Susitna-Watana Hydroelectric Project Document
ARLIS Uniform Cover Page

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SUSITNA-WATANA HYDRO

Susitna-Watana Hydroelectric Project (FERC No. 14241)

Geomorphology Study (6.5)

Figures

Initial Study Report

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared By

Tetra Tech

Watershed GeoDynamics

February 2014 Draft

LIST OF FIGURES

10. FIGURES

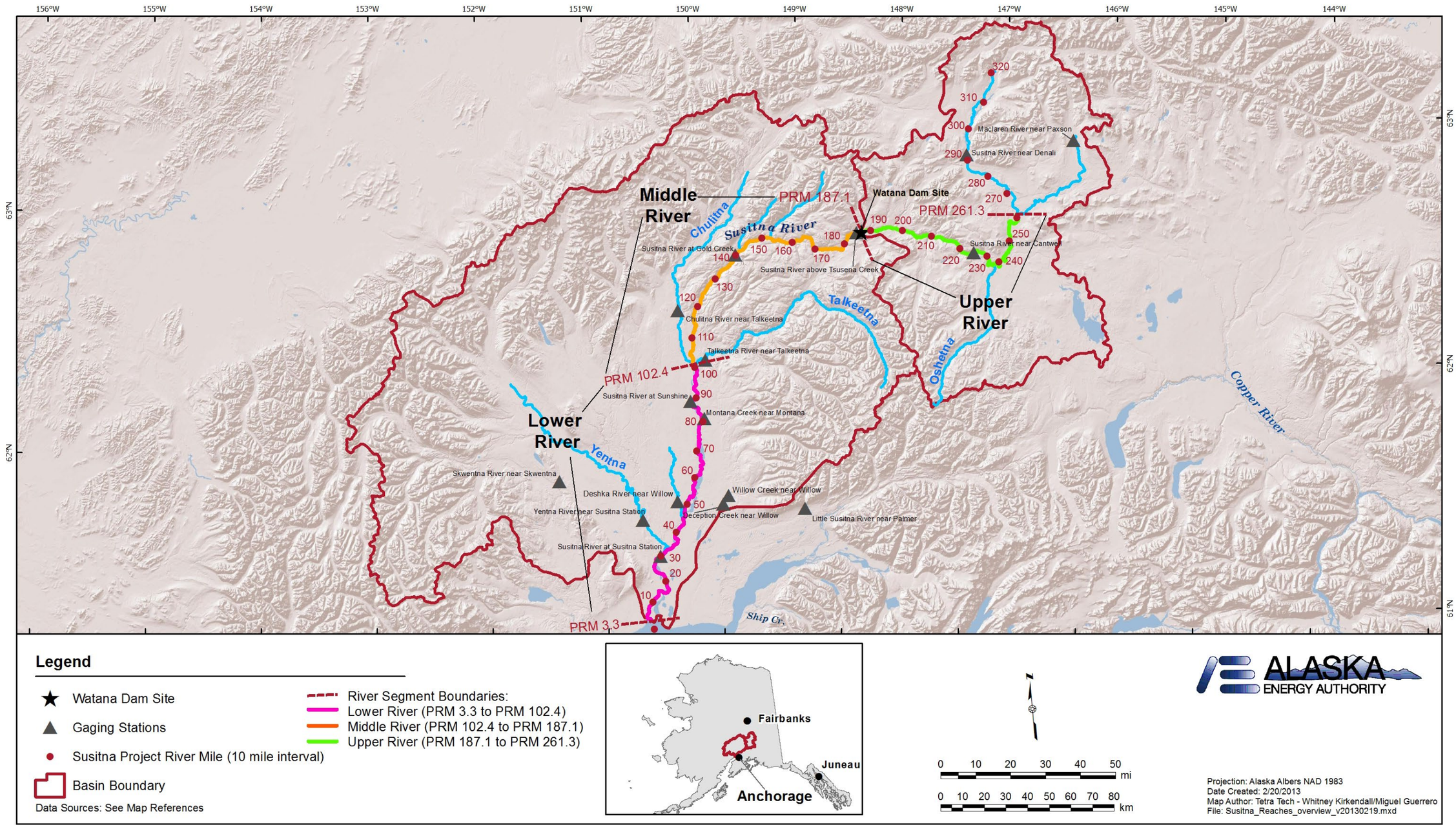


Figure 3-1. Susitna River geomorphology study area and large-scale river segments.

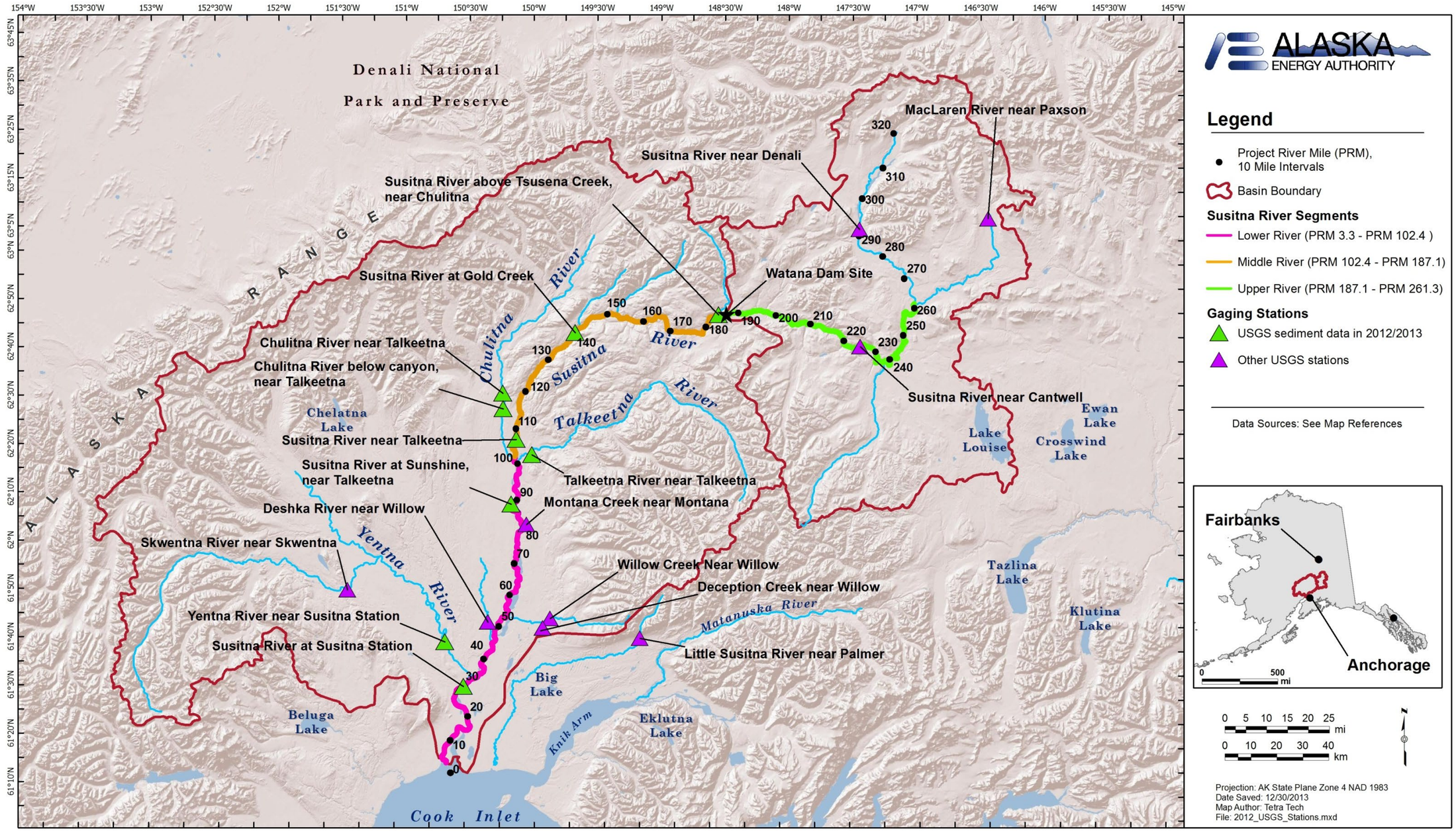


Figure 4.2-1. USGS Susitna River basin gaging stations.

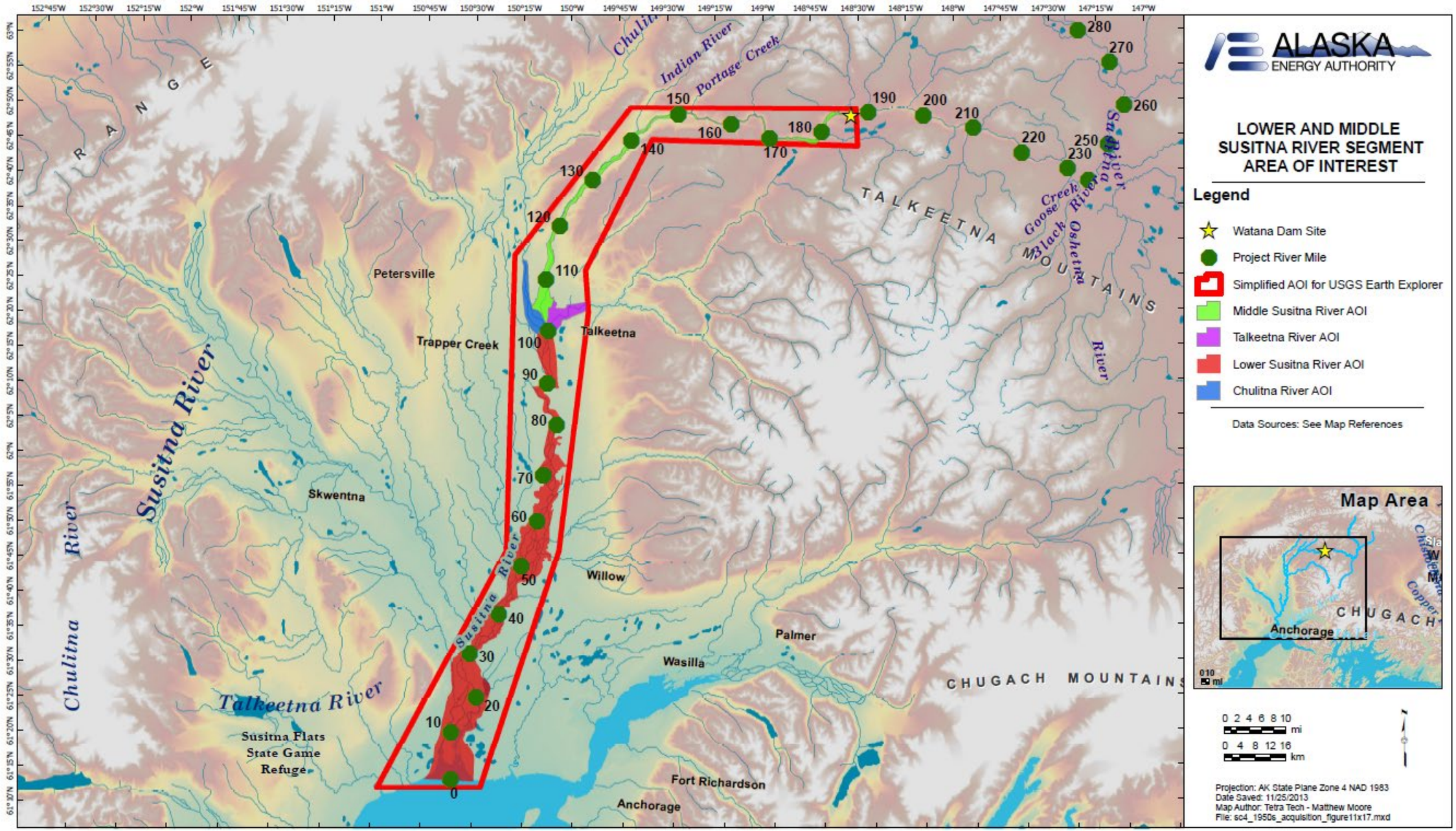


Figure 4.4-1: Simplified Area of Interest (AOI) used to request 1950s aerial photography from USGS Earth Explorer.

