

Virginia District Programs in the Northern Shenandoah Valley

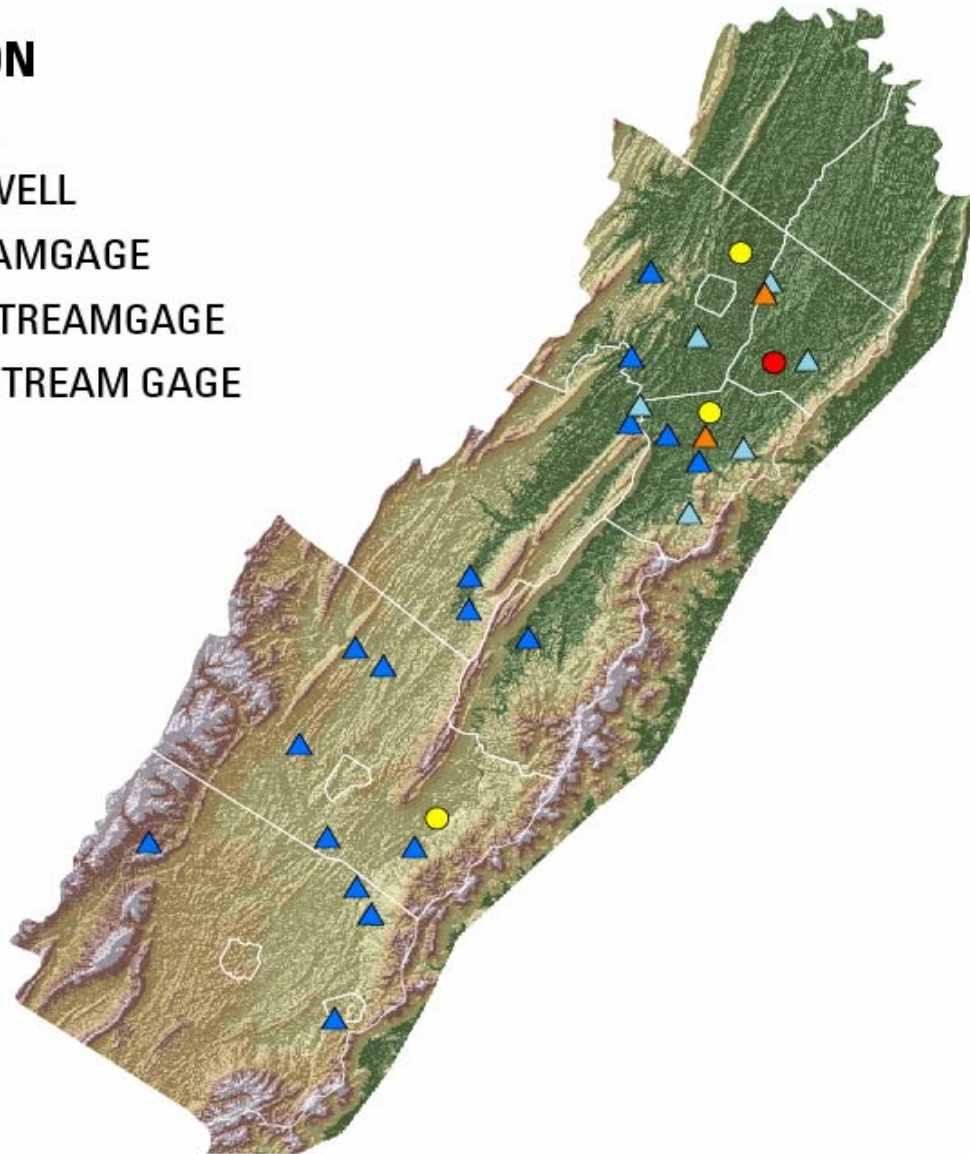


U.S. Department of the Interior
U.S. Geological Survey

Real-Time Water-Data Network

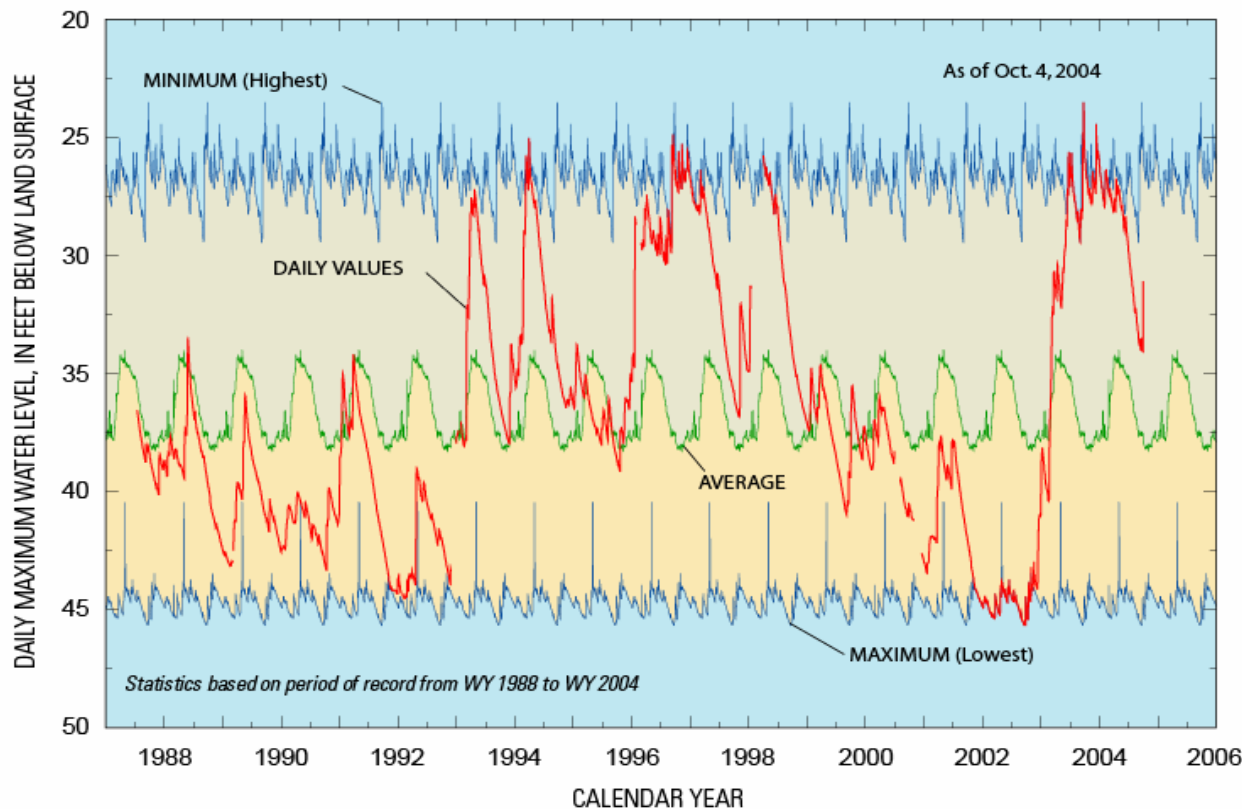
EXPLANATION

- NEW WELL
- EXISTING WELL
- ▲ NEW STREAMGAGE
- ▲ PROJECT STREAMGAGE
- ▲ EXISTING STREAM GAGE



Long-Term Monitoring Program (Ground Water)

