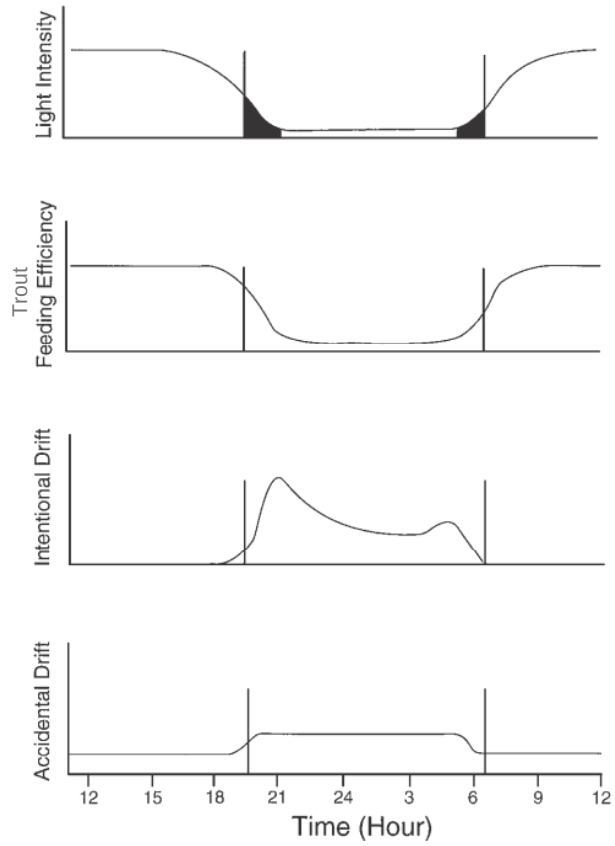
Behavioral Drift

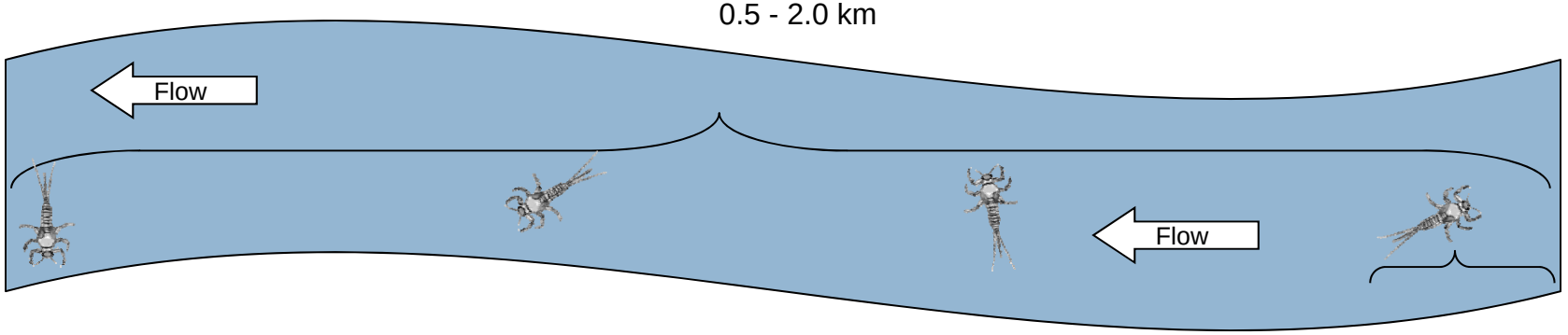
- Active drift – animals actively enter the water column
  - Escape from predators
  - Search for food
  - Search for space
- Passive drift – accidental dislodgement during foraging activity or movements



Sources: Allan 1995; Brittain & Eikeland 1988; Rader 1997; Waters 1972; Wilzbach et al. 1988

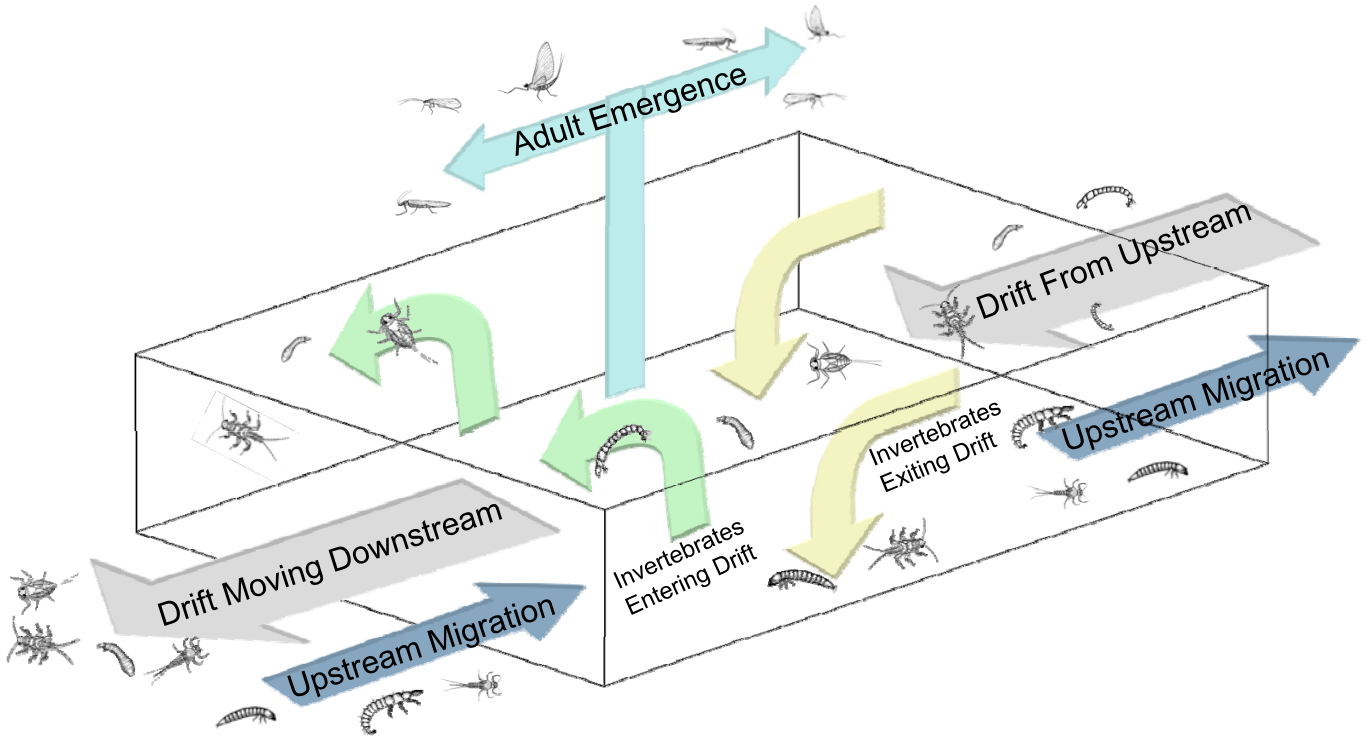
Drift Distances

Multiple drift trips
over weeks or months
0.5 - 2.0 km



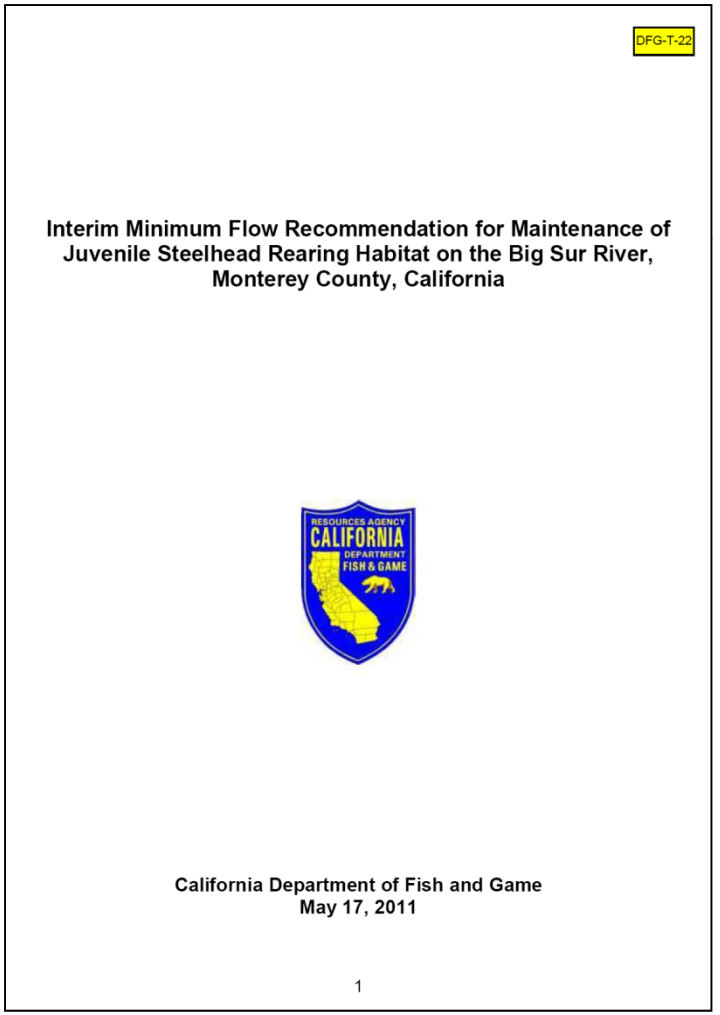
Single drift trips
4-6 m swimmer
10-20 m non-swimmer

Insect Drift Model



Assignment

1. Review CDFG (2011) report and its conclusions, and supporting field data (data from September 17, 1992 through August 3, 1995) and electronic data (Excel files (BSR_Wetted_ Perimeter_PRA).



