Hydrogeology of Eastern Jefferson County, Washington: Implications for Surface water/Ground water Interactions

Presentation by

F. William Simonds

5th Washington Hydrogeology Symposium, April 13, 2005

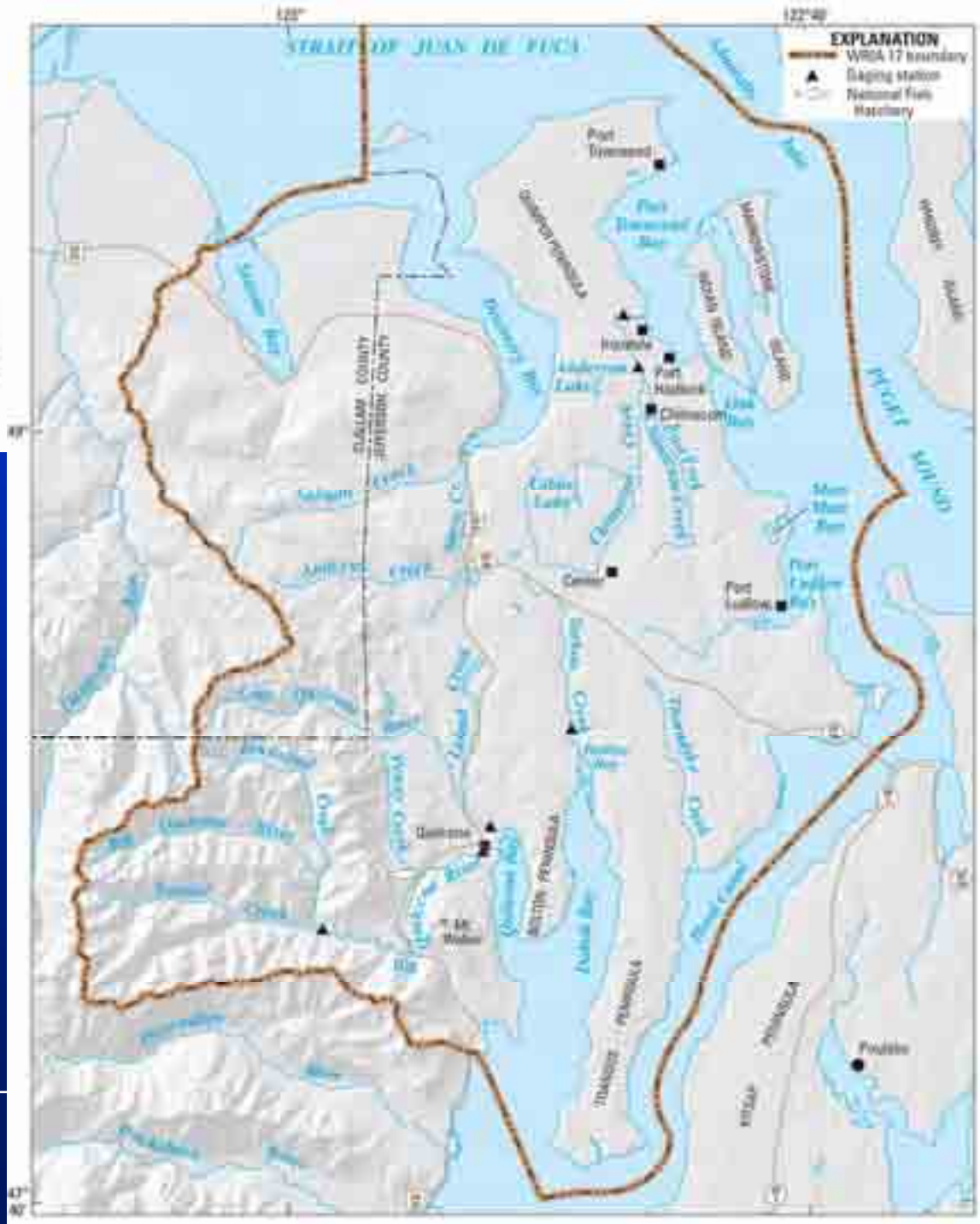
http://wa.water.usgs.gov

USGS

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

WRIA 17
Eastern
Jefferson County

USGS



Objectives of this study:

To characterize the ground-water resources of the Chimacum Basin in Eastern Jefferson County

- Where ground water occurs in the subsurface
- Determine the direction of ground-water movement
- How ground water interacts with surface water

