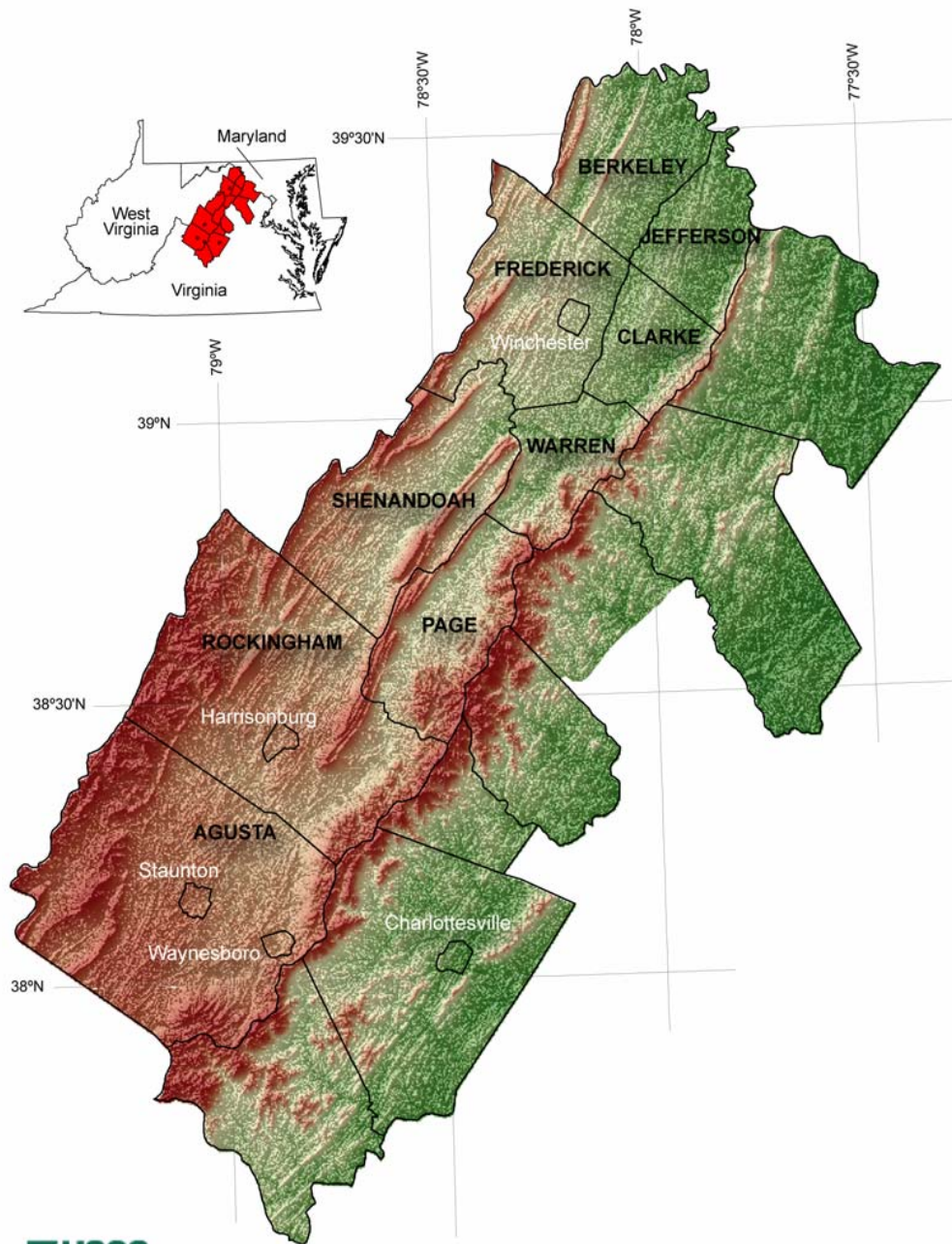


**MULTIDISCIPLINARY
ASSESSMENT OF KARST AND
FRACTURED-ROCK
HYDROGEOLOGIC SYSTEMS
AND WATER RESOURCES OF
THE NORTHERN SHENANDOAH
REGION**





Background:

- Historically Rural Area
- Plentiful Supply
- Rapid, Increasing Urbanization
- Five-Year Drought

Problem:

- Resource quantification lacking
- Groundwater/surface water interactions not well defined
- Quality impacts
- Impacts to aquatic ecology



Study Objectives for Regional System:

- Characterize karst and fractured-rock aquifer systems
- Characterize ground water interaction with surface water
- Characterize water quality and sources of degradation
- Develop numerical model to simulate regional ground-water flow system



Key Work Components:

- Develop and maintain long-term monitoring networks
- Conduct detailed hydrogeologic assessment

Major work elements of the hydrogeologic assessment

- Formulate a comprehensive hydrogeologic framework that describes aquifer geometries, hydraulic properties, and water levels that are consistent with the best available geologic information.

- Develop a complete, accurate, and maintainable database of ground-water and related hydrologic information, including ground-water withdrawal, needed to describe the water budget of the basin that can efficiently provide required model-input datasets for ongoing simulation needs.



- Develop a complete, accurate, and maintainable database of ground-water quality that can be used to evaluate aquifer susceptibility to contamination.

- Develop geographic information system coverages of other features that depict critical aspects of geologic, hydrologic, and land-surface features within the basin.

- Information gained through this research will be assessed on an ongoing basis and updates provided to stakeholders through a variety of outreach mechanisms, ranging from workshops to a series of USGS-approved publications.



- Develop and calibrate a series of ground-water-flow models for the Shenandoah Valley Region to be published in a transferrable format for use by interested stakeholders.



USGS PROGRAM ACTIVITIES IN THE NORTHERN SHENANDOAH VALLEY

- **National Cooperative Geologic Mapping Program**
 - Karst Applied Research Studies Project (KARST)
 - Bedrock Regional Aquifer Systematics Study (BRASS)
- **National Landslide Hazards Program**
 - Debris-Flow Hazards in the Blue Ridge of Virginia



- **Land and Remote Sensing Program**
 - National Civil Applications Project (NCAP);
mapping of karst features

- **Cooperative Water Program**

Virginia District

- North Fork Shenandoah River
Instream Flow Study
- Frederick County Carbonate Aquifer
Appraisal
- Clarke County Aquifer Appraisal
- Warren County Siliciclastic and
Crystalline Aquifers Appraisal



West Virginia District

-Berkeley County Karst Aquifer:

Water-Quality Assessment

Hydrogeologic Assessment

Fracture Trace Analysis

Bacteria Assessment



Jefferson County Karst Aquifer:

Water-Quality Assessment

Hydrogeologic Assessment

Fracture Trace Analysis (Proposed)

• **Bacterial Source Tracking Technique
Evaluation**



- **Other USGS Federal Program**

- Leetown Science Center, W. Va. Karst Aquifer Hydrogeologic Assessment

- **National Research Program (NRP)**

- Kinetic Modeling (Ground-Water Age Dating)

- Shenandoah National Park

- Karst Springs

- Transport Phenomena in Fractured Rock
Leetown Science Center



- **National Water-Quality Assessment (NAWQA) Program**

- Potomac-Delmarva (PODL) Study Unit

- **National Biological Information Infrastructure**

- Shenandoah NBII node - proposed



- **USGS Water Availability for Human and Ecological Needs**
 - Integrated Science Study
- **West Virginia Water Research Institute**
 - Age-Dating Regional Karst Waters - proposed



