



The following presentation is provisional and subject to change:

**Pending Approval of the Director
U.S. Geological Survey**

Northern Shenandoah Valley Water Resources Initiative

November 15, 2006
Winchester, VA



Multidisciplinary Assessment of the Northern Shenandoah Valley in Virginia and West Virginia

- The objective of this first integrated regional assessment is to better characterize the aquifer systems in the Northern Shenandoah Valley and provide relevant hydrogeologic information that can be used to guide the development and management of these water resources.
- This regional study of the karst and fractured-rock aquifer systems will use hydrologic, geologic, cartographic, and biologic information to improve the understanding of the aquifer systems, their relationship to surface features, and potential hazards over a multi-county area of Virginia and West Virginia.

Study Approach for Regional System:

Numerical Modeling

Yager and others

Geologic Mapping

Weary and others

Geophysical Techniques

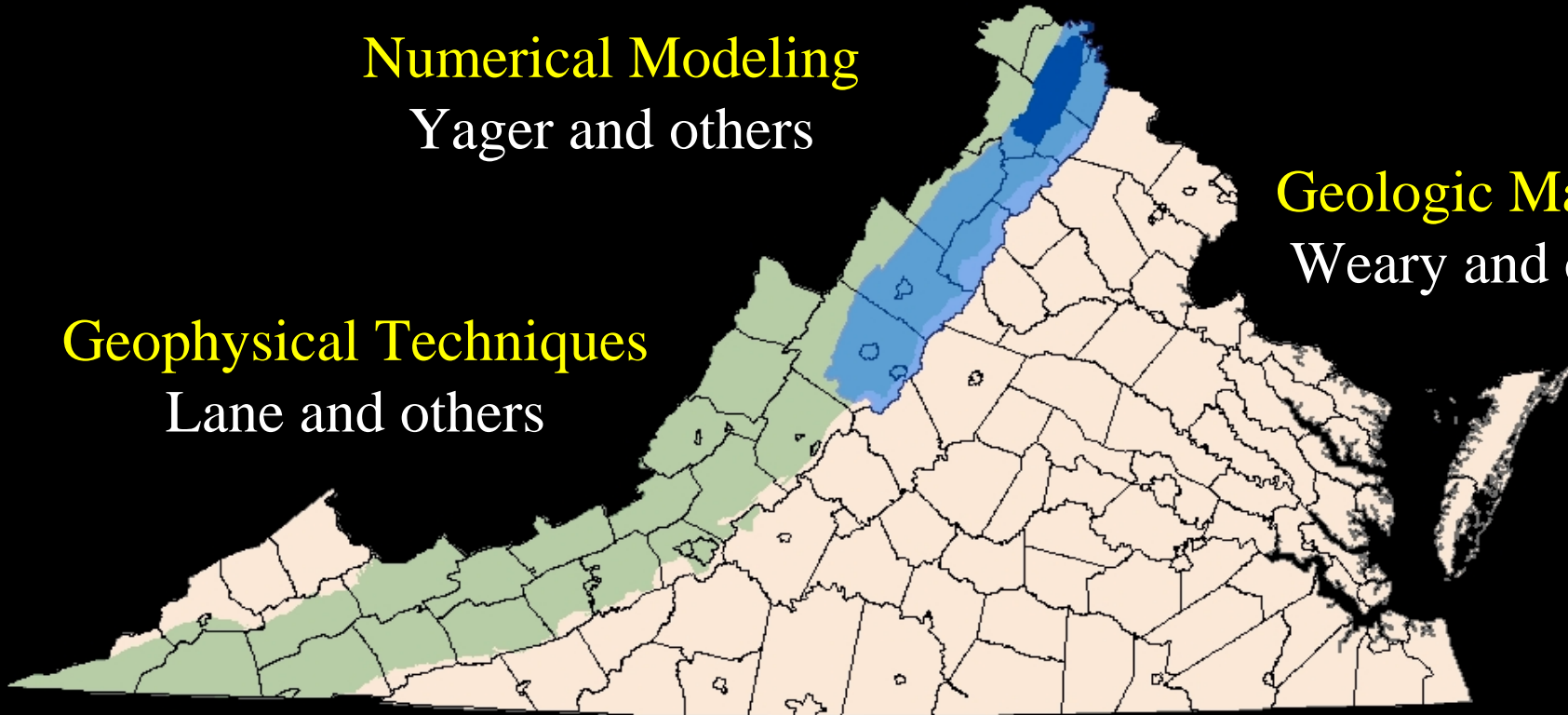
Lane and others

Environmental Tracers

Plummer and others

GW/SW Interactions

Sanford and others



Estimation of Water Availability

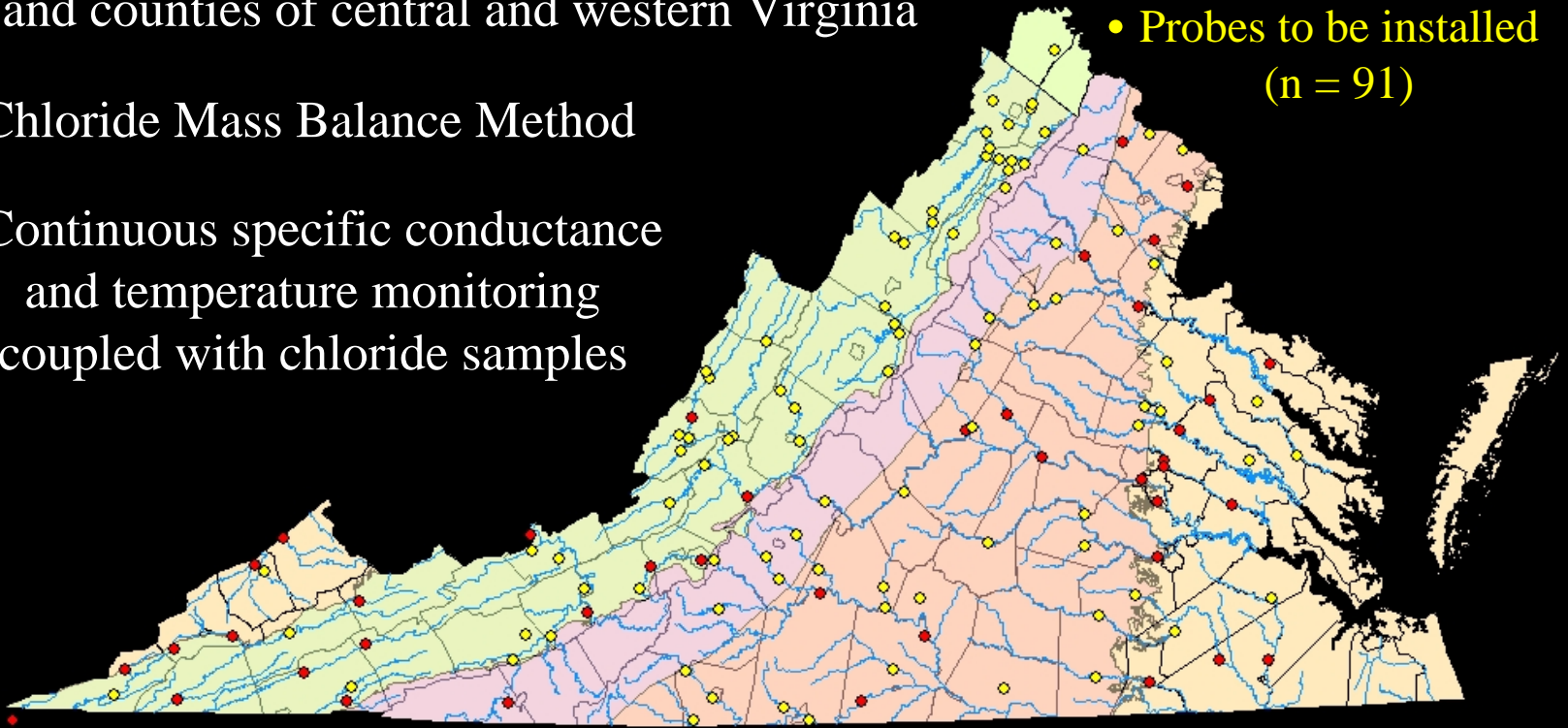
-Develop hydrologic budgets for the watersheds and counties of central and western Virginia

• Total Sites (n = 132)

• Probes to be installed (n = 91)

-Chloride Mass Balance Method

-Continuous specific conductance and temperature monitoring coupled with chloride samples