The Chimacum Basin

USGS

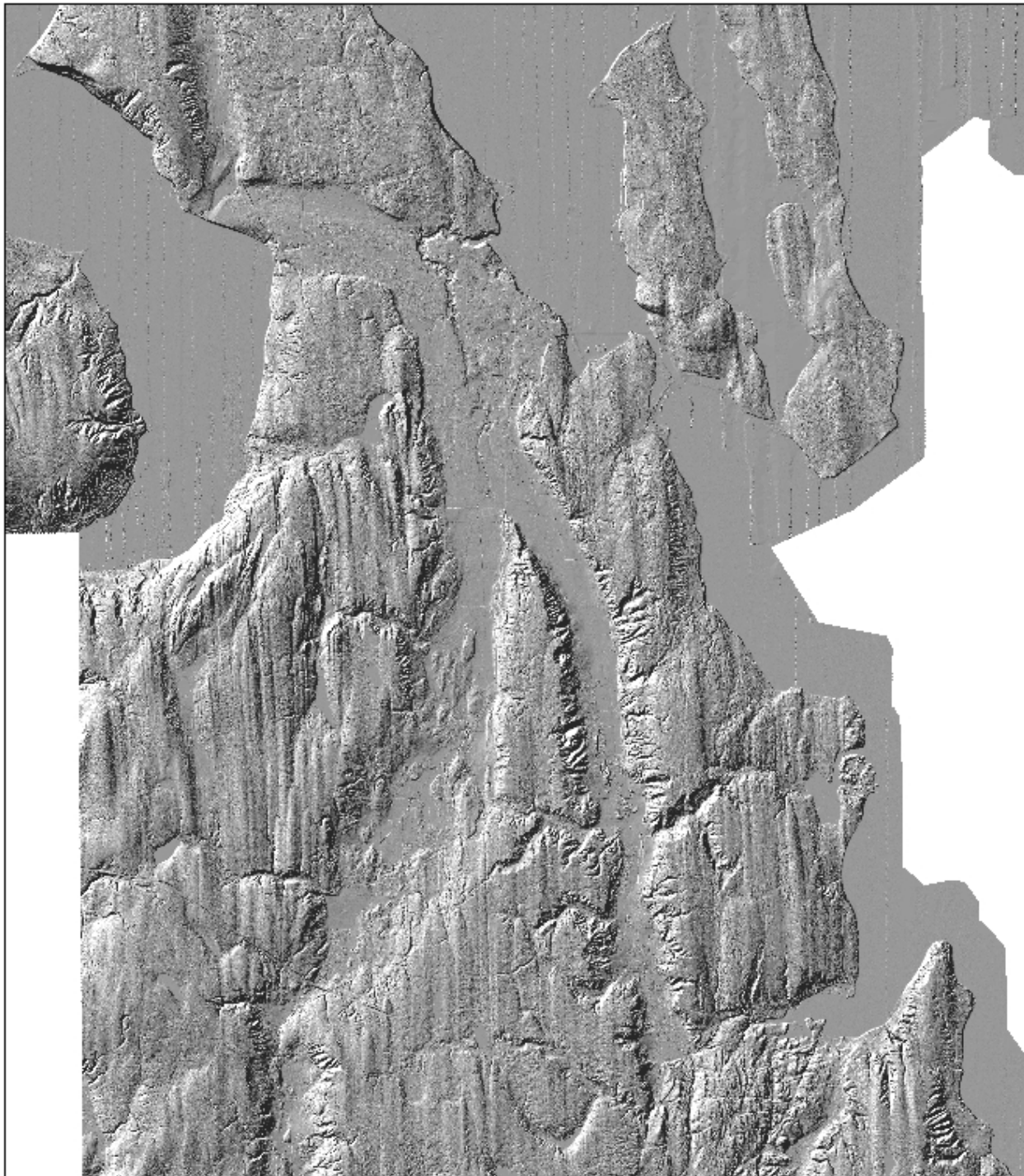
Approach:

- Used LIDAR imagery to better understand the surficial geology of the area
- Conducted a well inventory to help define the subsurface geometry of geologic units and obtain water–level information
- Measured water levels in select wells on a monthly basis for a period of a year
- Evaluated surface-water/ground-water interactions between creeks and the shallow aquifer

LIDAR IMAGERY

- Light Distance and Ranging
- 6 ft horizontal resolution, 1 ft vertical resolution
- Data processed to remove vegetation

(LIDAR imagery available from Puget Sound LIDAR Consortium)