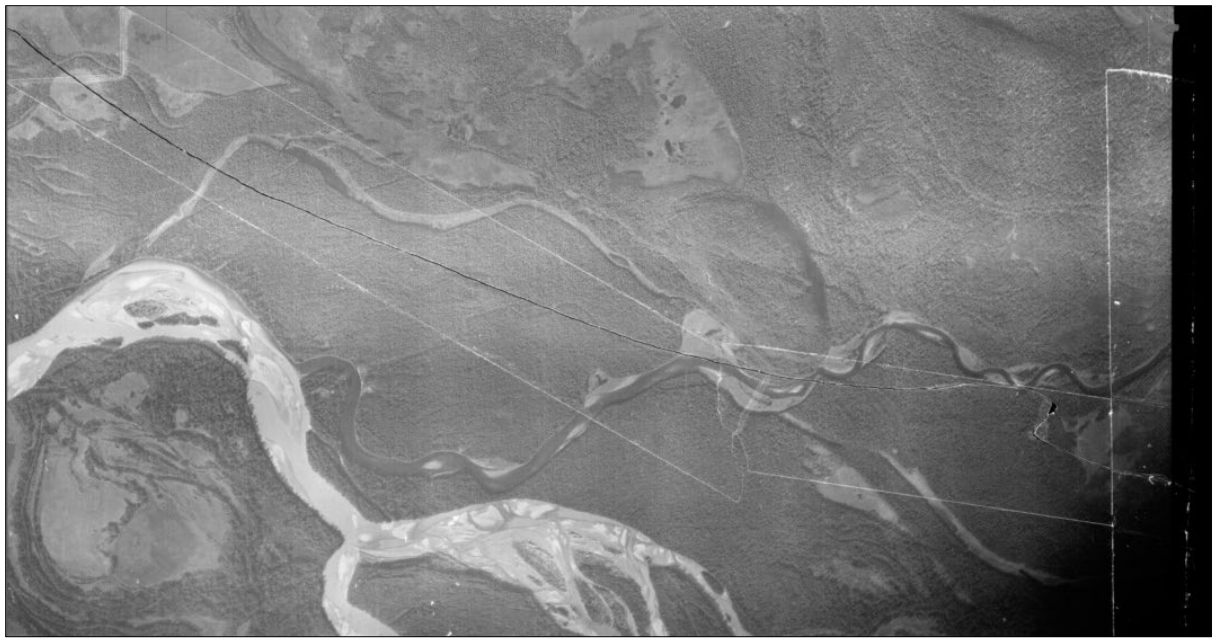


Figure 4.4-2: Contact Print repaired with transparent tape

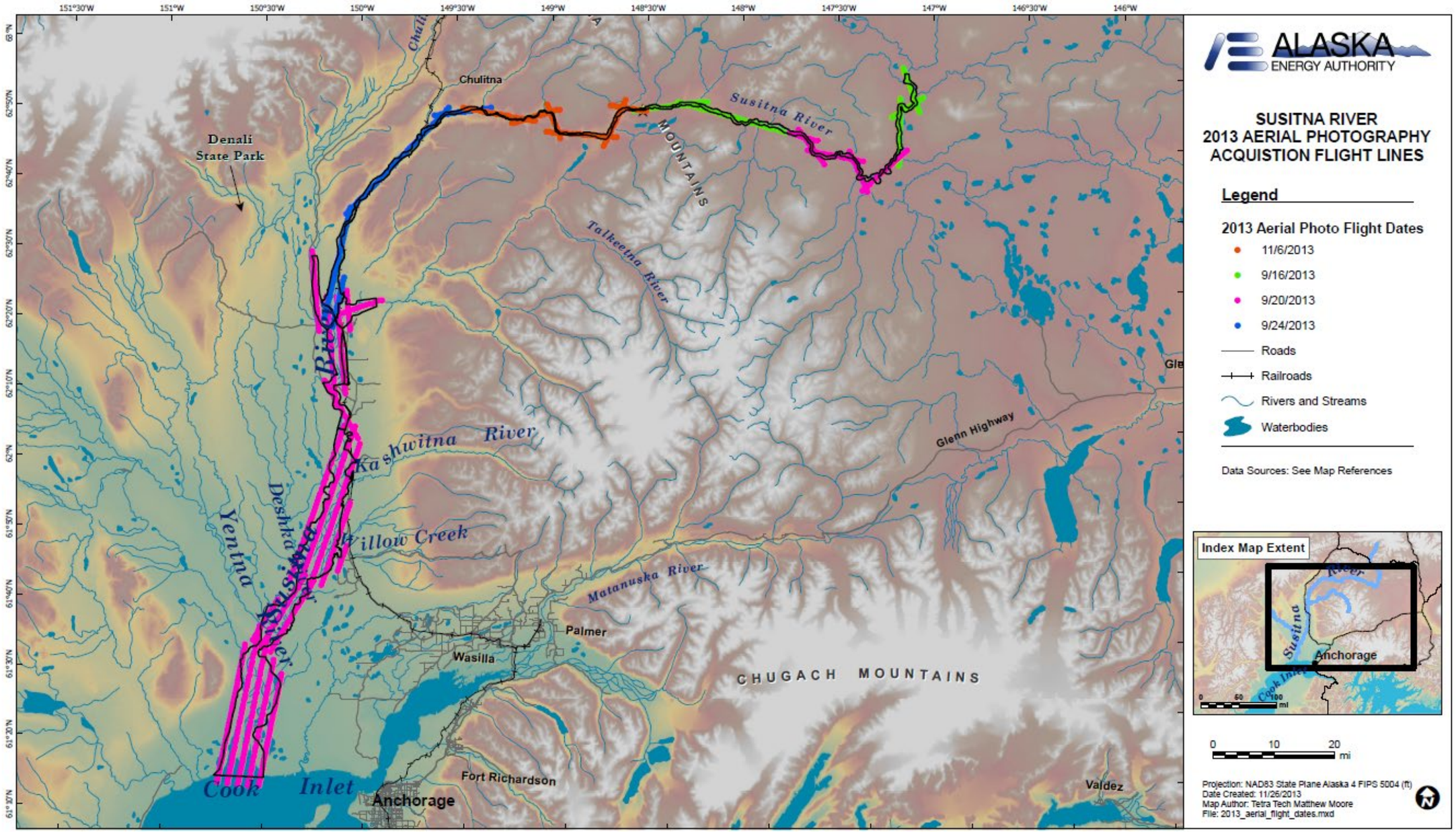


Figure 4.5-1. 2013 aerial photography acquisition flight lines.

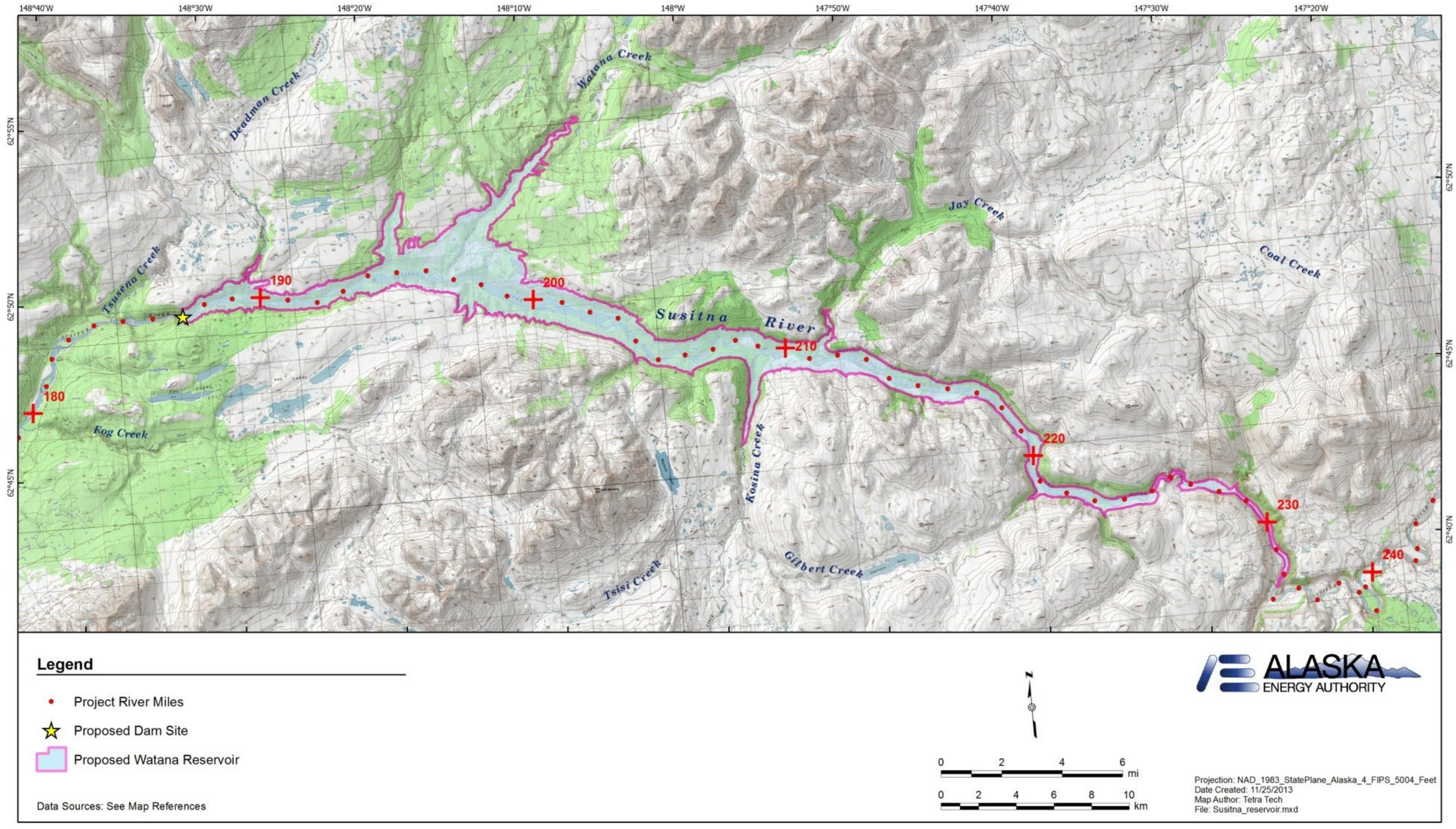


Figure 4.8-1: Proposed Susitna-Watana reservoir inundation zone at proposed maximum water level (elevation 2,050 feet).