46W175 Blandy Farm Observation Well



PROVISIONAL DATA SUBJECT TO REVISION

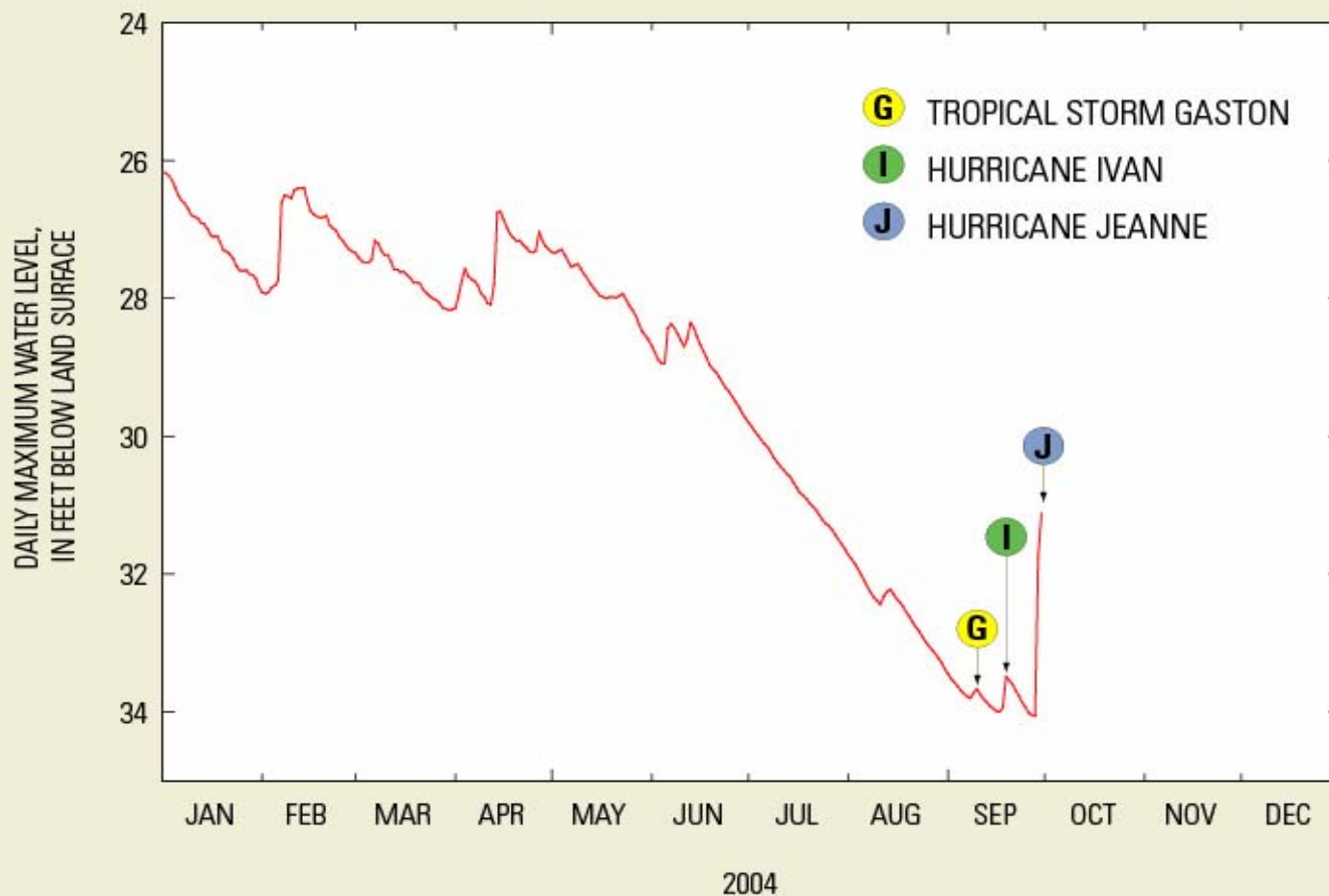
Internet Access:

Real Time Water Levels: <http://waterdata.usgs.gov/va/rwis/current/?type=gw>

Ground Water Climate Response Network: <http://groundwaterwatch.usgs.gov/>

Long-Term Monitoring Program (Ground Water)