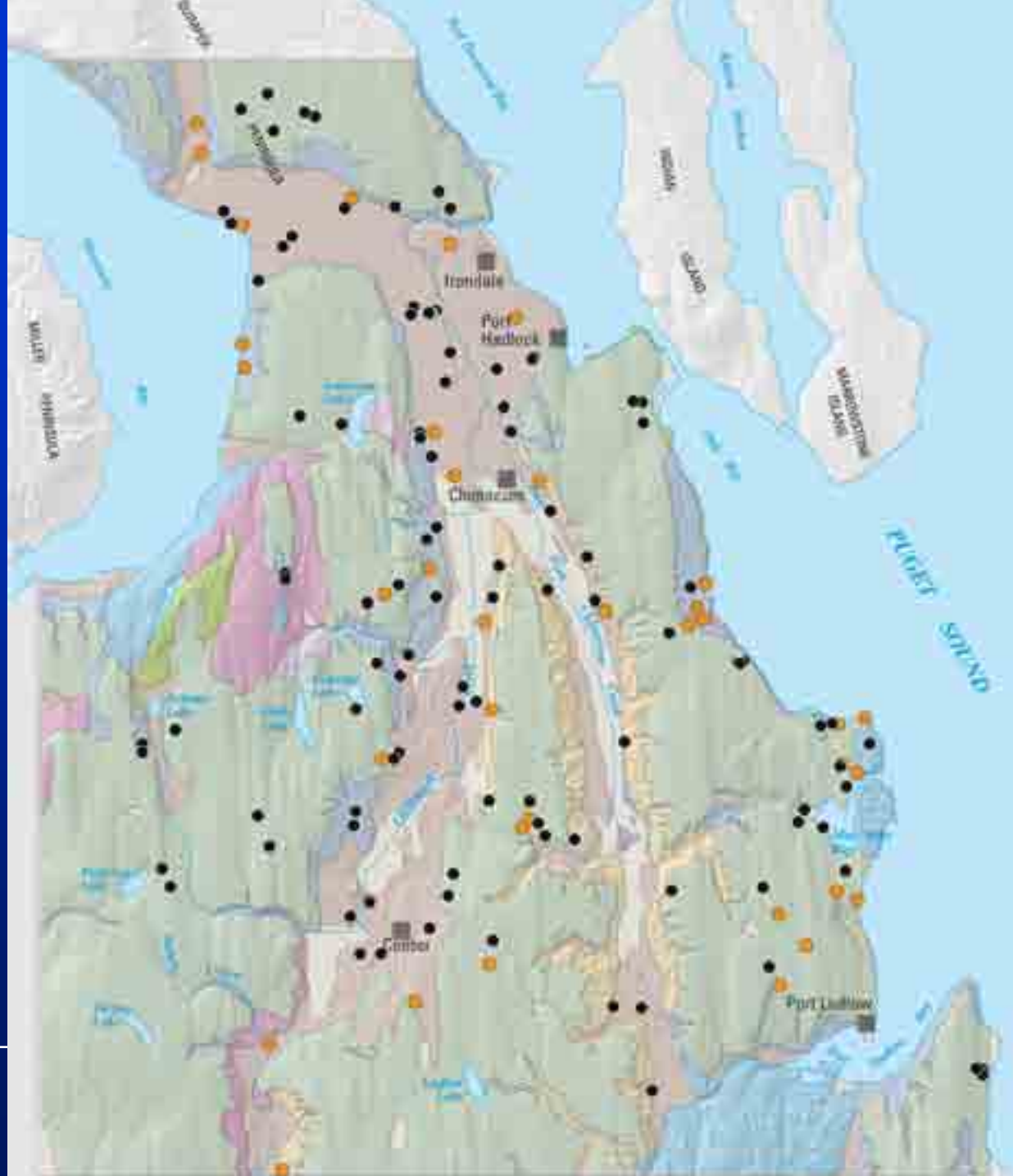
Interpreted surficial Geology

Took existing geologic maps and revised geologic contacts to match detailed LIDAR imagery

USGS

Compiled well data

Took available data from published reports and located approximately 100 additional wells in the field



USGS

Constructed geologic cross sections

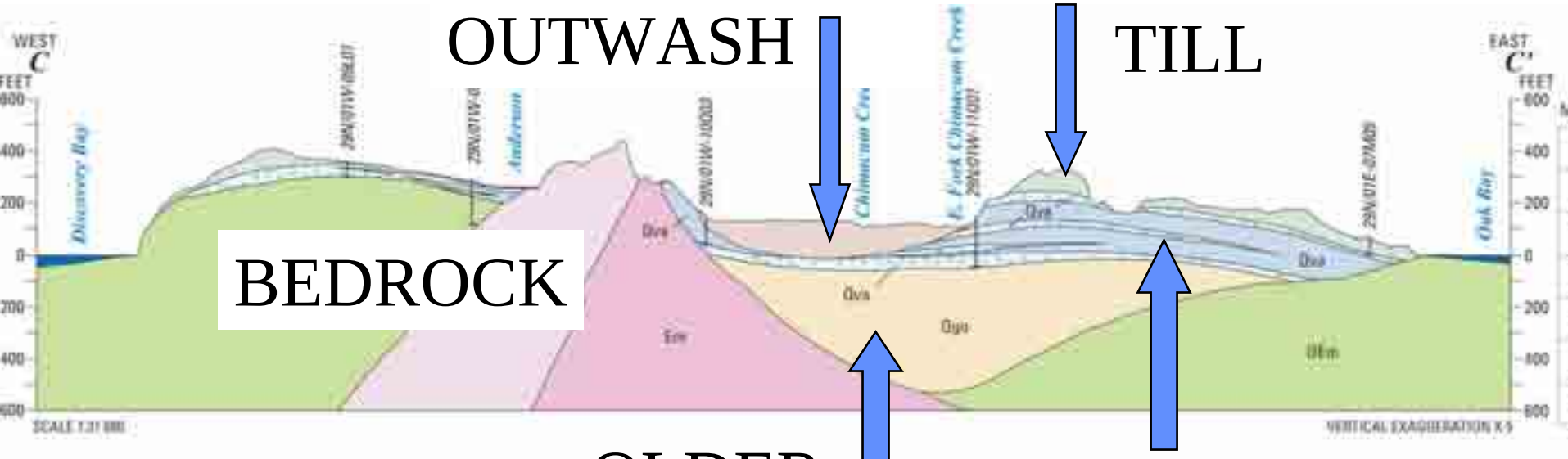
Compiled all lithology data from well logs to construct a series of geologic cross sections

