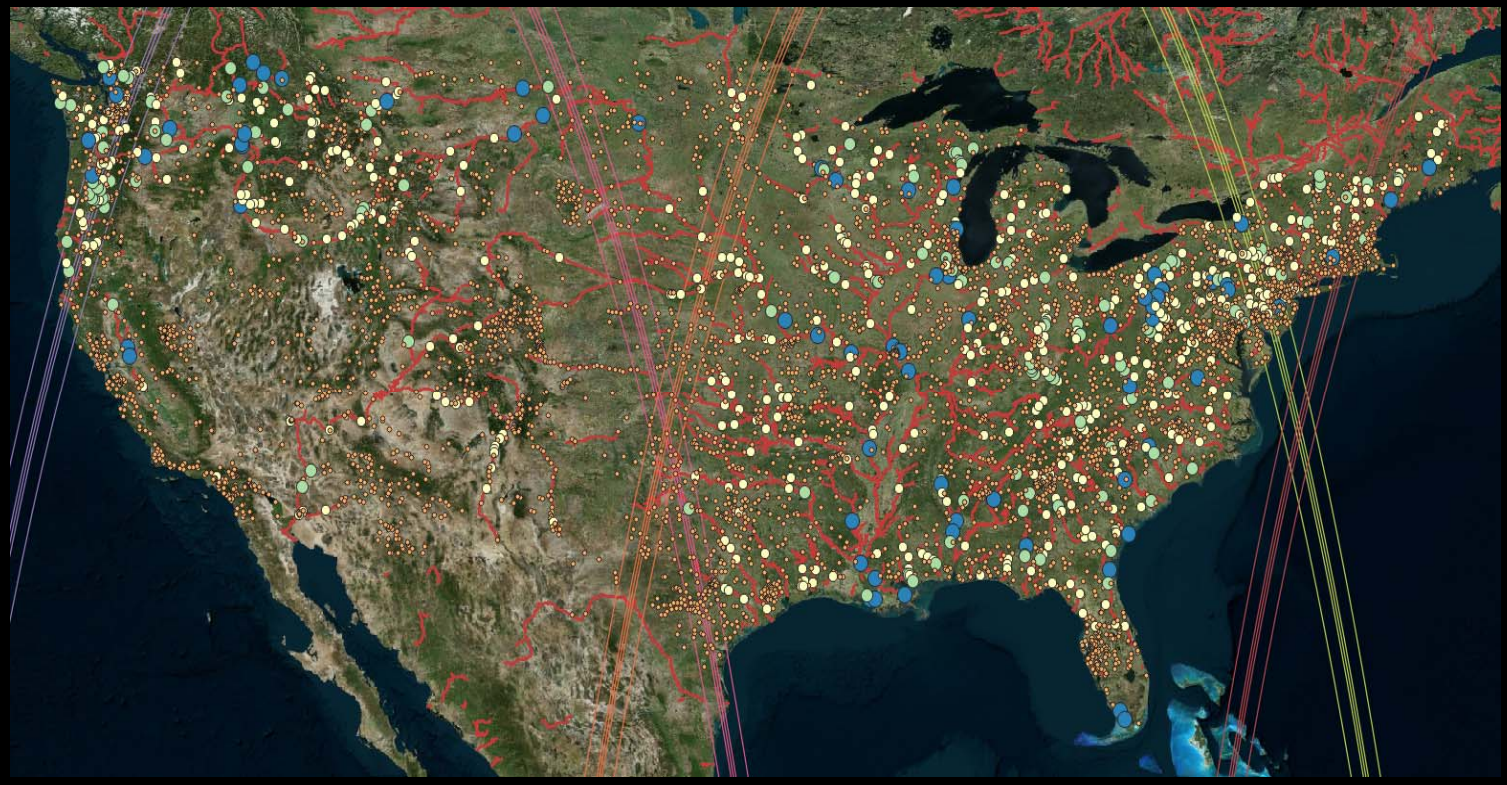
SWOT Tier 2 Cal/Val sites



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ESOC / CIRES

SWOT Tier 2 Cal/Val sites

- Background thoughts
- Selection criteria
- Methods

SWOT Tier 2 Cal/Val sites

Objectives:

- Establish a large number of inexpensive sites at which water surface elevations can be compared to SWOT measurements
  - Rely on existing gage infrastructure

- End goal: Create a population of ground-based water surface measurements that can be used to:
  - Determine if SWOT is meeting Science Design Requirements
  - Assist with diagnosing known possible issues
    - transcontinental drift, wet troposphere delay
  - Help diagnose unforeseen issues