46W175 Blandy Farm Observation Well



Drought Analysis

Wet Conditions



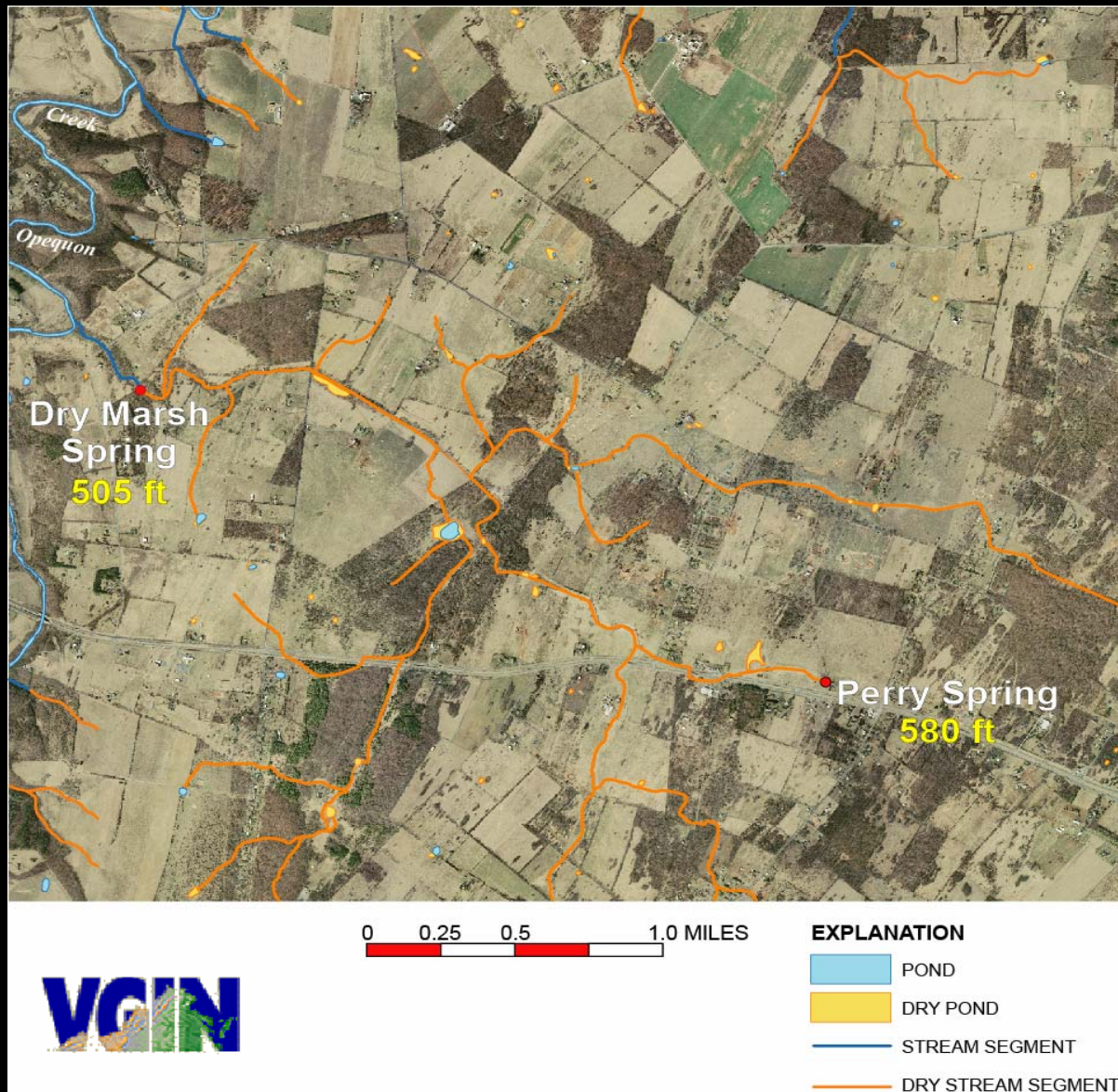
1997 Aerial Photography
1in. : 200ft

Drought Conditions



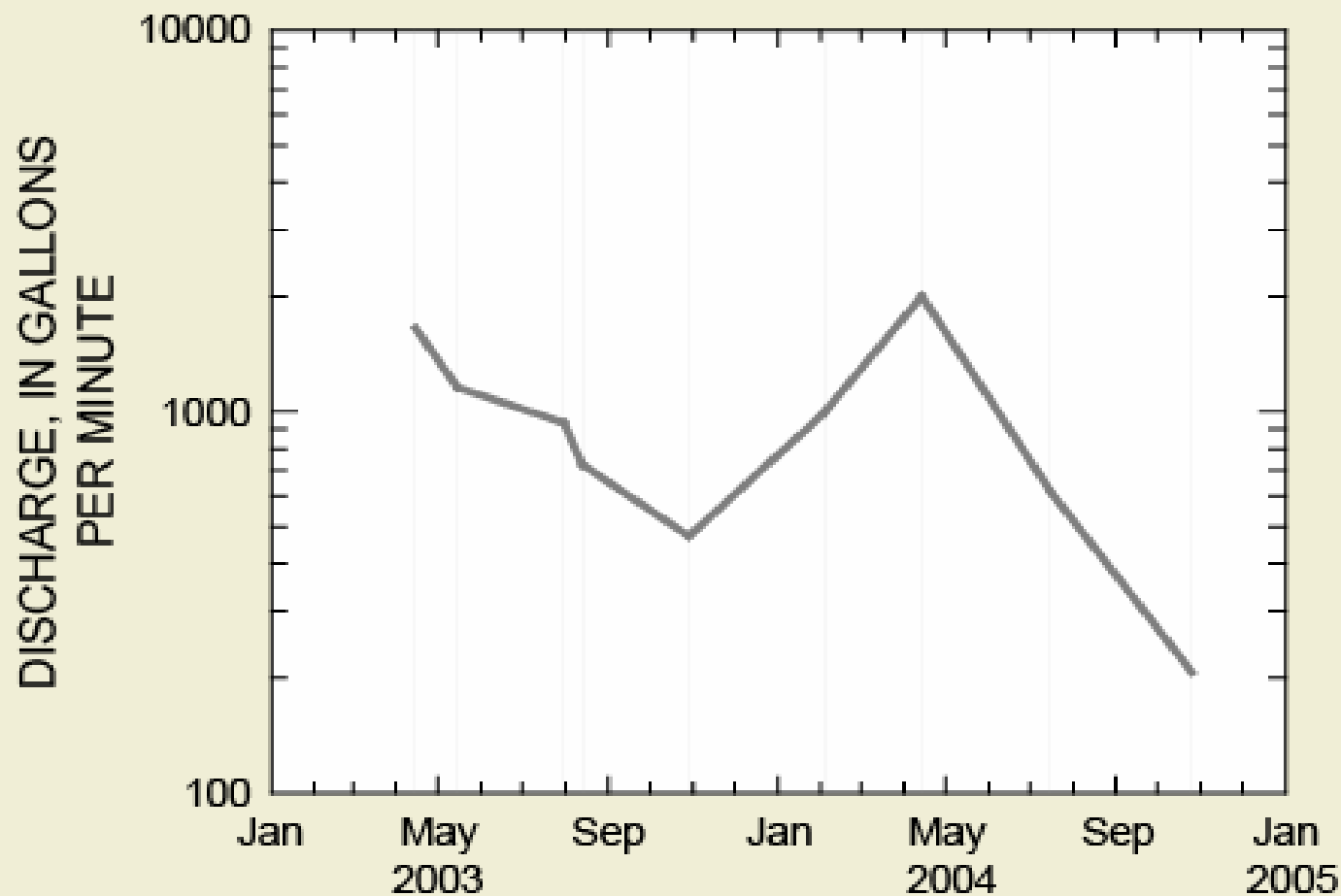
2002 Aerial Photography
