

# Groundwater Discharge Zone Delineation

To identify cold-water reaches and streamflow contributions from groundwater

# USGS Groundwater Discharge Zone Delineation



A PROJECT OF THE CHEHALIS BASIN PARTNERSHIP'S  
STREAMFLOW RESTORATION PLAN



## The Problem

We know that groundwater and surface water are connected in the Chehalis Basin, but we don't know the places that connection is the greatest. Groundwater input areas are areas that provide good conditions for fish, and are the most susceptible to groundwater pumping

## The Plan

### A Identify Stream Reaches with likely Groundwater Input

Areas where water quantity is a known limiting factor to salmon, and where there is likely exempt well growth

### B Take the Temperature in the Streams during Summer

Cooler water means groundwater input!



### C Analysis of Results



### D Develop projects to reduce consumptive water use in sensitive areas identified

Habitat Enhancement projects may also be sited at groundwater input areas



## Partners & Their Roles

- USGS – Technical lead on project and provide 30% match funding. Project design, field work, analysis, and reporting
- Quinault Indian Nation – Pre-project technical analysis to determine locations for field work
- Aquatic Species Restoration Plan – Provide data that will contribute to understanding watershed conditions
- Washington Department of Fish and Wildlife – Provide Thermalscape data
- Chehalis Basin Partnership – Commit to project development in regions with groundwater influenced streams