DFG-T-22

Interim Minimum Flow Recommendation for Maintenance of Juvenile Steelhead Rearing Habitat on the Big Sur River, Monterey County, California

California Department of Fish and Game
May 17, 2011

1

Assignment

2. Evaluate whether the data and methods used in the report are reliable, were appropriately used, and support the conclusions reached concerning the interim flow needs of the Big Sur River.

Conclusions

- The data used in the report are RELIABLE *for habitat characterization purposes.*
- The data are NOT RELIABLE for deriving accurate Wetted Perimeter vs Flow relationships for the Big Sur River.

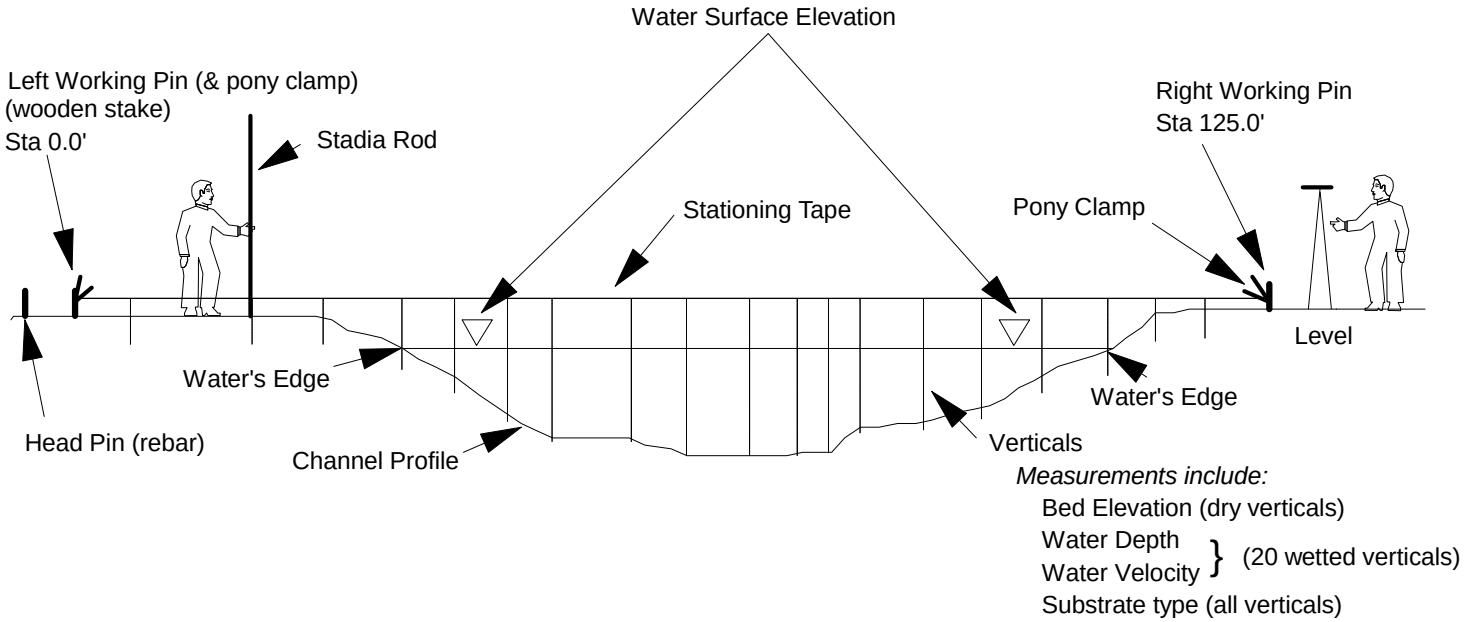
Basis for Conclusions

- Data were not collected specifically for use in a WP-Q analysis but rather a general habitat characterization.
- Data collection methods did not conform to standard practices for defining WP-Q analysis.

General methods to determine WP-Flow relationships (Annear et al. 2004)

- Establish 1 or more fixed Cross-channel transects at locations representative of riffle type habitats.

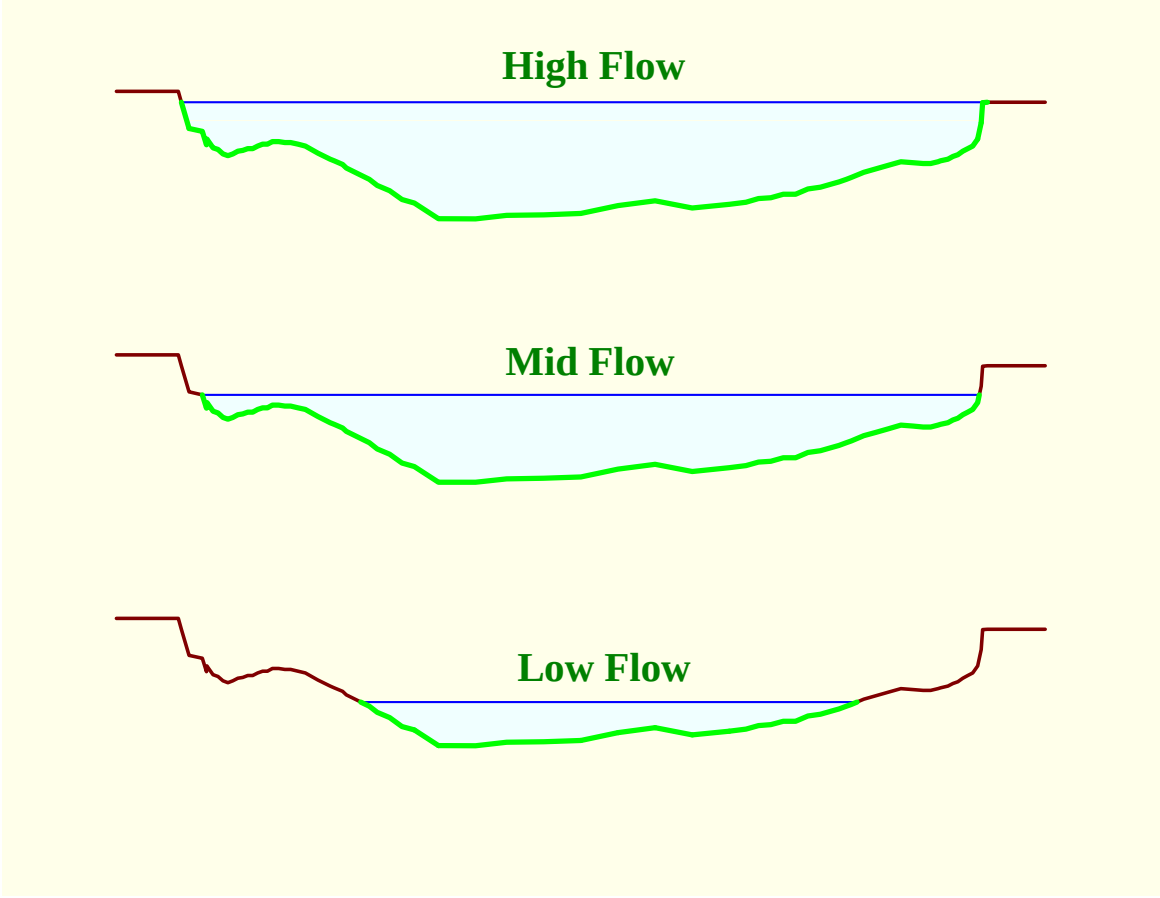
View Downstream



Wetted Perimeter Definition

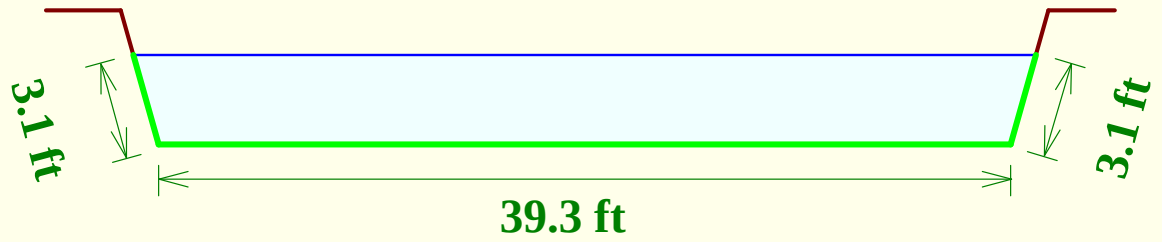
Total length of wetted portion of cross-section boundary