USGS

Geologic Cross Sections

VASHON RECESSIONAL OUTWASH

VASHON TILL



BEDROCK

OLDER GLACIAL DEPOSITS

VASHON ADVANCE OUTWASH

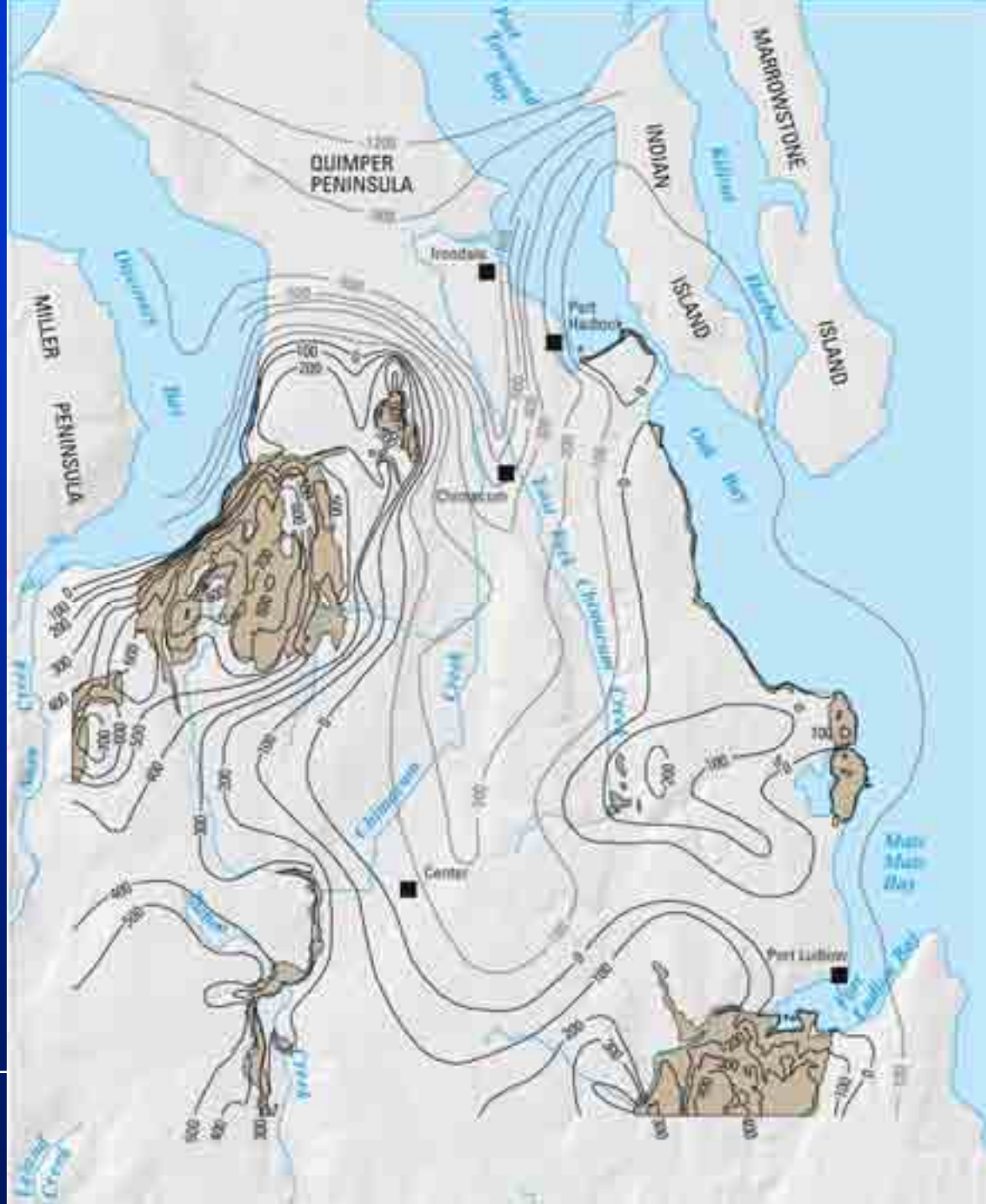
Topography of the Bedrock Surface

Irregular surface that ranges from 800 feet above sea level to >1200 below sea level

North-South trending trough

Bedrock drops off beneath the Quimper Peninsula

USGS



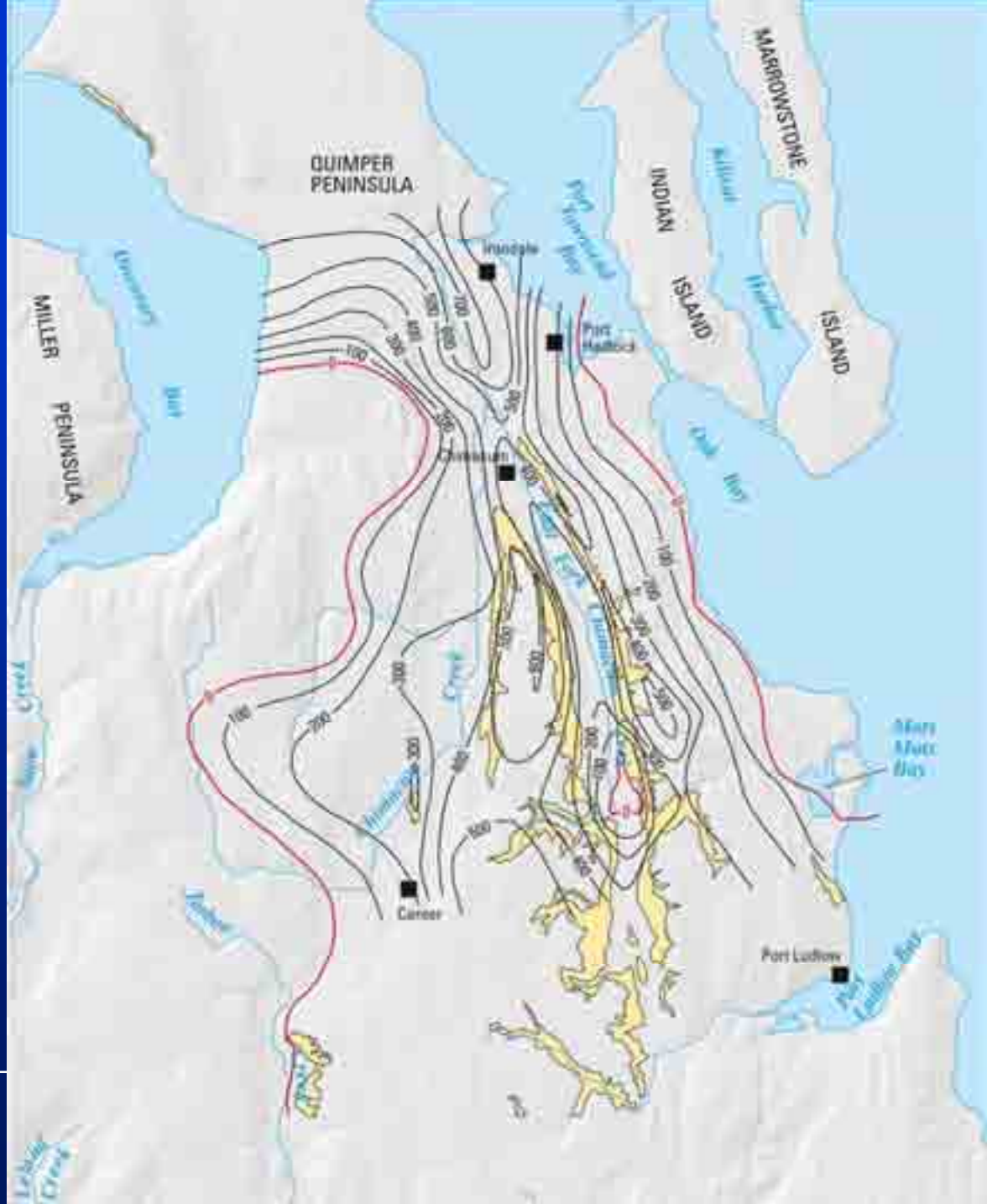
Extent and Thickness of Vashon Advance Outwash

