



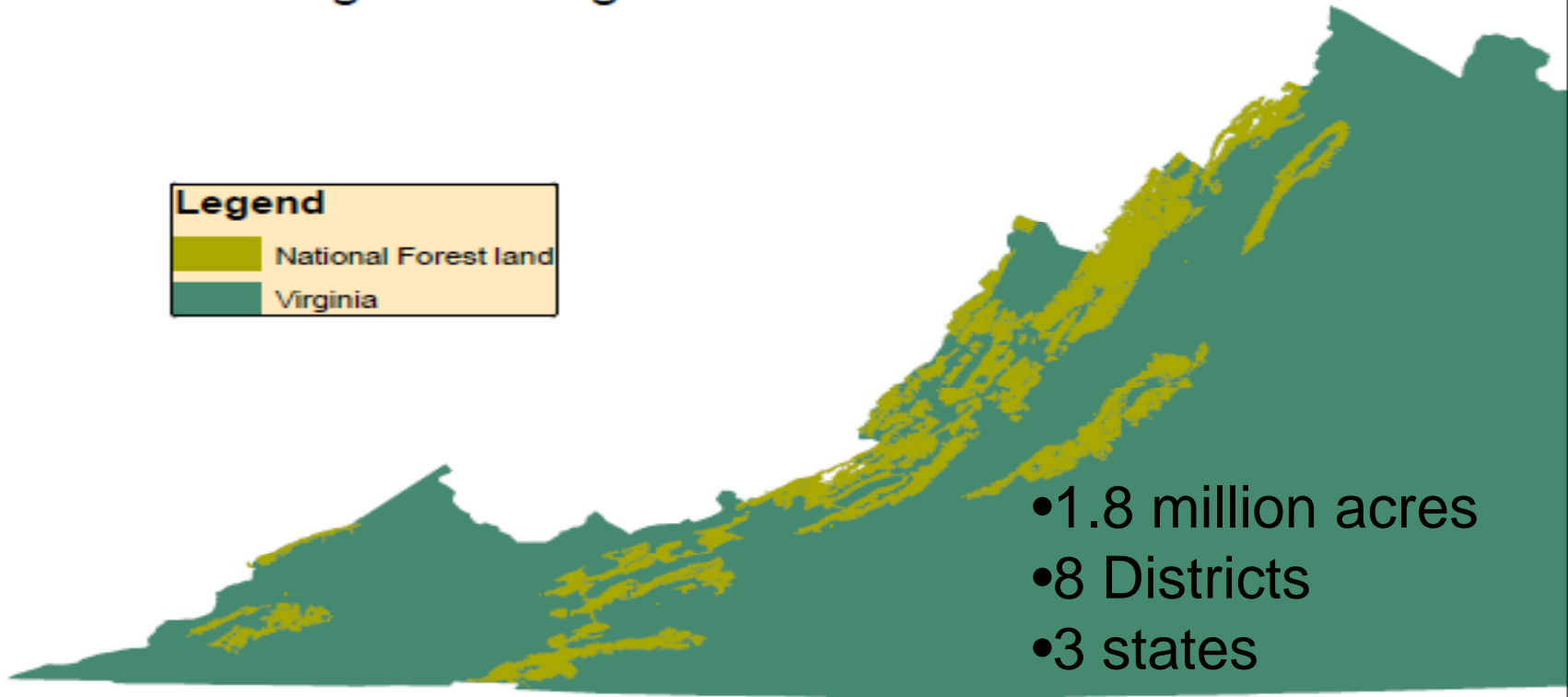
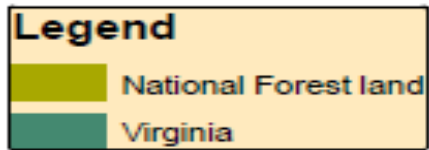
Aquatic Restoration

George Washington and Jefferson NF

Dawn Kirk
Fisheries Biologist
US Forest Service



George Washington & Jefferson National Forests



- 1.8 million acres
- 8 Districts
- 3 states

0 30 60 120 Miles





Aquatic Resources

- 2,224 miles perennial streams
- 4,318 miles intermittent streams
- 3,577 acres of lakes, ponds, and wetlands



Restoration Project Case Studies

Physical Restoration Example – North River





Chemical Restoration Example – St. Mary's River

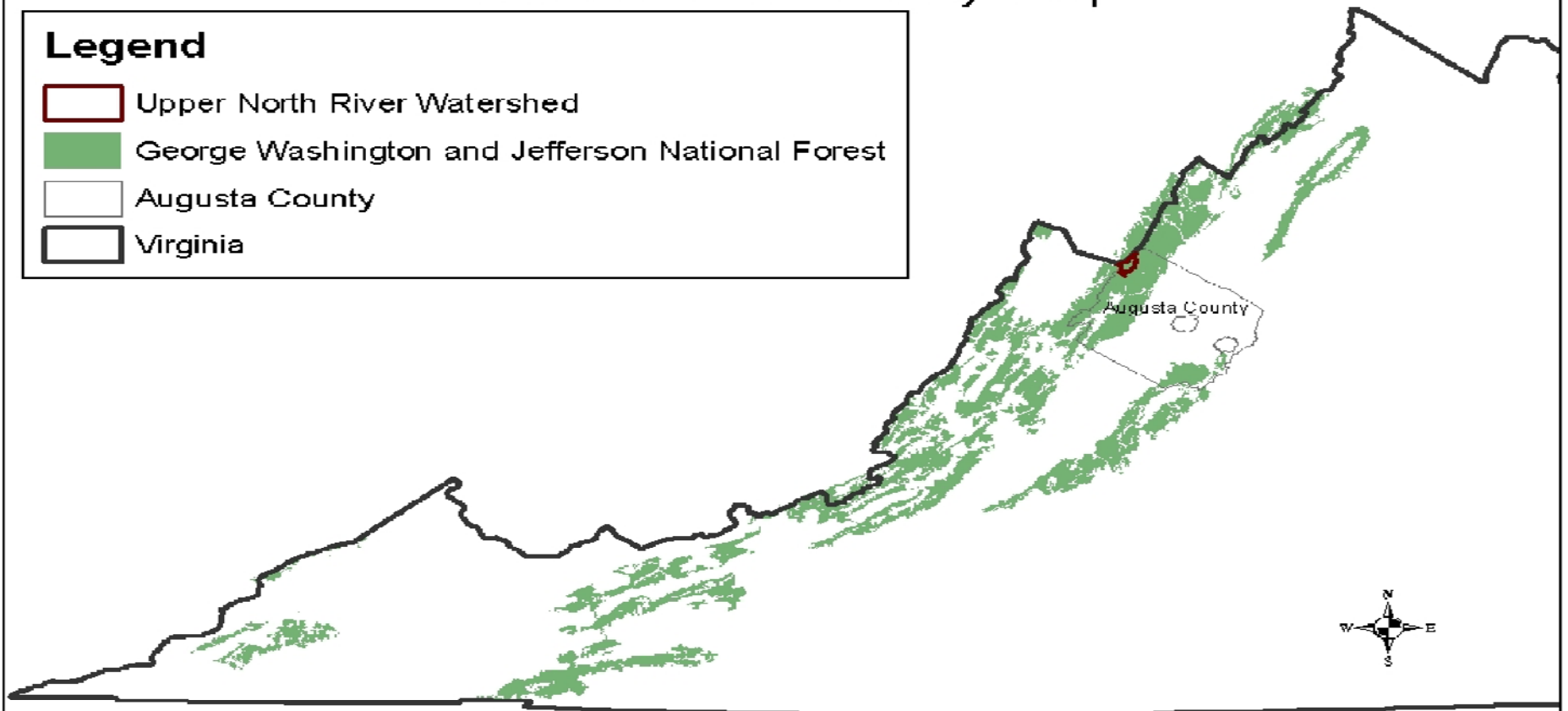


**North River
Habitat Enhancement Project:
A USFS, VDGIF, USFWS and TU
Partnership
2005-2013 and beyond**

North River Vicinity Map

Legend

-  Upper North River Watershed
-  George Washington and Jefferson National Forest
-  Augusta County
-  Virginia