Wetted perimeter shown as green line in illustration



Wetted Perimeter Calculation

Simple Trapezoidal Cross-Section Shape



Wetted Perimeter = 3.1 ft + 39.3 ft + 3.1 ft = 45.5 ft

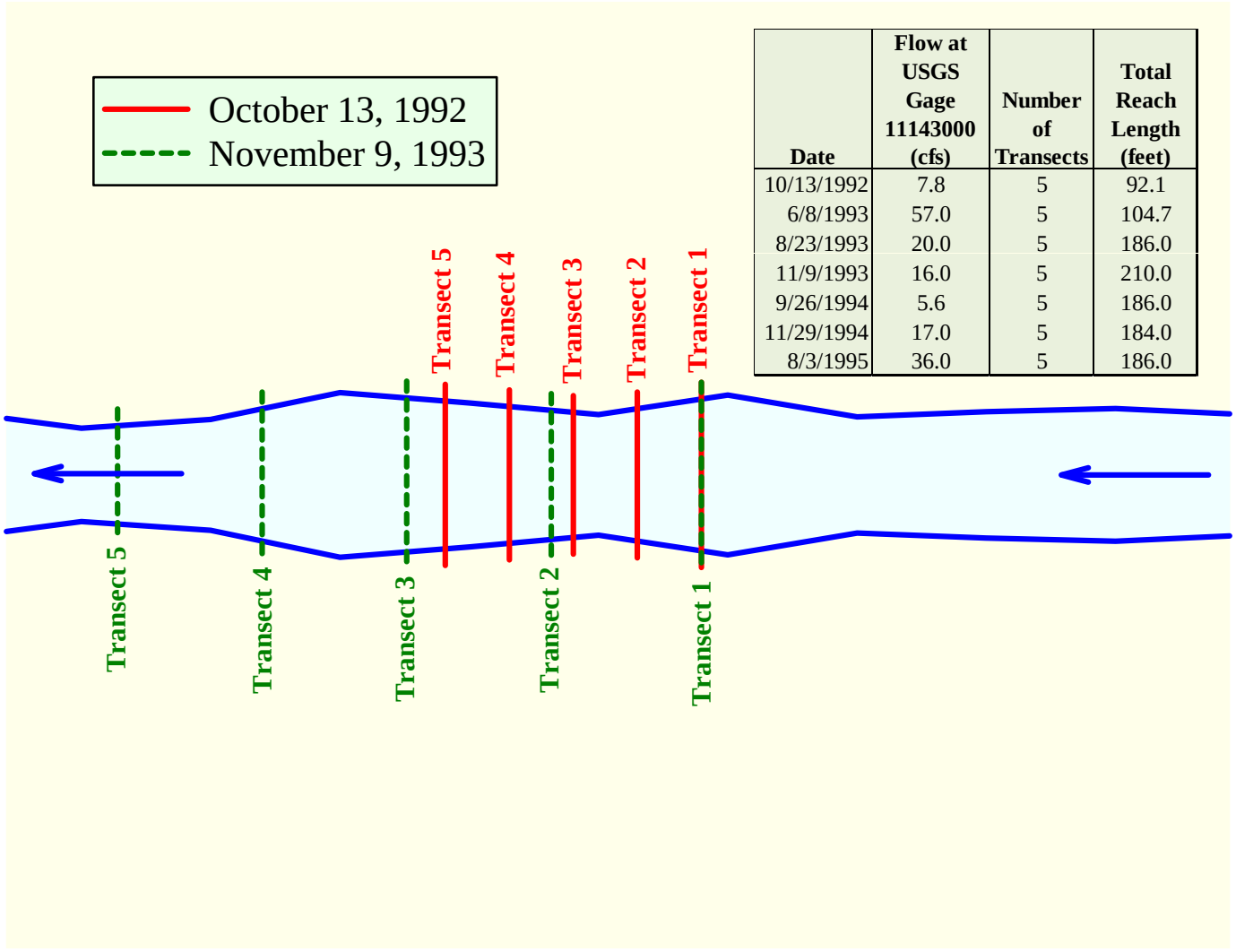
WP-Flow Relationships

- Empirical Derivation
  - Measurements of water depth and widths at numerous intervals (verticals) across "fixed" transects.
  - Same locations and intervals measured under numerous different flows (Annear et al. 2004 suggest 10 or more flows should be measured).
  - Plot WP vs Flow.
- Computer generation
  - Single set of field measurements that includes Water Surface elevation.
  - Synthesize stage-discharge relationships that can be used to compute WP under different flows.

Basis for Conclusions (cont)

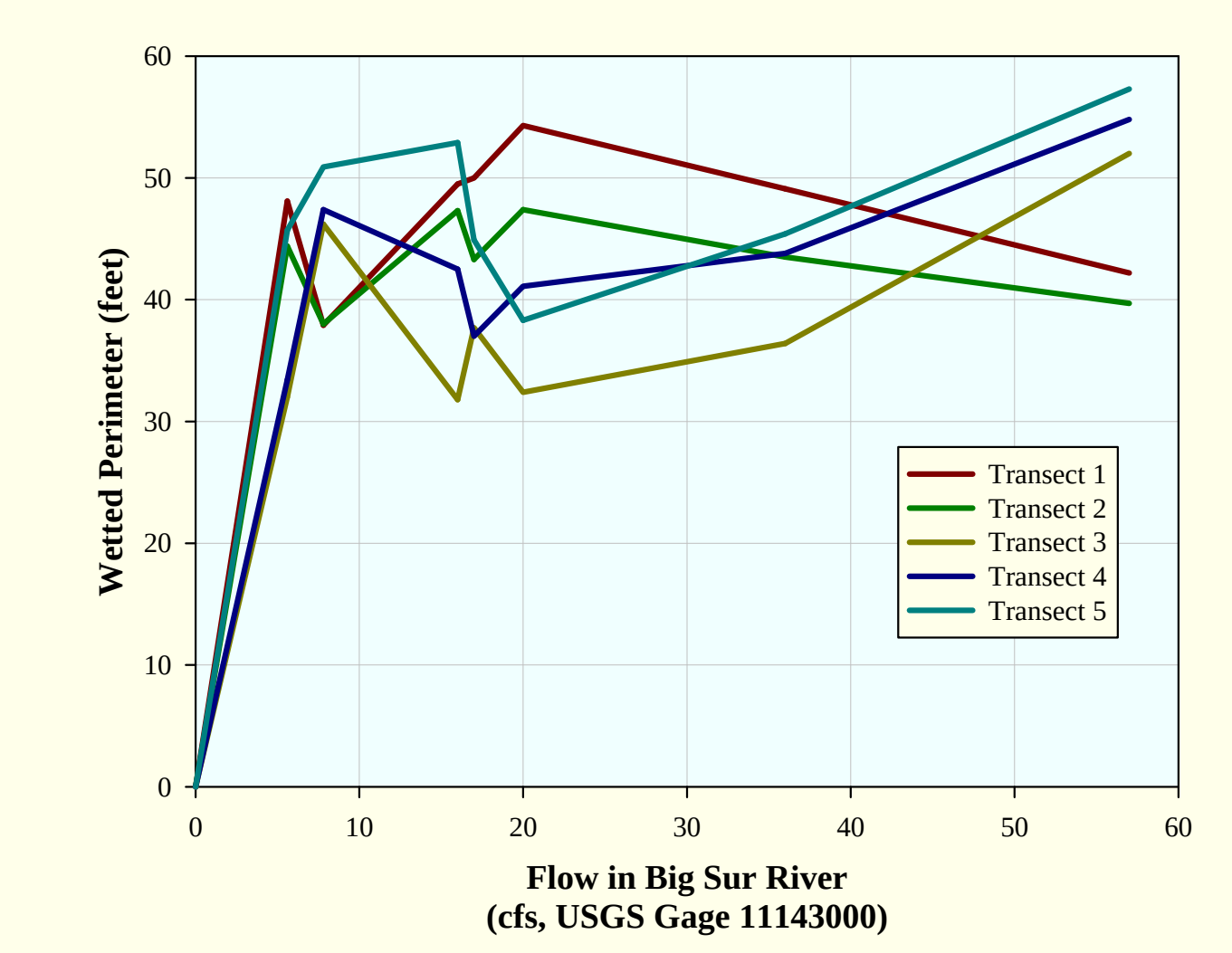
- CDFG 2011 Analysis
  - No "fixed" transects used - same locations not sampled each time.
  - Different lengths of stream surveyed at different times – same locations not sampled each time.
  - Included thalweg depths and channel widths that appear to have been measured at different locations, within the same data set used in developing WP-flow relationships for a given location.