1in. : 200ft

Drought Analysis



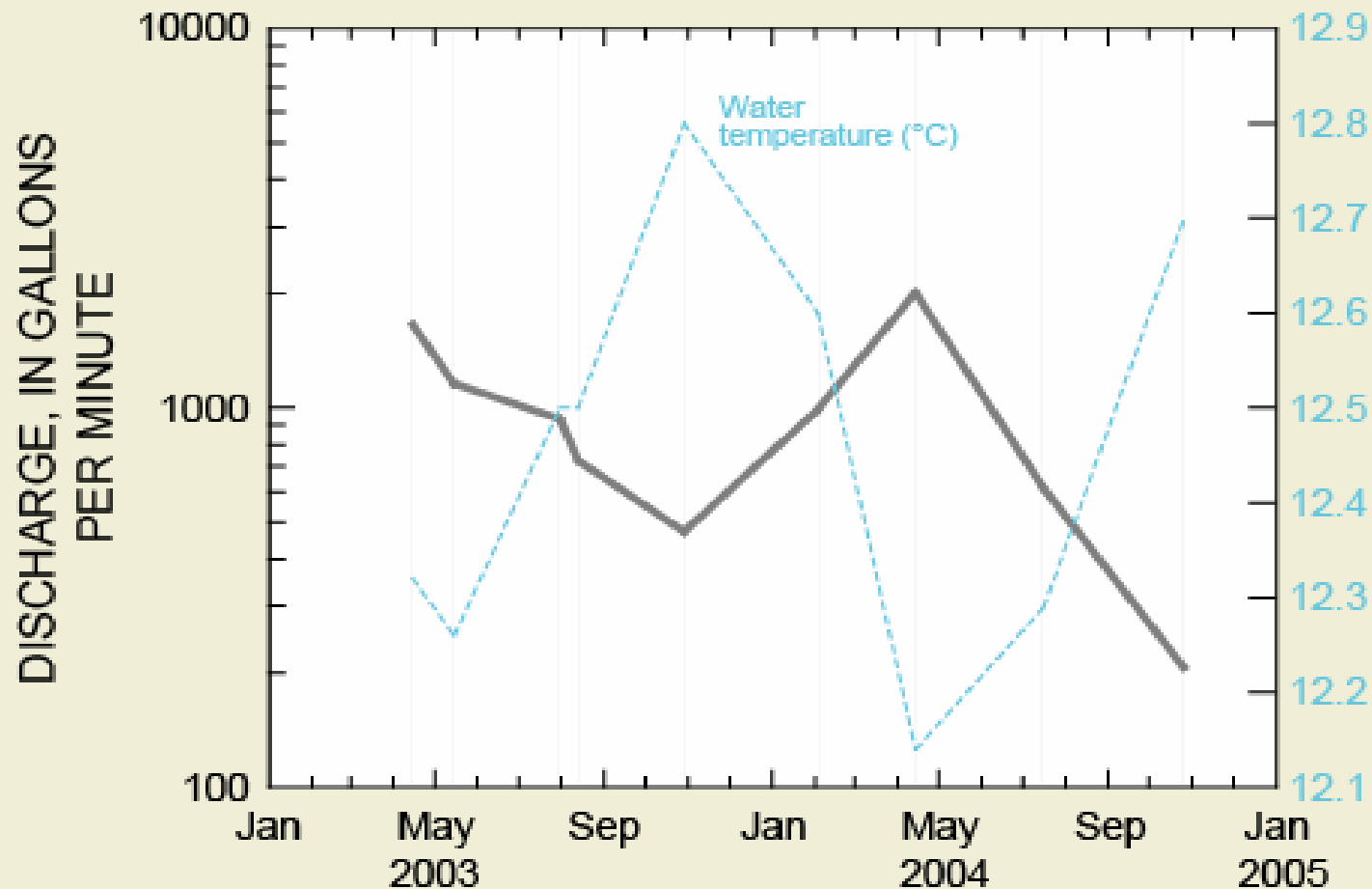
Perry Spring in Clarke County

(Quarterly measurements)



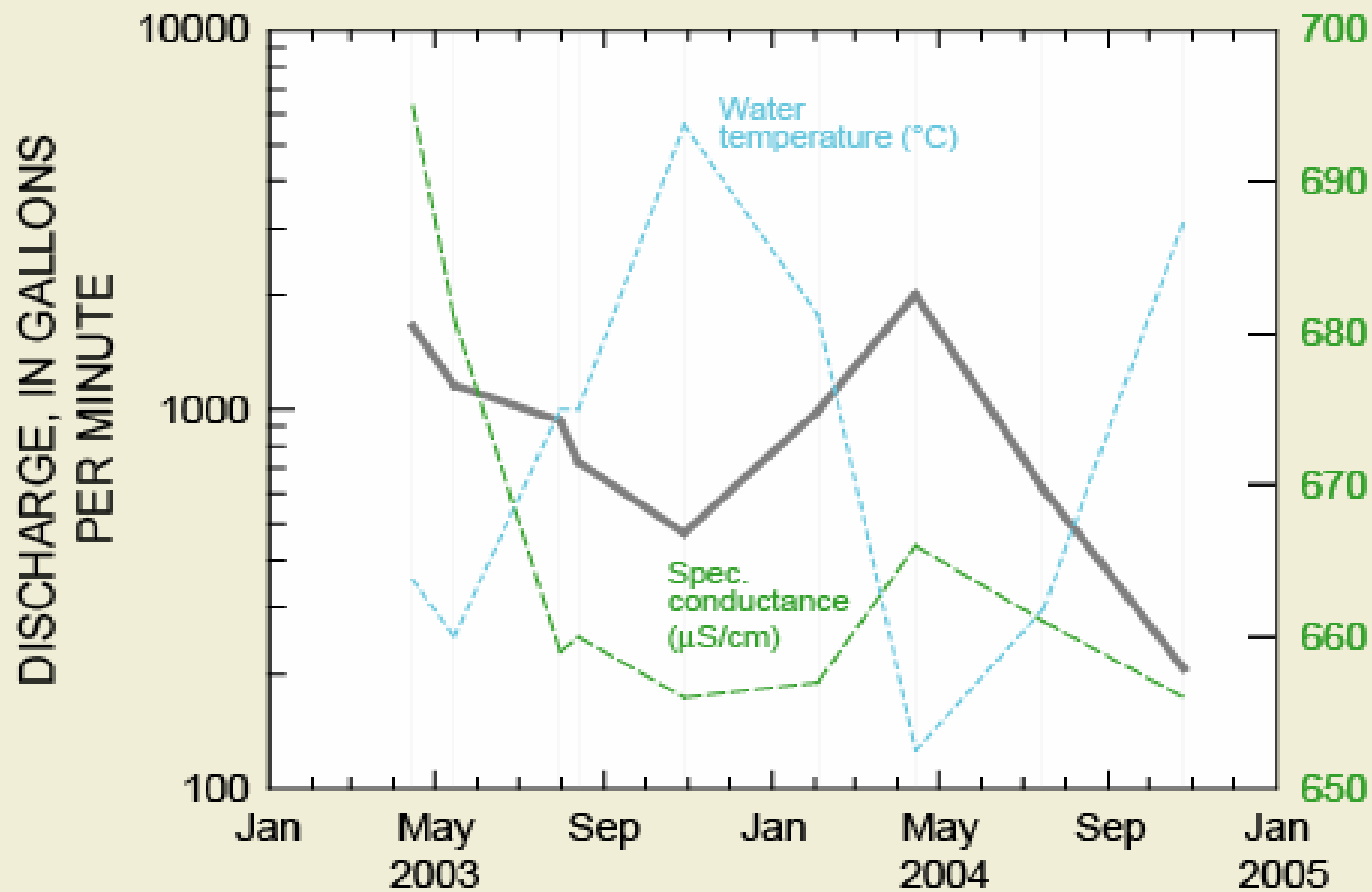
Perry Spring in Clarke County

(Quarterly measurements)