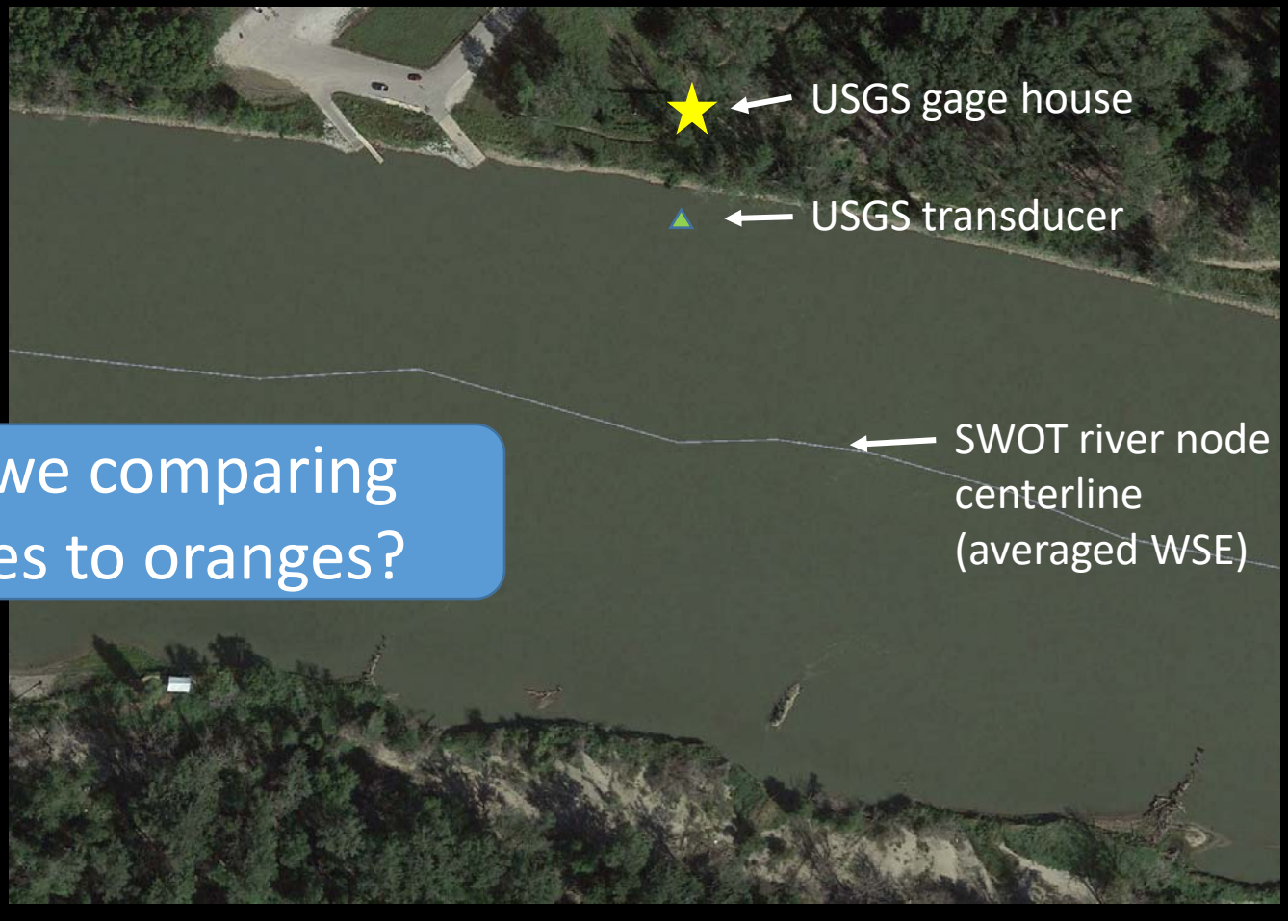
How do we do this? Which sites do we select and what methods do we use?

SWOT Tier 2 Cal/Val sites

- ~75 river and lake sites across the US
  - “a few hundred” mentioned in SWOT CalVal Study Plan
- General concept: GNSS-leveled USGS gages
  - Point water-surface elevation through conversion of USGS stage measurements
  - Discharge, channel geometry for river gages
- Sites selected across a range of lakes and river types and locations in the SWOT swath
  - Sites across US; 10-60km away from centerline of SWOT swath

Background thoughts

- USGS gage measurements are at a point in the river, which may not reflect the WSE that SWOT measures

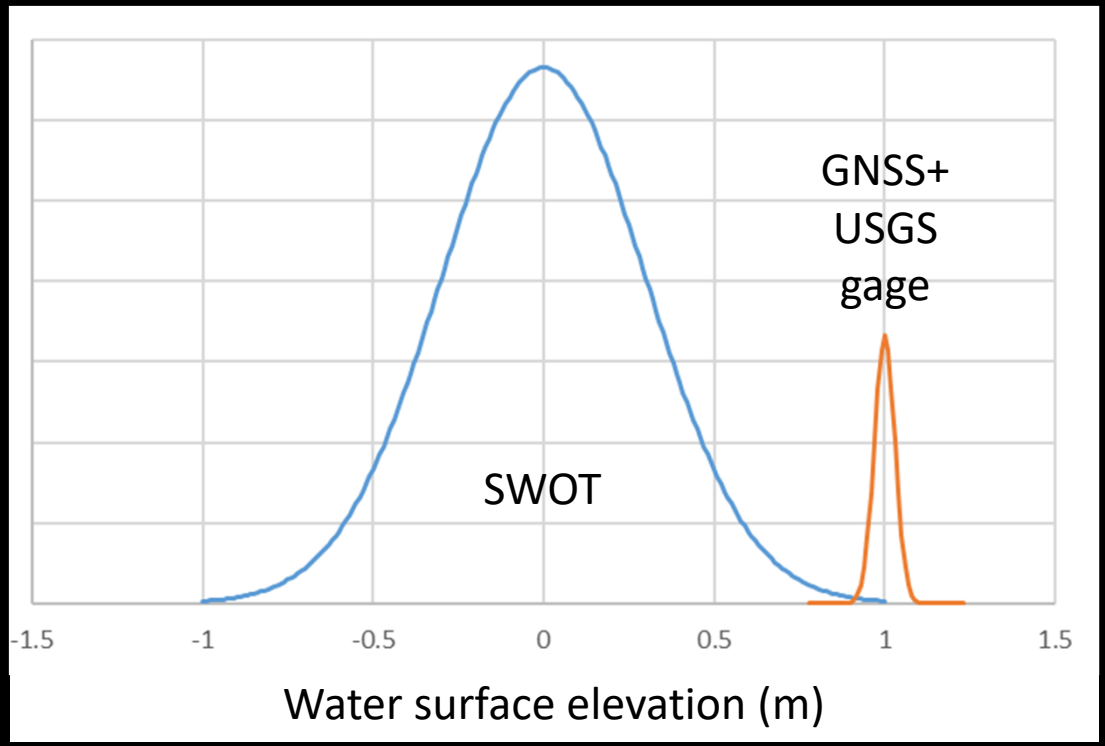


Are we comparing apples to oranges?

Background thoughts

For the comparison between SWOT WSE and ground-validation WSE:

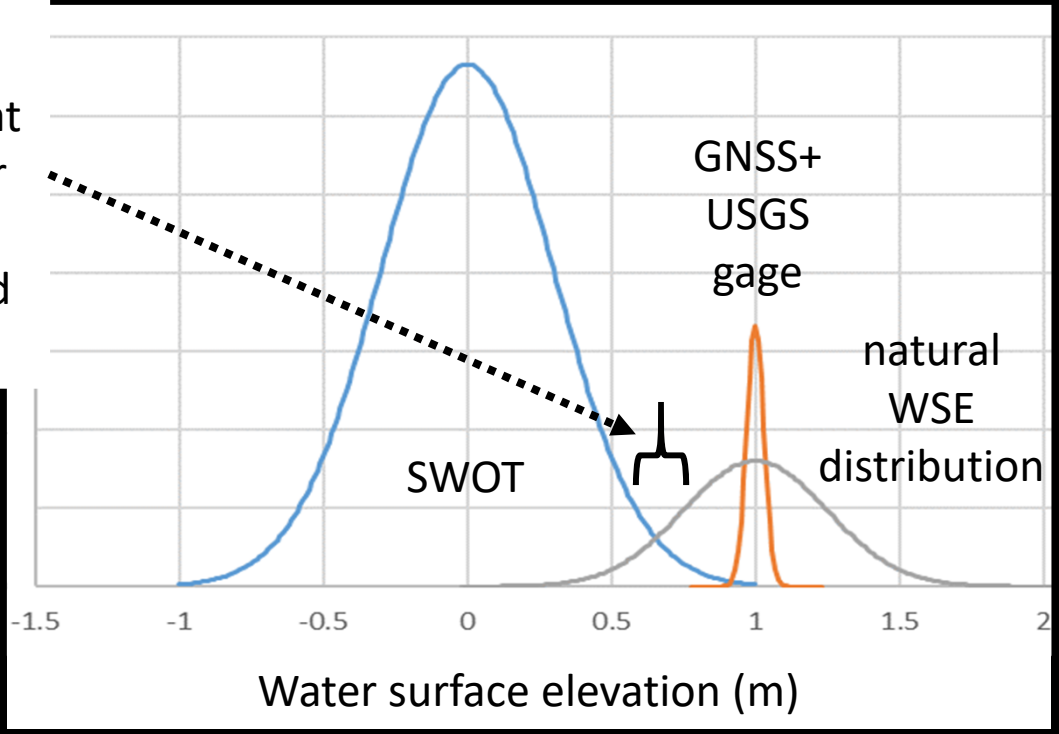
- Ho: averaged SWOT WSE ≠ ground WSE
- Ha: averaged SWOT WSE = ground WSE



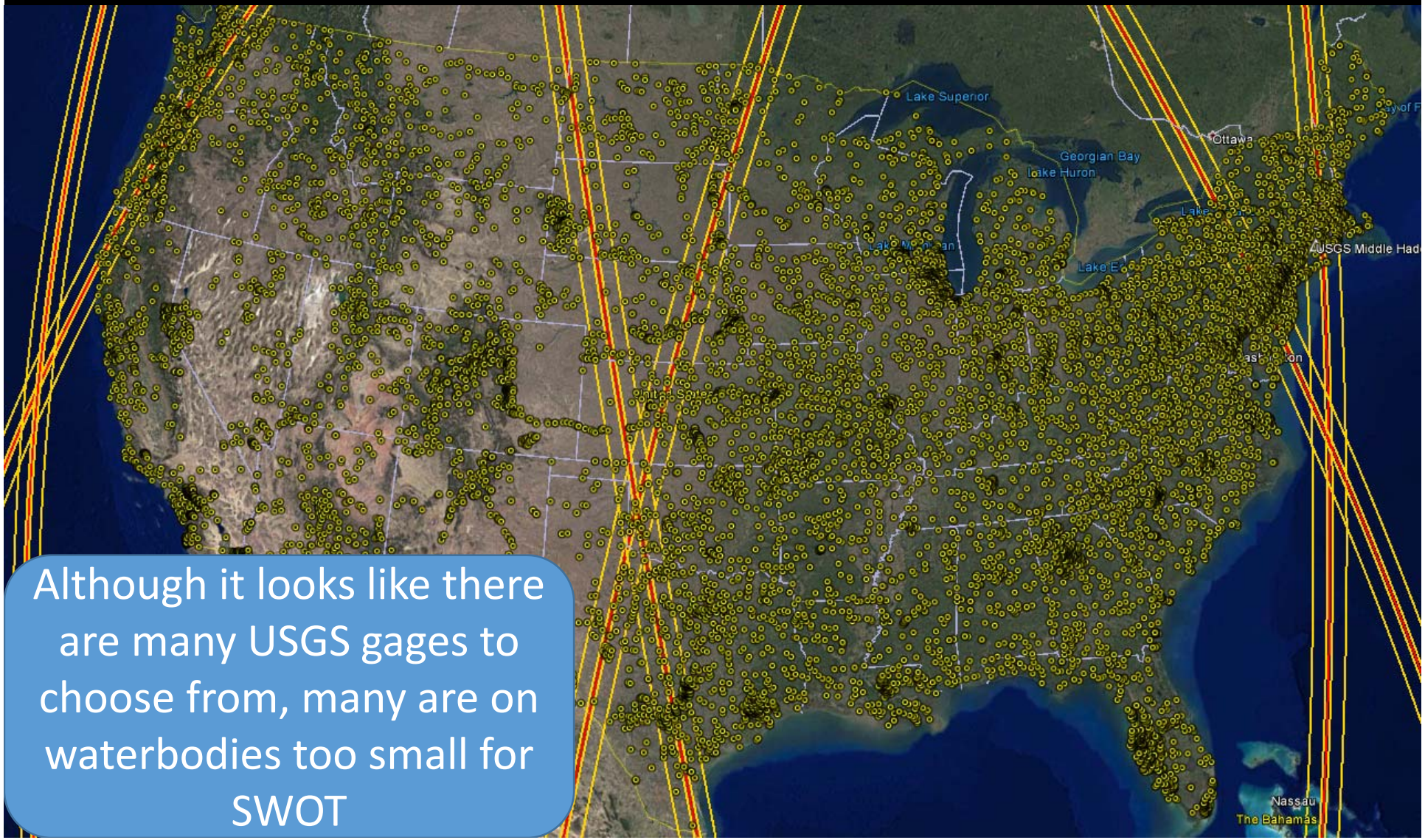
Background thoughts

- What we think SWOT WSE, point GNSS+USGS gage WSE, and natural WSE distributions might look like:

Separation between distributions at desired power determines if Ho is accepted or rejected