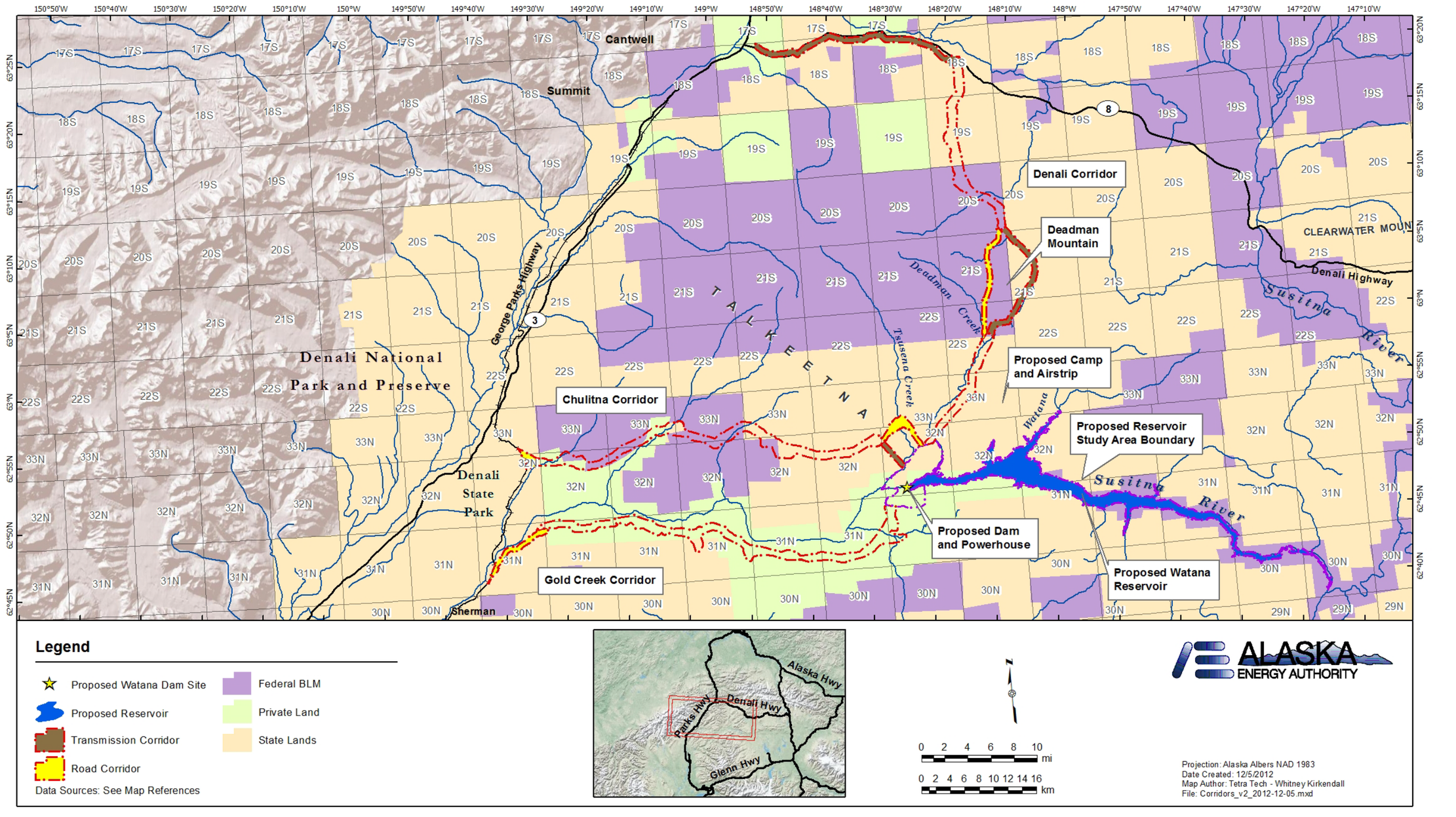


Figure 4.10-1: Susitna-Watana access corridors.

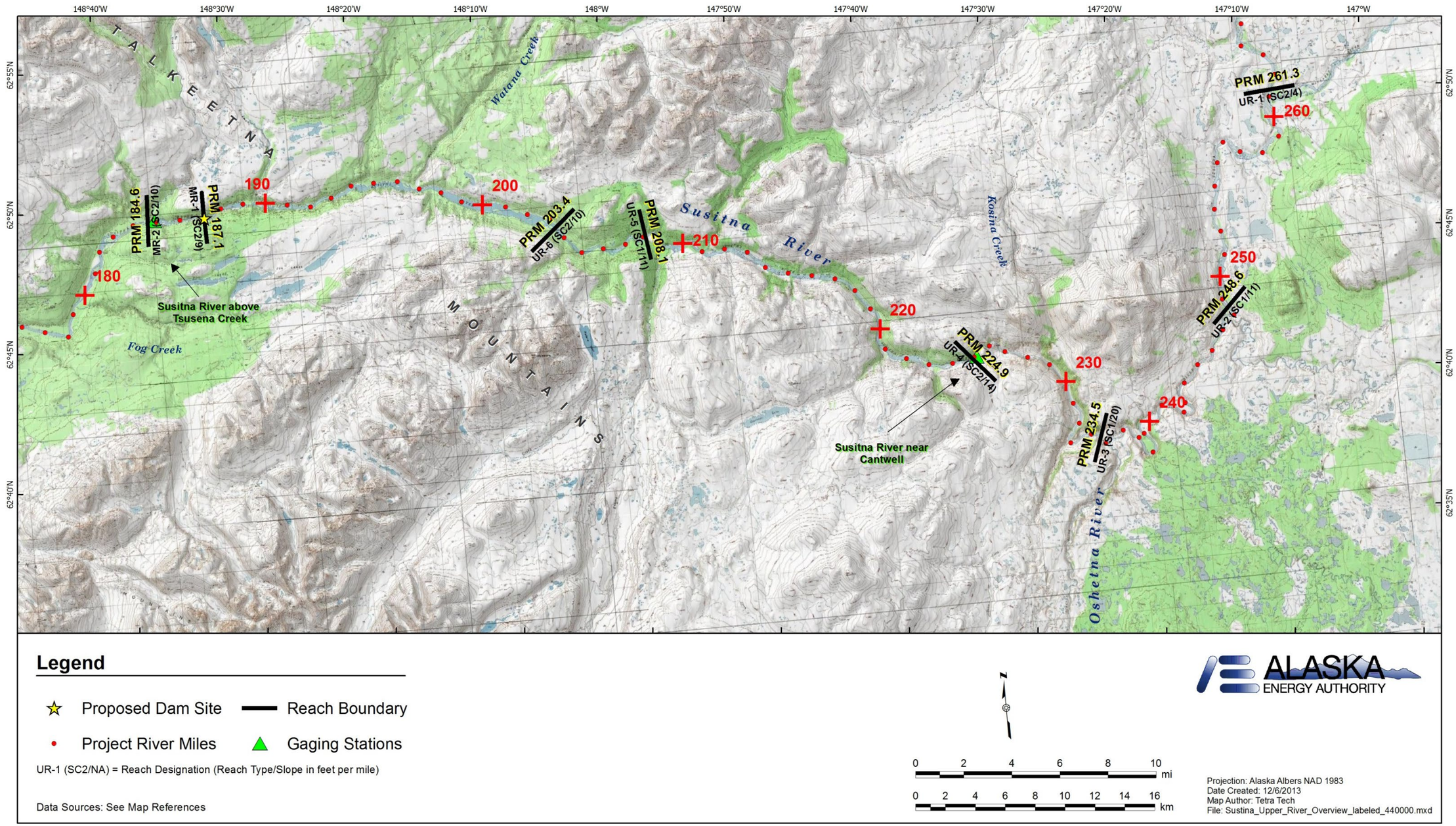


Figure 5.1-1 Map of the Upper Susitna River Segment showing the geomorphic reaches.

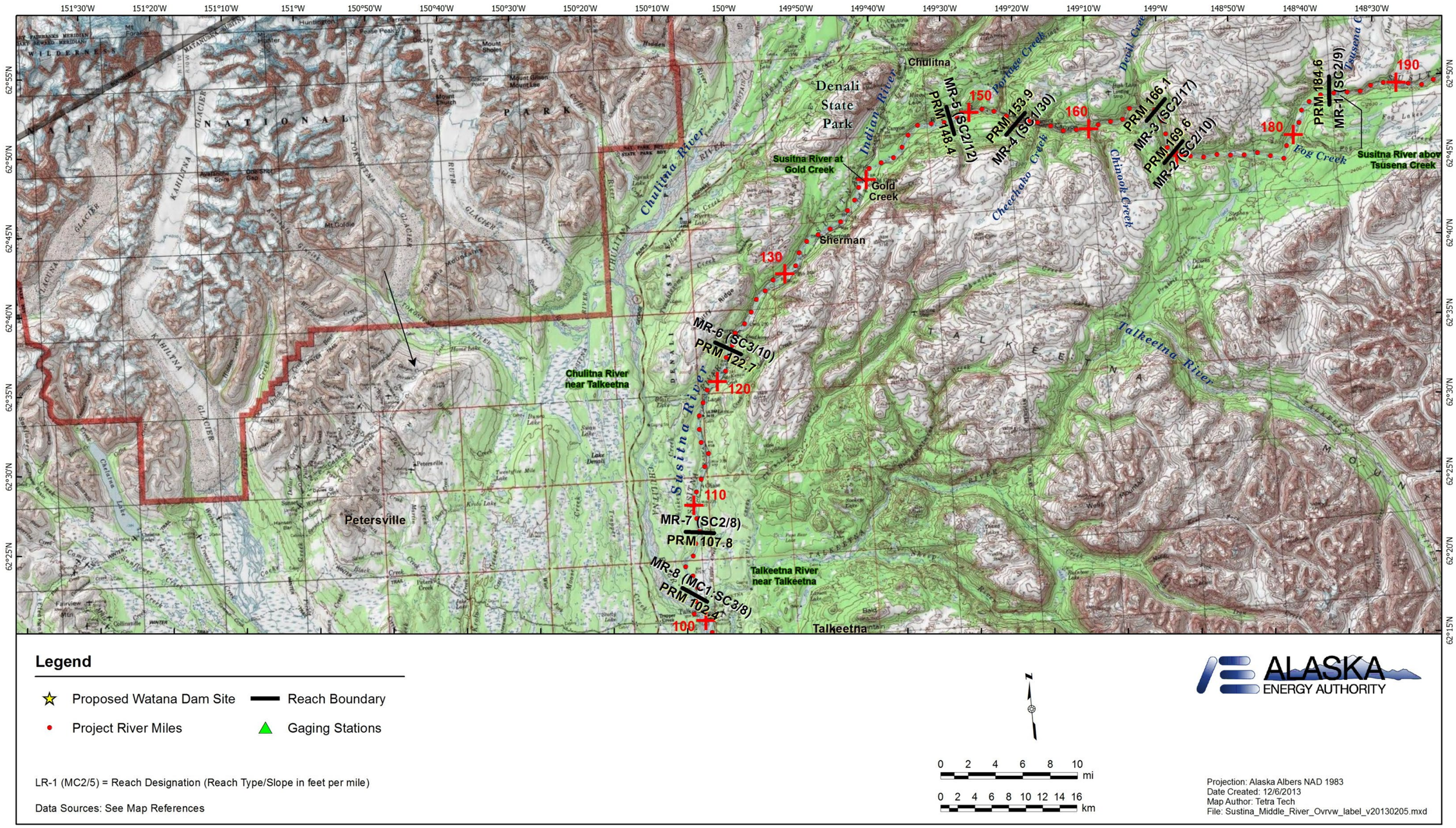


Figure 5.1-2 Map of the Middle Susitna River Segment showing the geomorphic reaches.