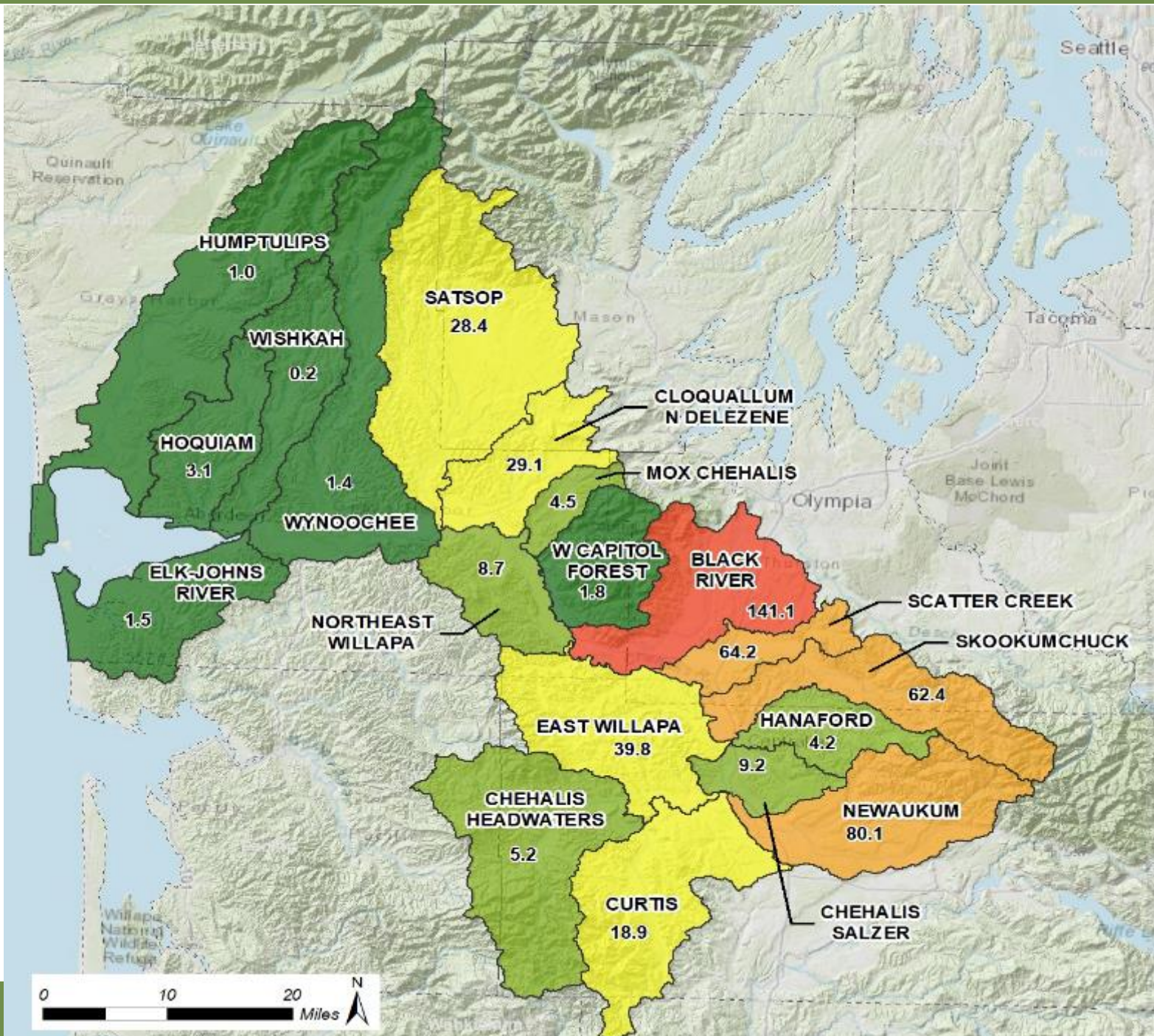


# Identification of groundwater seepage zones is needed to:

- Identify areas with greatest risk of impact from increased groundwater consumptive use.
- Identify locations where greatest benefits may be achieved through habitat restoration and enhancement.


# Objectives



- Develop framework for technical study.