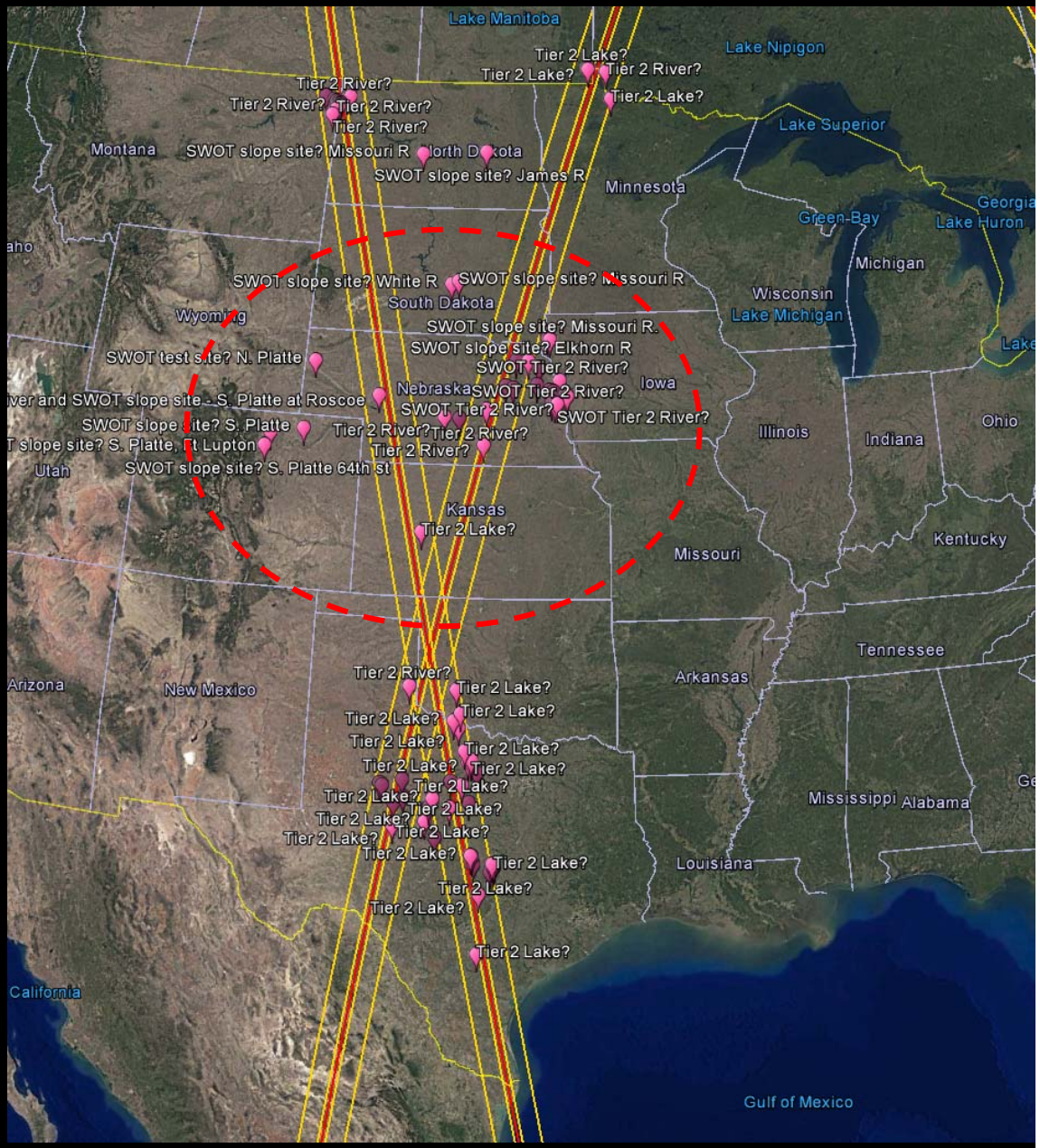
Tier 2 site selection criteria



Although it looks like there are many USGS gages to choose from, many are on waterbodies too small for SWOT

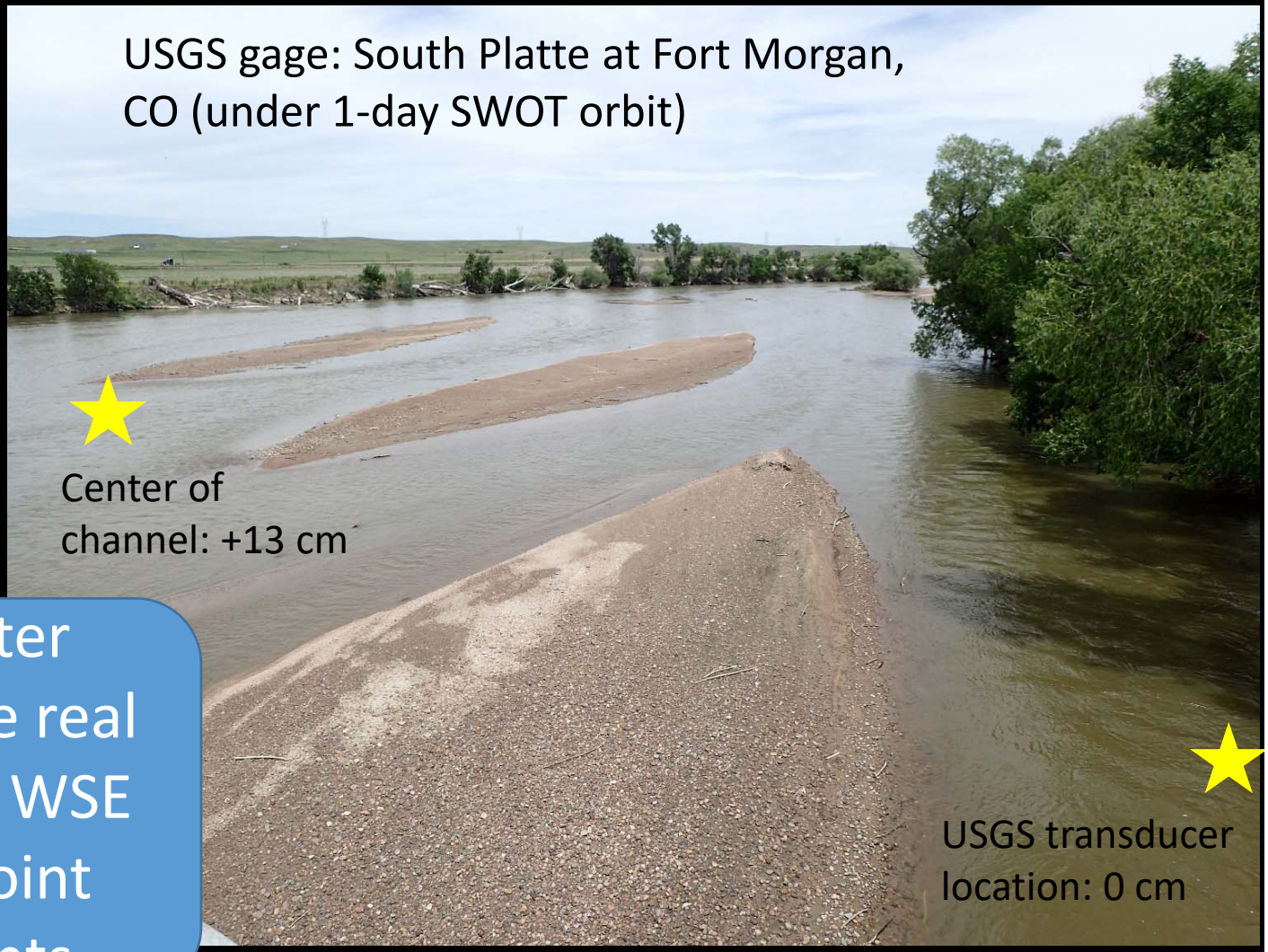
Selection criteria

Primary Tier 2 test site (in red circle), for now mostly focusing on those sites under 1-day orbit