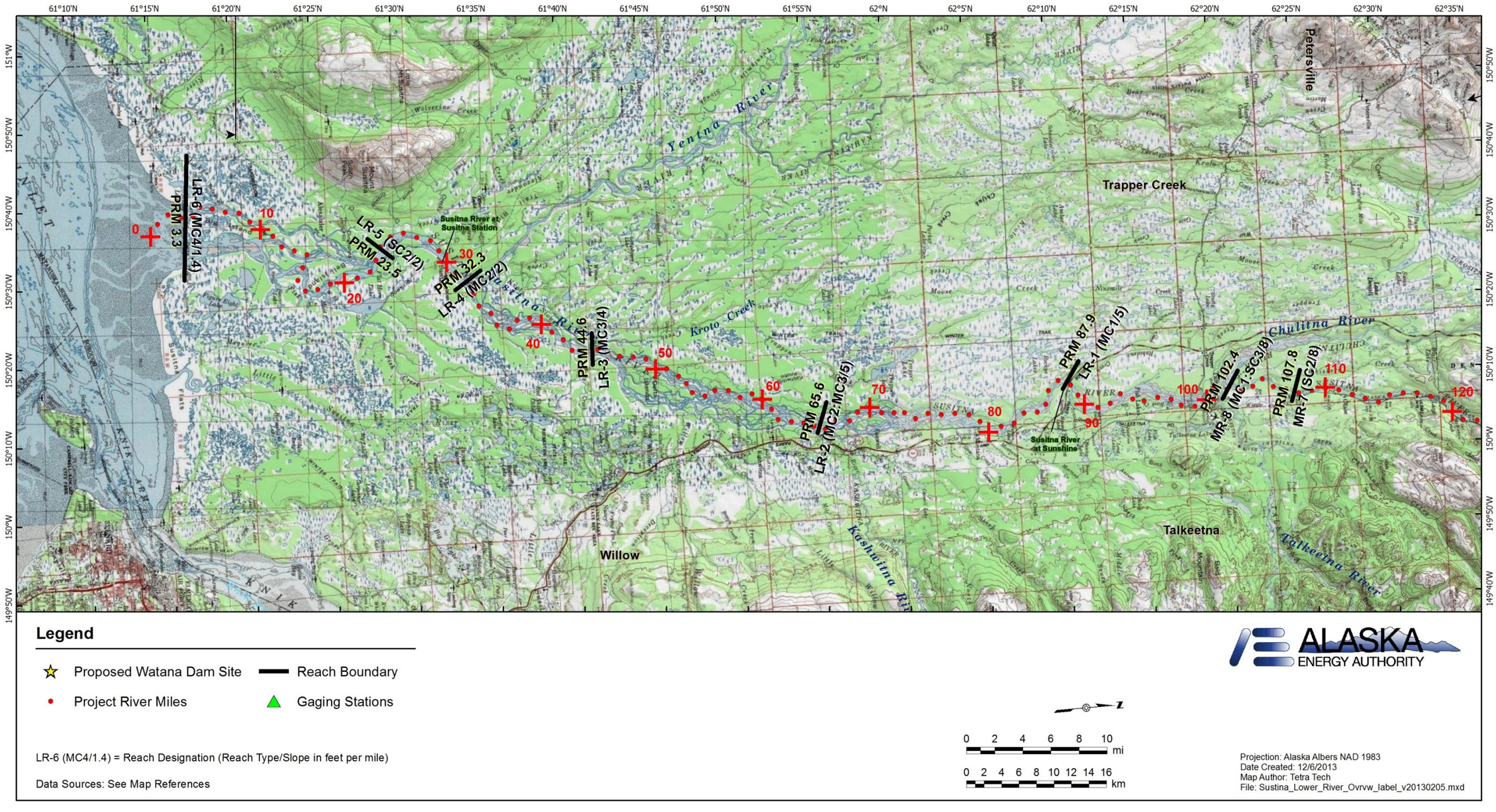


Figure 5.1-3: Map of the Lower Susitna River Segment showing the geomorphic reaches.

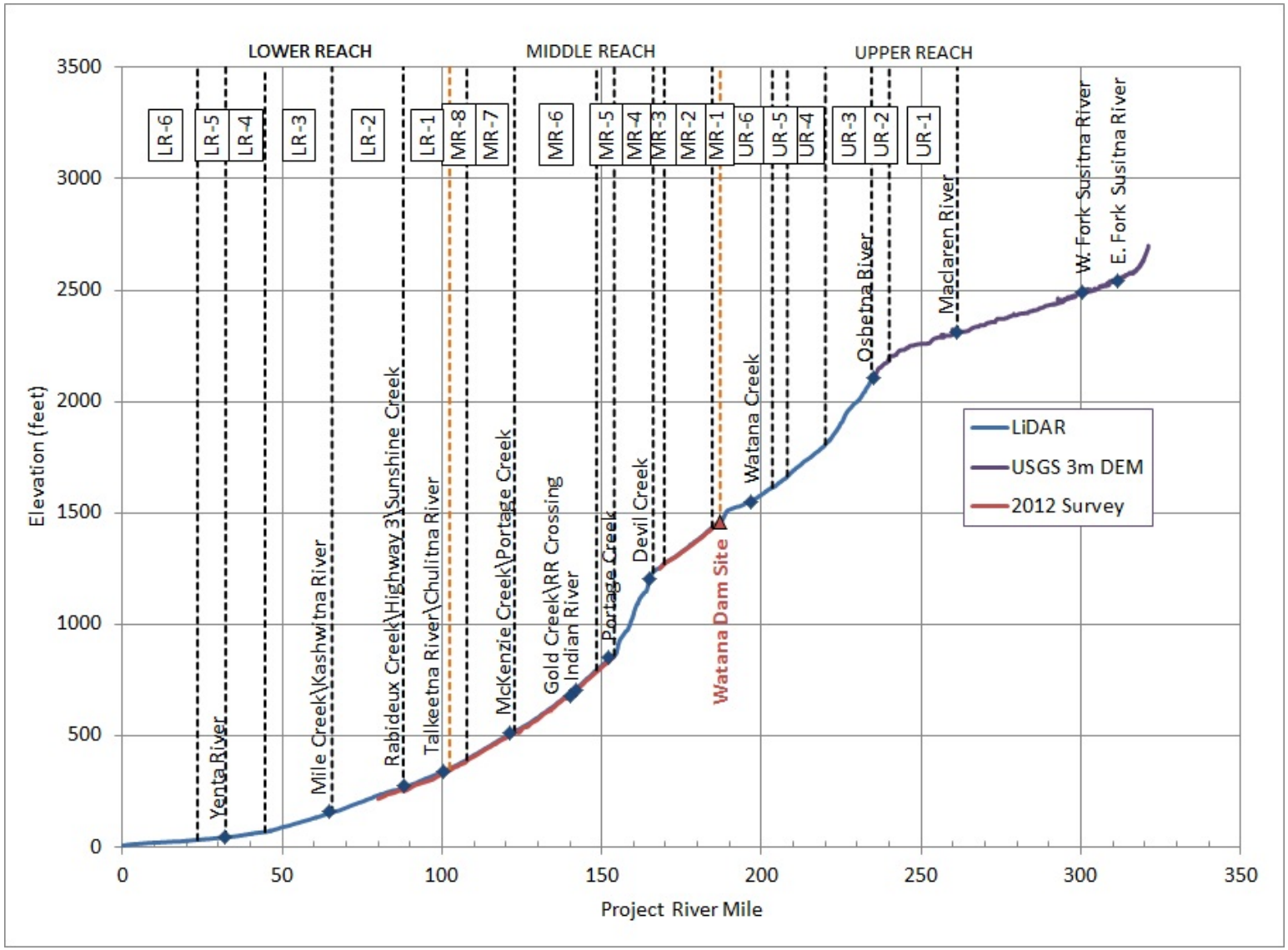


Figure 5.1-4: Longitudinal Profile of Susitna River from Cook Inlet to the Headwaters. Sources of data are shown on the figure. Reach boundaries are also included.