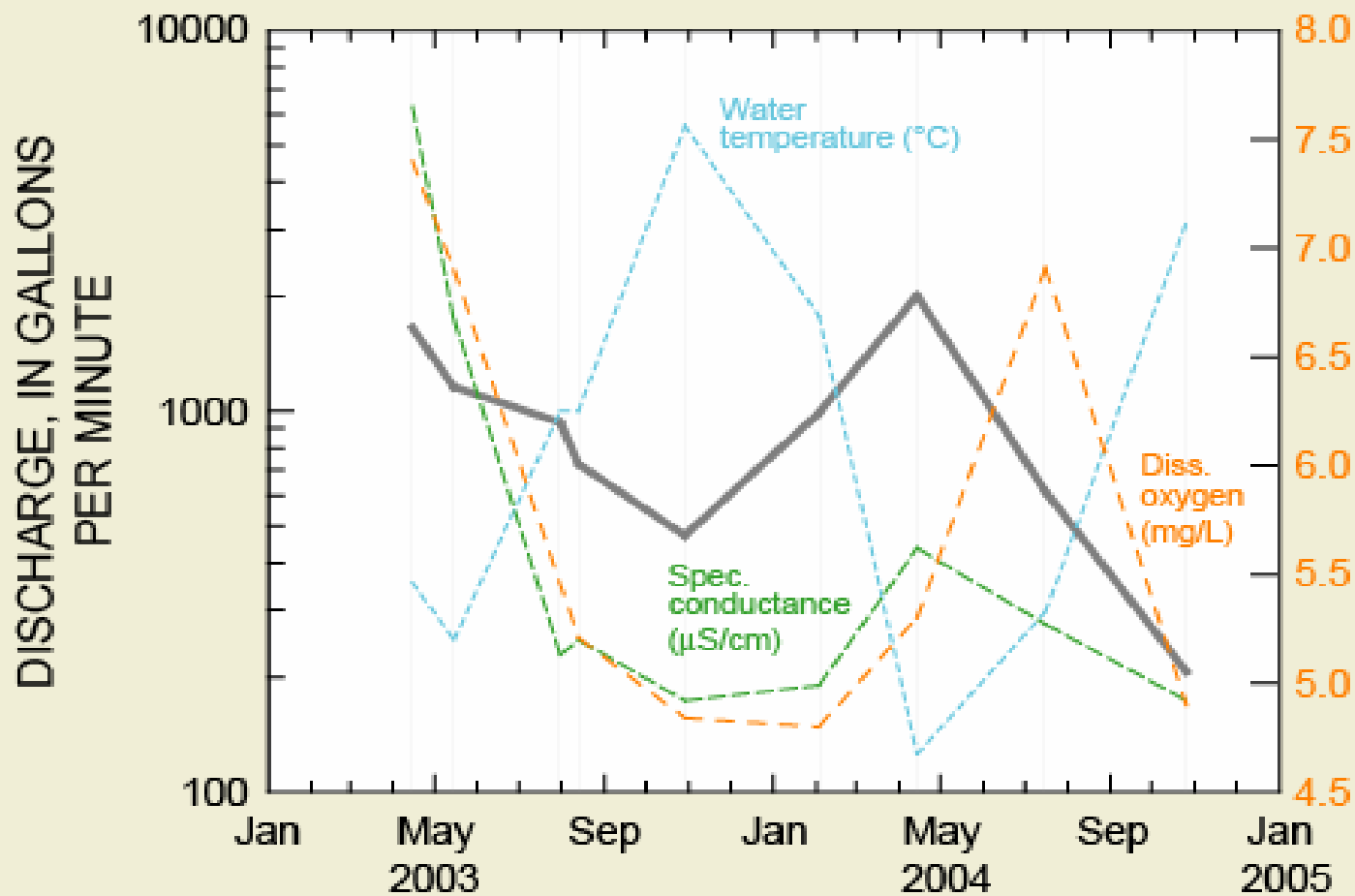
Perry Spring in Clarke County

(Quarterly measurements)



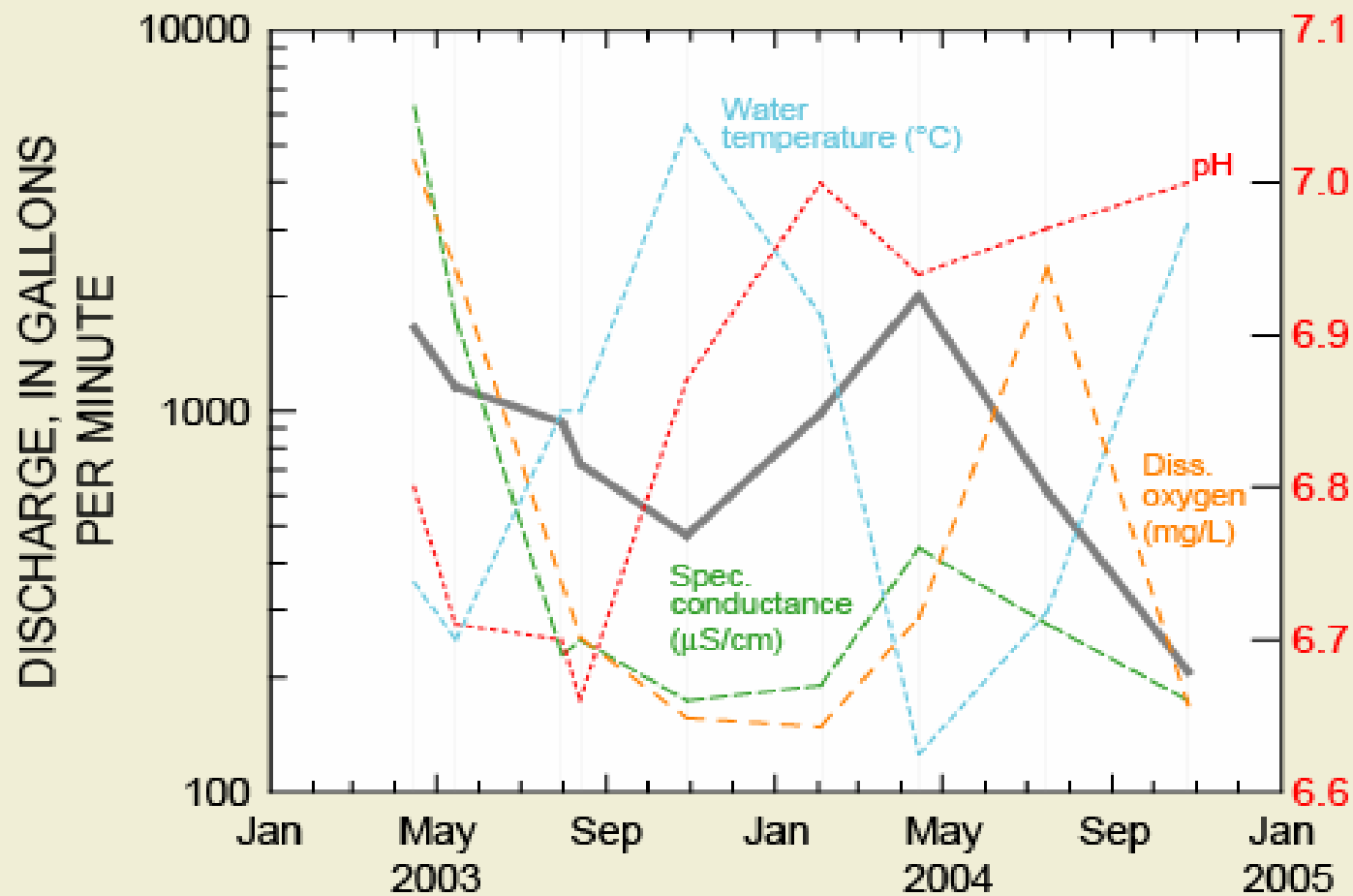
Perry Spring in Clarke County

(Quarterly measurements)



Perry Spring in Clarke County

(Quarterly measurements)



Ground-Water-Age Dating: Perry Spring

Tritium (^3H)	7.5 \pm 0.5	TU
Helium (2.1)	4.3	NanoMol/L
Hydrogen (0.4)	2.4	NanoMol/L
Neon (9)	12.2	NanoMol/L
Deuterium	-53.1	per mil
Oxygen-18	-8.4	per mil
dExcess	13.8	per mil