Tier 2 site selection criteria

River at gage is wide enough to be SWOT observable, yet there is a 13 cm difference between the WSE at the USGS transducer and the center of the channel

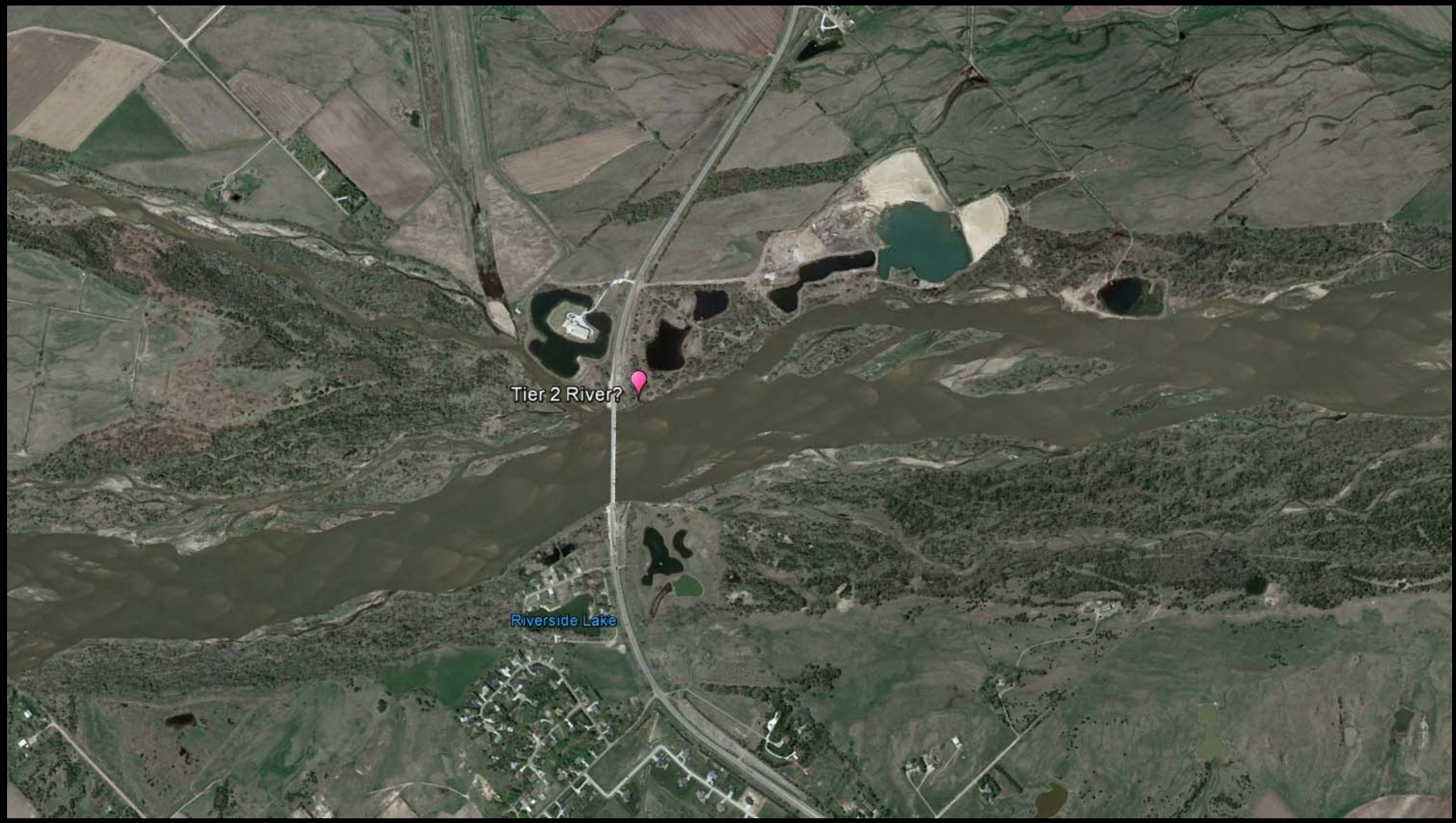


Need to better understand the real distribution of WSE near USGS point measurements