GEOMORPHIC SUCCESSION
MIDDLE SUSITNA RIVER SEGMENT

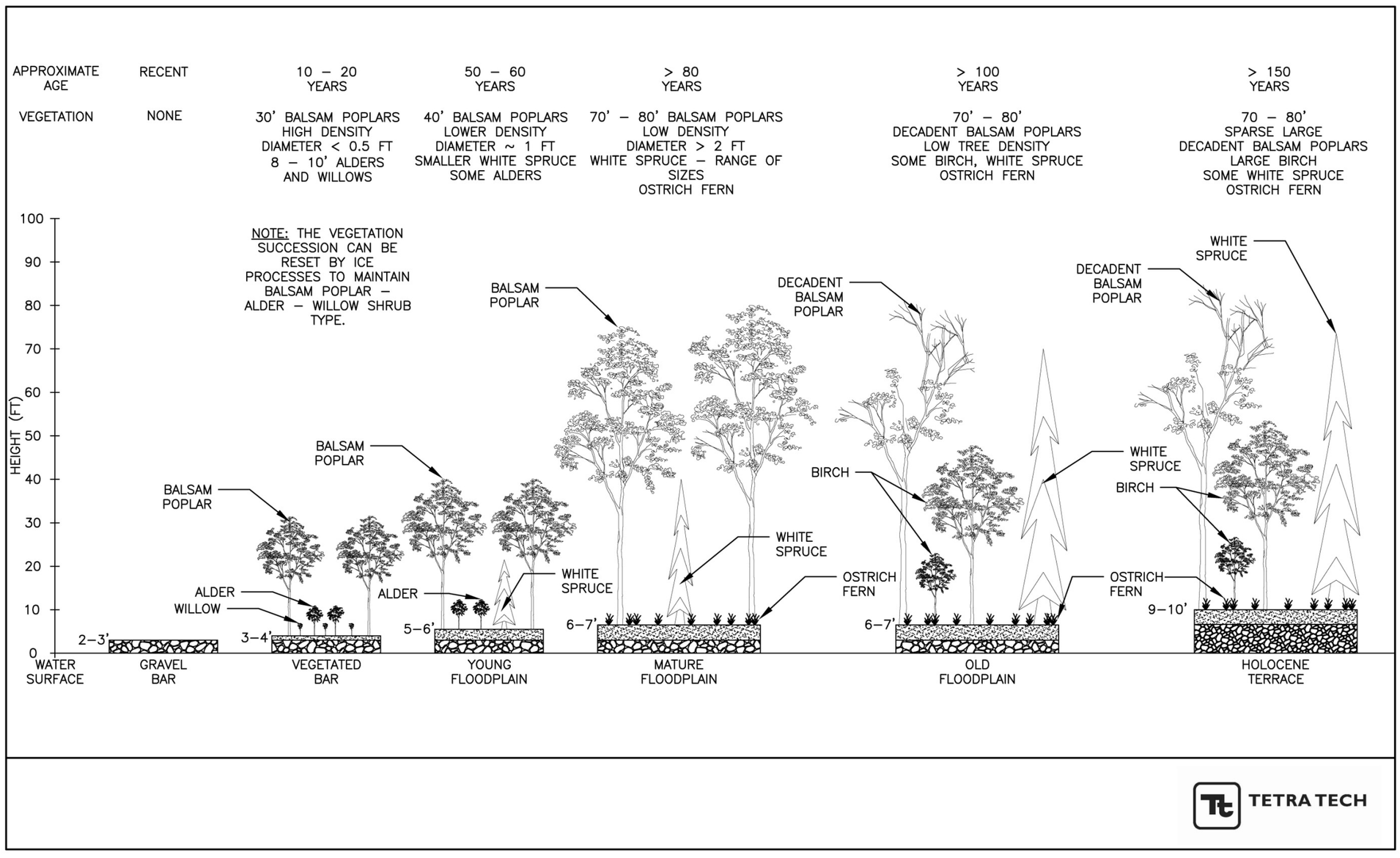


Figure 5.1-5: Geomorphic Succession conceptual geomorphic model.

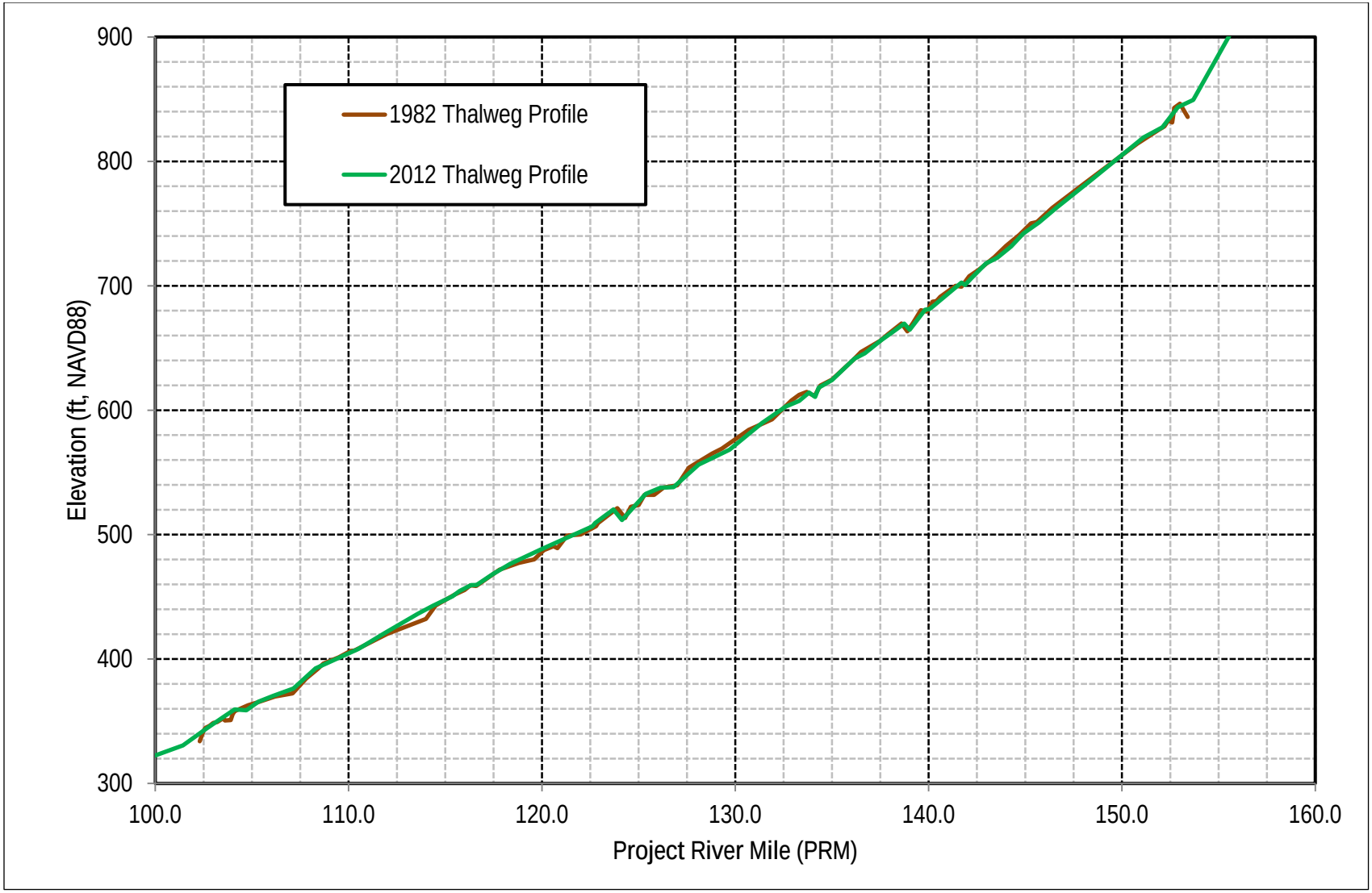


Figure 5.1-6: 1982 and 2012 thalweg profiles in the Middle Reach between PRM 100 and PRM 160.

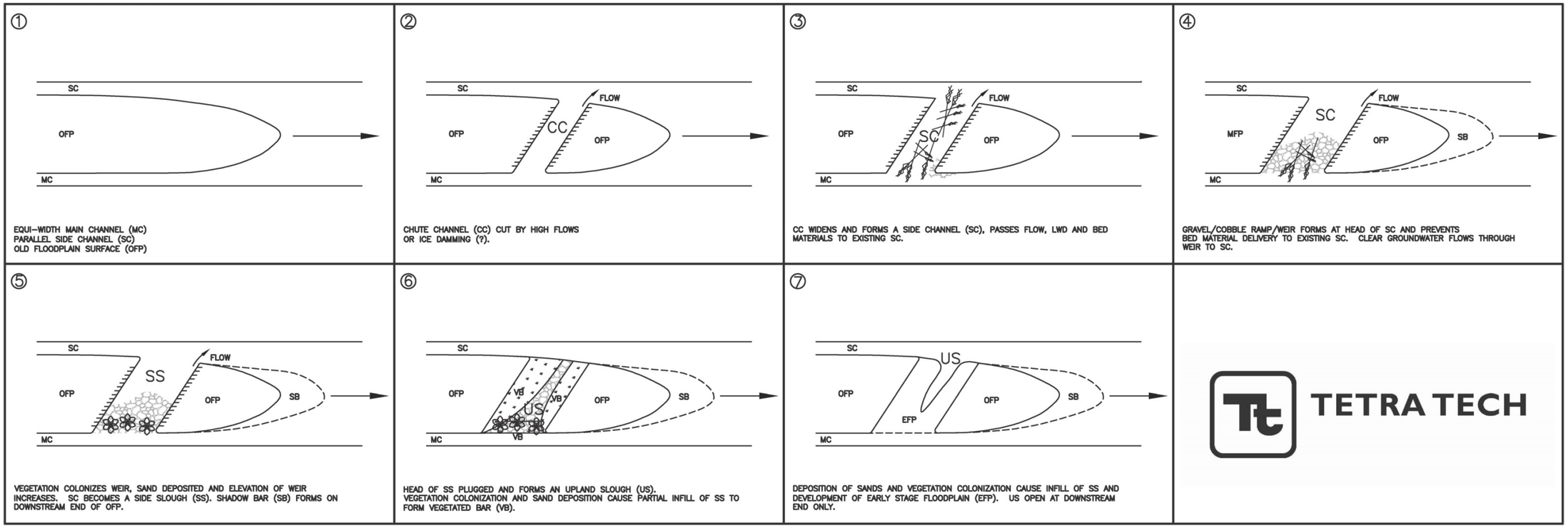


Figure 5.1-7: Side Channel and Side Slough Dynamics conceptual geomorphic model for alluvial reaches of the Middle River.

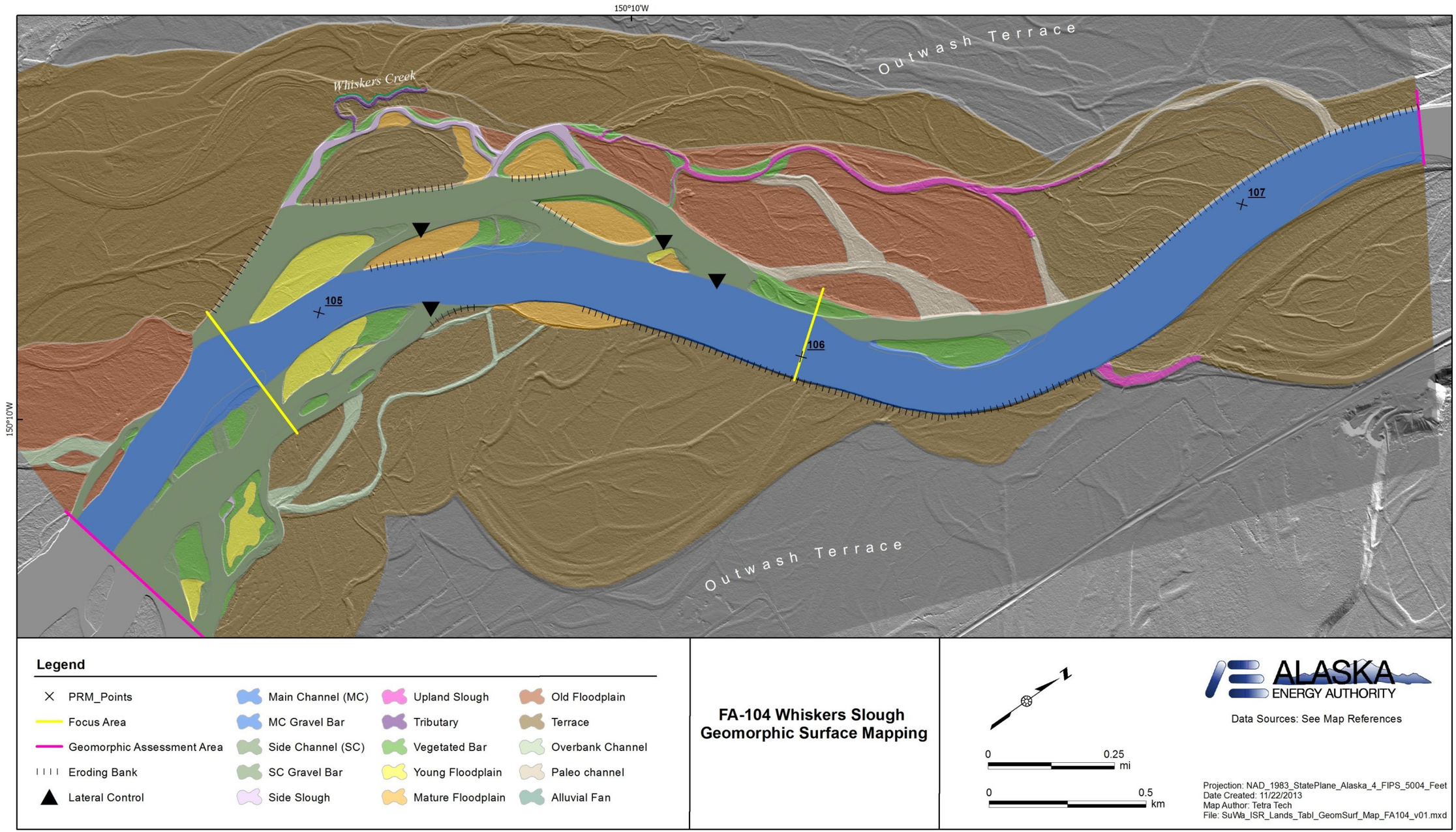


Figure 5.1-8: Geomorphic Map for FA-104 Whiskers Slough with Geomorphic Assessment Area boundaries.