- Establish scope of work and planning-level budget estimates for sub-basin scale study.
- Identify current and future funding opportunities.
- Support adaptive management process:
  - Provides the basis for prioritization of future projects.

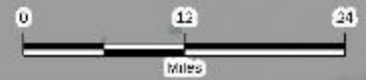
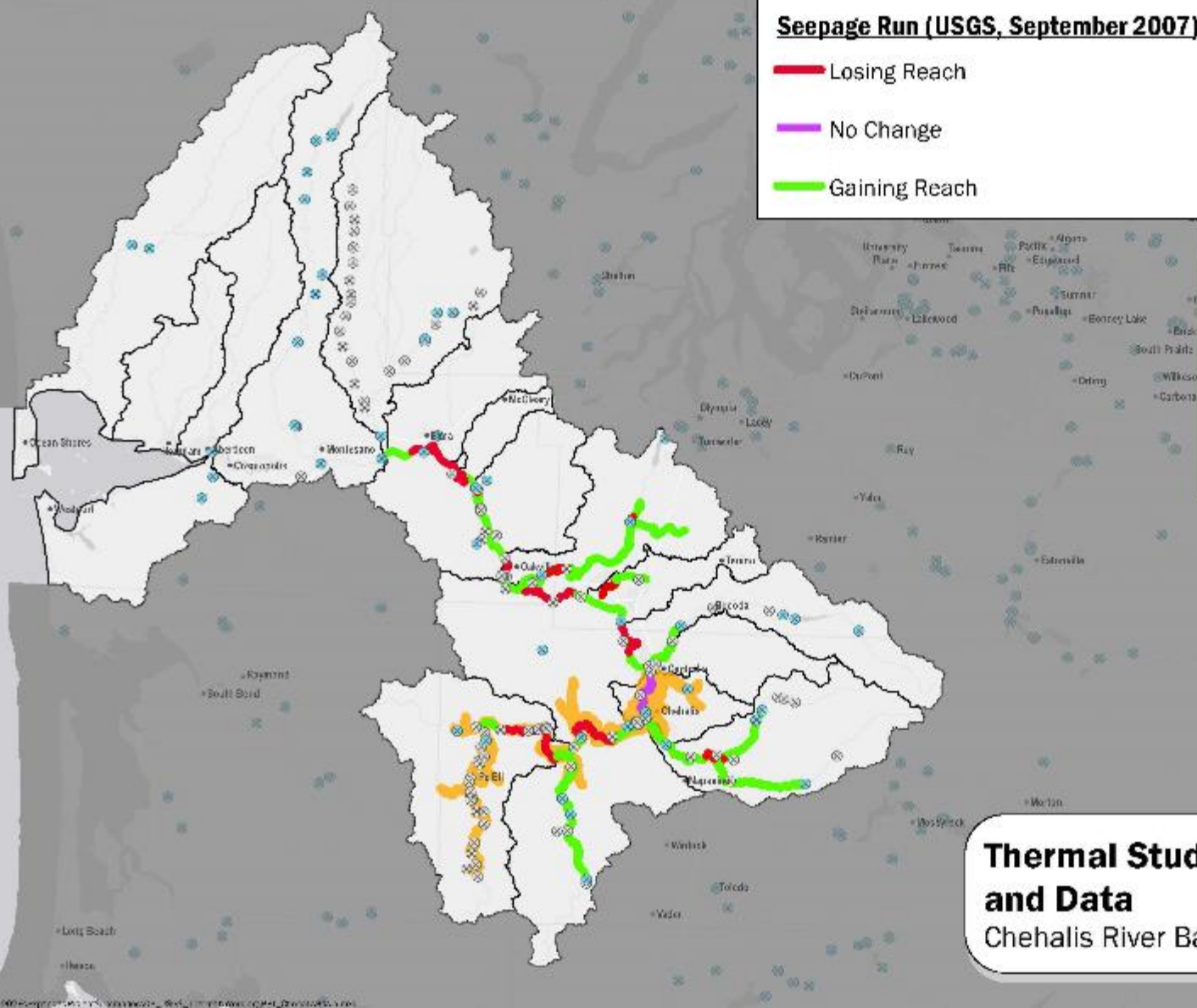