Tier 2 site selection criteria

Example: USGS gage - Platte River near Grand Island, NE

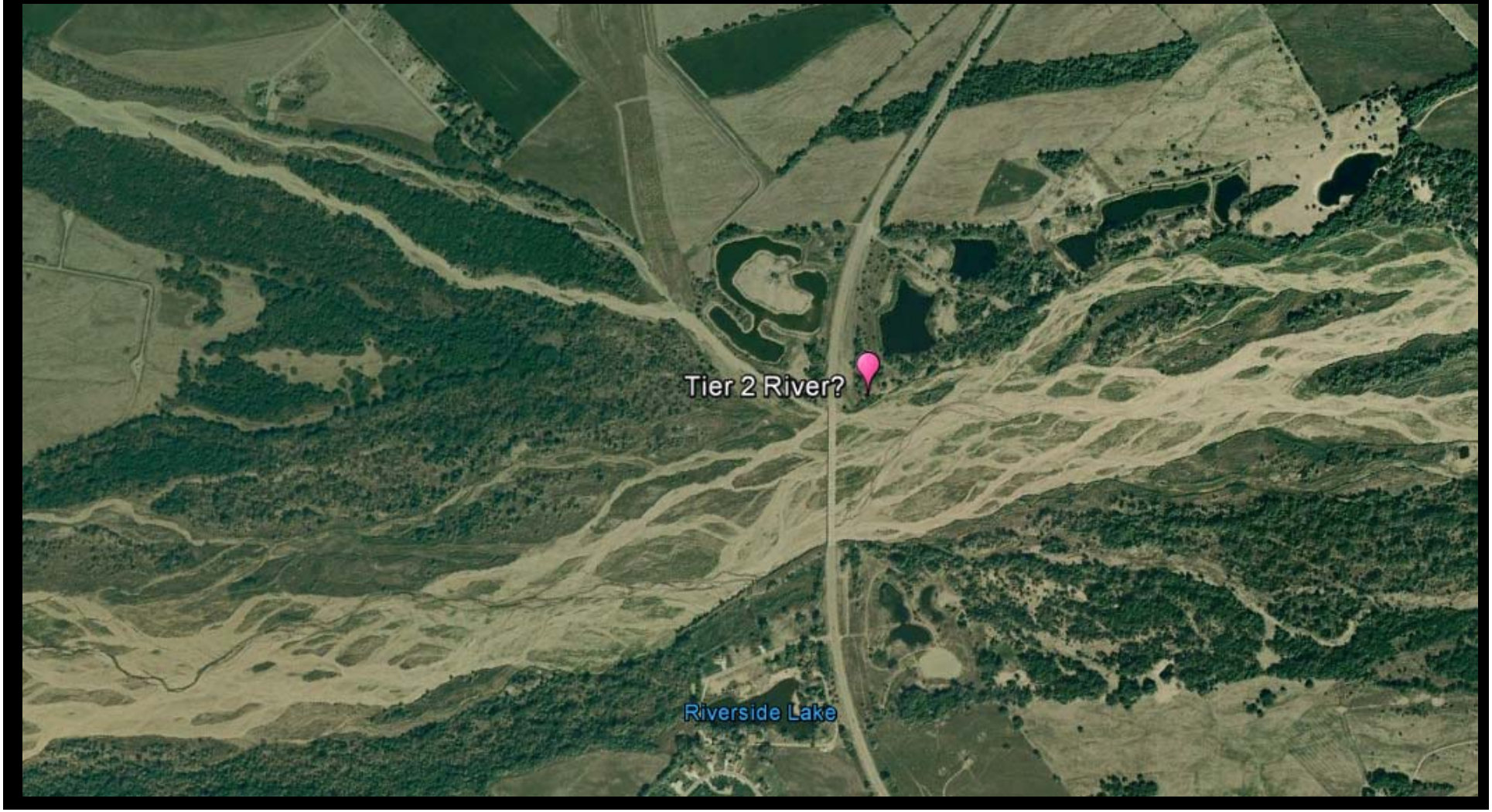
290 meters wide at gage. Looks great for SWOT, right?