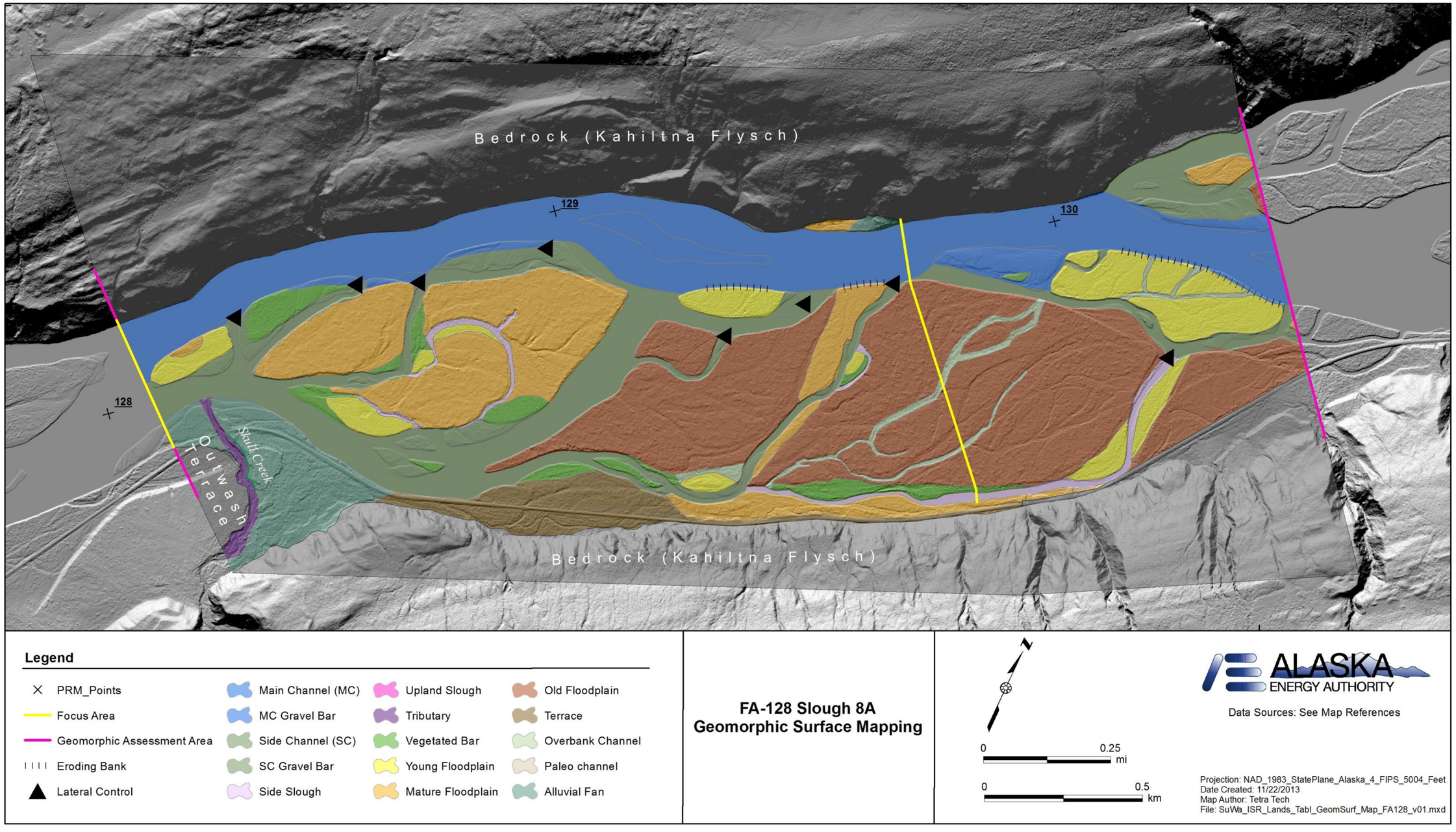


Figure 5.1-9: Geomorphic Map for FA-128 Slough 8A with Geomorphic Assessment Area boundaries.

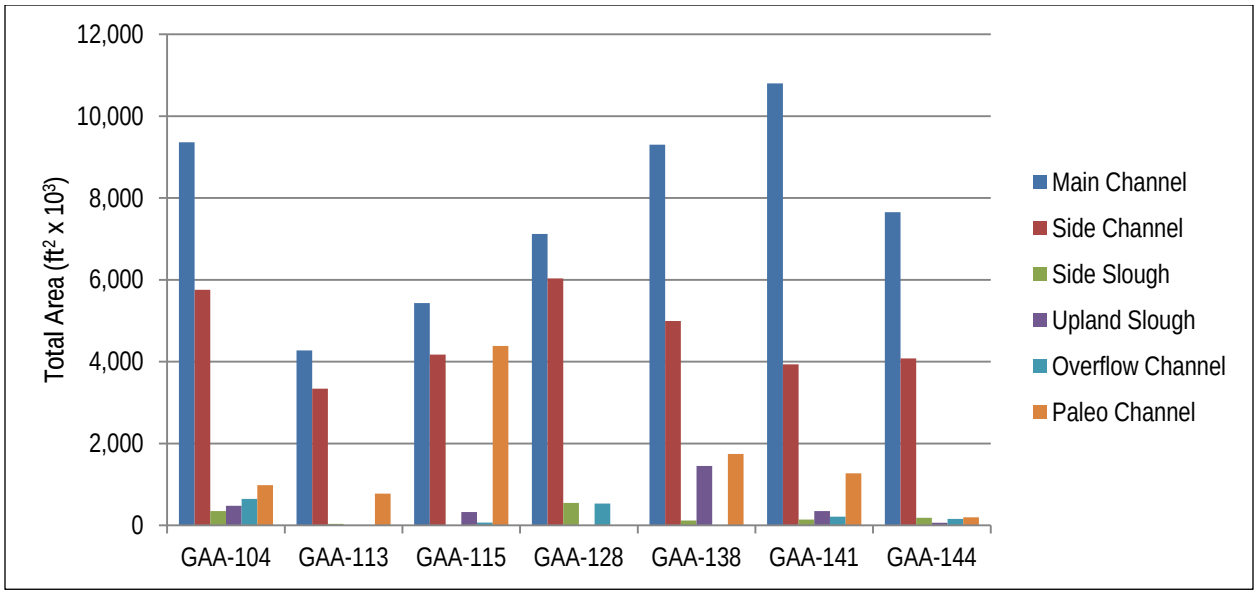


Figure 5.1-10: Total Surface Area (ft^2) of geomorphic surfaces in 7 Focus Areas.

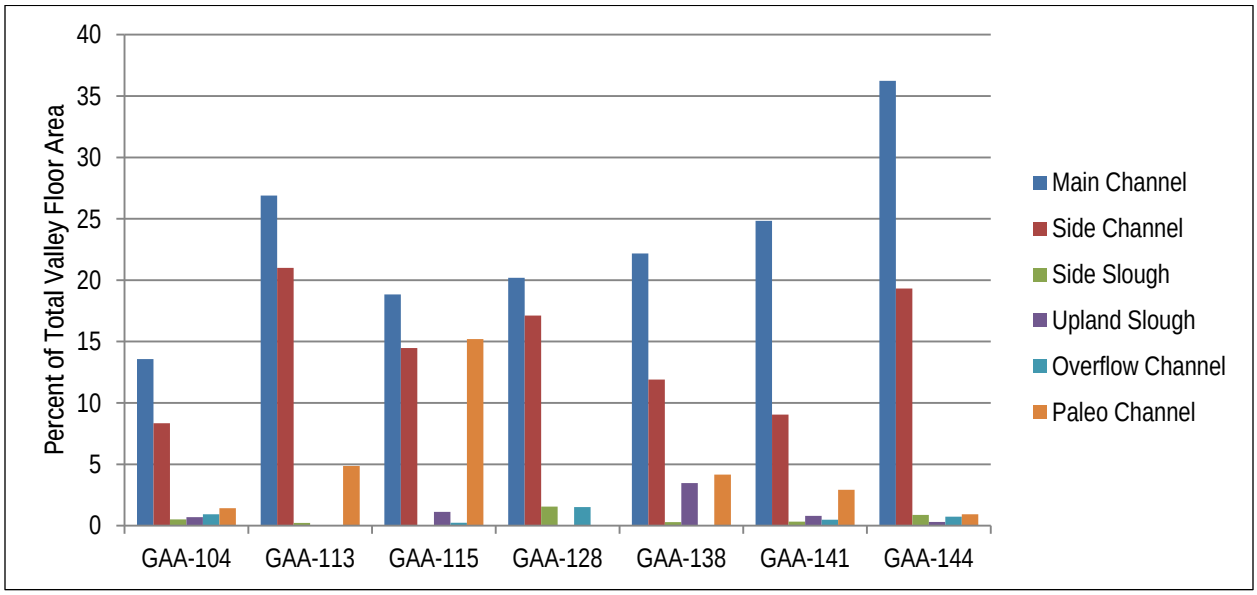


Figure 5.1-11: Percent of Total Valley Floor Area of geomorphic surfaces in 7 Focus Areas.