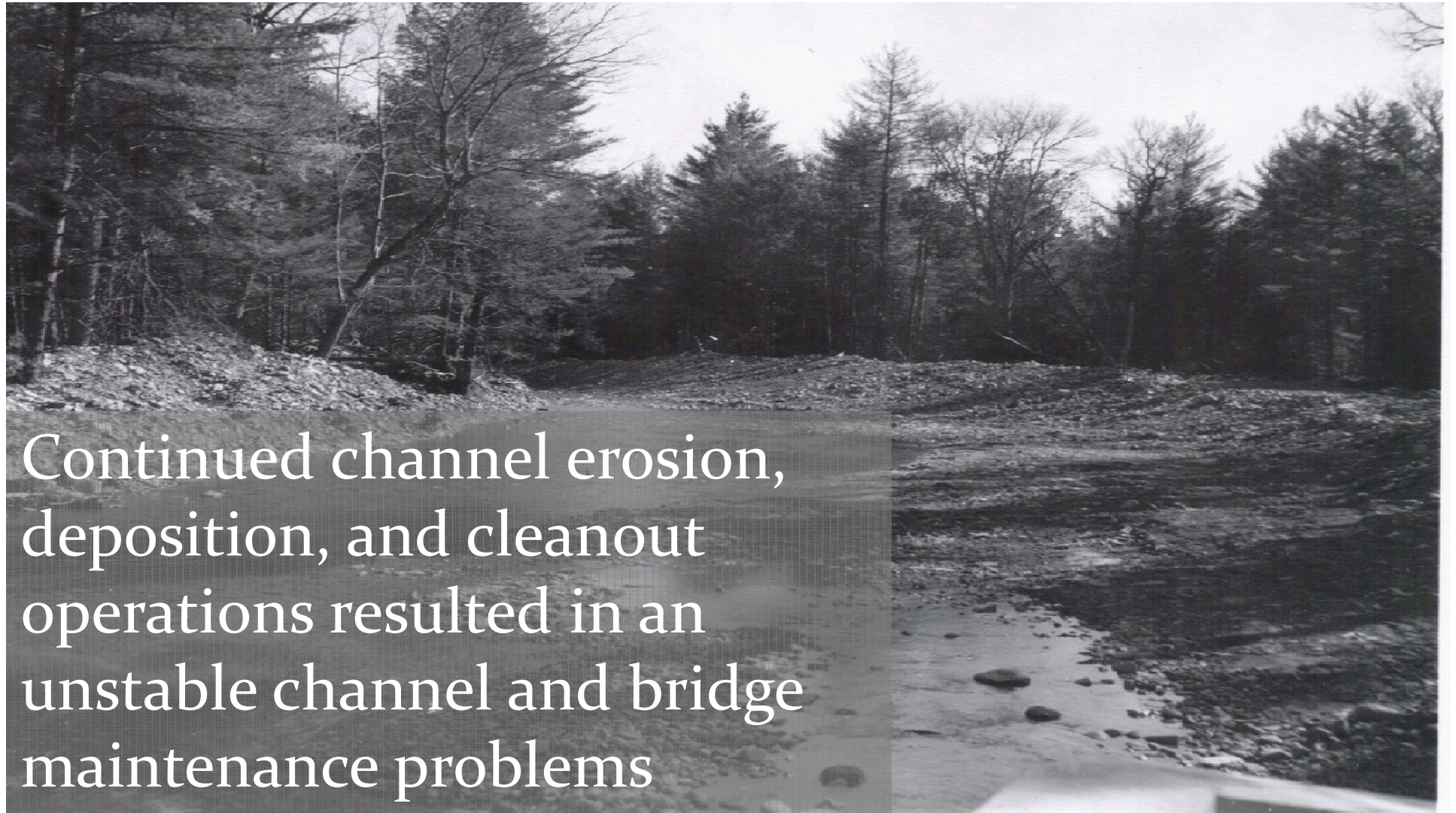
0 25 50 100 Miles

North River Restoration Area



Channel restoration following 1949 flood





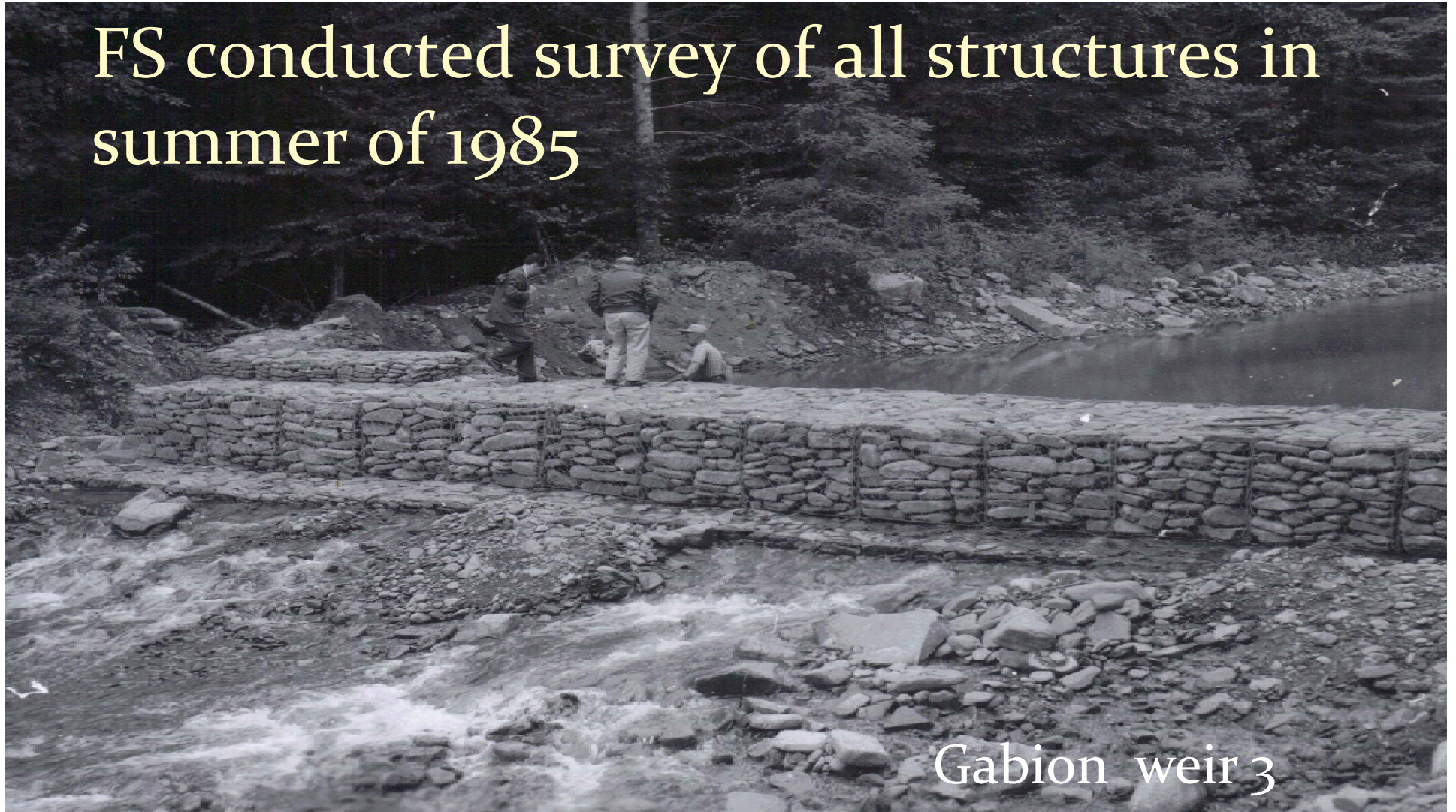
Continued channel erosion, deposition, and cleanout operations resulted in an unstable channel and bridge maintenance problems





1959-1965:
7 cross-channel weirs
69 walls
17 groins

FS conducted survey of all structures in
summer of 1985



Gabion weir 3

Flood of 1985

- Remnants of Hurricane Juan stalled over VA & WV from Oct. 31 – Nov. 5
- Steady rain previous weekend saturated soils and set the stage for flood
- In excess of 20 inches of rain were reported over 6 days
- Stream gauge on North River overtopped by backwater from Elkhorn Reservoir

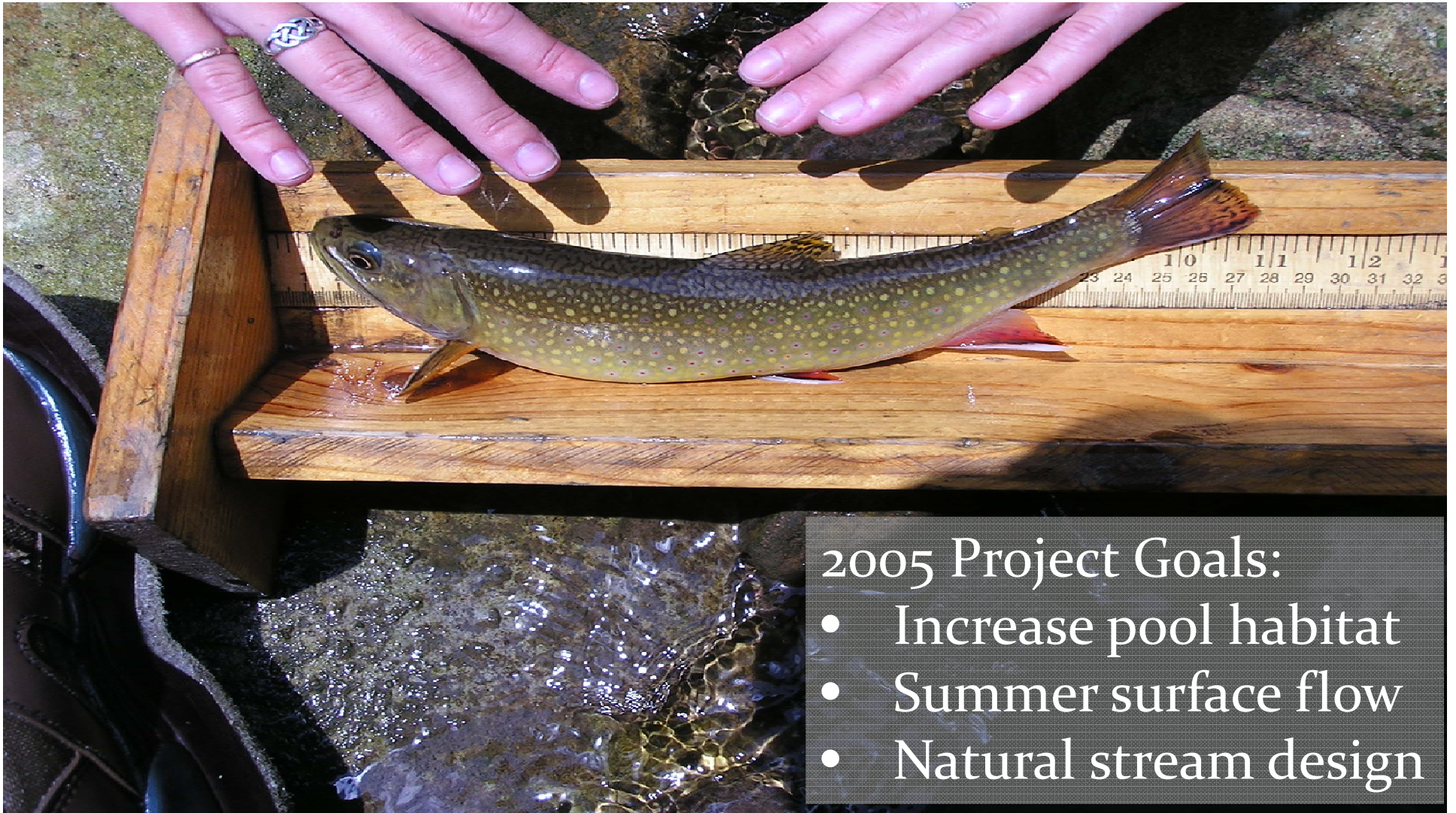
Walnut St. in Roanoke, VA





Survey following 1985 Flood:

- Most of structures gone, buried, or had major damage
- Overall impact was general widening (by 16 feet) and deepening (by 1 foot) of the channel transects.
- Lack of channel complexity; large areas with little summer surface flow



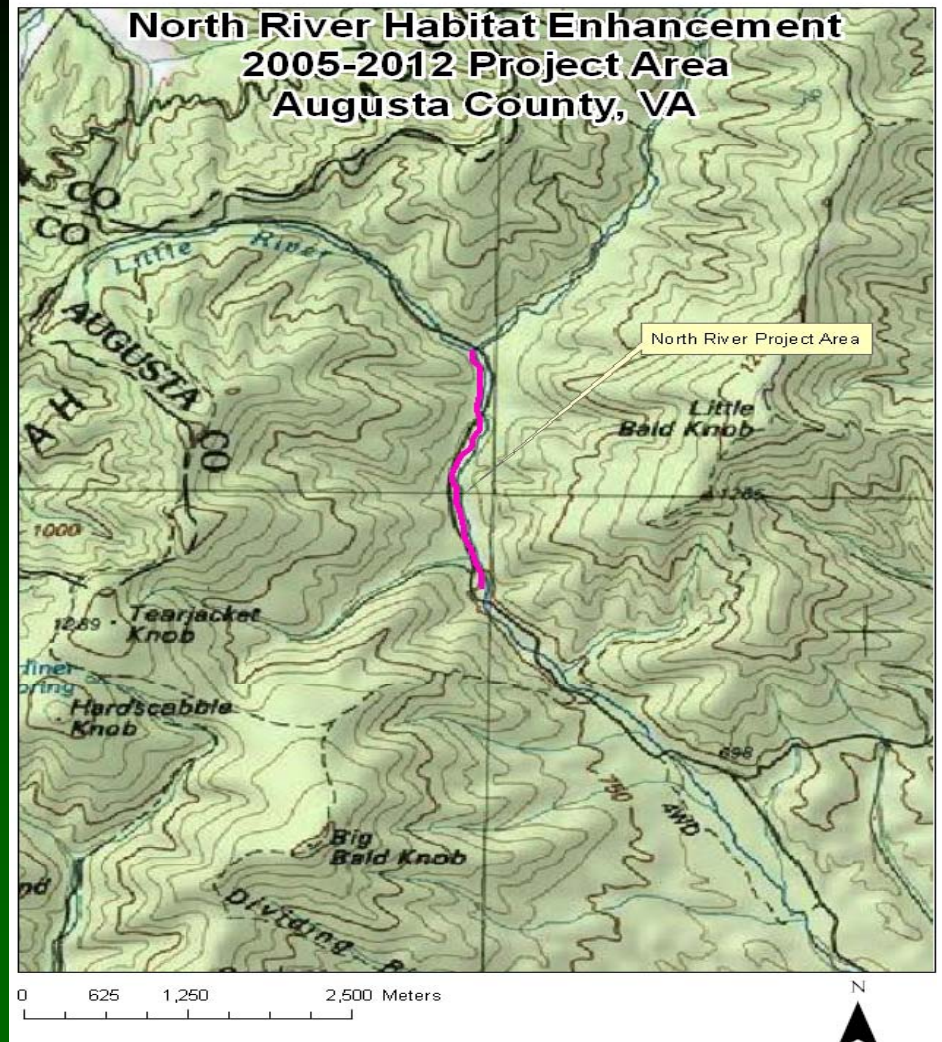
2005 Project Goals:

- Increase pool habitat
- Summer surface flow
- Natural stream design



Project to-date:

- 8 construction seasons
- 67 structures installed
- ~3 km stream habitat enhanced
- ~\$115,000 total cost





**Typical channel
"before"**

Typical restored reach





2005 demolition of
gabion walls
blocking the
floodplain





2005 rock vane
construction



2006



2007



2011





1958 Wall 6
pre-installation



2006 Wall 6



2008







Incorporating wood into structures







- Opened berm to older channel:
- lower elevation
 - forested
 - channel shape and dimension of “reference”
 - cut off from current channel by berm