Transect Locations on Two Different Dates at Site C7

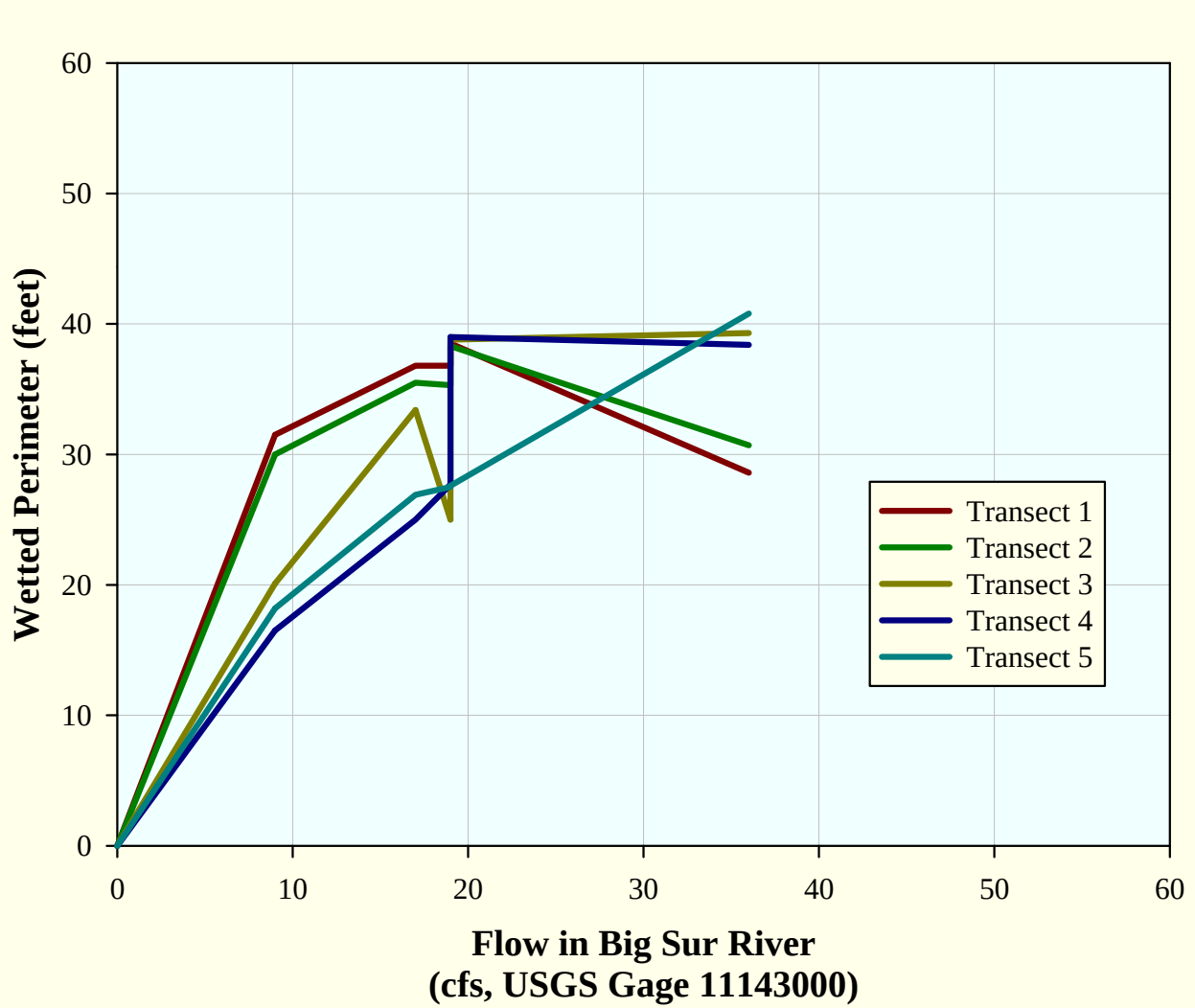


Date	Flow at USGS Gage 11143000 (cfs)	Number of Transects	Total Reach Length (feet)
10/13/1992	7.8	5	92.1
6/8/1993	57.0	5	104.7
8/23/1993	20.0	5	186.0
11/9/1993	16.0	5	210.0
9/26/1994	5.6	5	186.0
11/29/1994	17.0	5	184.0
8/3/1995	36.0	5	186.0

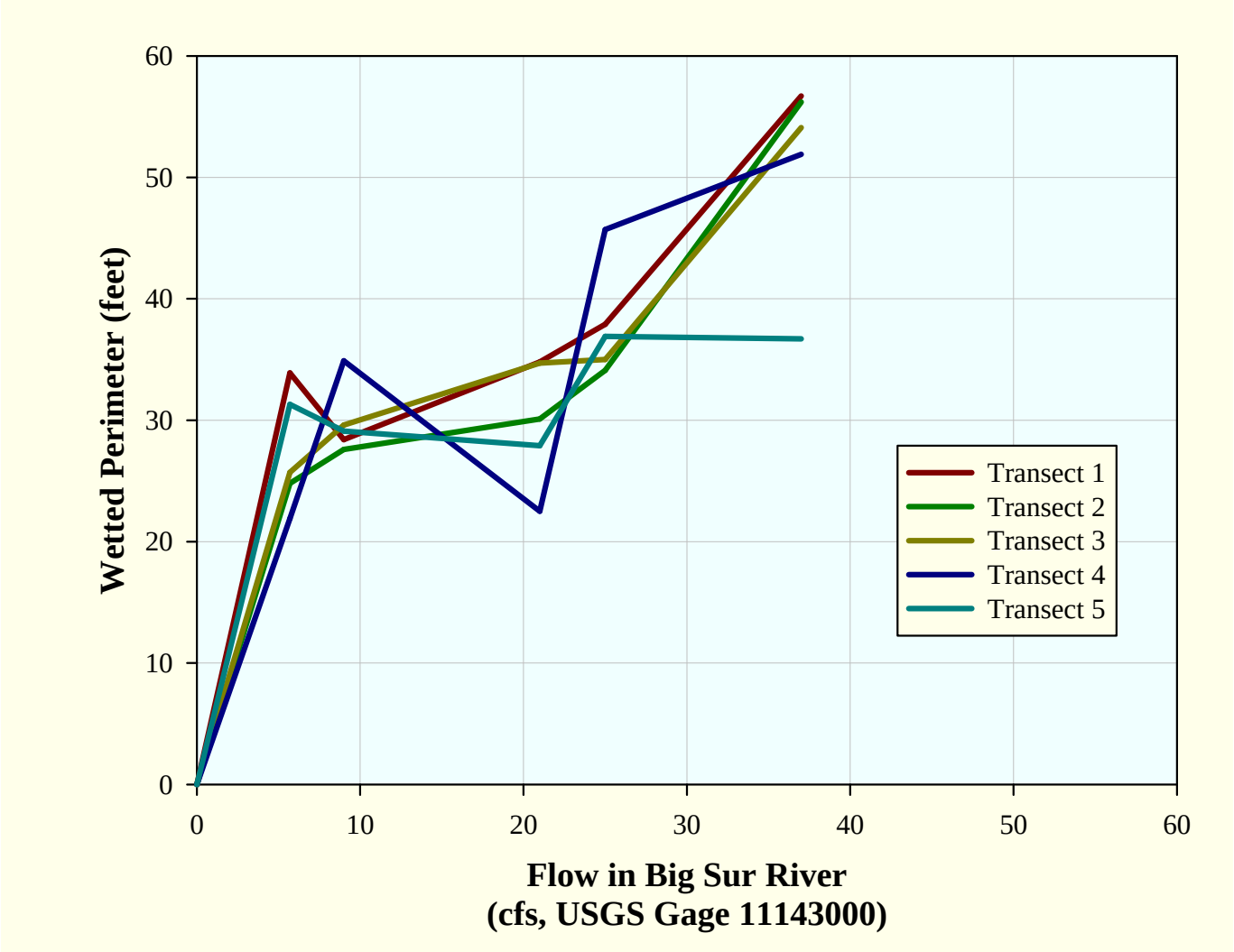
Wetted Perimeter/Flow Relationships for Each Transect at Site C7