- Not present everywhere
- Present in a band west of Chimacum Creek
- Locally up to 200 feet thick

USGS

Extent and Thickness of Older Glacial Deposits

- Up to 600 feet thick
- Exposed at the surface in Beaver Valley (East Fork of Chimacum Creek)



USGS

Construct water-table maps

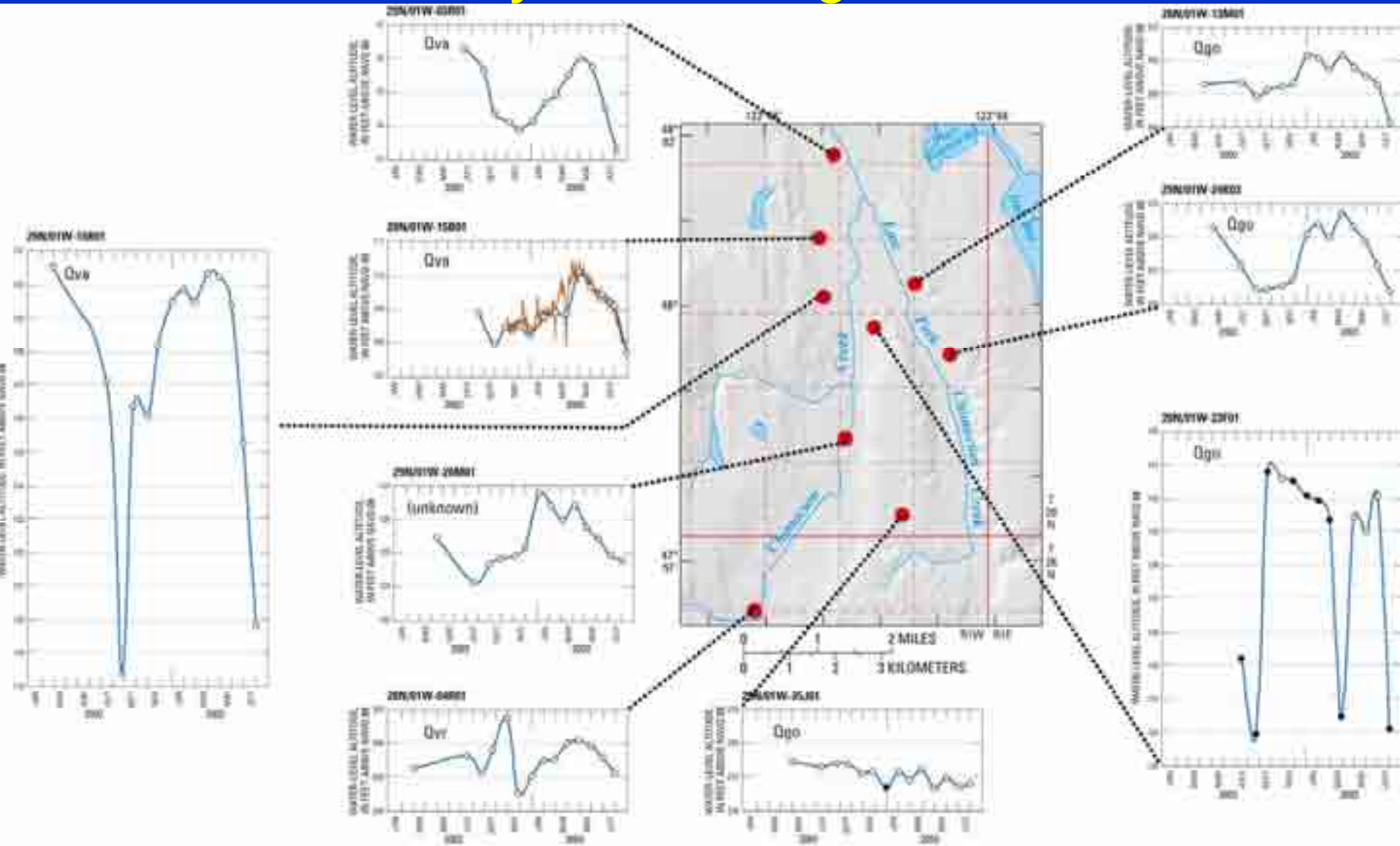
Measured water levels in wells (Spring and Fall)