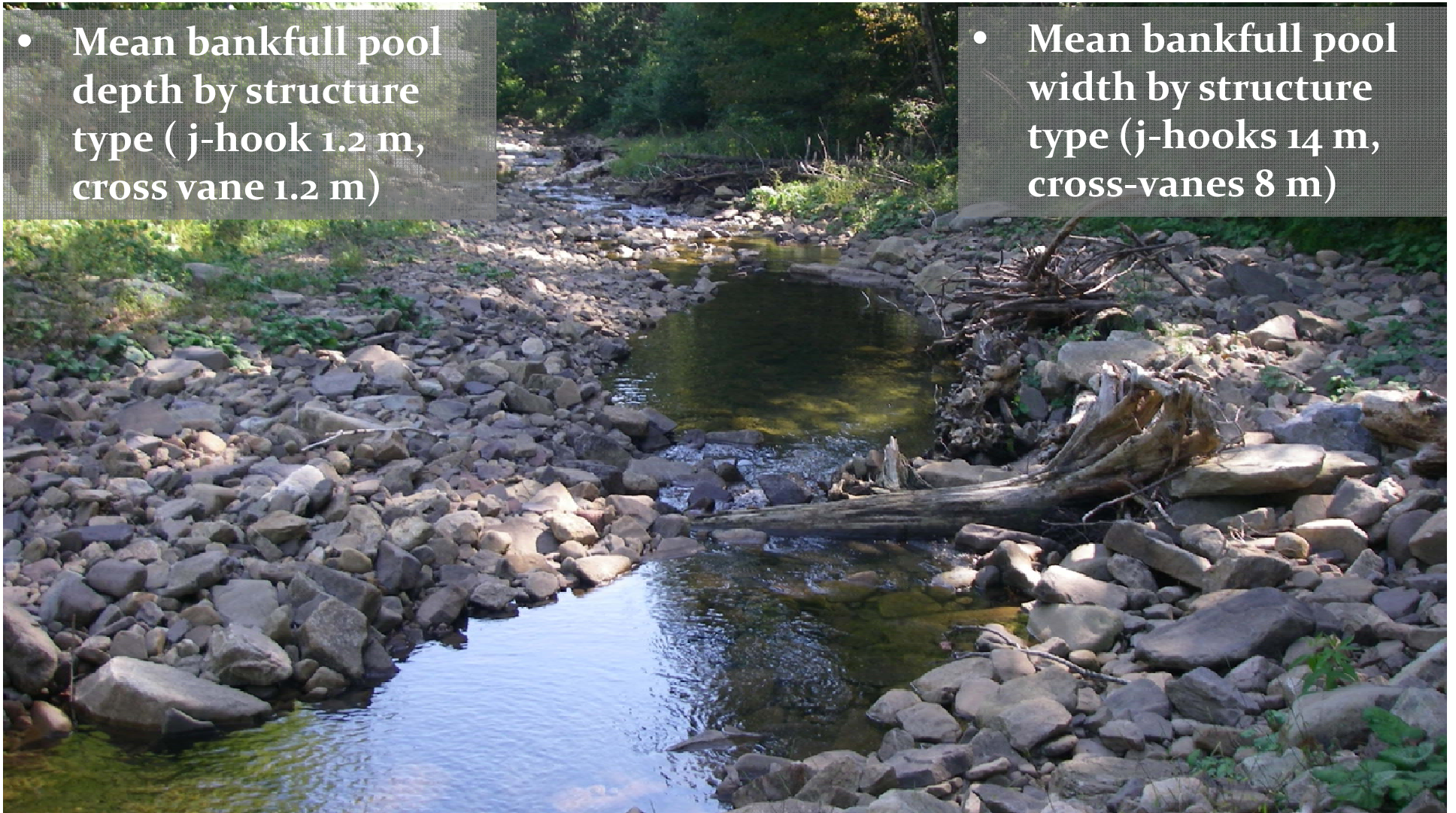




Were Pools Created?

- Mean bankfull pool depth by structure type (j-hook 1.2 m, cross vane 1.2 m)

- Mean bankfull pool width by structure type (j-hooks 14 m, cross-vanes 8 m)

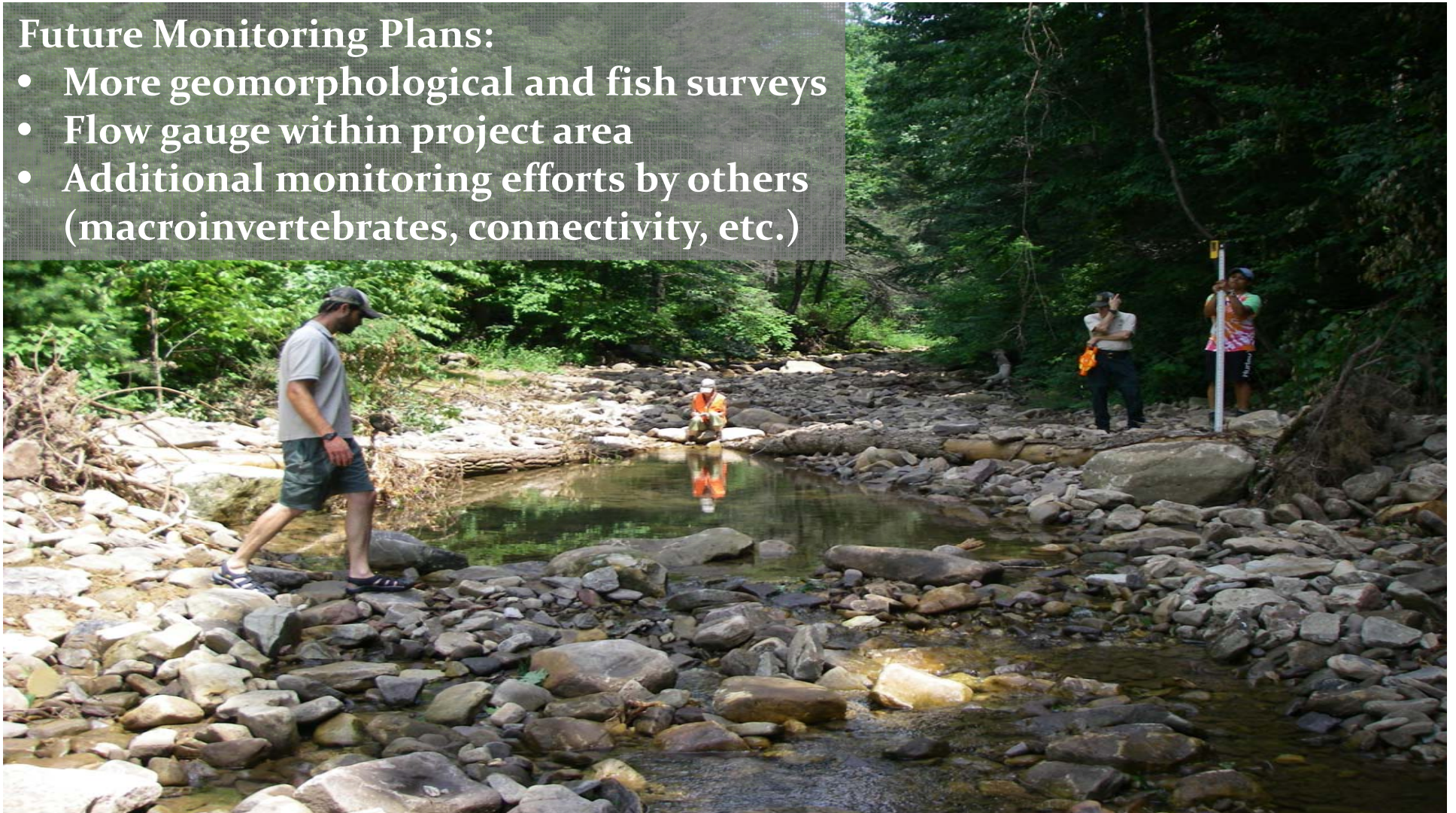


Do fish use the pools?



Future Monitoring Plans:

- More geomorphological and fish surveys
- Flow gauge within project area
- Additional monitoring efforts by others (macroinvertebrates, connectivity, etc.)



- Relocated 3 road sections out of floodplain
- Eliminated 2 crossings
- Installed 2 bottomless arches

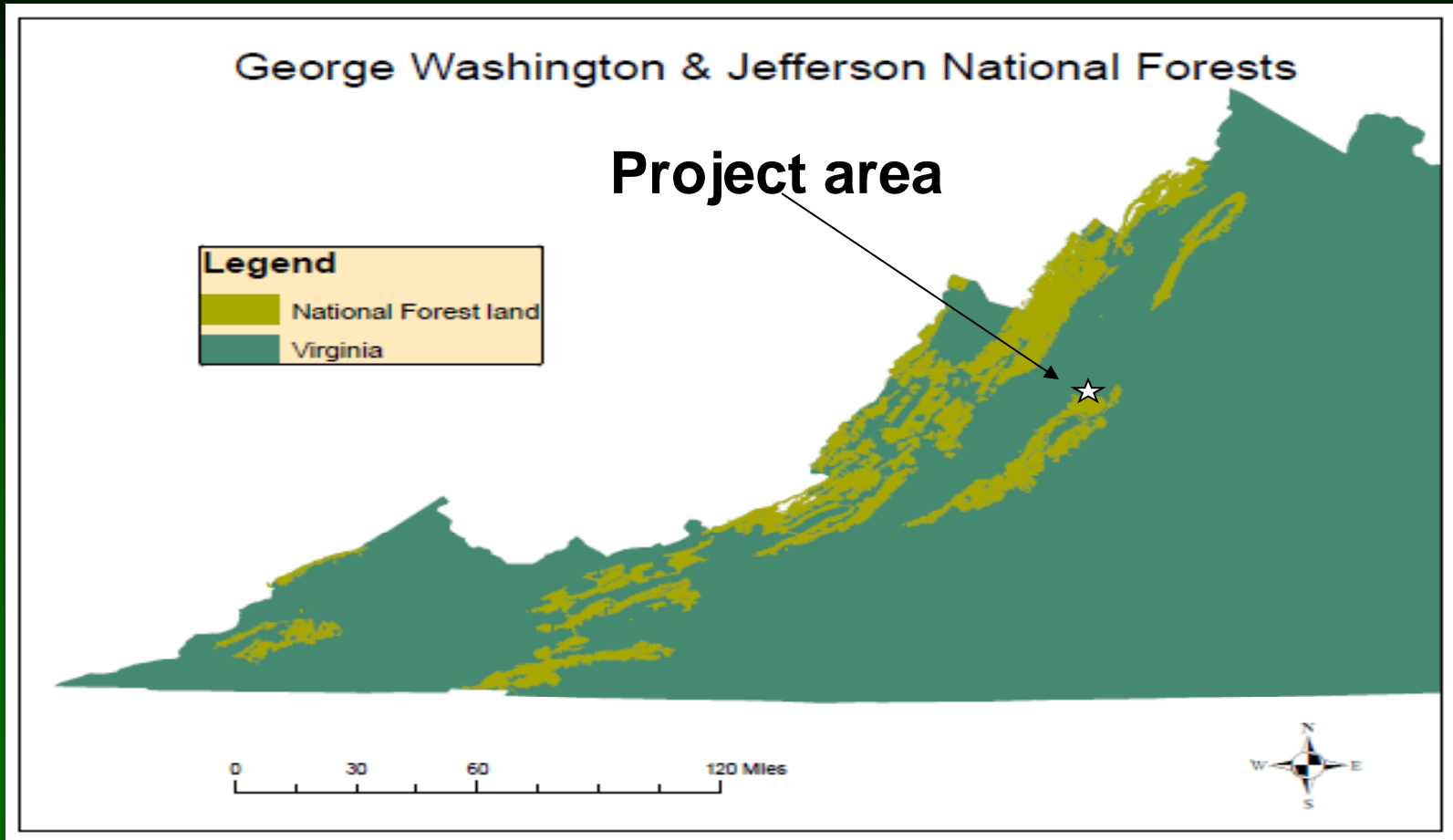


An aerial photograph showing a small aircraft flying over a large, open field. The aircraft is positioned in the upper center of the frame, with a long, thin cable or hose extending downwards from it towards the ground. The field below is mostly brown and appears to be a construction or restoration site, with some equipment and materials visible in the distance. The background consists of a line of bare trees and a clear, blue sky. The text "Chemical Restoration- St. Mary's Liming" is overlaid in yellow on the sky.

