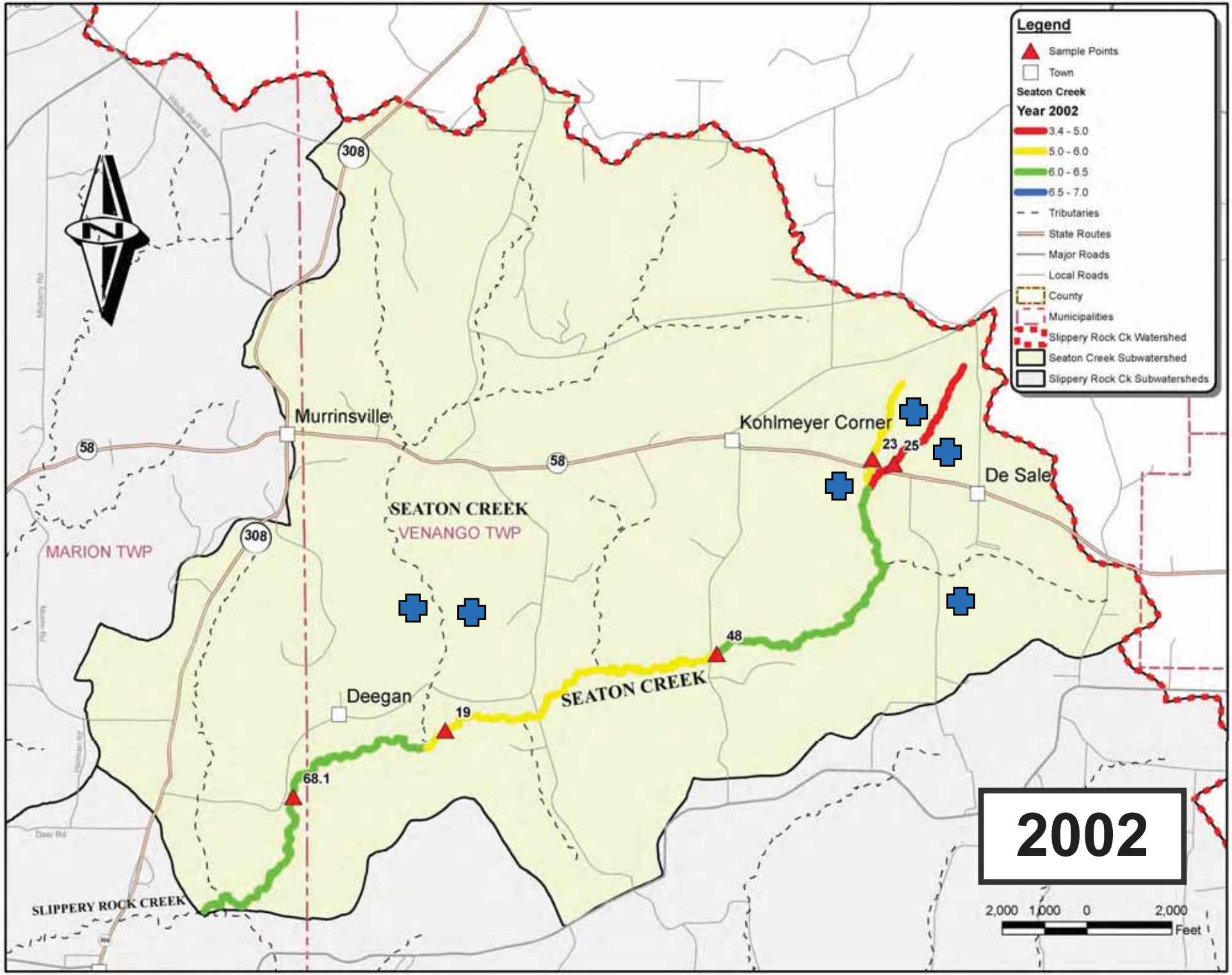
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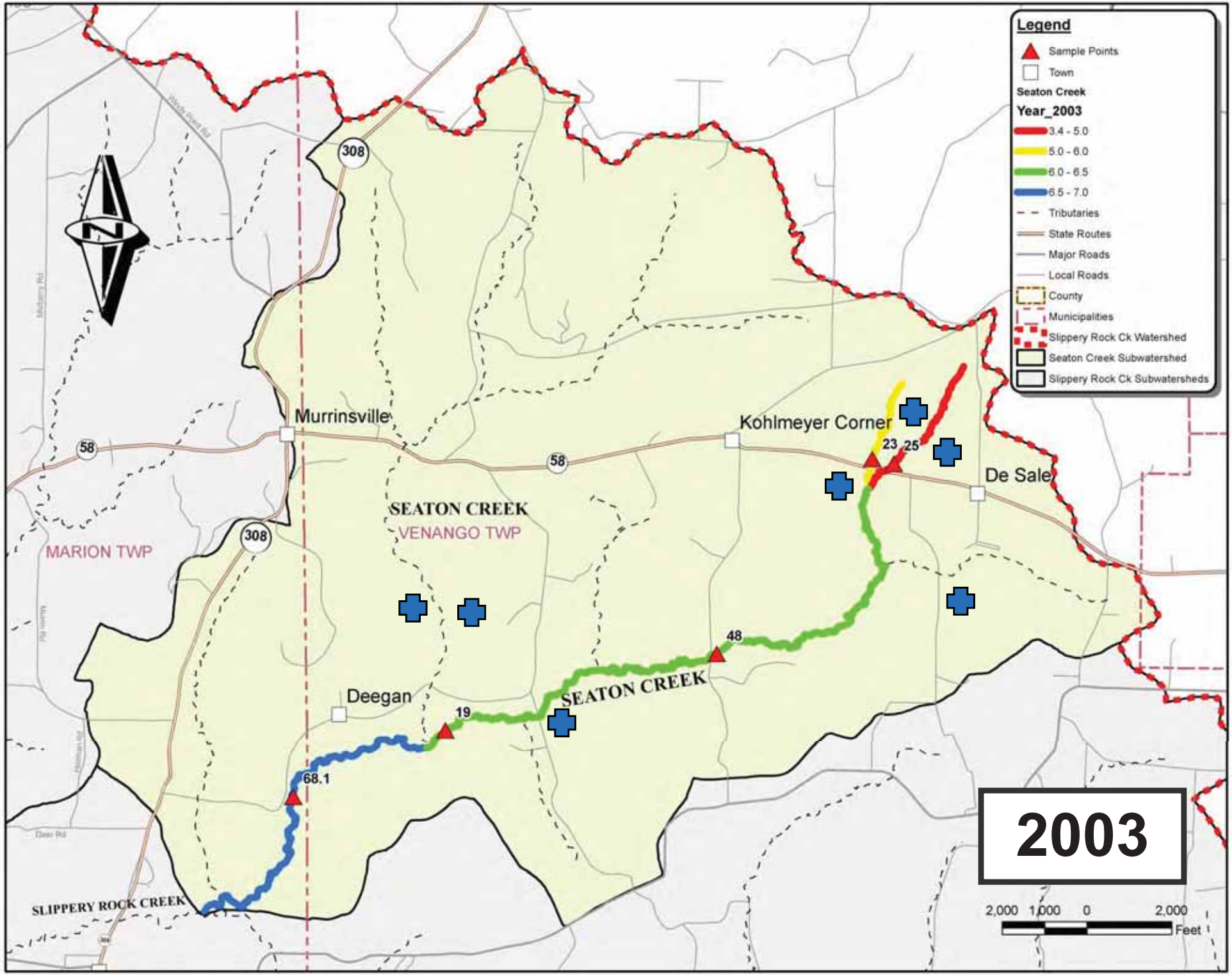