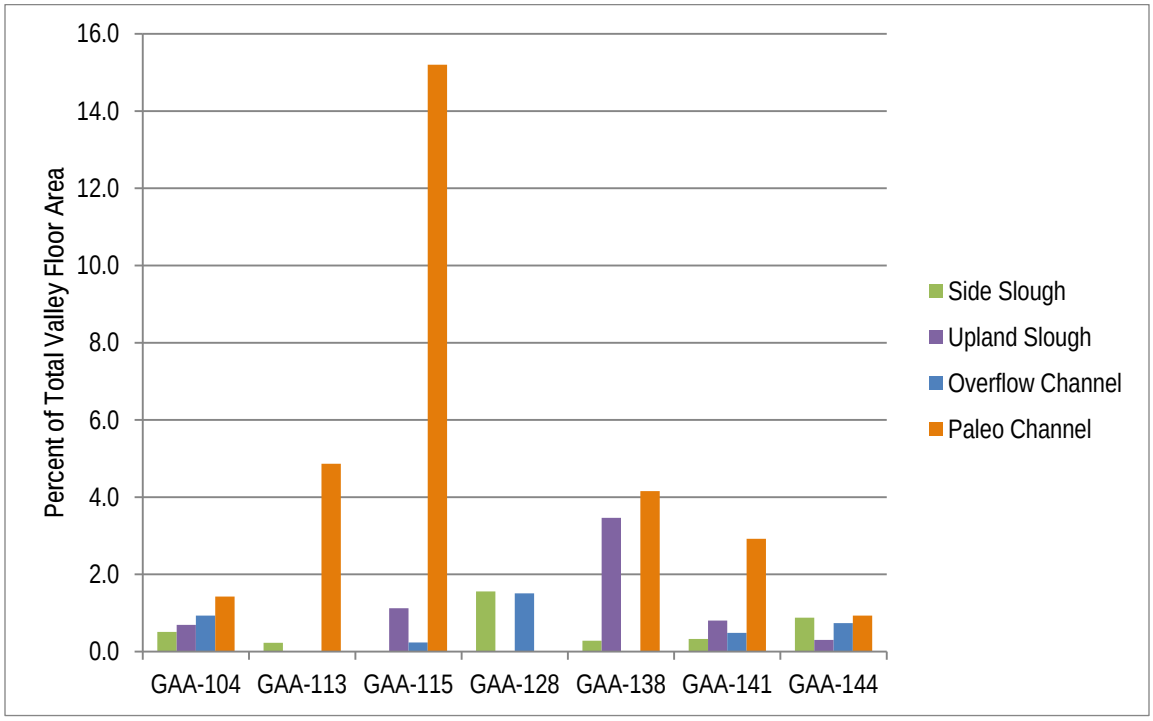


Figure 5.1-12: Percent of Total Valley Floor Area of geomorphic surfaces in 7 Focus Areas.

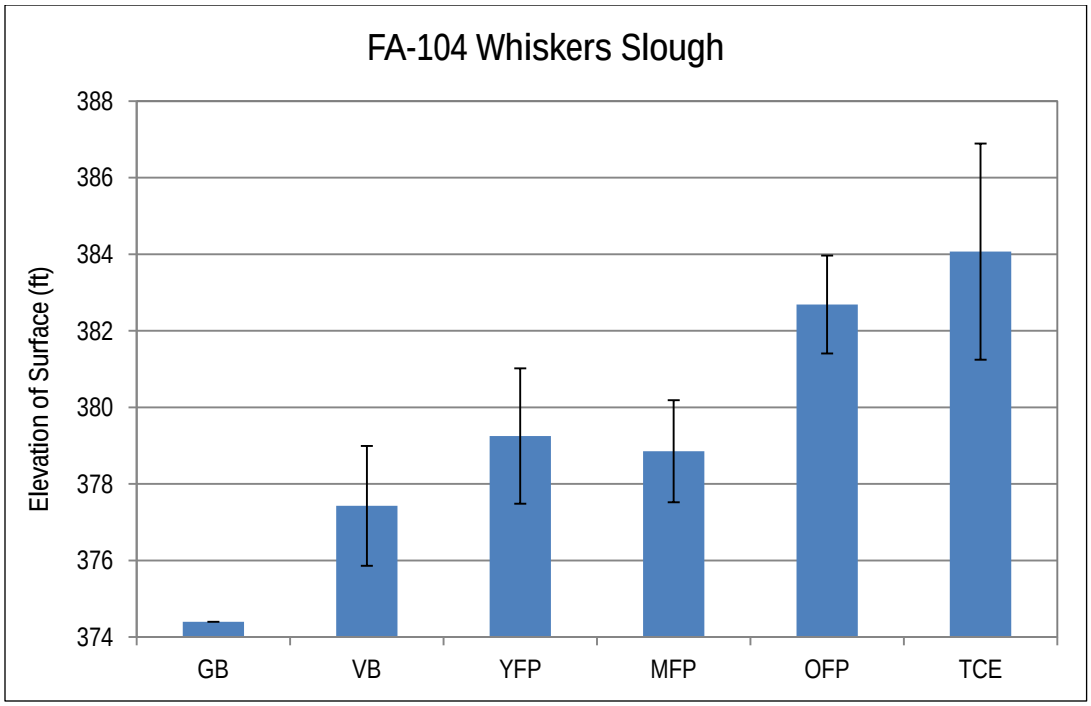


Figure 5.1-13: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-104 Whiskers Slough.

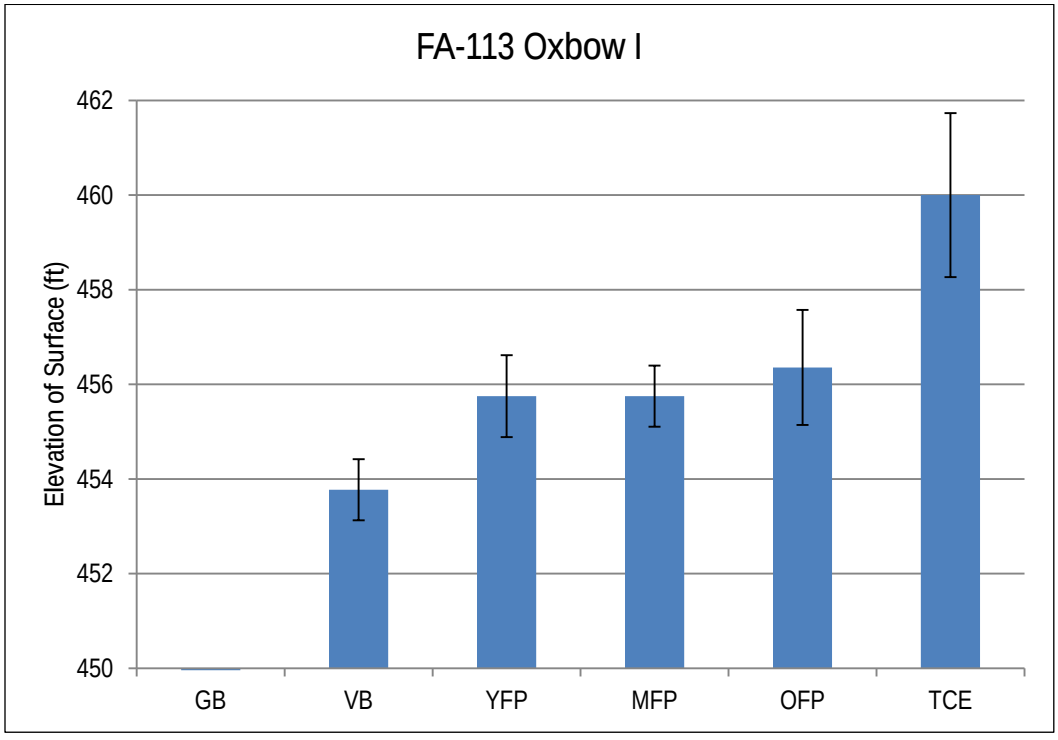


Figure 1.1-14: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-113 Oxbow I.

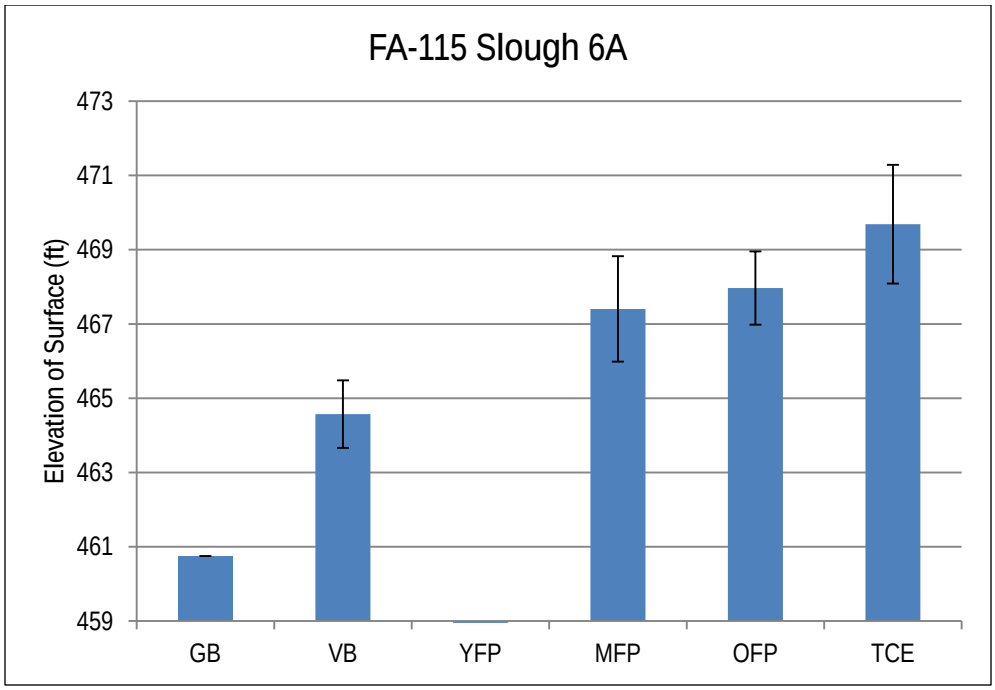


Figure 5.1-15: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-115 Slough 6A.

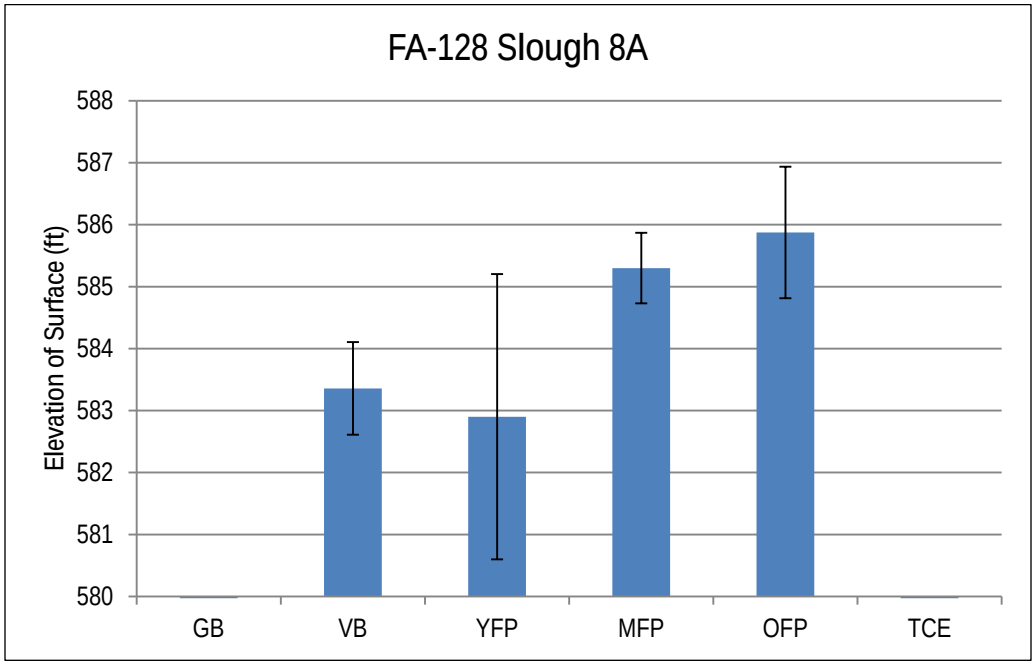


Figure 5.1-16: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-128 Slough 8A.