Contoured the water-table elevations

Interpret directions of ground-water flow

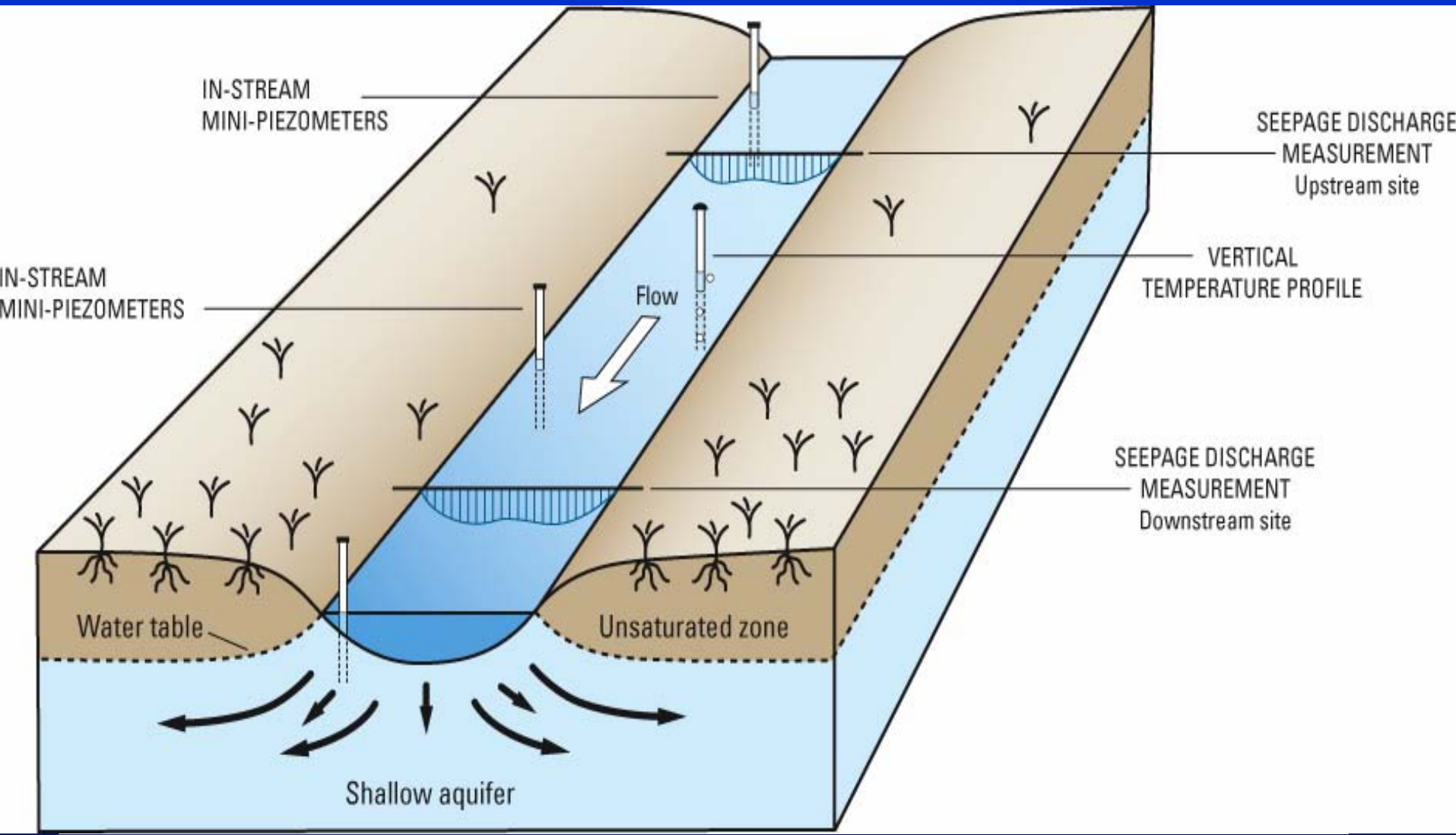
USGS

Monthly Monitoring Wells



USGS

SW/GW Investigations



USGS

Chimacum Creek:

Net Gain of 6 cfs

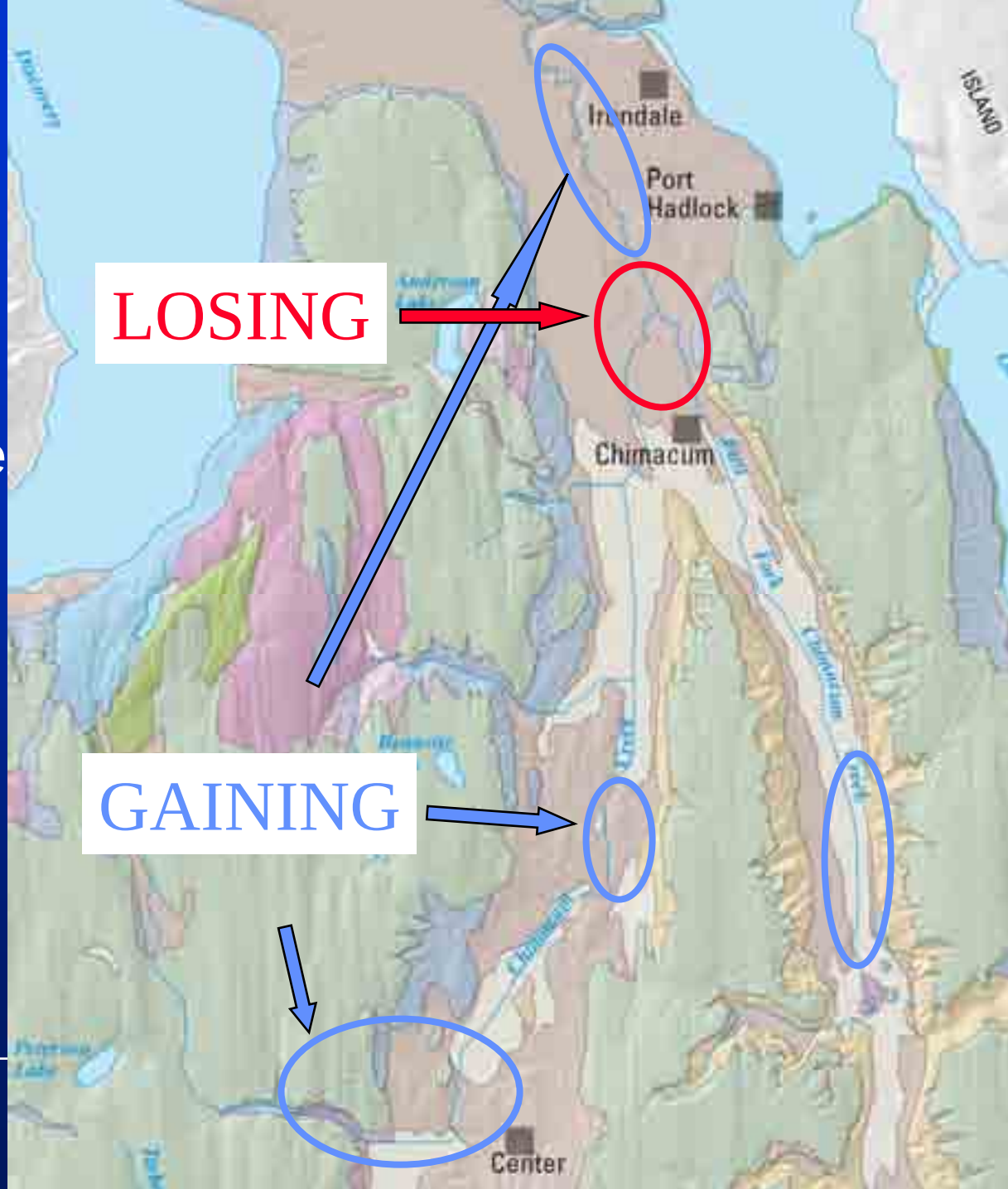
- Upper reaches gain water
- Losses occur where the streambed encounters Qvr at Chimacum
- The lower reaches generally gain water
- Little exchange occurs where peat deposits underlie the streambed