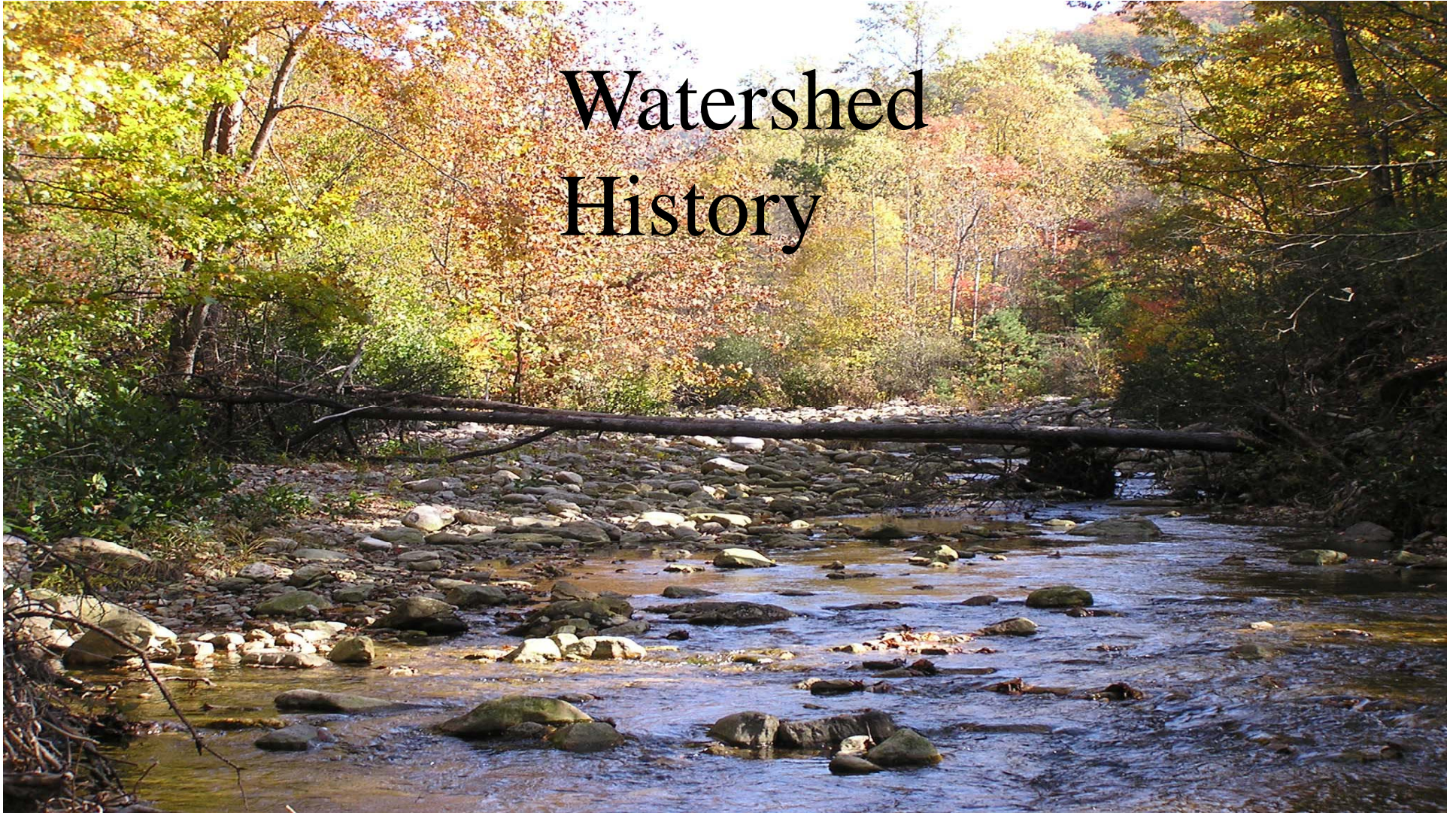
Chemical Restoration- St. Mary's Liming



St. Mary's Aquatic Mitigation

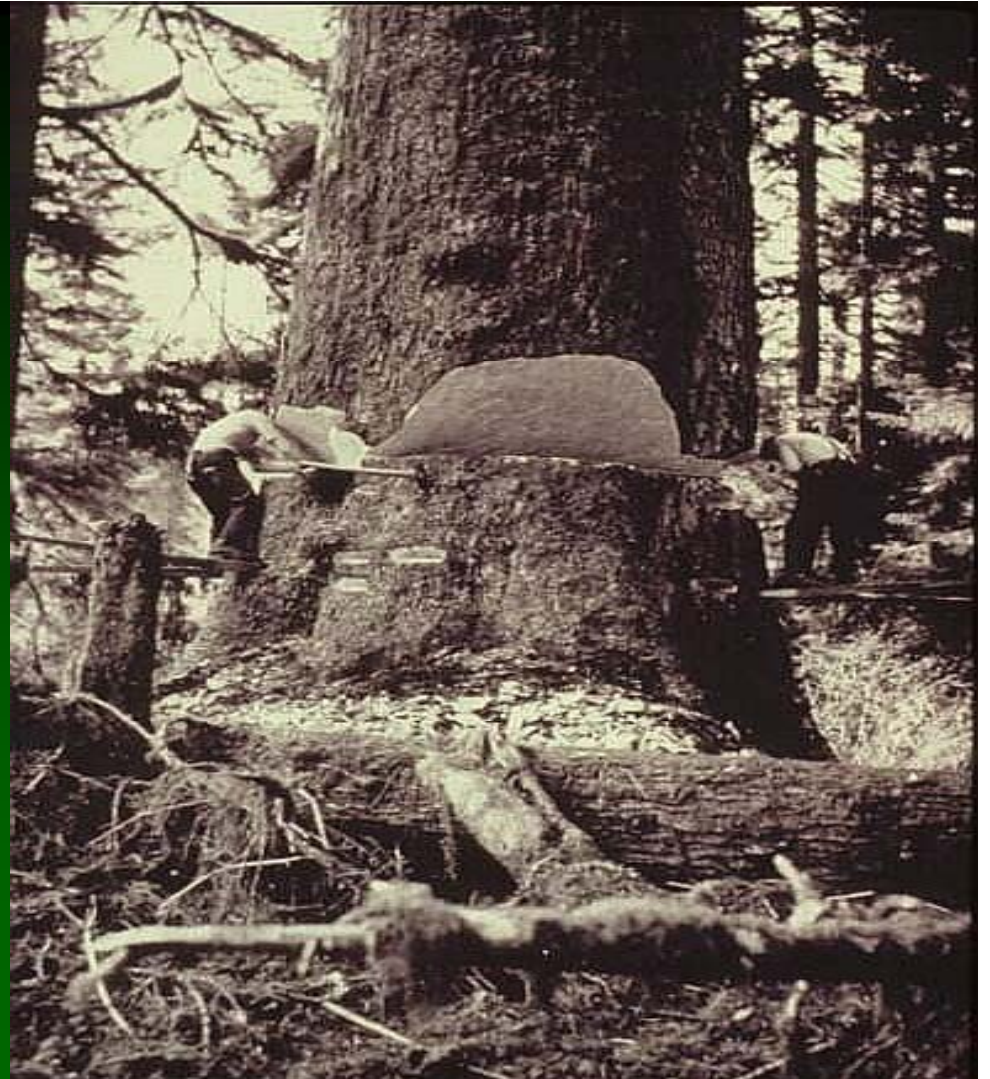


Watershed History





Extensively
logged in the
late 19th and
early 20th
centuries





Manganiferous iron ore extraction from 1910-WWI, WWII

Most of watershed is Antietam Quartzite, but mines are located in a lens of deeply weathered Shady Formation, a Cambrian age dolomite

Manganese deposits of the west foot of the Blue Ridge, Virginia, by G.W. Stose, H.D. Miser, F.J. Katz, D.F. Hewett. Prepared in co-operation with the United States Geological Survey – University of Virginia, 1919

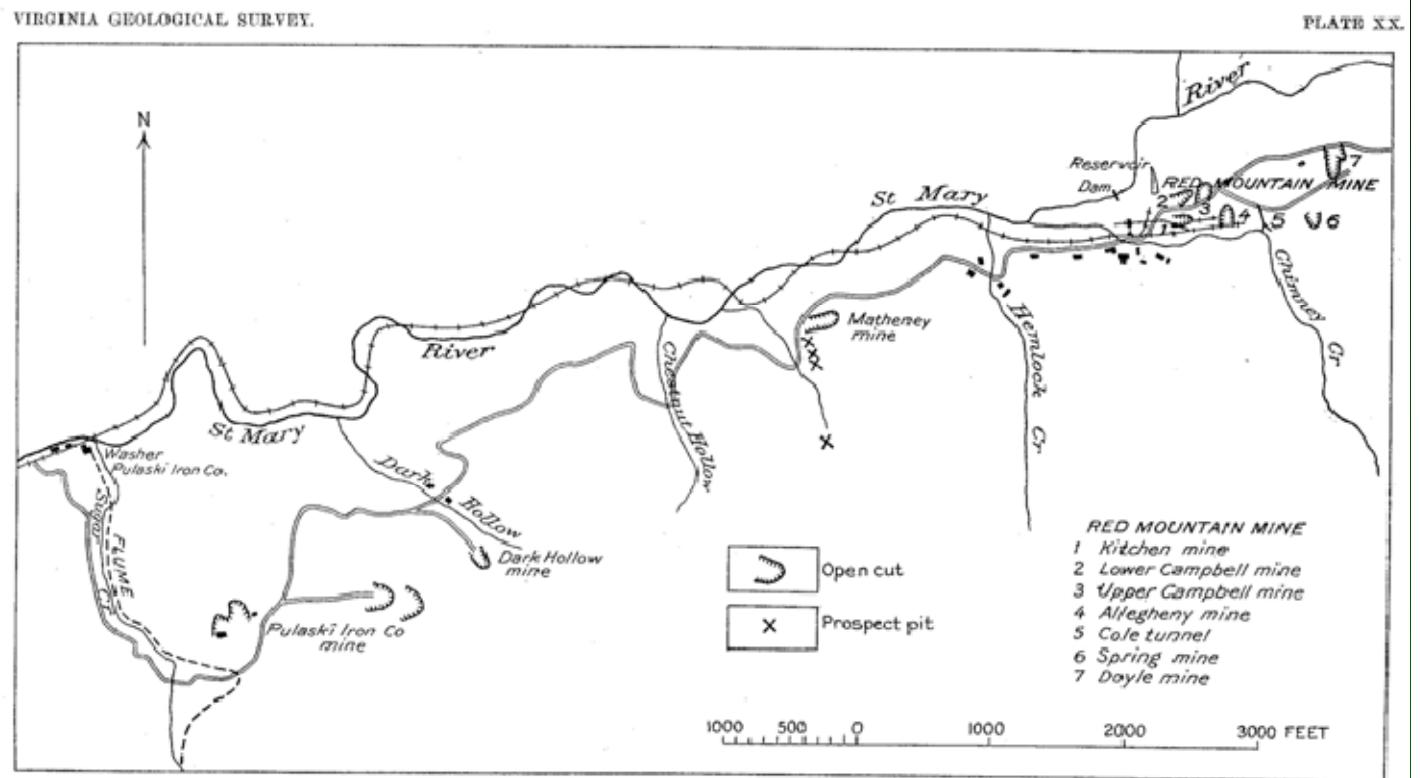


Plate XX.—Map of St. Mary River basin, showing location of Red Mountain and Pulaski mines. Drawn from mine plats by the Union Manganese Corporation.



Part of Big Levels
Game
Management Area
in 1932, where
deer and turkey
were re-
introduced, trout
stocked.