Tier 2 site selection criteria

Example: USGS gage - Platte River near Grand Island, NE

At lower flows, river width shrinks below SWOT min width



Tier 2 site selection criteria

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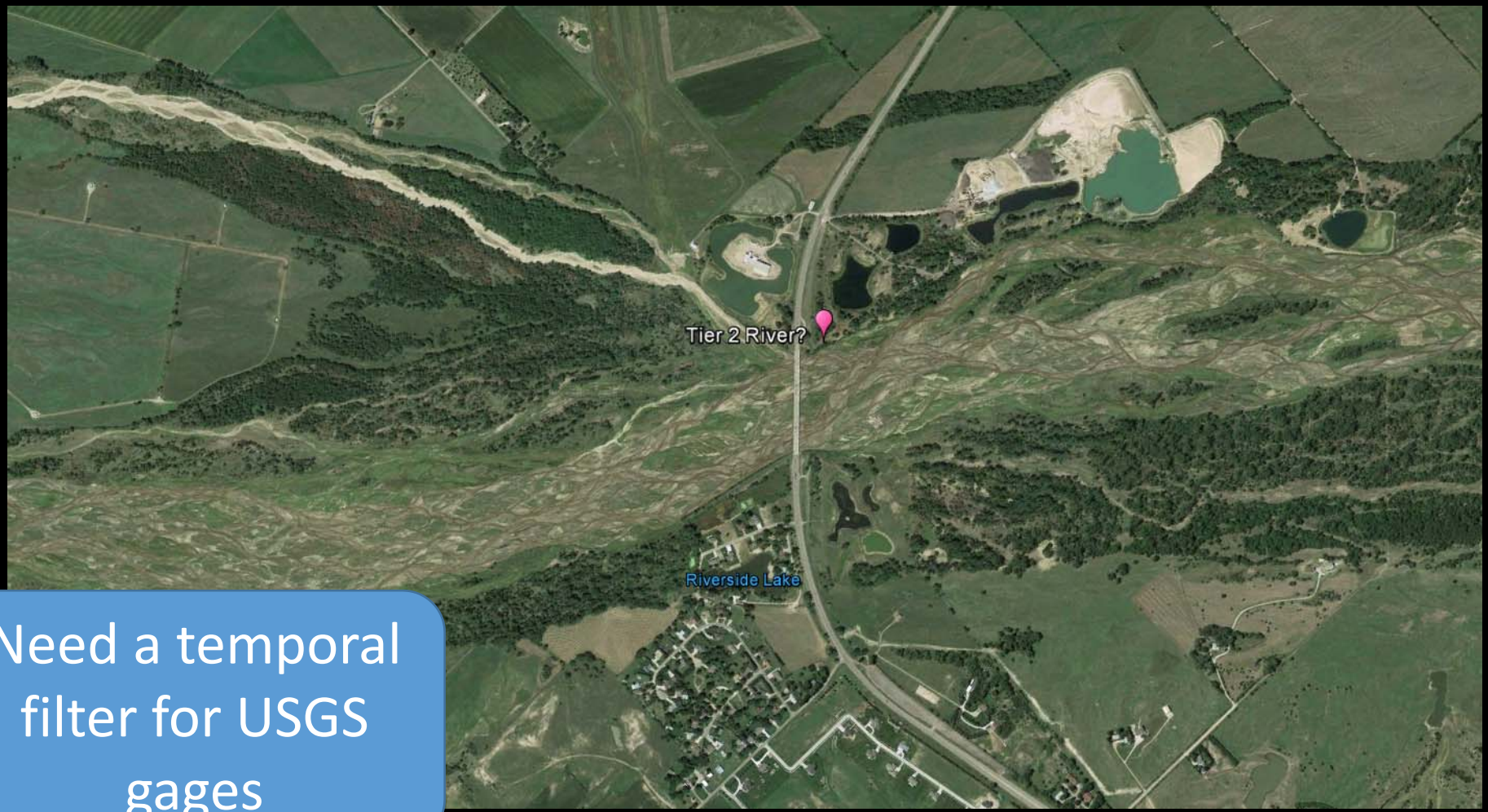
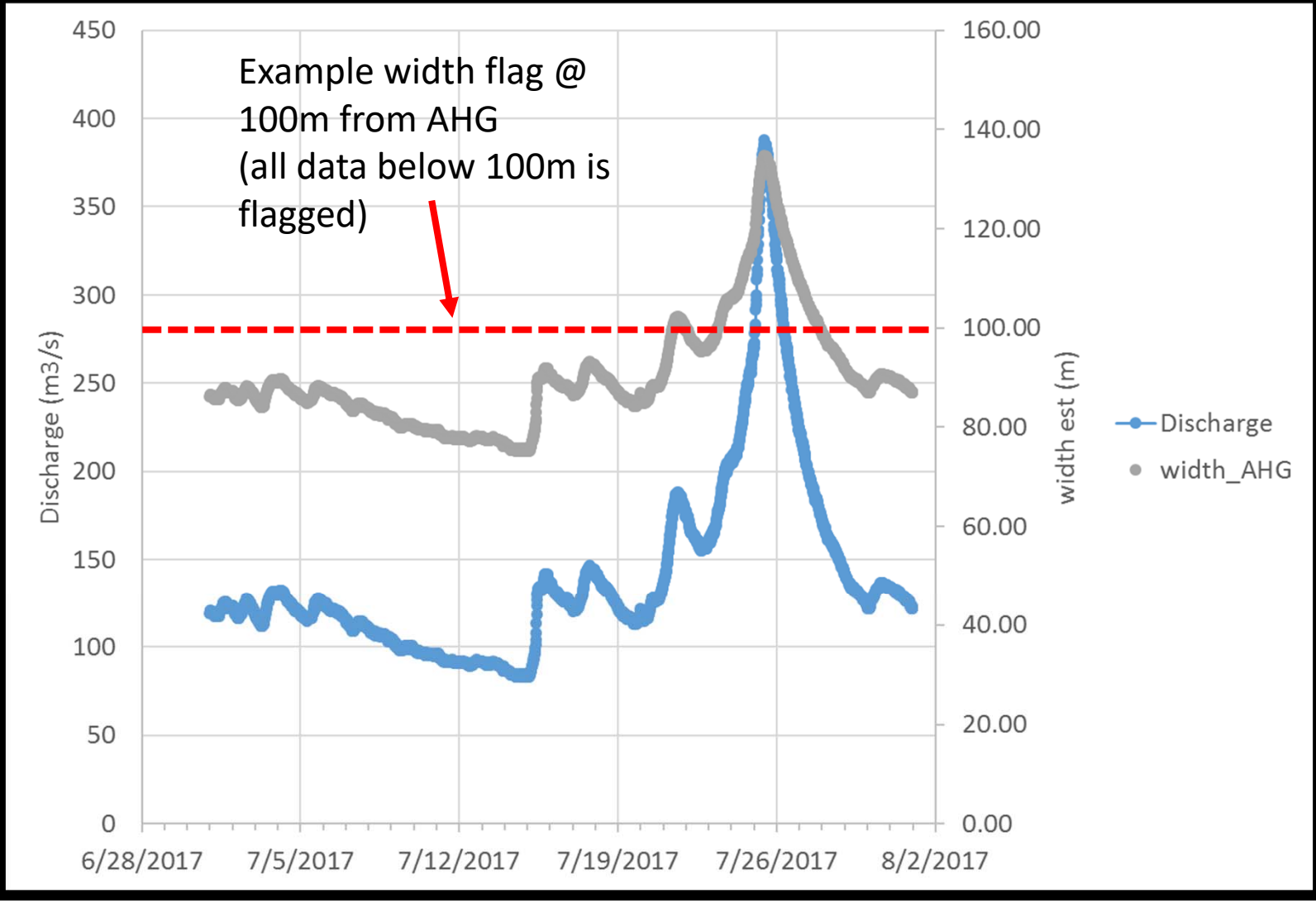