USGS

Chimacum Creek:

Net Gain of 6 cfs

- Upper reaches gain water
- Losses occur where the streambed encounters Qvr at Chimacum
- The lower reaches generally gain water
- Little exchange occurs where peat deposits underlie the streambed



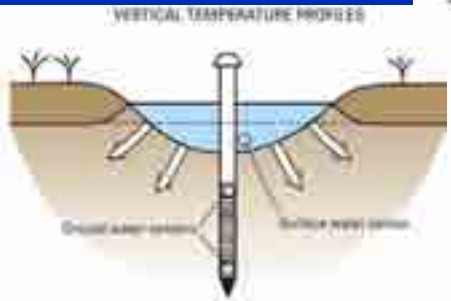
USGS

Vertical Temperature Profiles

- Install tidbit temperature loggers at different depths below the streambed
- Record continuous temperatures
- Visually compare gaining and losing reaches

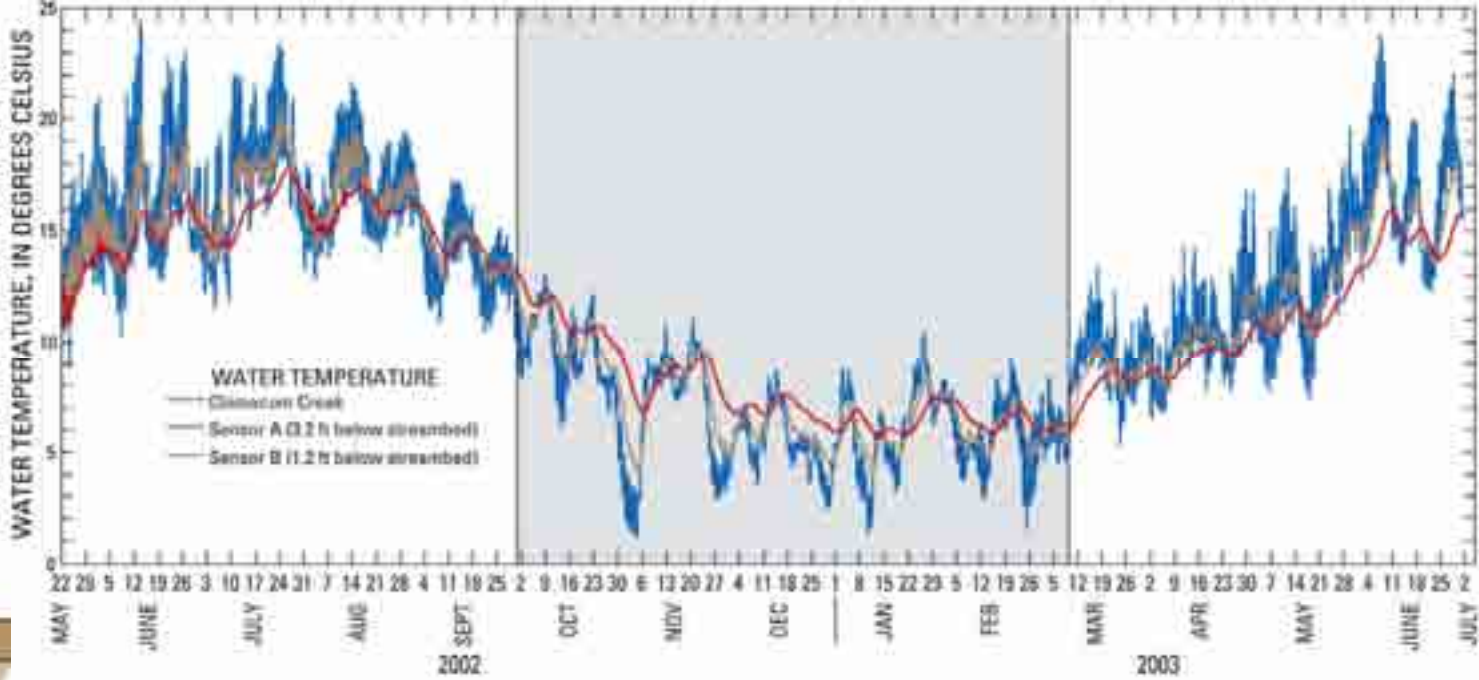