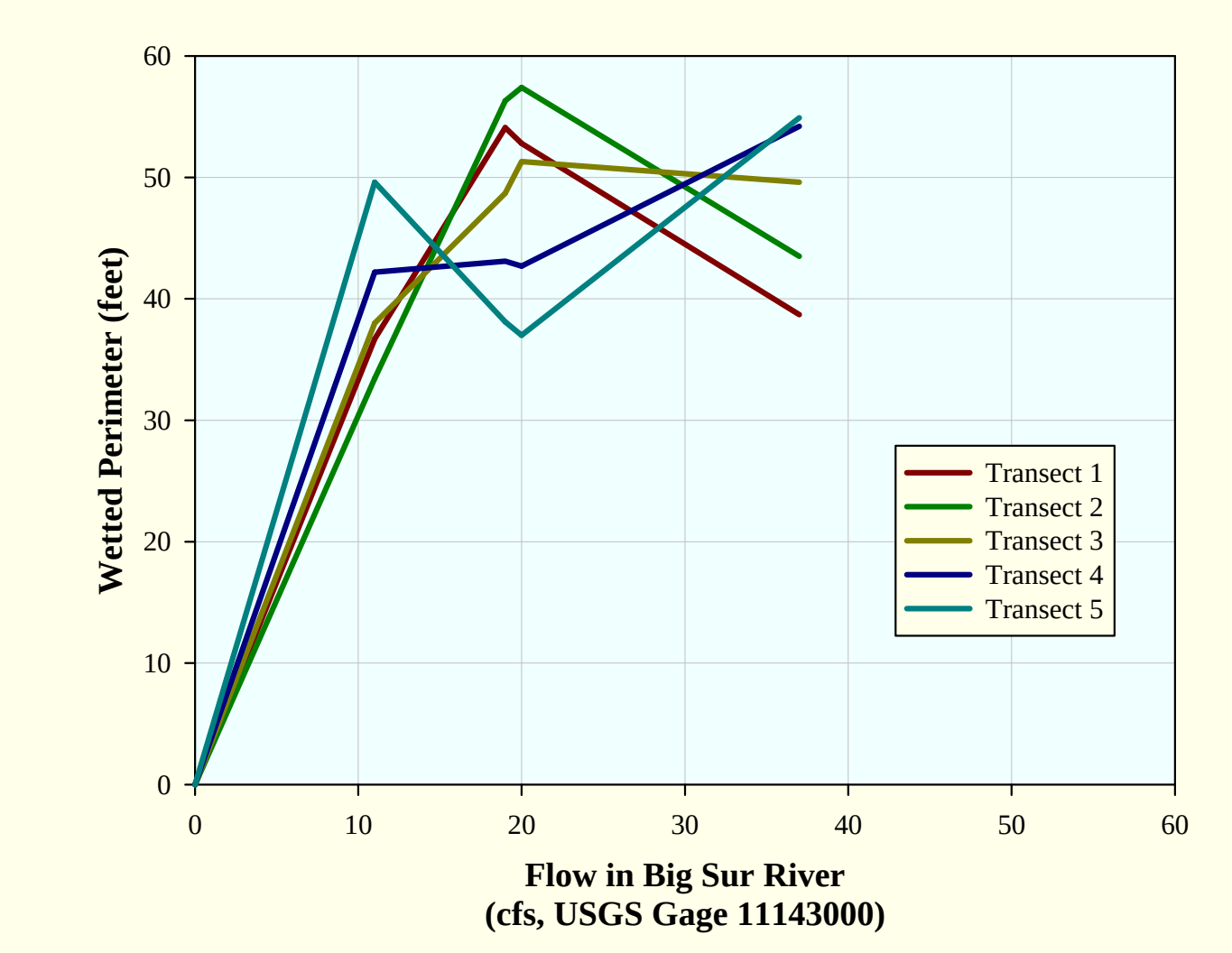
Wetted Perimeter/Flow Relationships for Each Transect at Site C14



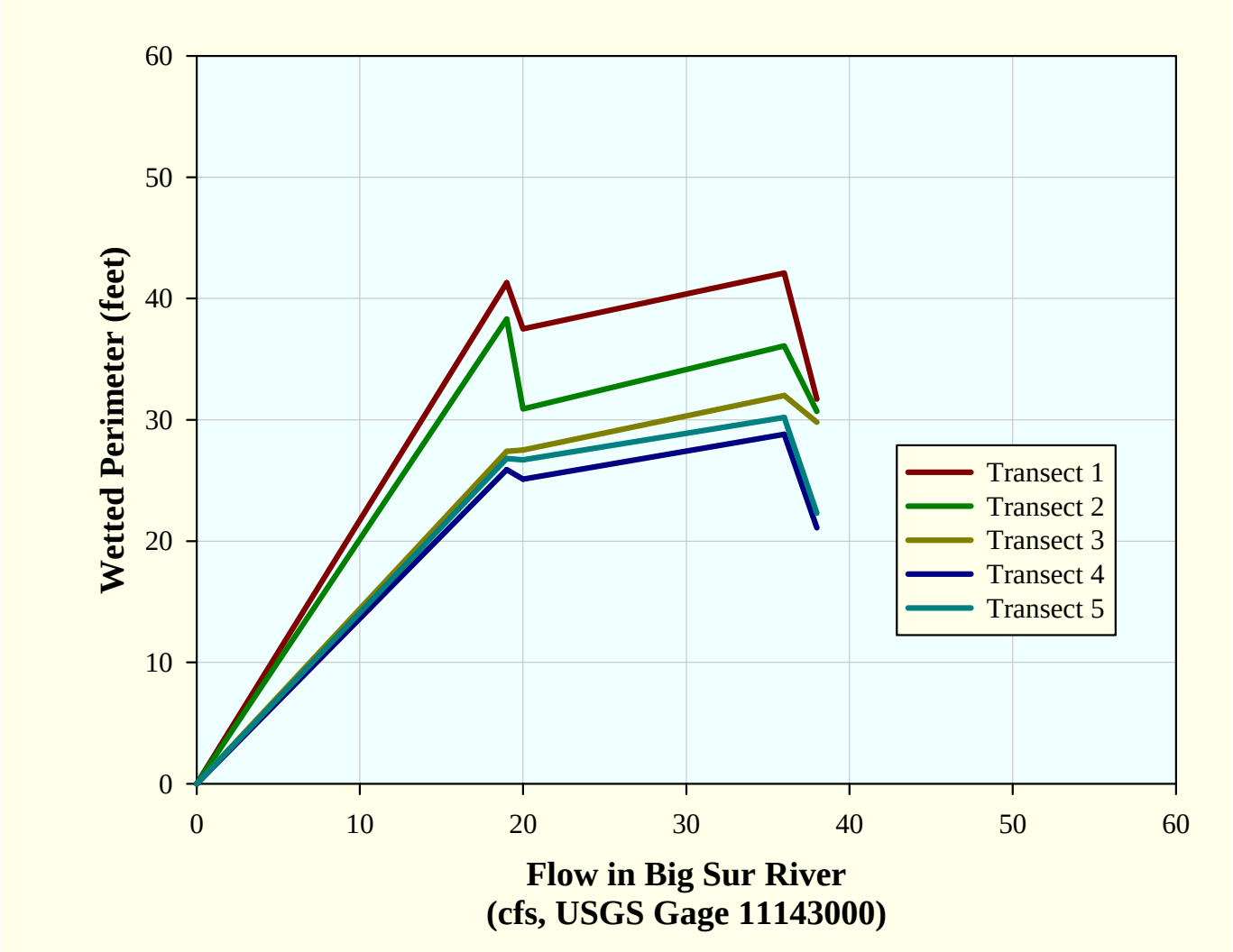
Wetted Perimeter/Flow Relationships for Each Transect at Site M16



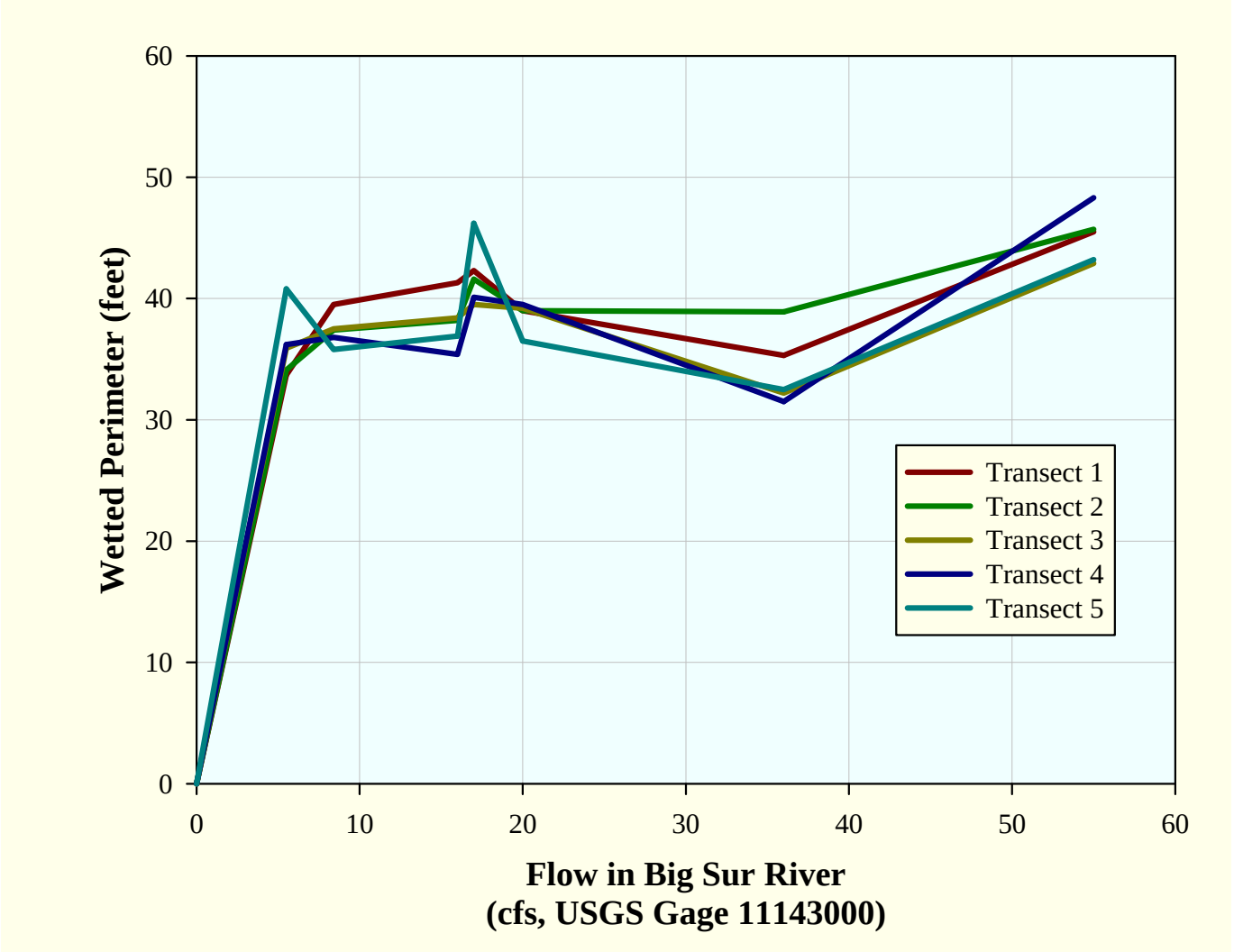
Wetted Perimeter/Flow Relationships for Each Transect at Site M18