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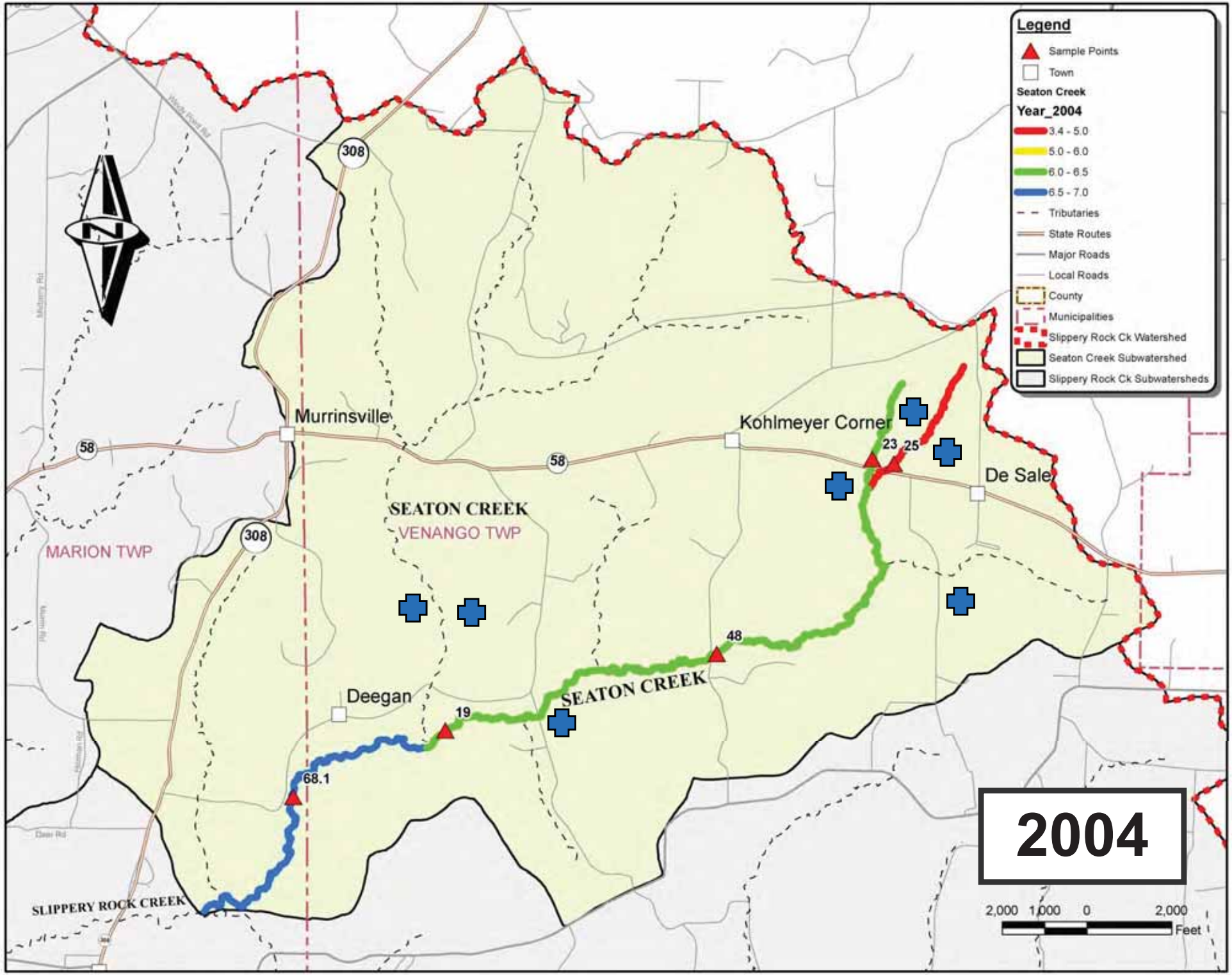
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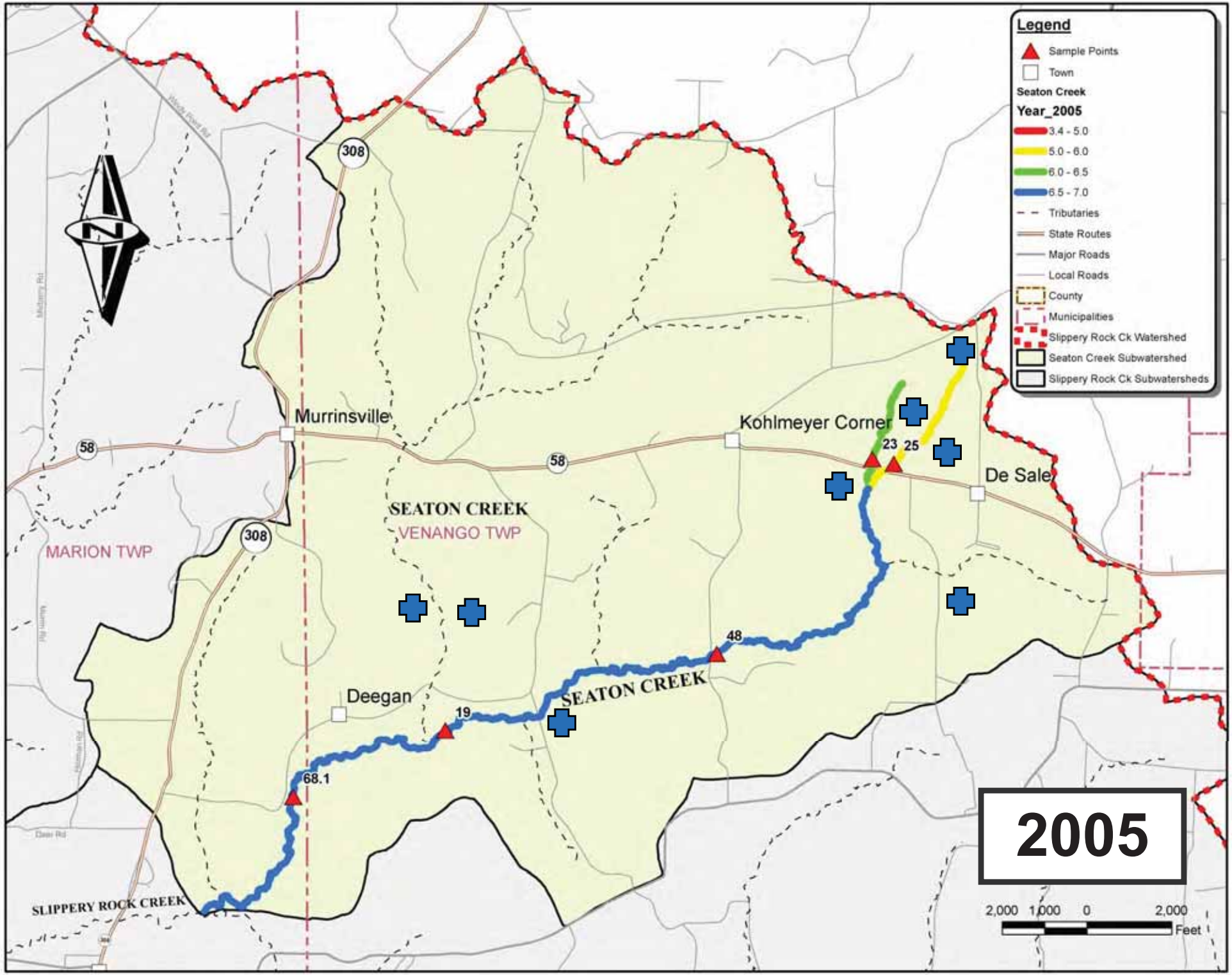