Floods in 1969 and 1972 destroyed fish stocking access; managed as special regulation wild trout stream





**Supported wild brook,
rainbow, and brown
trout**

Federally designated Wilderness Area 1984

Enjoyed widespread support - Seen
as a way to protect the outstanding
aquatic resources





Gypsy moth defoliation



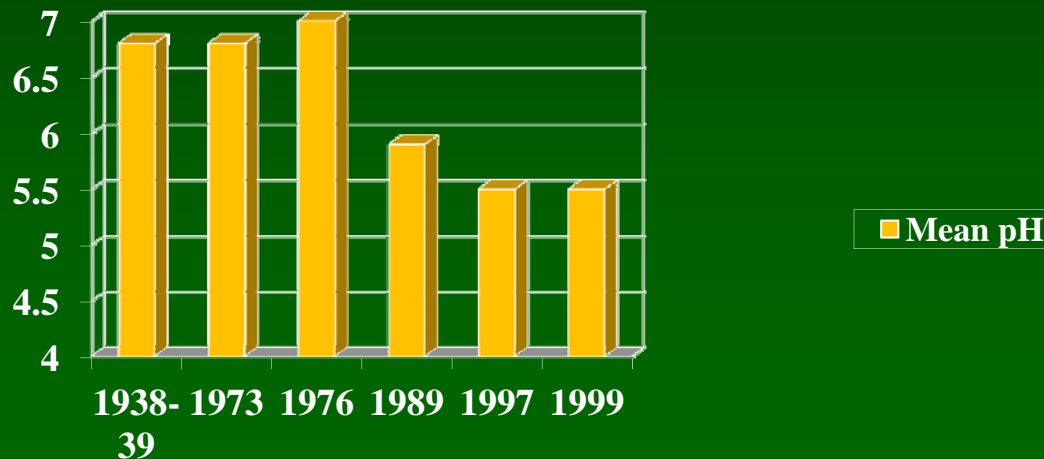
Acid
deposition



The Problem

- Ave rainfall pH is 4.3
- Headwater streams acidifying

St. Marys River Historic and Recent pH Means

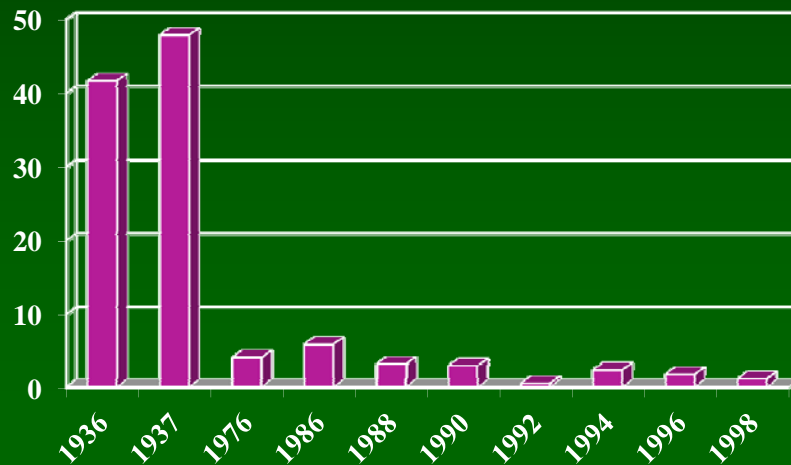




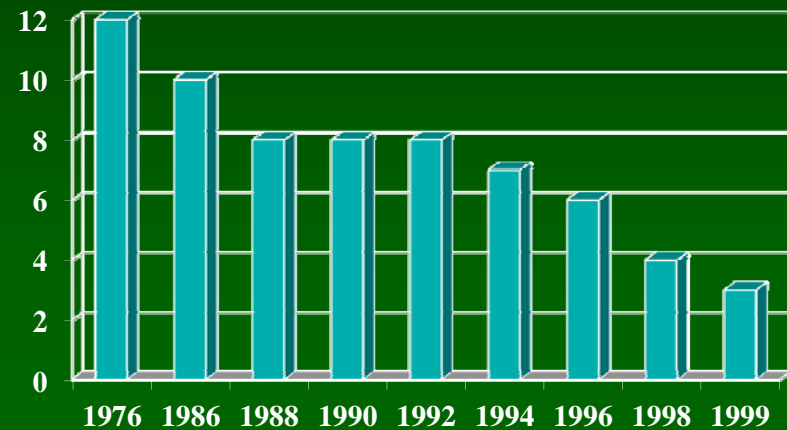
The Problem

- Loss of aquatic life

**St. Marys River
Percent Mayfly Abundance**



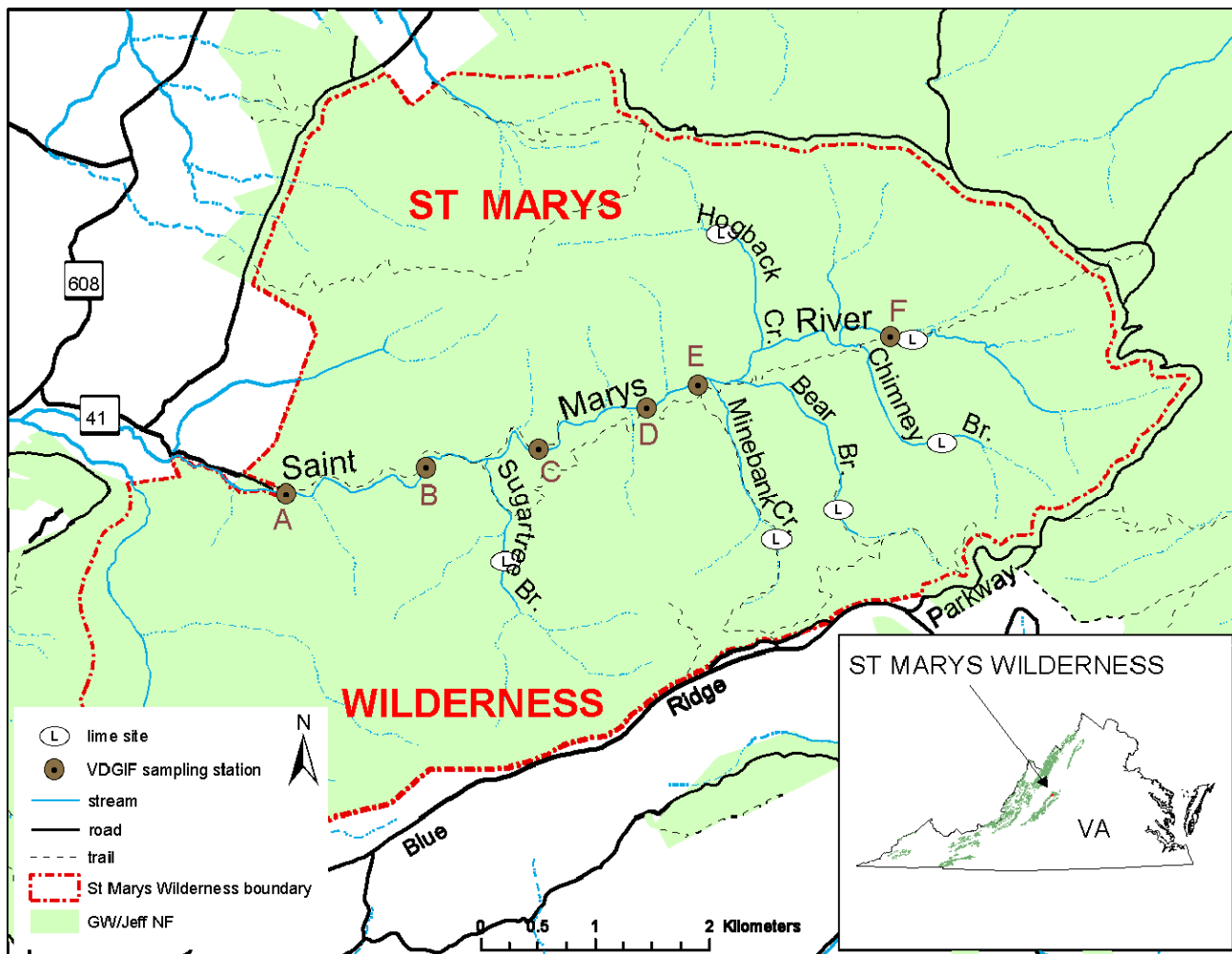
**St. Marys River
Number of Fish Species**





**Proposed Restoration Project
on August 27, 1997**

- To restore the aquatic ecosystem health and biodiversity of the river within the St. Mary's Wilderness using limestone sand





Concerns:

- Designated Wilderness Area
- Limited Access
- Repeat treatment
- Effectiveness

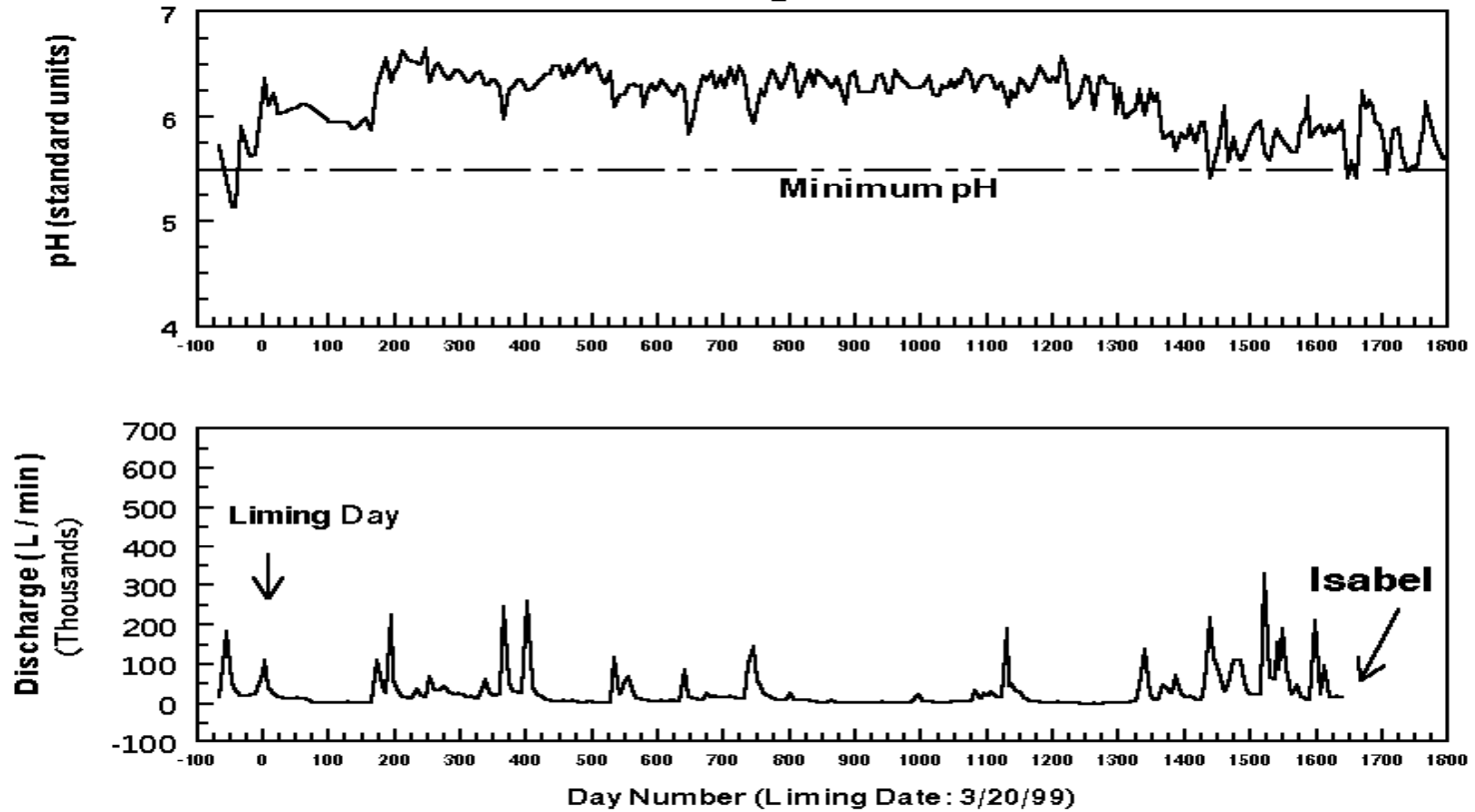
March 1999

- 140 tons limestone sand
- 6 hours

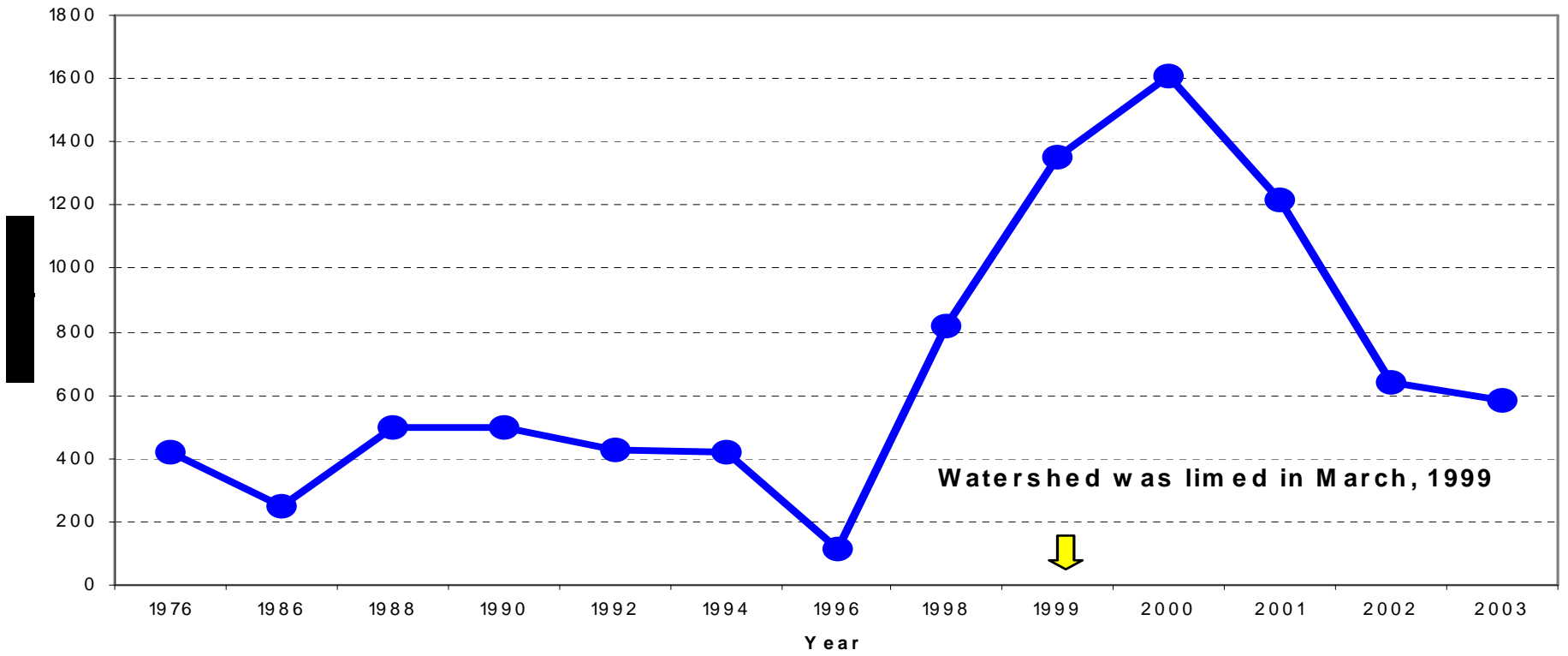


St. Marys River pH and Flow

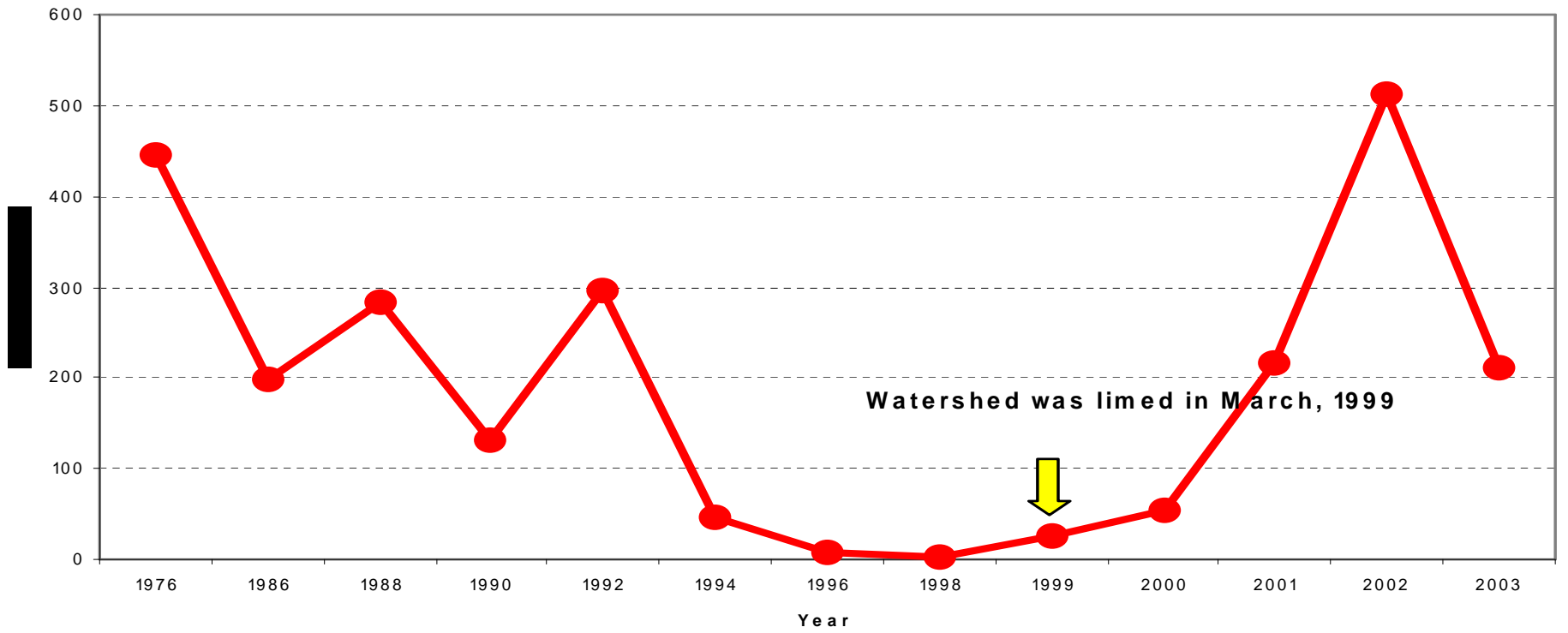
Figure 2



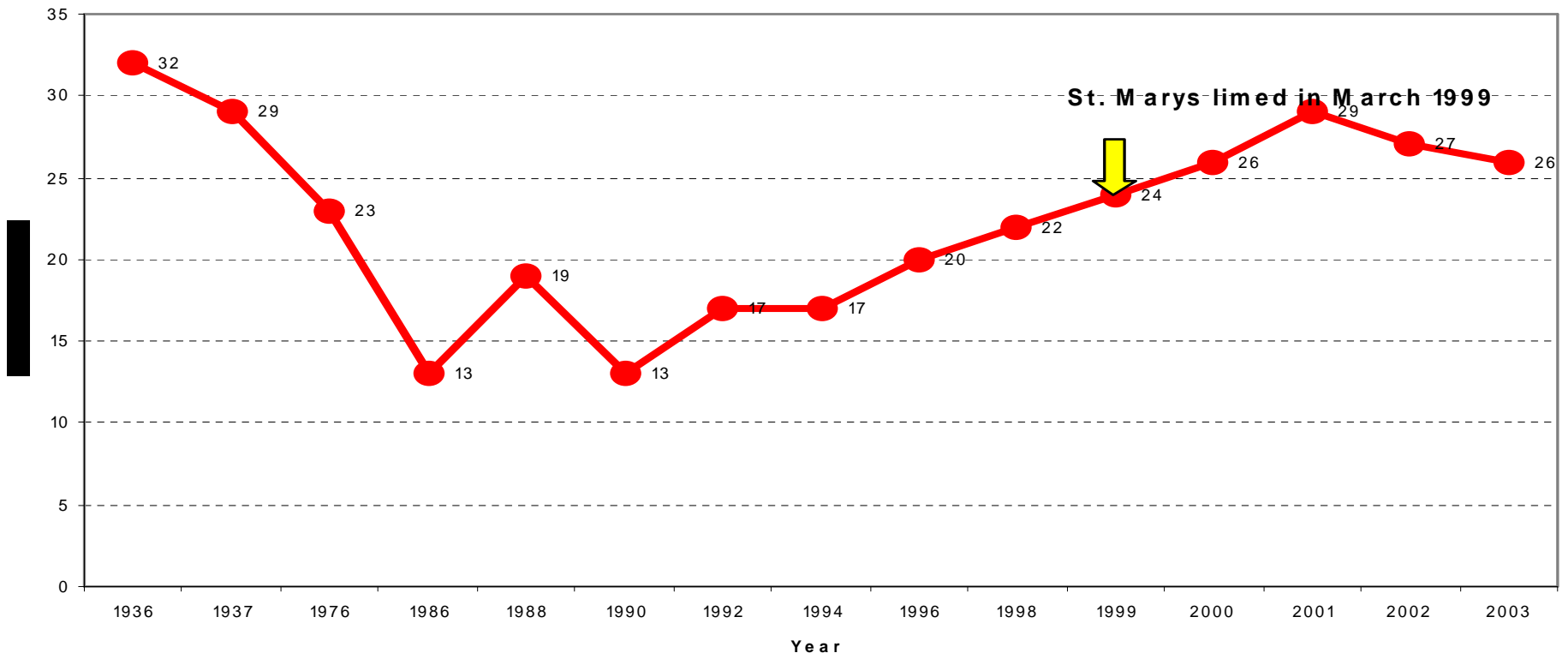
St. Marys Brook Trout Density



St. Marys Blacknose Dace Density



St. Marys Invertebrate Taxa Richness





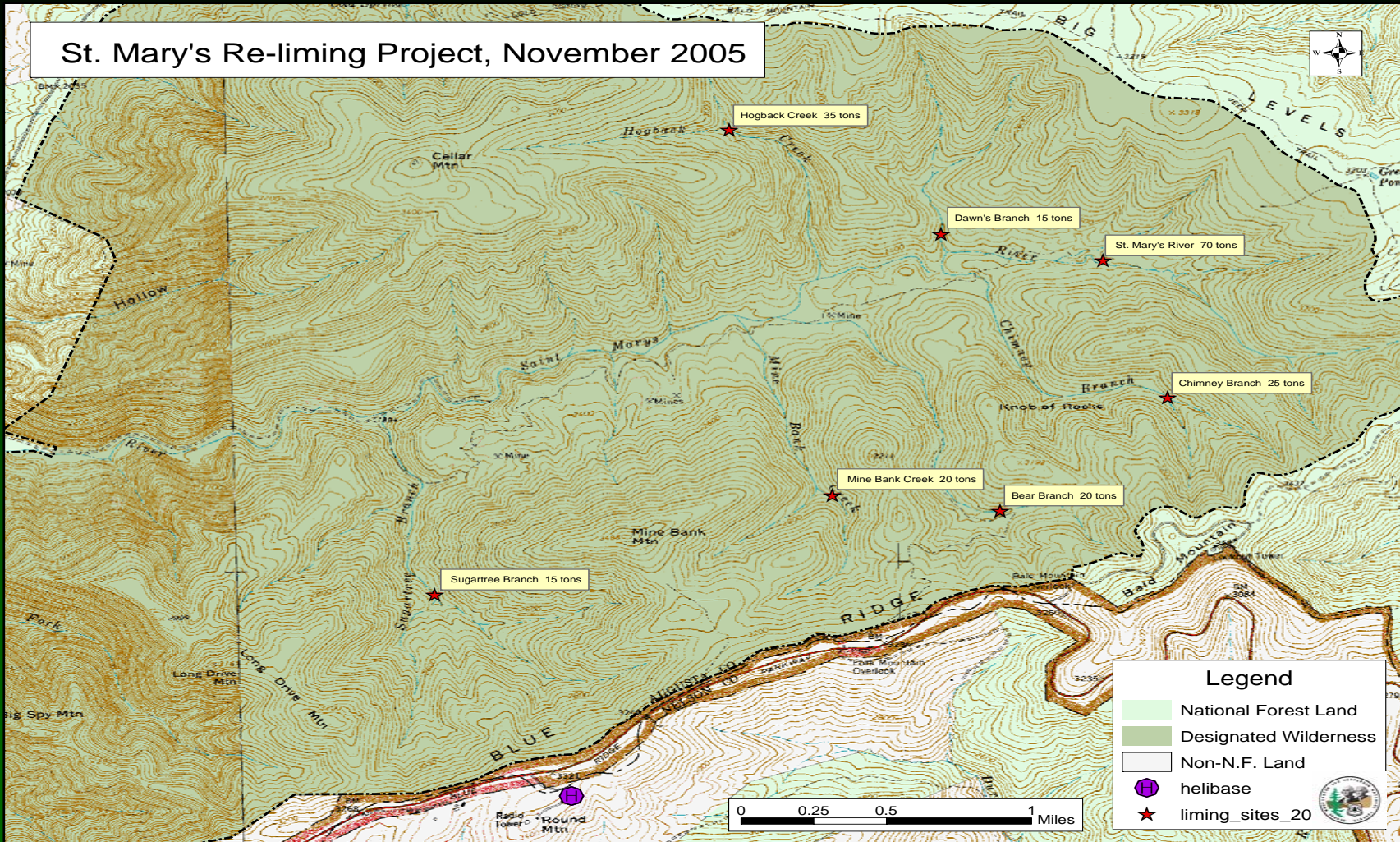
CAMPING and DAY USE
in
ST. MARY'S WILDERNESS
will be **CLOSED**

**from Wednesday, November 2nd
through Friday, November 4th**

**This closure is necessary as a safety
precaution while 200 tons of limestone sand
is applied to selected river branches by
helicopter in an effort to temporarily mitigate
continued acid deposition.**