Oxygen, diss.	5.2	mg/L
pH	6.7	
Spec. Cond	659	$\mu\text{S/cm}$
Water Temp	12.5	Celsius
Rech Temp	9.5	Celsius
Excess air	5.2	cc STP/L
Rech Elev	560	ft above Sea Level

3.0

EXPLANATION

— Piston Flow

Binary mixture of old (pre-CFC) with

--- 1980

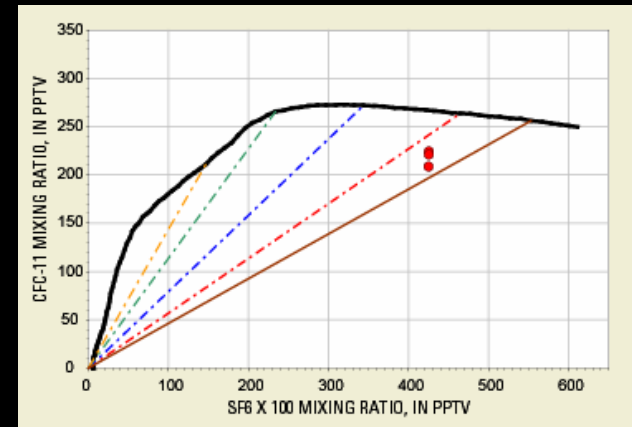
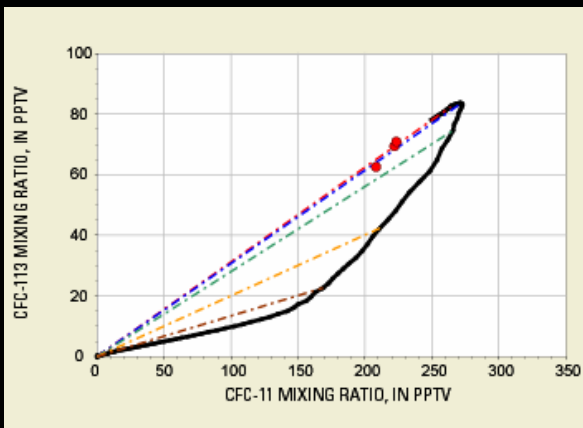
--- 1985

--- 1990

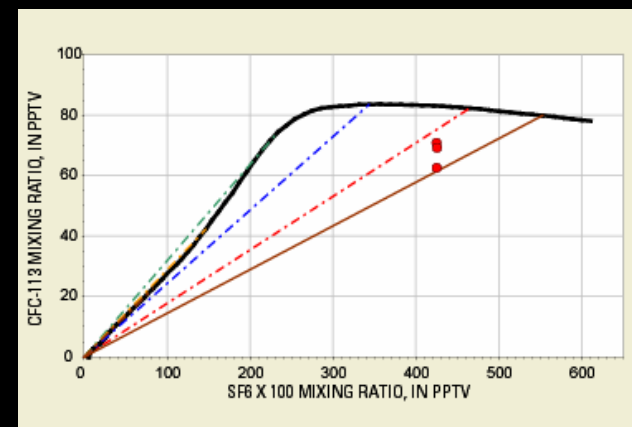
--- 1995

--- 2000

--- 2003.5 (Sample period)



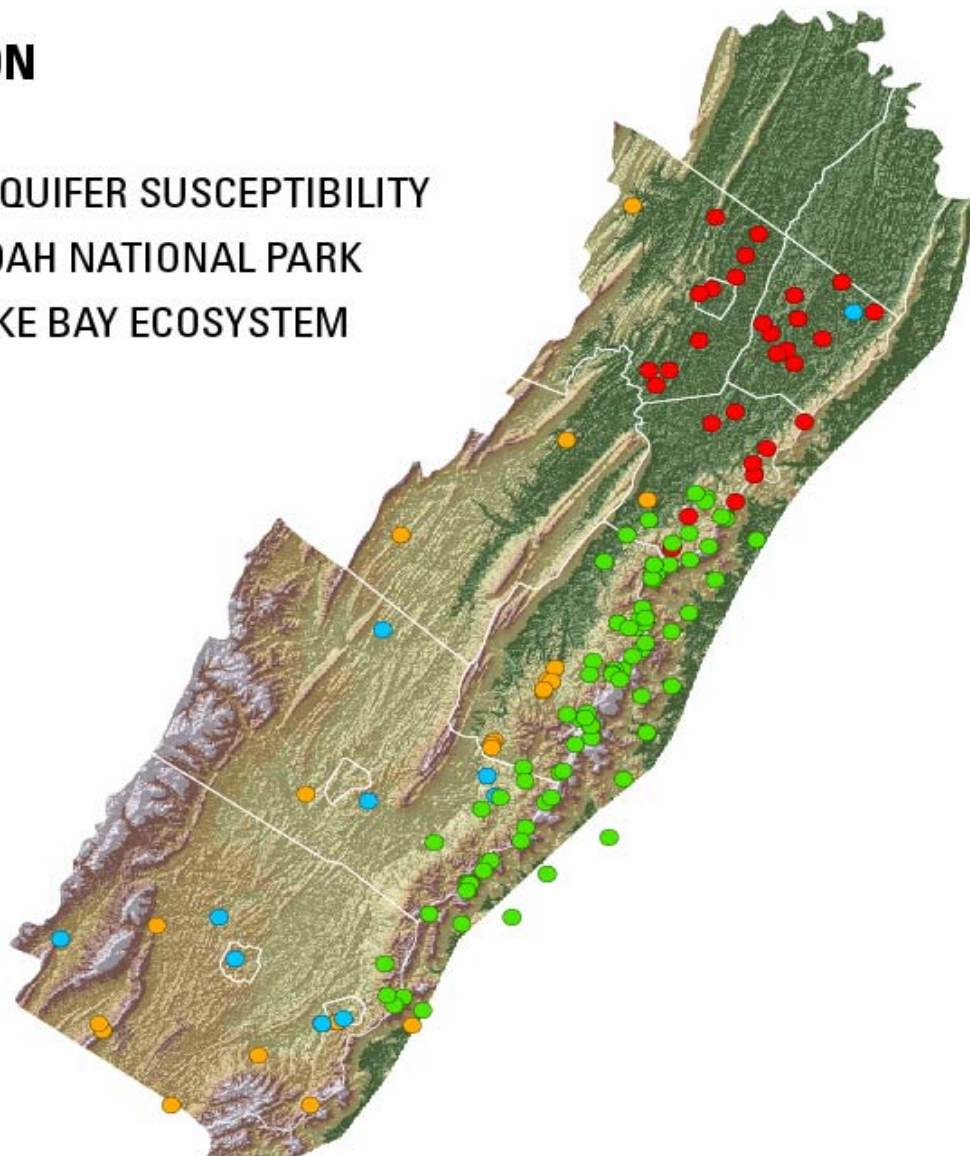
Binary Mixture:
85% - 2 year water
15% - pre-CFC water