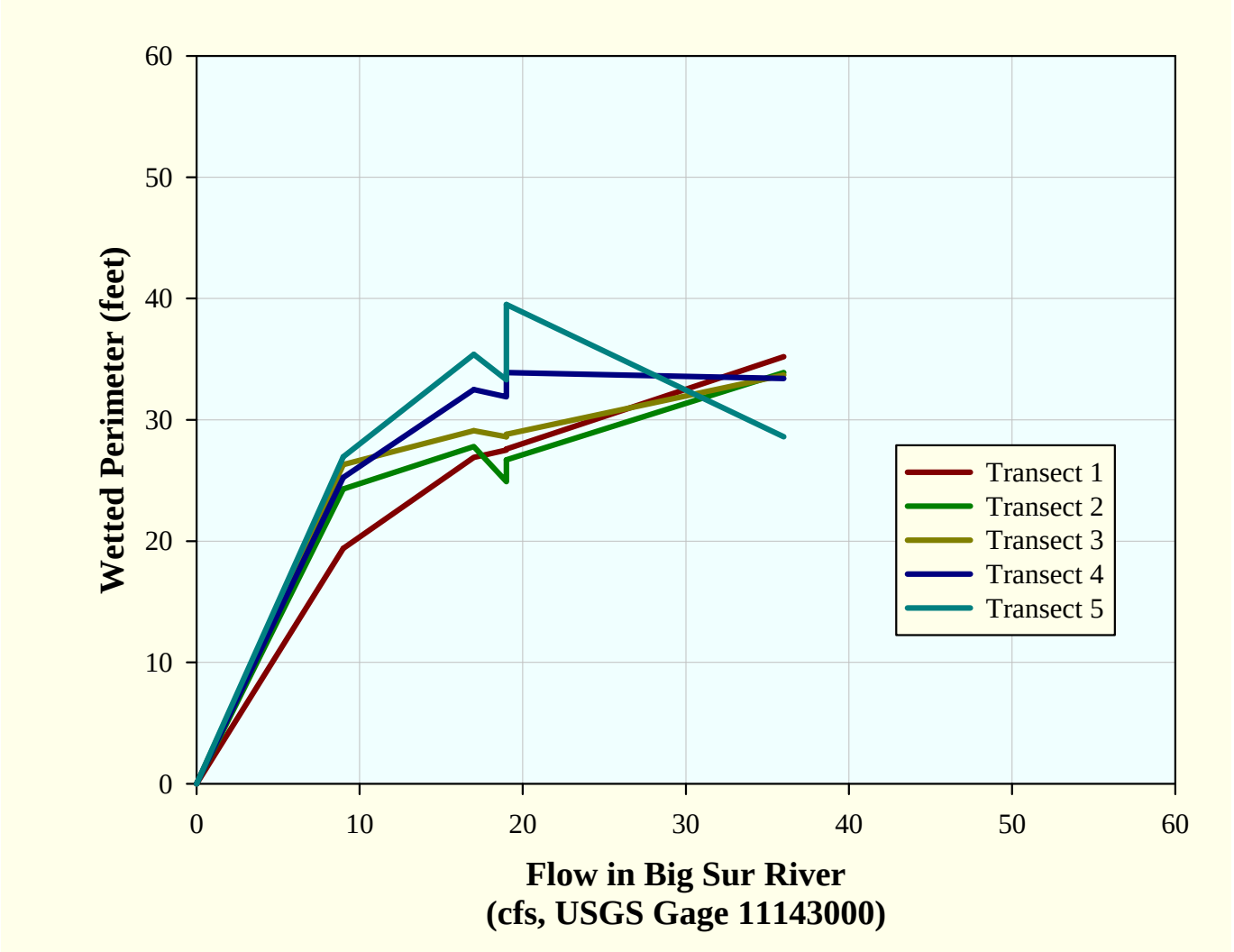
Wetted Perimeter/Flow Relationships for Each Transect at Site M20



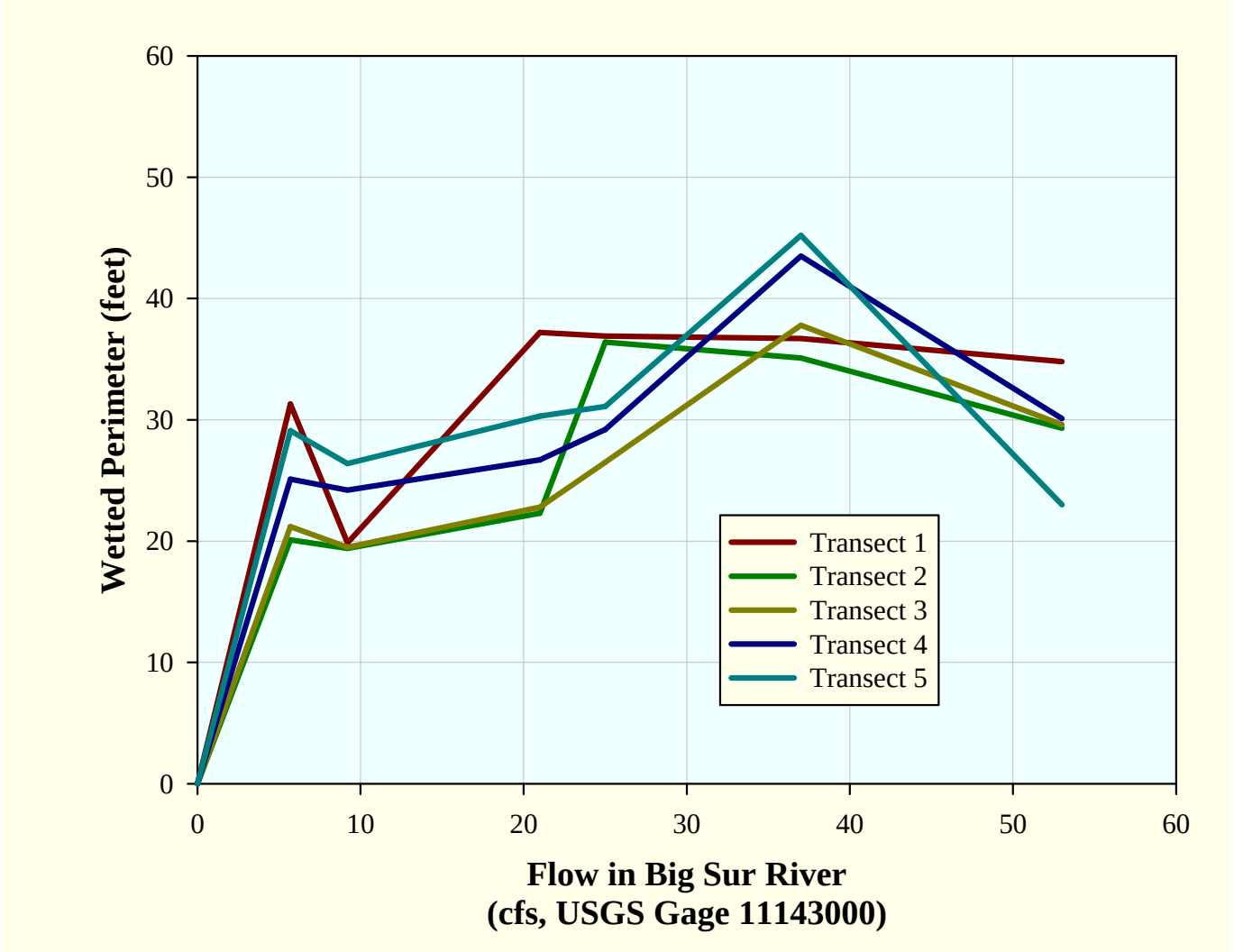
Wetted Perimeter/Flow Relationships for Each Transect at Site C9