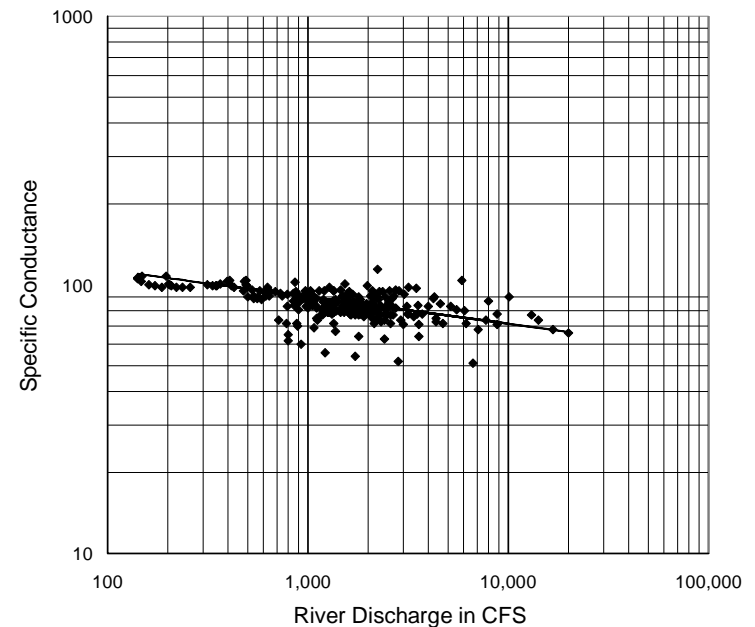
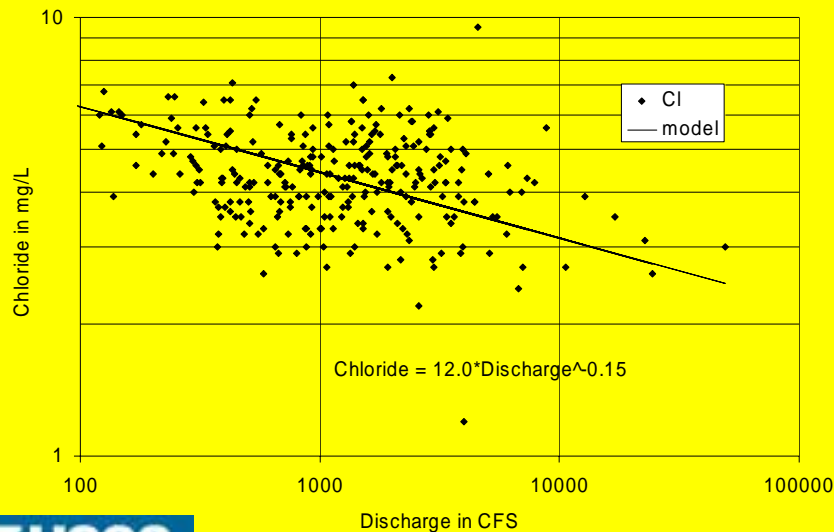
*Innovative evaluation of Ground-Water/Surface-Water Interactions
Sanford and others

Estimation of Water Availability

*Based on chloride values measured in a stream over a range of flow rates, and combined with a long-term stream flow record, the long-term hydrologic budget of a watershed can be estimated.

*Specific conductance can serve as a proxy where chloride data is limited.

*Do not need measurements of chloride in precipitation, nor is the method compromised by anthropogenic sources (i.e. road salts).



Estimation of Water Availability

-Fairly dense coverage of the Shenandoah Valley

-Instrumented to serve as a control population

GW/SW Interactions
Sanford and others



• Probes to be installed (n = 21)

*Investigate possible scale effects by installing several probes within one watershed