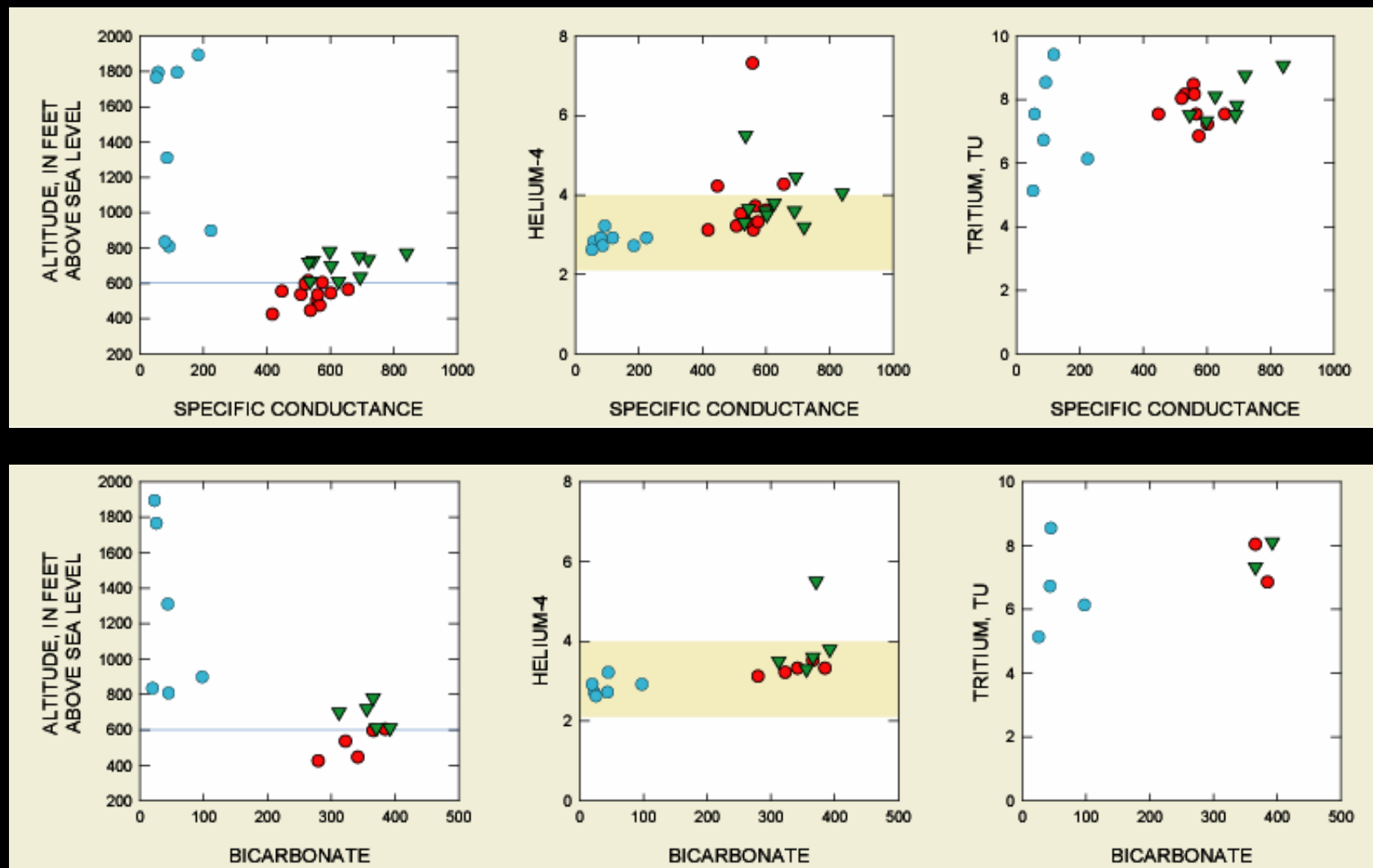
Ground-Water Age Dating

EXPLANATION

- COUNTY
- VIRGINIA AQUIFER SUSCEPTIBILITY
- SHENANDOAH NATIONAL PARK
- CHESAPEAKE BAY ECOSYSTEM



Ground-Water Age Dating



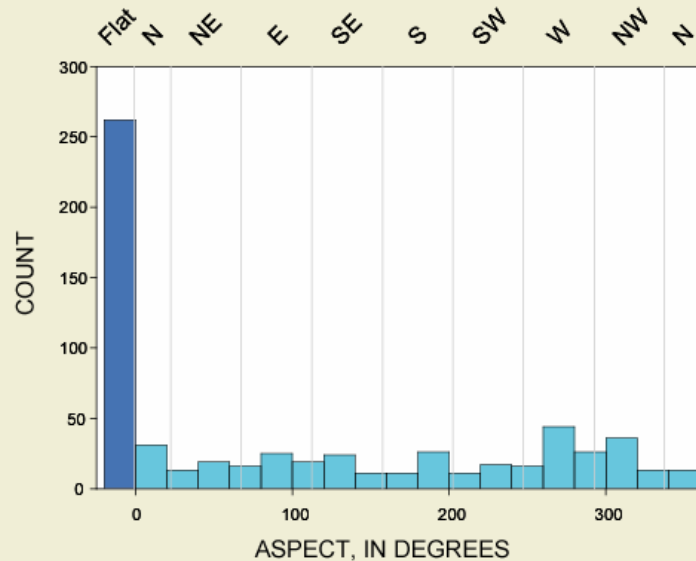
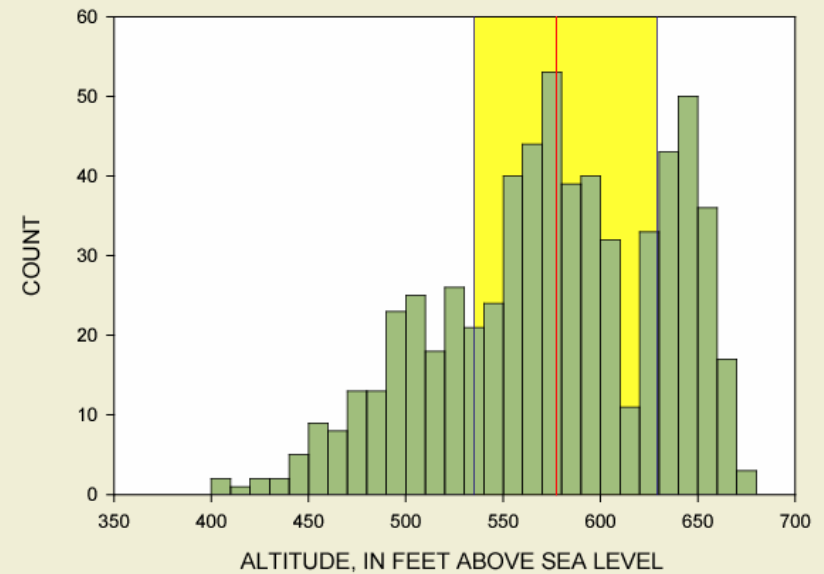
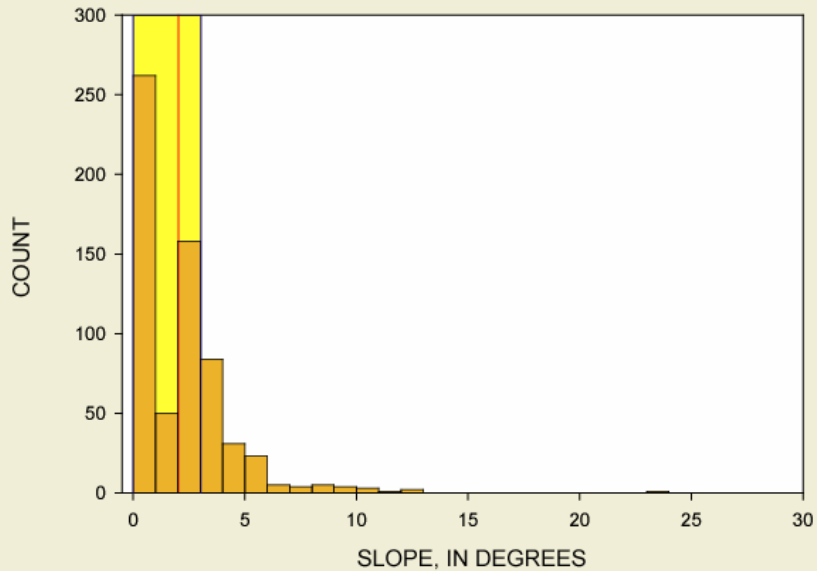
- BLUE RIDGE
- VALLEY & RIDGE - EAST
- ▼ VALLEY & RIDGE - WEST