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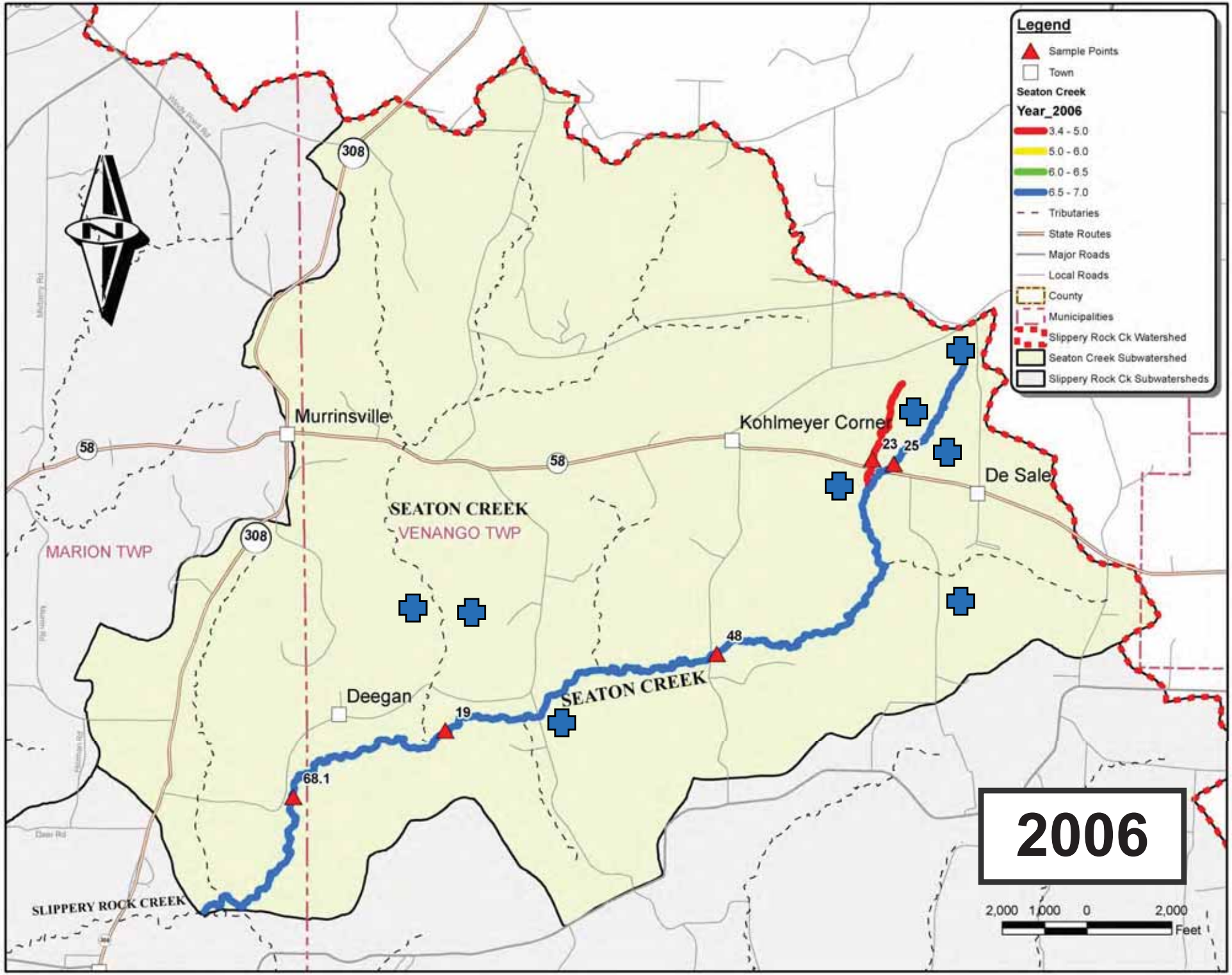
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