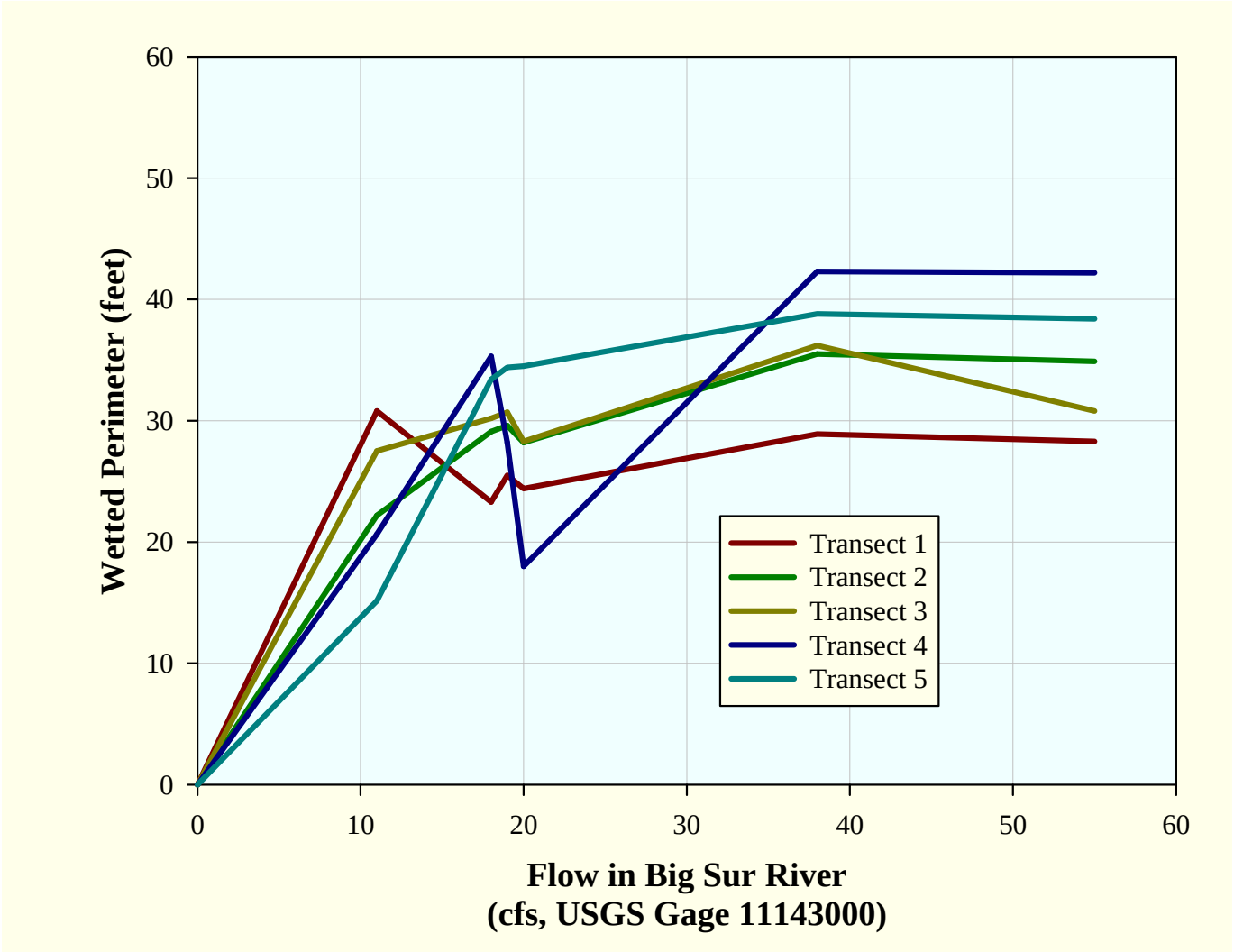
Wetted Perimeter/Flow Relationships for Each Transect at Site C15



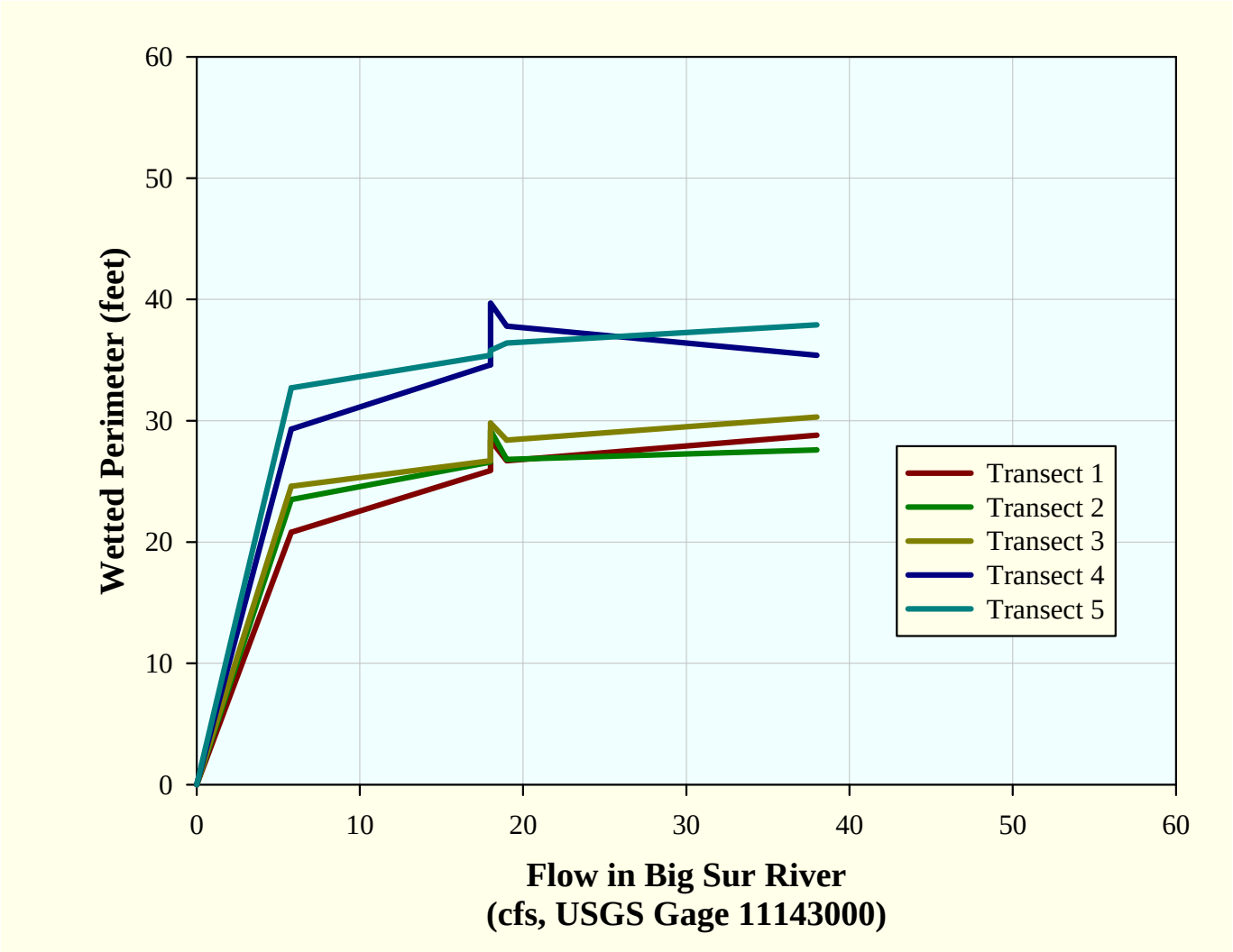
Wetted Perimeter/Flow Relationships for Each Transect at Site M17



Wetted Perimeter/Flow Relationships for Each Transect at Site M23



Wetted Perimeter/Flow Relationships for Each Transect at Site M25



Basis for Conclusions (cont)

- CDFG 2011 Analysis
  - No consistency in the flow conditions measured at the different locations; five locations included "low flow measurements in September 94"; the other five did not.
  - Inflection points largely determined by "lowest" flow measured.