### Seepage Run (USGS, September 2007)

-  Losing Reach
-  No Change
-  Gaining Reach

 FLIR Survey Extent

-  Flow and Water Level Gage
-  Temperature Gage



**Thermal Studies and Data**  
Chehalis River Basin



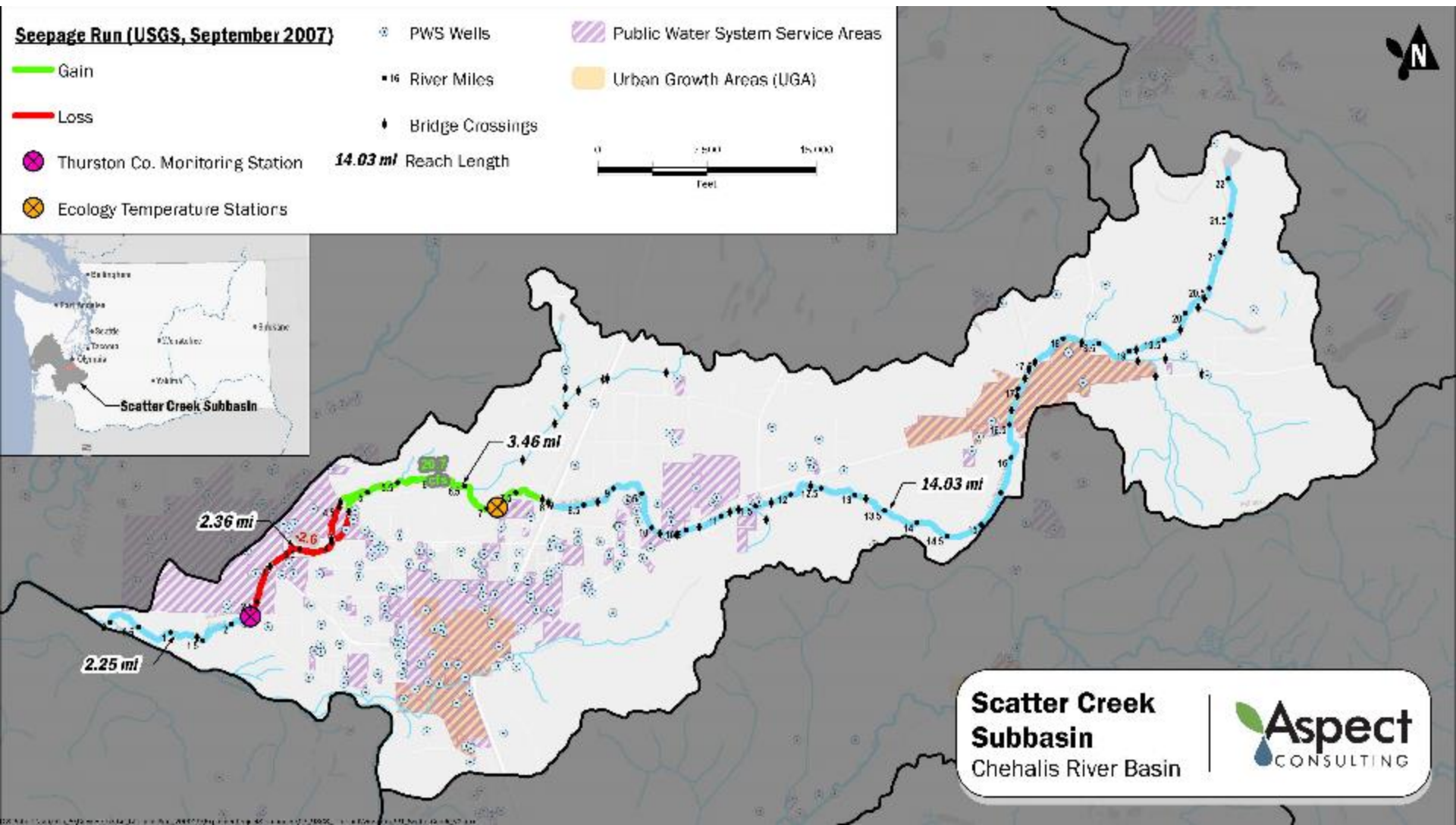
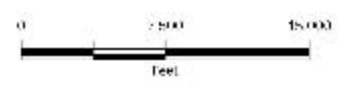
**Aspect**  
CONSULTING

**Seepage Run (USGS, September 2007)**

- Gain
- Loss
- Thurston Co. Monitoring Station
- Ecology Temperature Stations

- PWS Wells
- 16 River Miles
- Bridge Crossings
- 14.03 mi Reach Length

- Public Water System Service Areas
- Urban Growth Areas (UGA)



**Scatter Creek Subbasin**  
Chehalis River Basin

# Map of projects in Scatter Creek



# Draft Scope of Work

- Desktop Assessments
- FLIR thermal survey (fly-over using thermal imaging)
- Field investigations
  - Visual observations and citizen science
  - Thermal profiling
  - Seepage runs
  - Isotope tracer study

# Desktop Assessments

- GIS mapping
  - Land ownership and tributary access constraints
  - Canopy cover may limit FLIR data
- Improve conceptual hydrogeologic model:
  - Well log review and preliminary geologic mapping
  - Water level analysis

# FLIR Survey

- Thermal imaging technology, helicopter fly-over
- Effort/cost depends on:
  - Channel sinuosity and width
  - Canopy or vegetation interference
  - Number and lengths of tributary segments

# Field investigations

- Field investigations
  - Visual observations and citizen science
    - Qualitative
    - Could include staff gauge installation and routine readings
  - Thermal profiling
    - Float or walk channel transects and record location and temperature
  - Seepage runs
    - Typical USGS style, velocity-area method for estimating discharge
  - Isotope tracer study
    - Could be completed in concert with thermal profiling and/or seepage runs.
    - May provide seepage data during higher flow periods

# Questions for CBP

- What do you think about the focus on Scatter Creek?
- Would you be interested in restoring/mitigating flows in Scatter Creek based on study results?
- Would you be interested in seeing a recharge component added, which would help engage in more landscape actions to restore flows?
- What questions do you have?