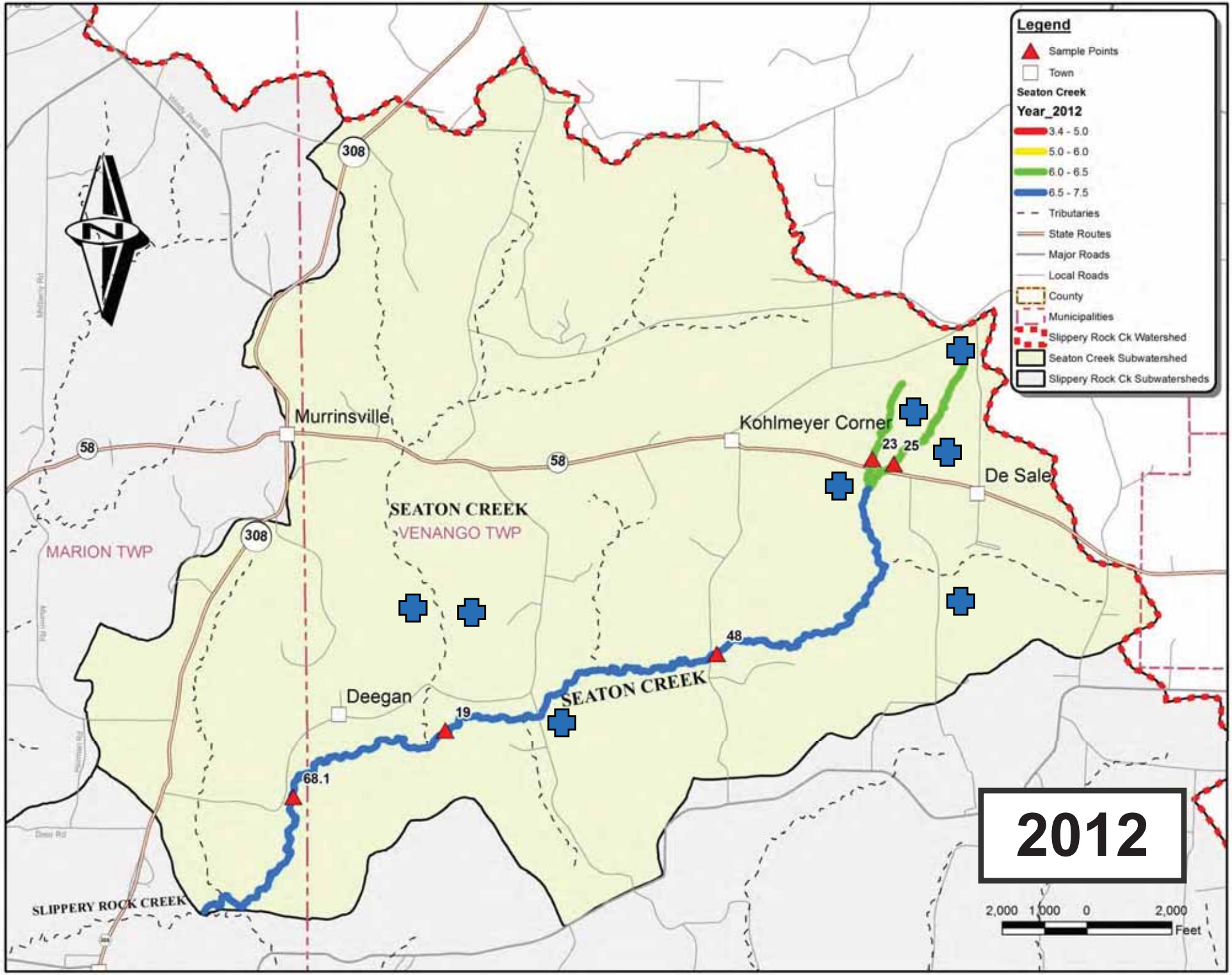
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Conclusions

- Reclaimed 126 acres with CFB ash
  - No projects since 2006
- Improved vegetative establishment
  - Use FRA to establish trees
- Monitoring consistently shows reduced flows of AMD
- Win-Win Situation
  - Use CFB ash as a resource rather than landfilling
  - Economically restore mine lands
    - Usually no cost to taxpayers