Need a temporal filter for USGS gages

Concept: Tier 2 width flag using AHG

USGS gage – Sagavanirktok River near Pump Station 3, AK

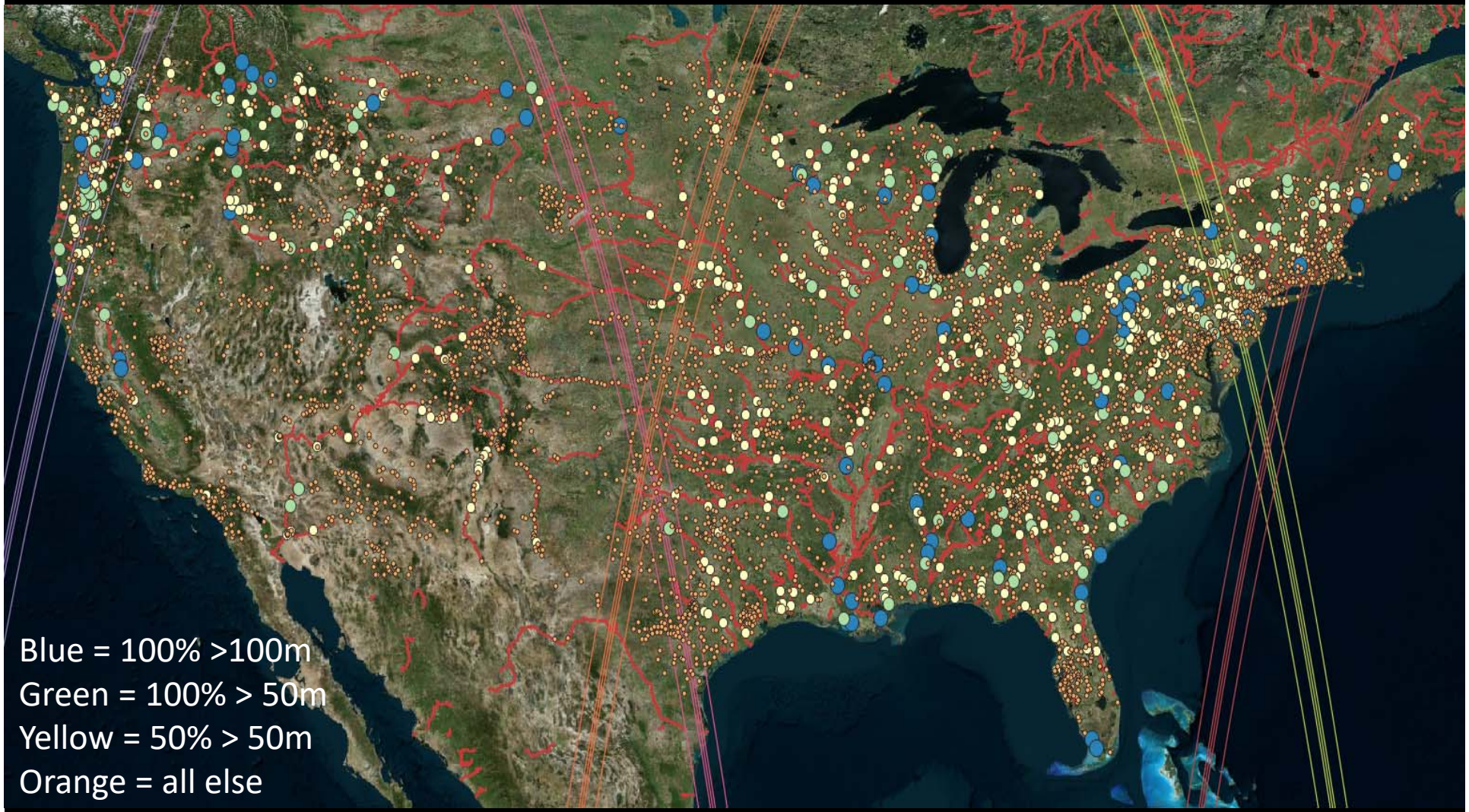


Proposed SWOT Tier 2 site selection critera

1. Must be KaRIN visible
   - 90% of the time, must have width >50m as determined by at-a-station hydraulic geometry
2. Avoid or flag tidal sites or sites with multiple channels
   - Should be apparent from at-a-station hydraulic geometry QA/QC
3. In-time width flags for sites

Some but not all of these sites should be under 1-day fast repeat orbit

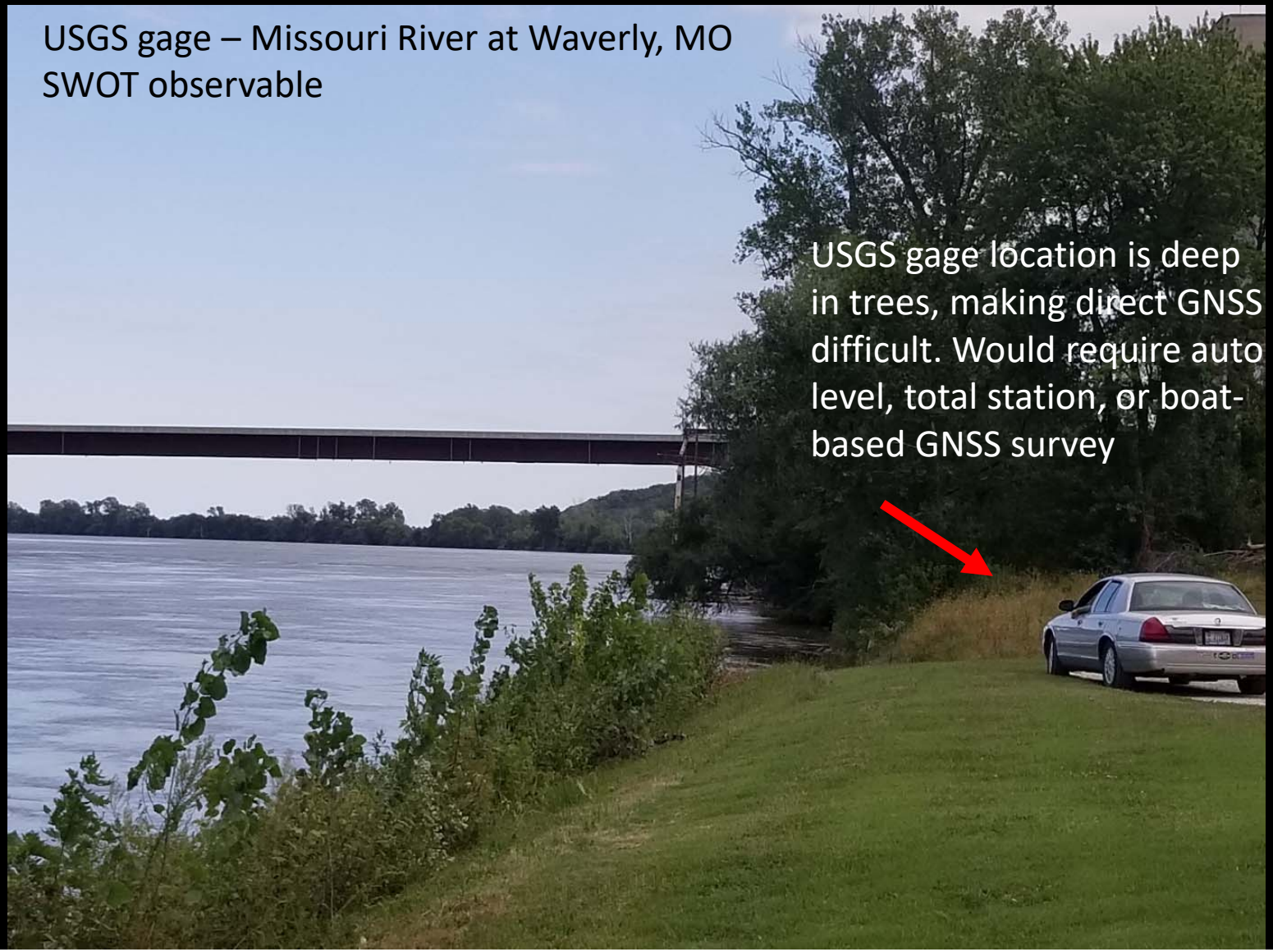
Filtered Tier 2 sites



Proposed SWOT Tier 2 methods

- Static GNSS receiver:
  - 15+ minutes minimum, 1 hr recommended
  - PPP solution
- WSE determined near gage transducer
  - One of two ways: 1.) survey to gage datum; 2.) survey to WSE
- Kinematic GNSS receiver:
  - 15+ minutes minimum
  - At least one pass in middle of river
  - PPP + PPK solution

Missouri River USGS gages



Missouri River USGS gages

Next steps

- Determine expected distribution of water-surface elevations within two channel widths of USGS gage transducer
- Confirm Tier 2 methods (drift?)