USGS

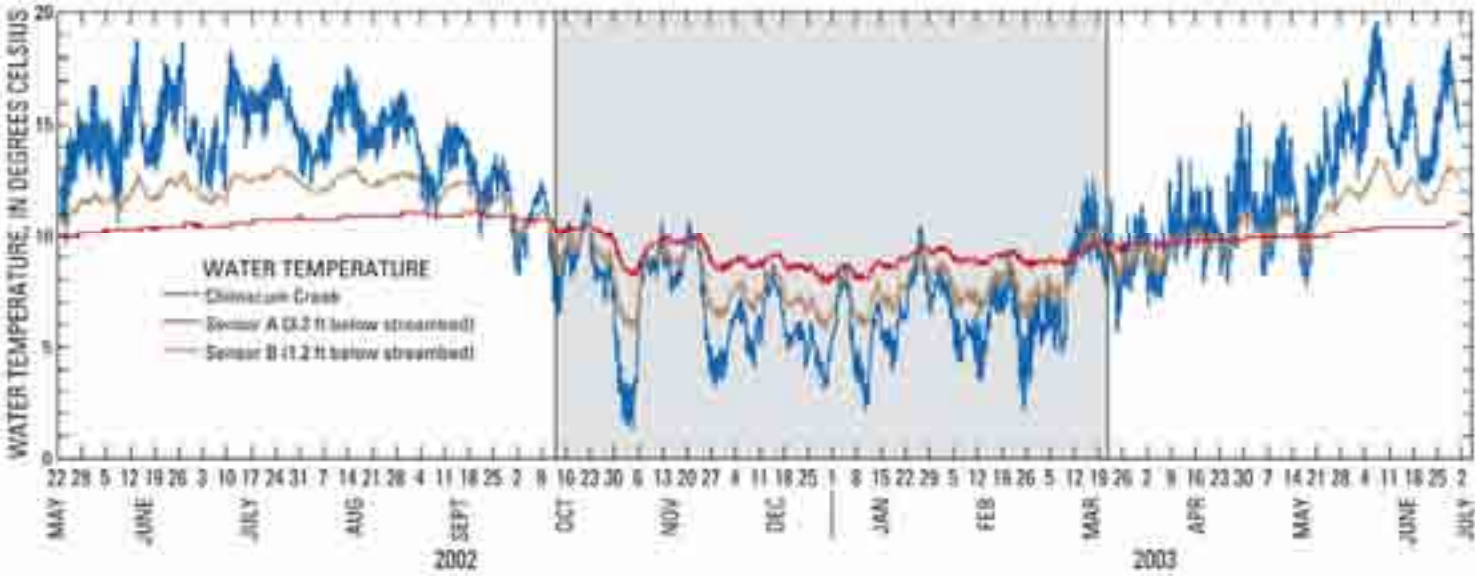
Losing Reach Chimacum High School



Gaining Reach Hilda Road

USGS



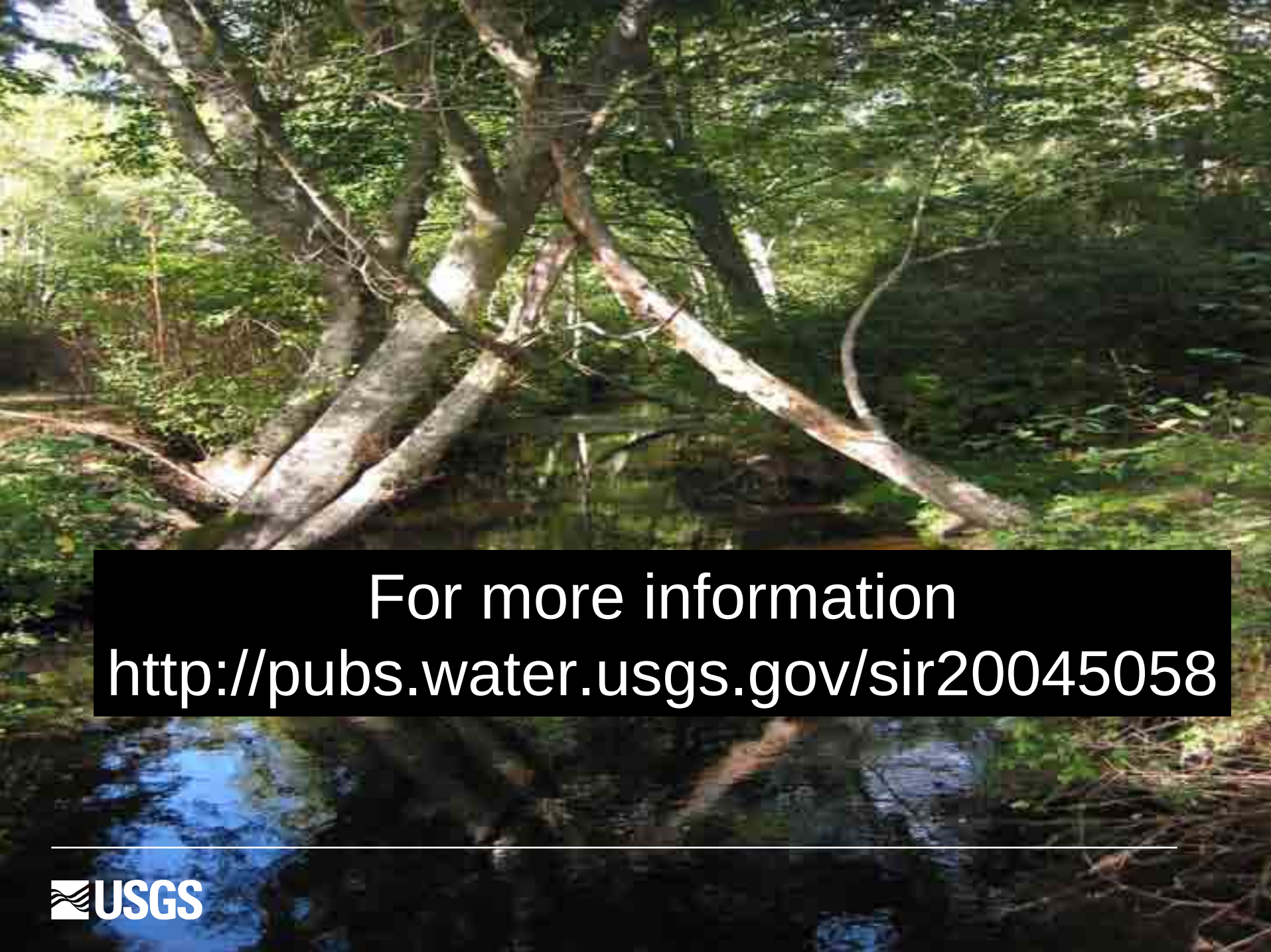


Conclusions

The geology of an area controls the distribution of water bearing materials

The geology controls the rate and direction of groundwater movement

The geology of the streambed controls the spatial distribution of gaining and losing reaches


For more information
http://pubs.water.usgs.gov/sir20045058
USGS