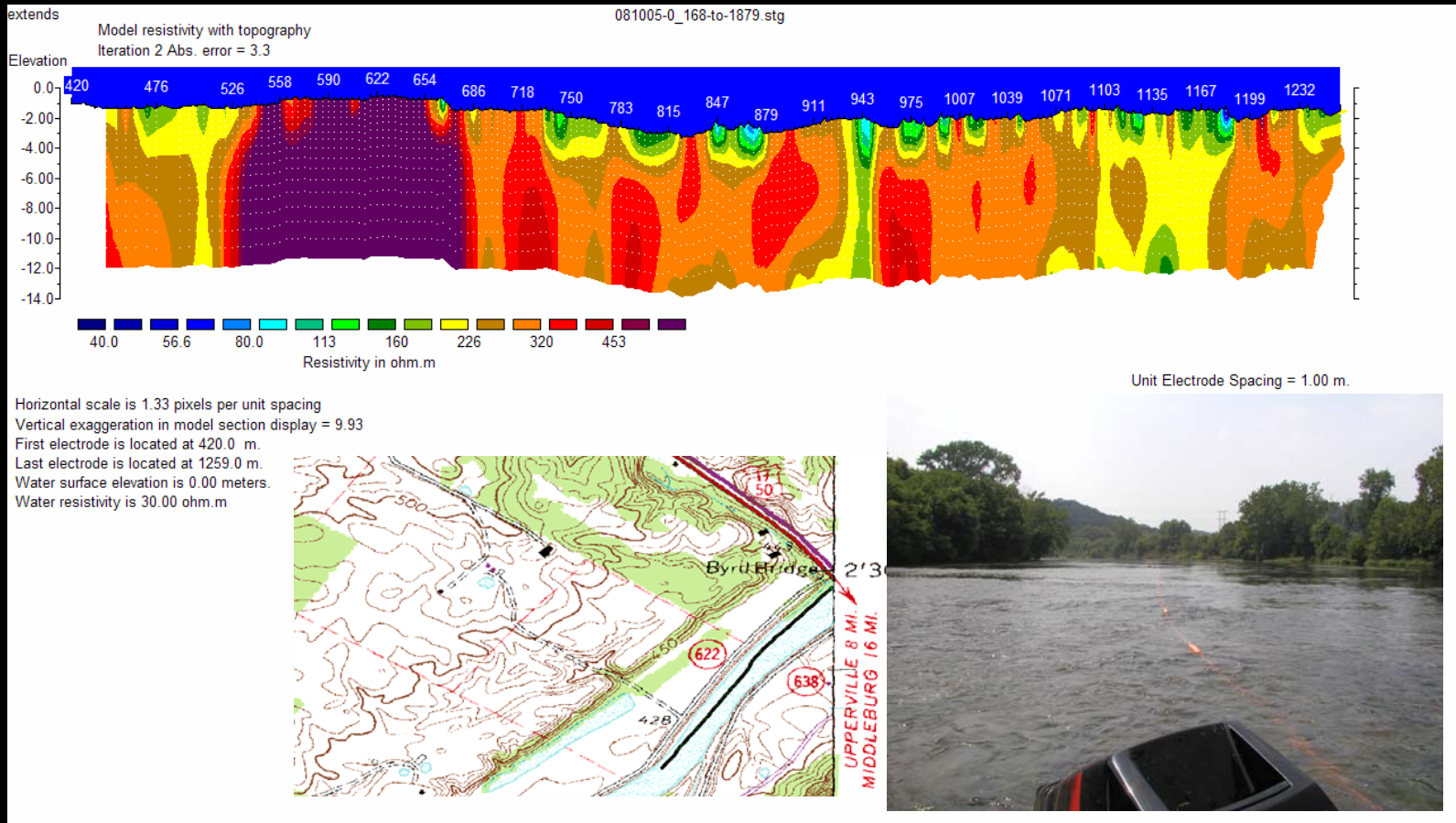
*Compare specific conductance/chloride relation measured during the study with historical data by instrumenting sites where substantial chloride samples and specific conductance has been collected in the past

Expected Results are long term average values by watershed and county for:

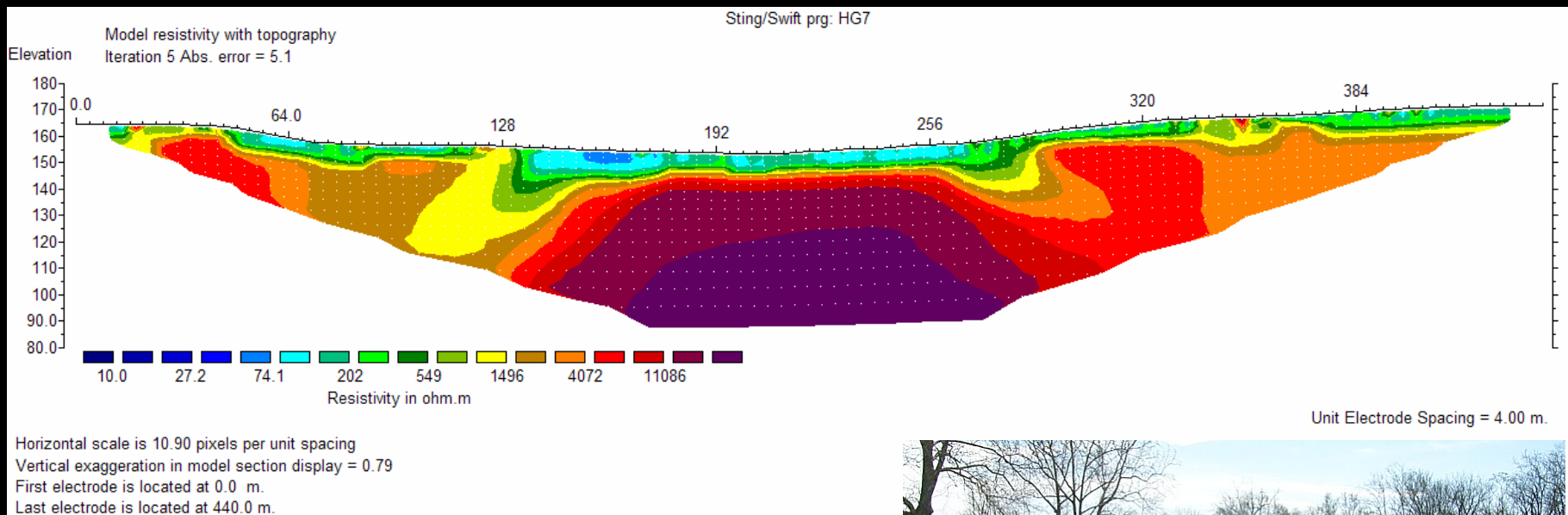
- Precipitation
- Runoff
- Infiltration
- Recharge
- Base flow
- Fraction of streamflow that is base flow
- Total evaporation
- Riparian evaporation
- Areal percentage of riparian ET that is floodplain
- Available surface water (MGD)
- Available ground water (MGD)

Geophysical Techniques:

- Both Marine & Land: Continuous Resistivity Profiling



Geophysical Techniques:



*Methods to come:

- Fiber optic temperature profiling
- Land seismic—streamer
- Passive seismic
- Audio-Magnetic-Tellurics (AMT)



A Great Deal of Research/Data Collection Continues in the Shenandoah Valley!!

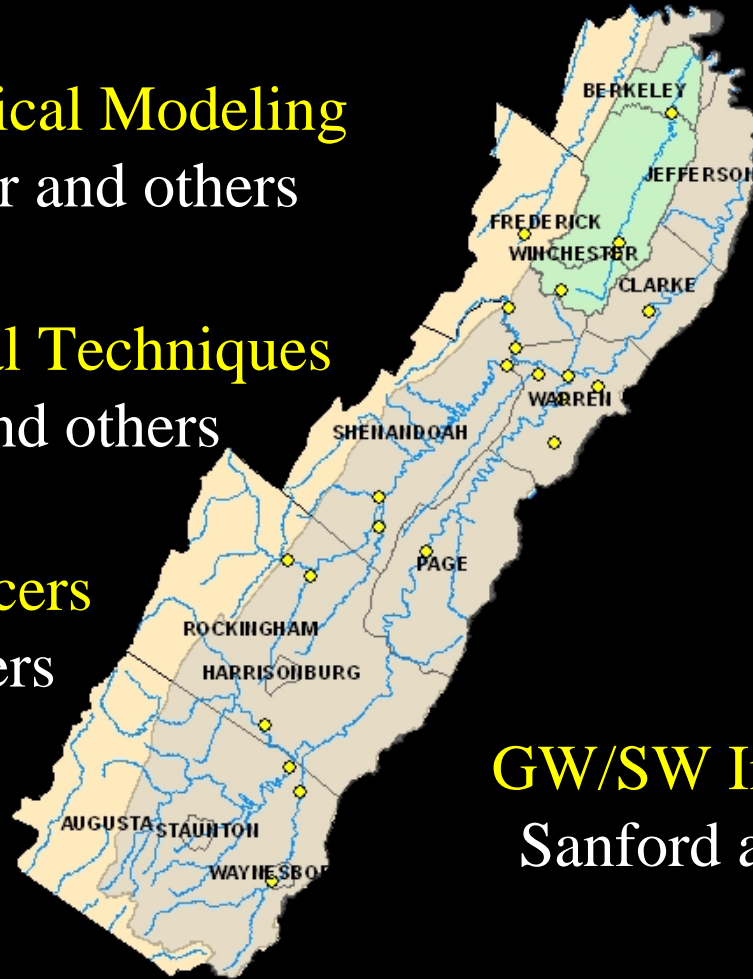
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Internet Sites

- **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>