**For more information, contact the Glenwood
and Pedlar Ranger District office
at (540) 291-2188.**

St. Mary's Re-liming Project, November 2005



Re-limed St. Mary's River and 6 tributaries

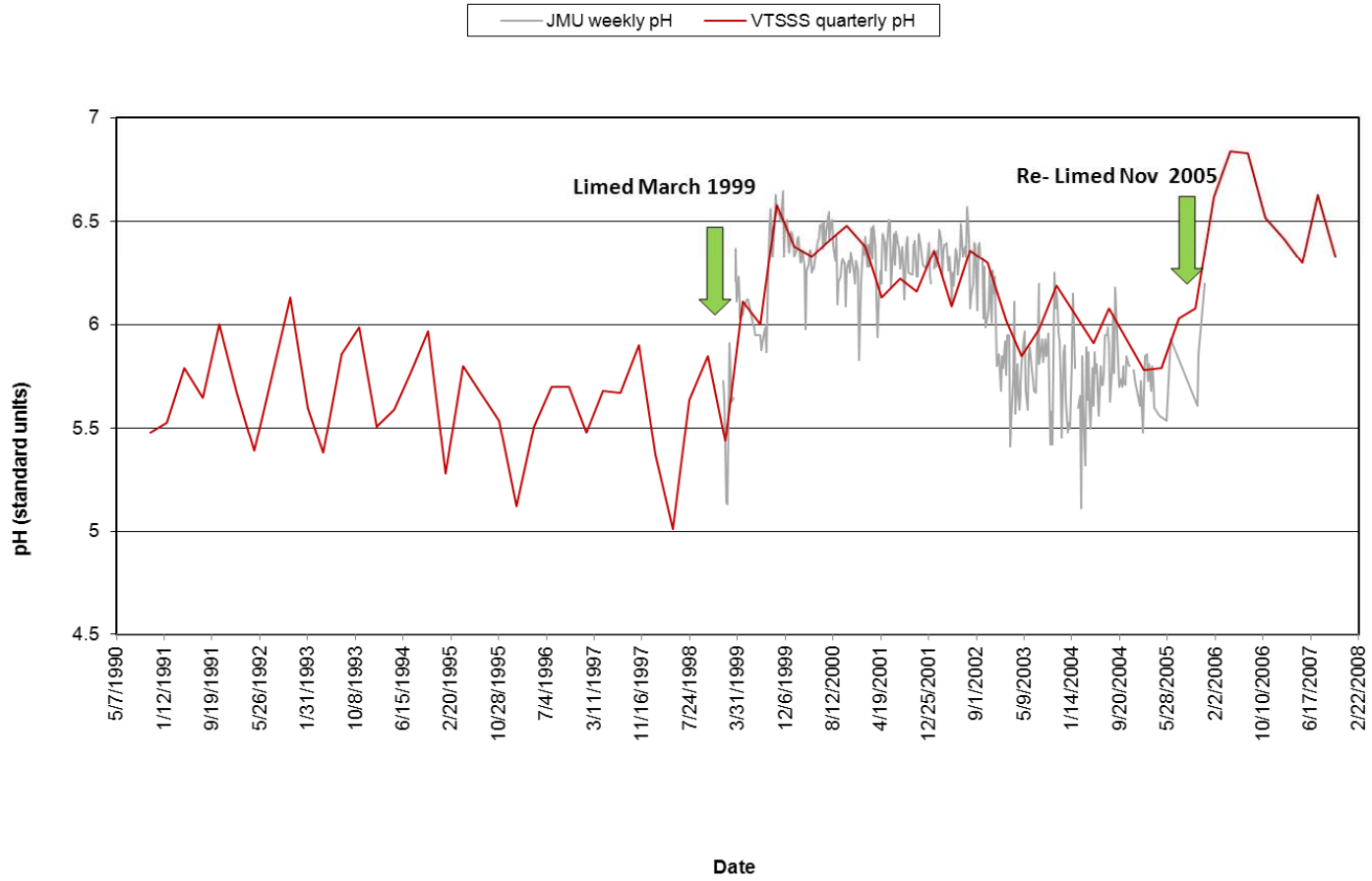
November 3-5, 2005



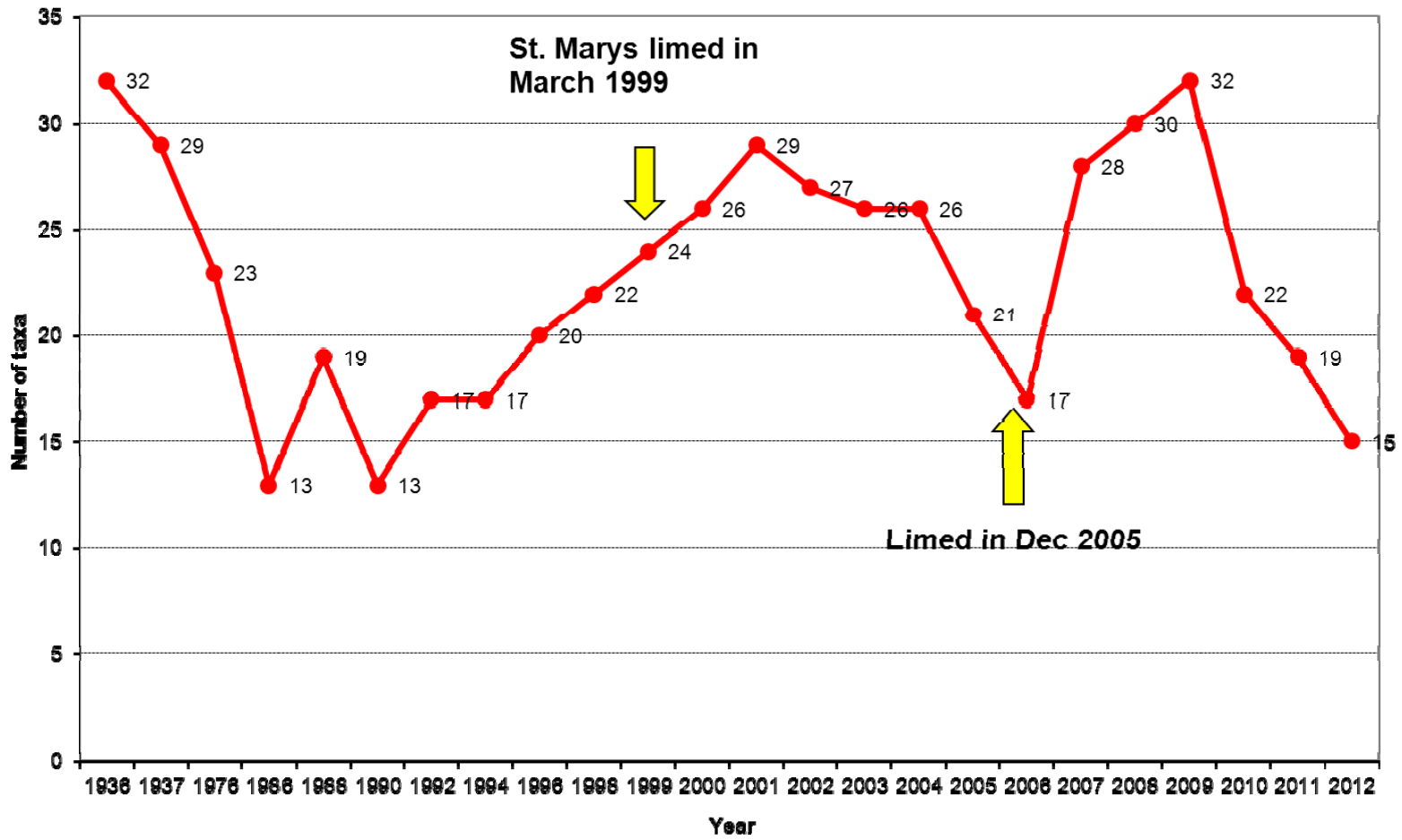
- **200 tons limestone sand**
- **8.5 hours**