Hydrogeologic Structures (*Fractures*)



1997 Aerial Photography
1in. : 200ft

Hydrogeologic Structures (*Sinkholes*)



Future Projects



Proposed Research: South Fork Shenandoah River Instream-Flow Study

The South Fork Shenandoah River, and its counterpart, the North Fork Shenandoah River, join to form the Shenandoah River, and drain an area that many in the State refer to simply as "The Valley". With Shenandoah National Park to the East, and Massanutten Mountain to the West, the South Fork basin is an area with much beauty, and is a draw for outdoor enthusiasts, tourists, and people who want to take up residency "away from the city". The South Fork basin shares a similar geology with the North Fork, in that it is underlain by karst, making the ground-water and surface-water highly connected.



North Fork, South Fork, and Shenandoah Basins

South Fork Study Components:

The South Fork is a large river, at least two times the width of the North Fork, which will require more than double the effort toward field work as the North Fork study, with much research done by boat.

Physical-Habitat Mapping: Along the mainstem South Fork from Linwood, Va. to Front Royal, Va. habitat mapping will provide the foundational information used to select hydraulic reaches and fish assessment sites. The geomorphology, channel slope, and the refuges present for the aquatic community will be examined during low-flow periods.

Fish Community Habitat Needs: The fish species assessment and South Fork-specific habitat-suitability curves need to be created. Fish habitat-suitability curves for the South Fork are essential to ensure the applicability of the modeling results. The size of the South Fork, and Dr. Quth's availability, will limit the study focus to the mainstem portion of the river.

Water-Quality Synoptic Survey: A low-flow study of diurnal water-quality conditions, as well as a comparison dataset measured during normal-flows will be useful to assess the relative stress on the aquatic community. In addition to the synoptic survey, water temperature and other water-quality parameters will be measured at the hydraulic-data reaches for use in modeling.



South Fork meander with Blue Ridge mountains in the background

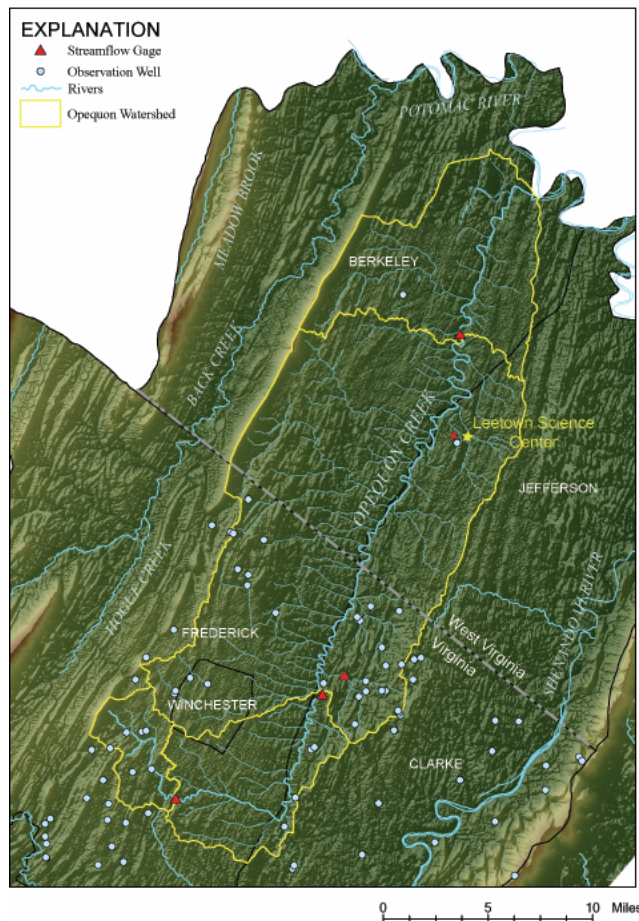
Reach-specific Hydraulic-data Collection: Four or more reaches will be selected for hydraulic-data collection. Stage, discharge, depth, velocity, and substrate characteristics along transects representative of the physical habitat on the South Fork will be measured. Hydraulic-data is used by PHABSIM to link flow with habitat, and habitat to the historical record of the stream gaging stations.

Modeling Results: PHABSIM habitat-availability curves will be simulated for a wide range of flows representing these sections of the South Fork associated with stream gaging stations (01626500, 01629500, 01631000). With habitat-flow relations for both the South Fork and the North Fork, timing of water-conservation during low-flow periods can be managed for each river individually, and at a basin level. With identical science-based monitoring, data collection, and modeling results, educated decisions can be made.

Task	Federal Fiscal Year (October 1 - September 30)					
	2005	2006	2007	2008	2009	2010
Reconnaissance, Study design, Reach selection						
Physical-Habitat Mapping						
Water-Quality Synoptic Survey (weather dependent, completed within the first 3 years)						
Reach-specific Hydraulic-data Collection						
Physical-Habitat Modeling						
Data Analysis and Publications (results published as each phase is completed)						
USGS Budget		Funding Needs				
NSWRC	\$35,000	\$50,000	\$72,000	\$80,000	\$85,000	\$87,000
USGS match	\$35,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Total funds	\$70,000	\$90,000	\$112,000	\$120,000	\$125,000	\$127,000

Proposed budget and timeline for South Fork Study

Opequon River Watershed



Internet Sites

- **Water Resources of Virginia**

<http://va.water.usgs.gov/>

- **Frederick County Project**

<http://va.water.usgs.gov/projects/va134.html>

- **Clarke County Project**

<http://va.water.usgs.gov/projects/va146.html>

- **Warren County Project**

<http://va.water.usgs.gov/projects/va142.html>

- **Shenandoah River Minimum Instream Flow Project**

<http://va.water.usgs.gov/projects/va111.html>

- **Great Valley Water-Resources Science Forum**

<http://va.water.usgs.gov/GreatValley/Index.htm>