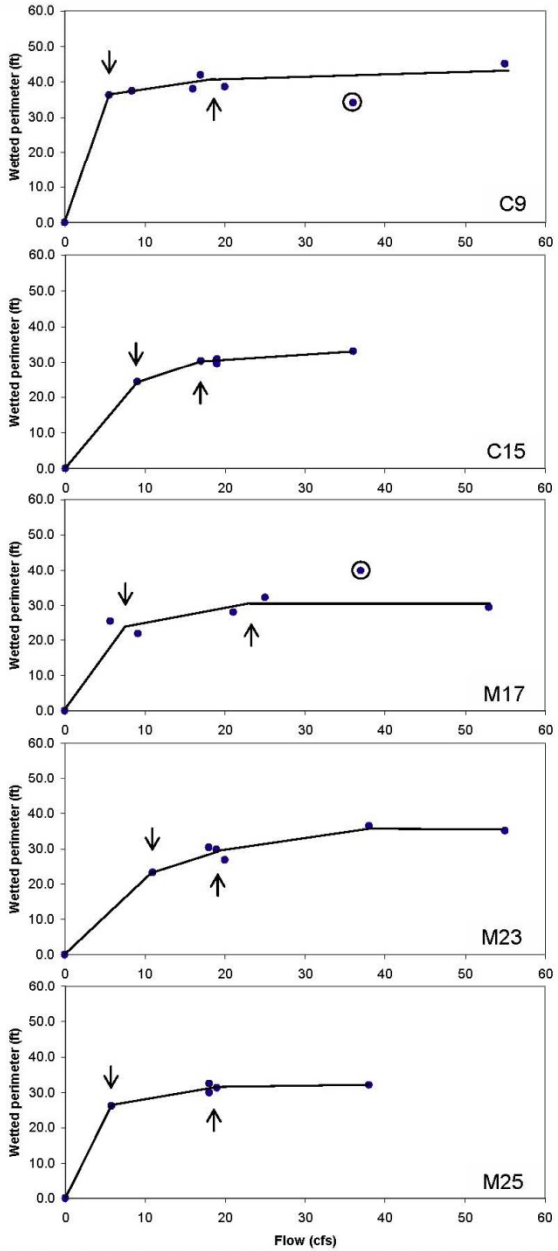
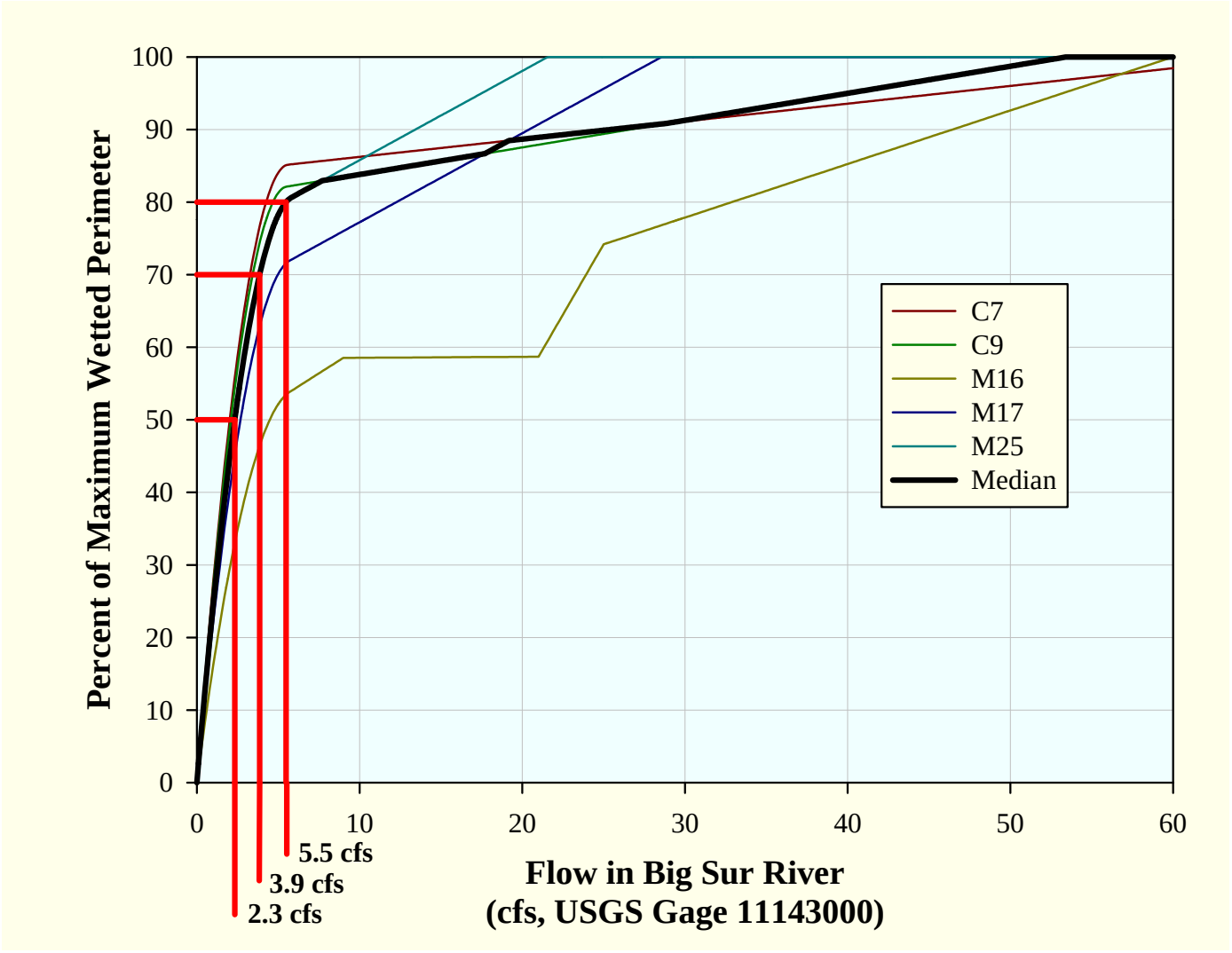
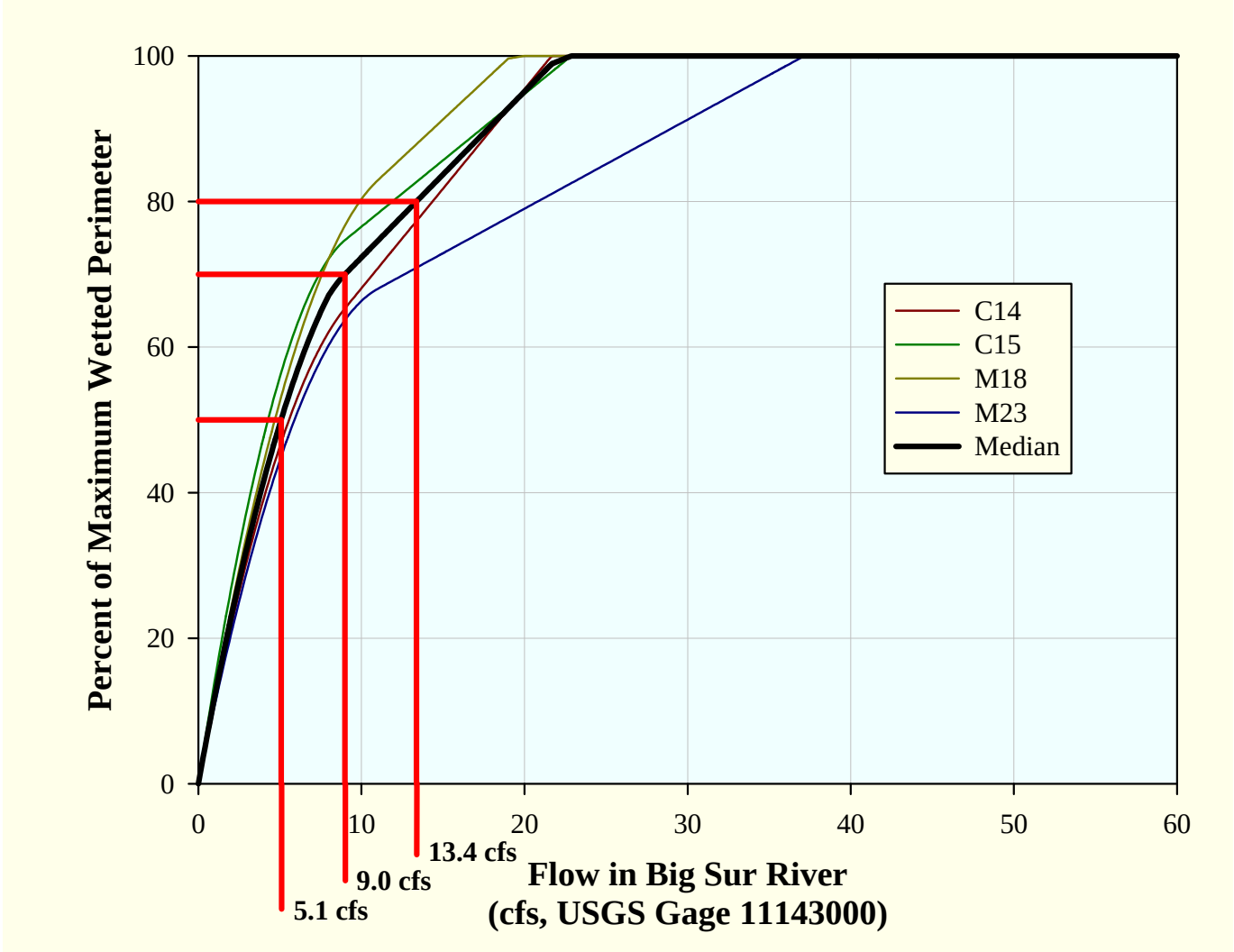


Figure 4. Wetted perimeter as a function of stream flow at runs on the Big Sur River from Pfeiffer Big Sur State Park to lower Andrew Molera State Park. See Table 1 for site descriptions. Outliers are circled. ↓ indicates the breakpoint, ↑ indicates the incipient asymptote.

Sites Visited Under Low Flow Conditions (September 1994)



Sites Not Visited Under Low Flow Conditions



Conclusions - Restated

- The data used in the report are RELIABLE *for habitat characterization purposes.*
- The data are NOT RELIABLE for deriving accurate Wetted Perimeter vs Flow relationships for the Big Sur River.