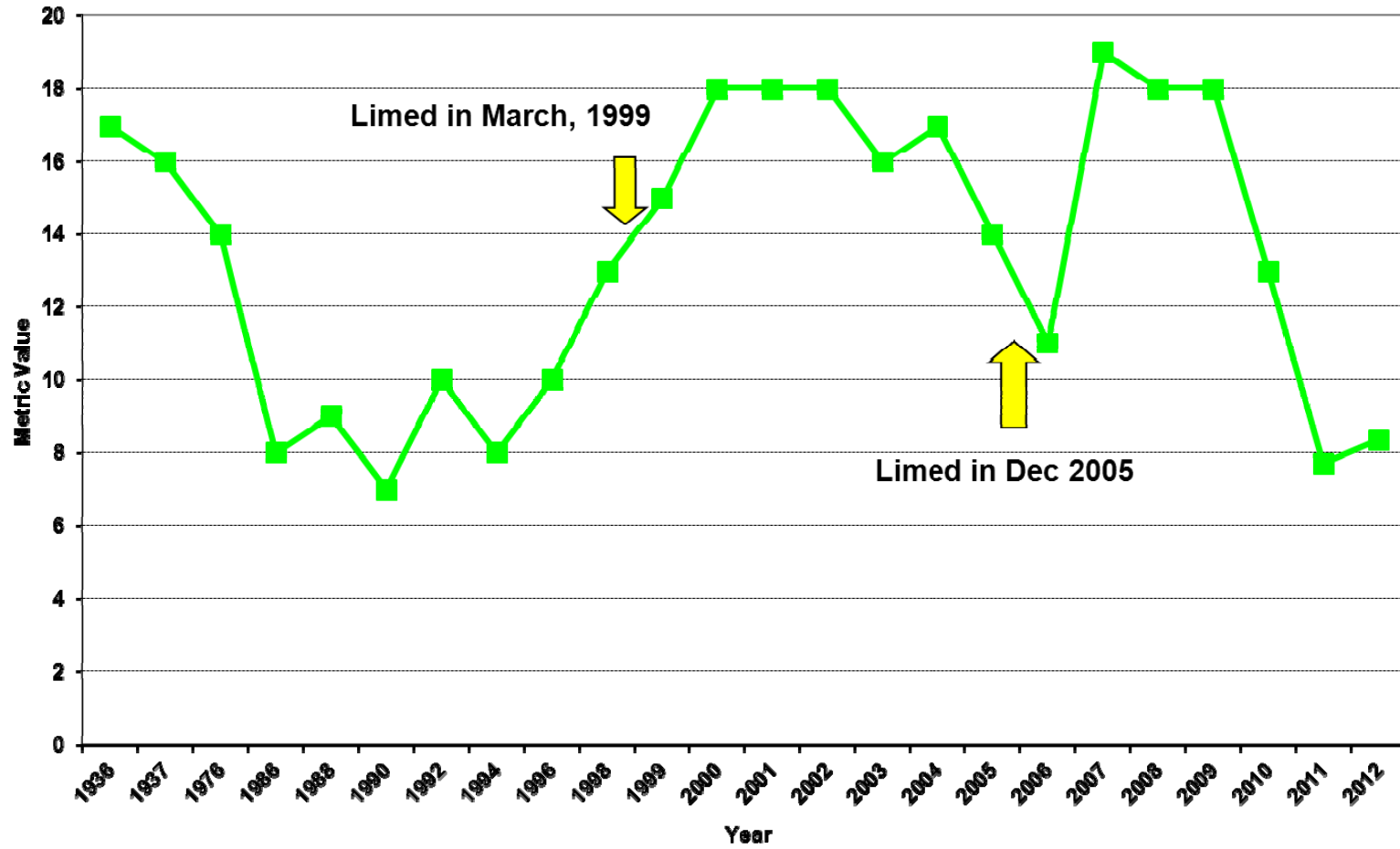
St. Mary's pH 1990 to 2008



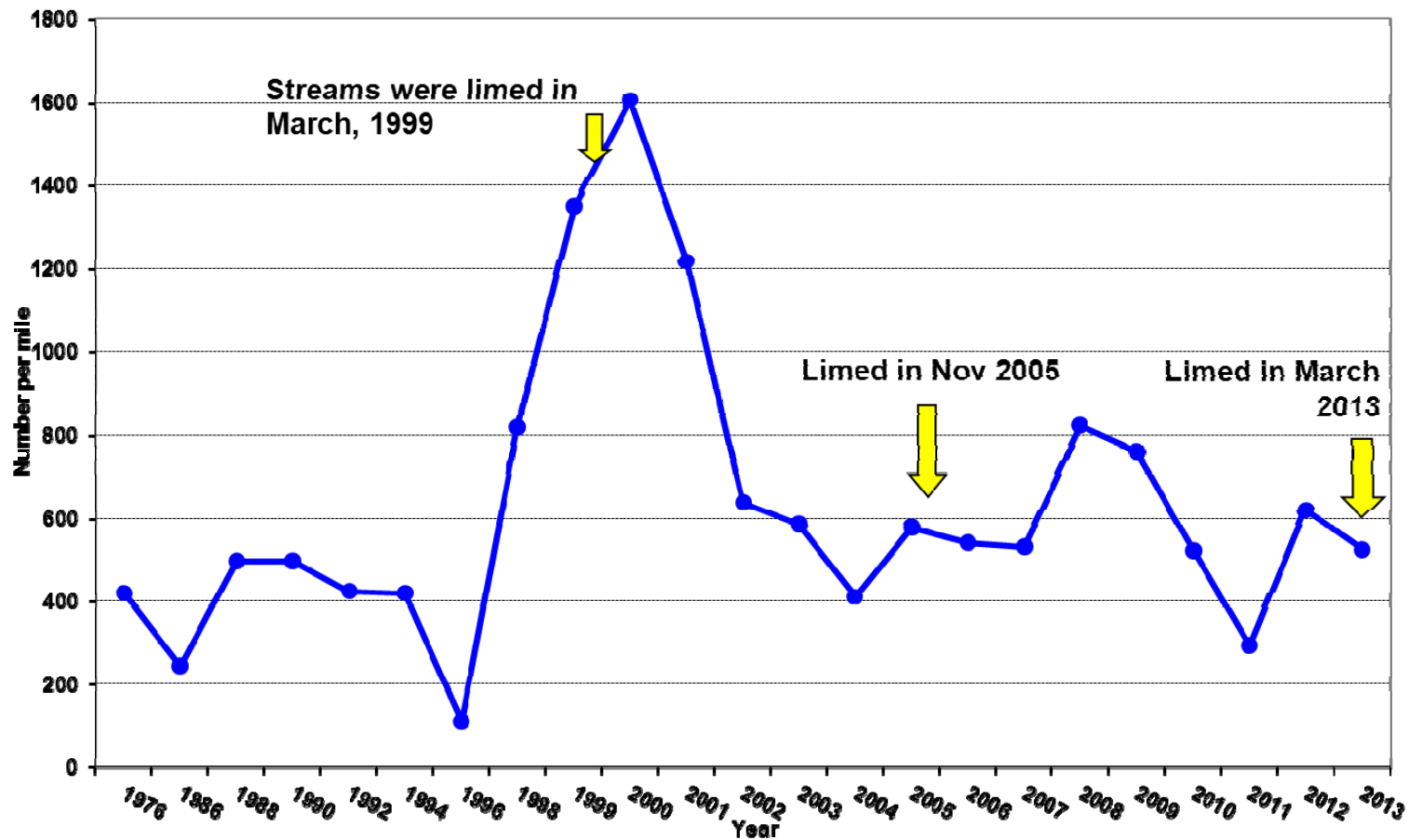
St. Marys Invertebrate Taxa Richness



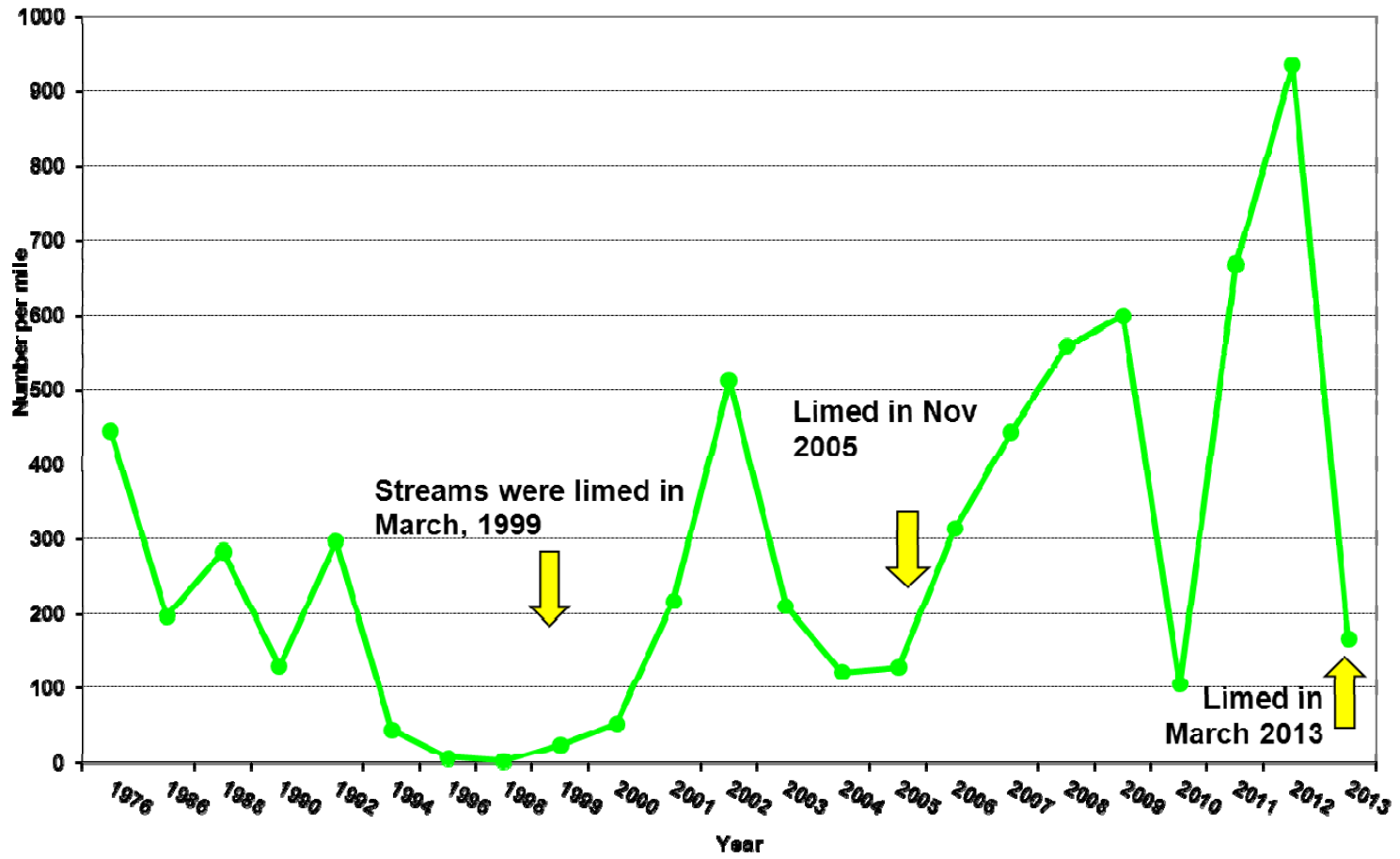
Ephemeroptera/Plecoptera/Trichoptera Index in St. Marys River



St. Marys Brook Trout Density



St. Marys Blacknose Dace Density





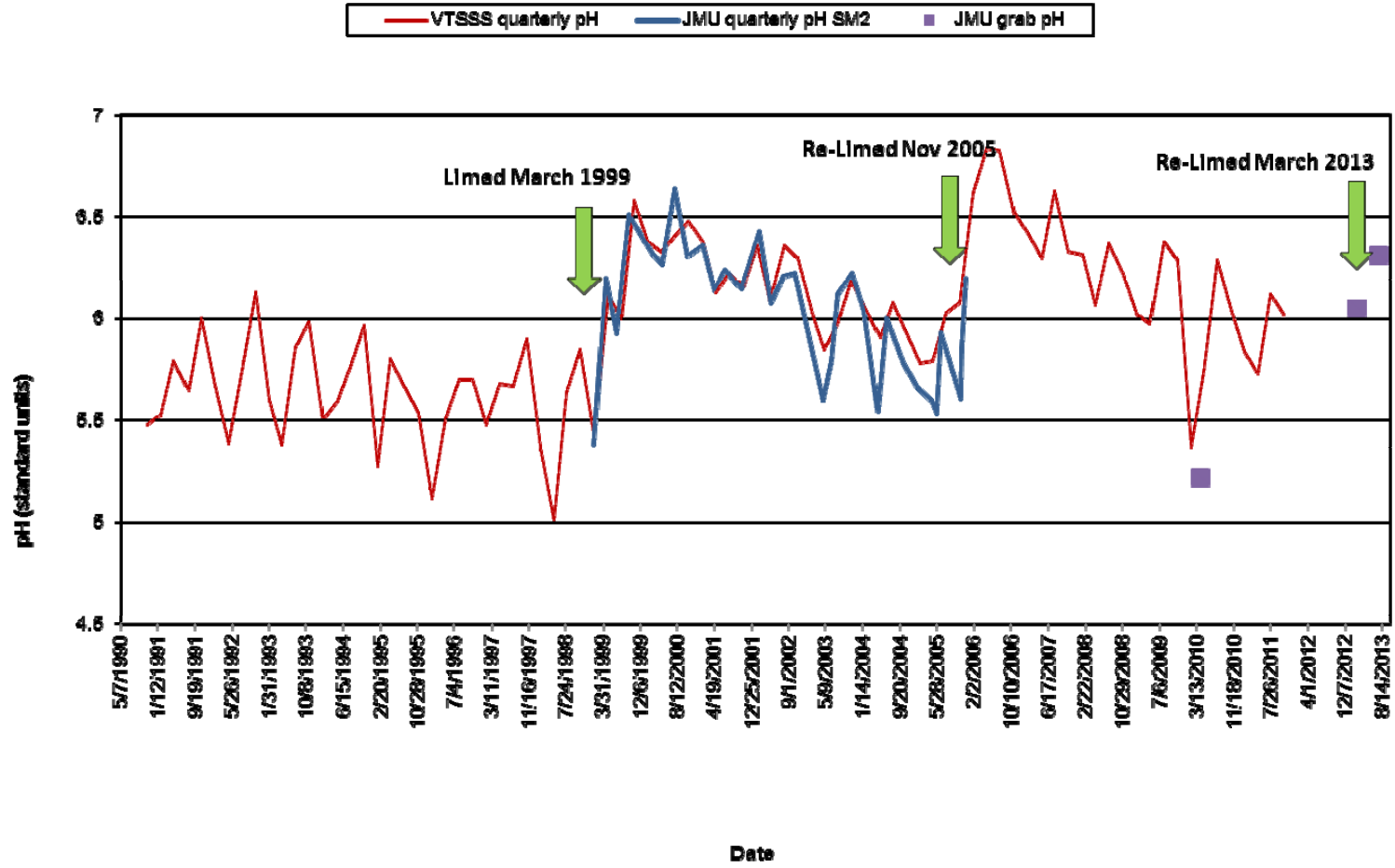
Re-limed St. Mary's River and 6 tributaries

March 4–7, 2013



- **200 tons limestone sand**
- **approximately 32 hours**

St. Mary's pH





1999 Cost

- \$4248 for limestone sand (delivered)
- \$34,270 for helicopter
- \$1,500 for 1 day labor
- **\$40,018**
TOTAL

2005 Cost

- \$7,500 for limestone sand (delivered)
- \$57,500 for helicopter
- \$1,200 for 3 days labor
- **\$66,200**
TOTAL

2013 Cost

- \$15,596 for limestone sand (delivered)
- \$97,500 for helicopter
- \$4,500 for 3 days labor
- **\$117,596**
TOTAL



1999 Benefits

- 12 miles of stream water buffered
- 5 to 8 years worth of treatment
- \$666 per stream mile over 5 years

2005 Benefits

- 14 miles of stream water buffered
- 5 to 8 years worth of treatment
- \$946 per stream mile over 5 years

2013 Benefits

- 14 miles of stream water buffered
- 5 to 8 years worth of treatment
- \$1,680 per stream mile over 5 years



1999

Cooperators

- US Forest Service
- VDGIF
- JMU
- National Fish & Wildlife Foundation
- Dominion Power
- Fly Fishers of VA
- Blue Ridge Parkway
- Skylark Farm (W&L)

2005

Cooperators

- US Forest Service
- VDGIF
- JMU
- Dominion Power
- Trout Unlimited
- Fly Fishers of VA
- Blue Ridge Parkway
- Skylark Farm (W&L)

2013

Cooperators

- US Forest Service
- VDGIF
- JMU
- Dominion Power
- Trout Unlimited
- USFWS (Eastern Brook Trout Joint Venture)
- Blue Ridge Parkway
- Skylark Farm



Thank you for data and pictures!

- Dan Downey - JMU
- Paul Bugas - VDGIF
- Steve Reeser - VDGIF
- Louise Finger - VDGIF
- Rick Webb- VTSSS/UVA