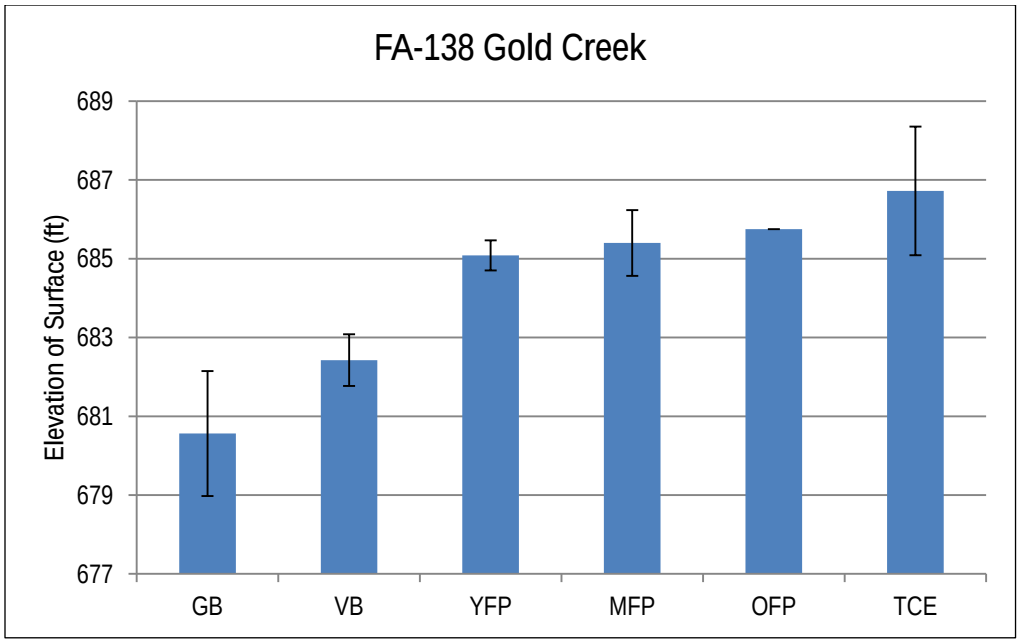


Figure 5.1-17: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-138 Gold Creek.

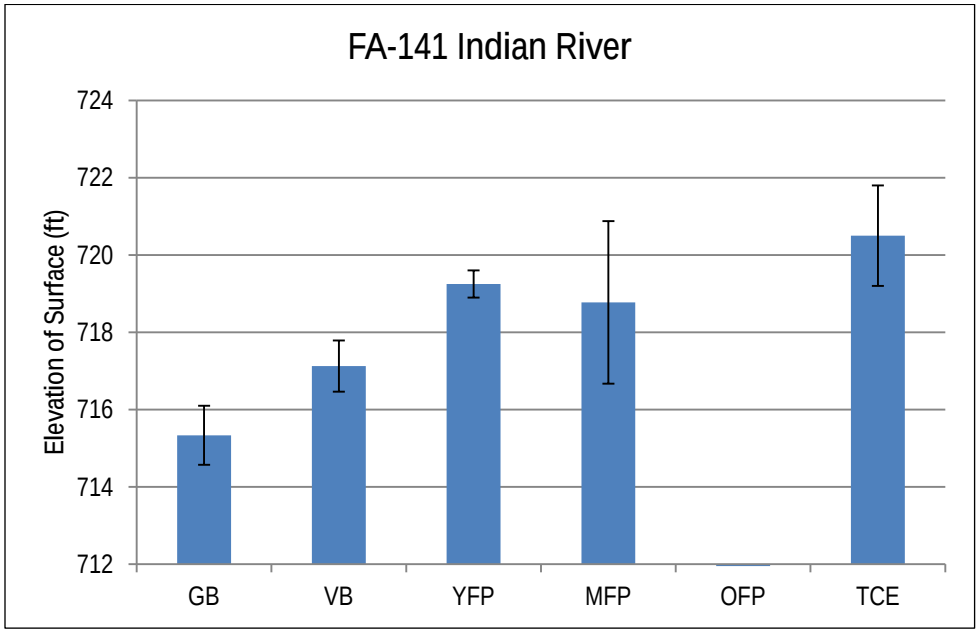


Figure 5.1-18: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-141 Indian River.

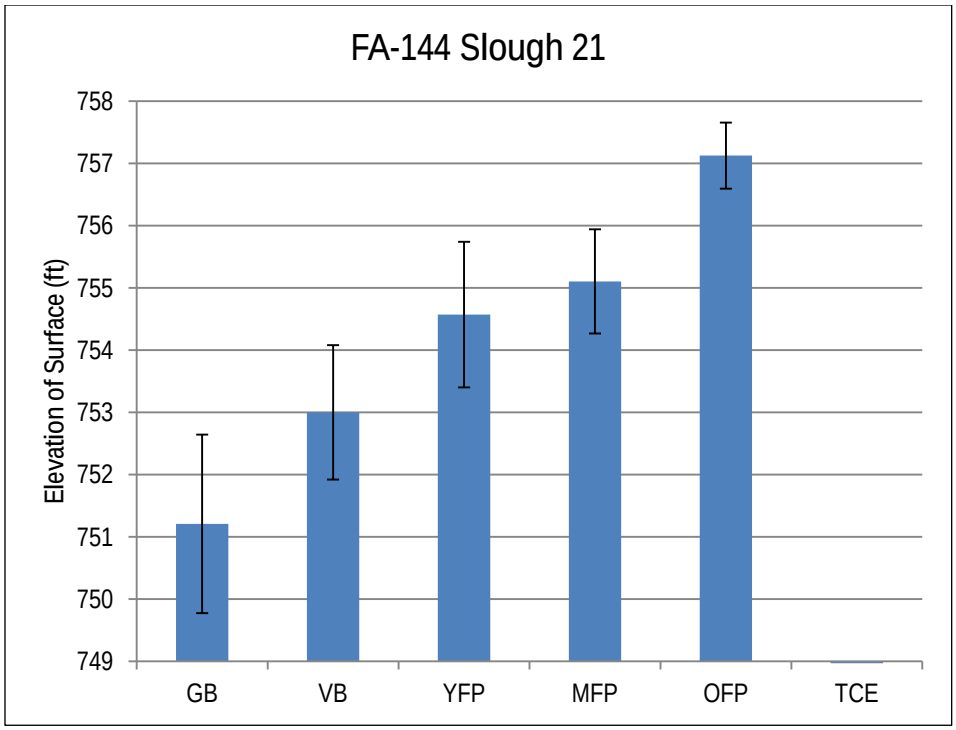


Figure 2: Mean elevation with one standard deviation error bars for geomorphic surfaces in FA-144 Slough 21.

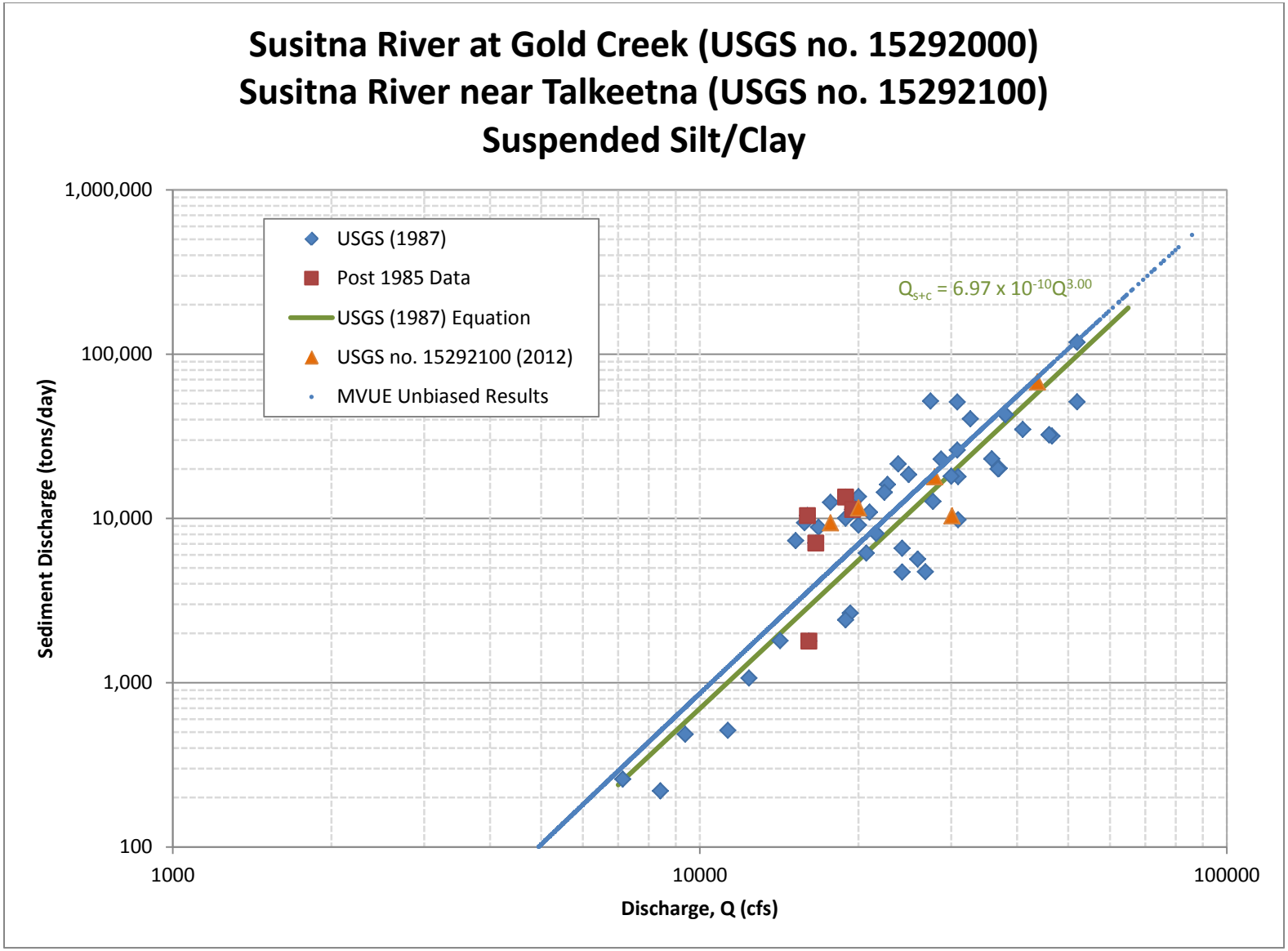


Figure 5.2-1 – Suspended silt/clay sediment-transport data and rating equations for Susitna River at Gold Creek and Susitna River near Talkeetna

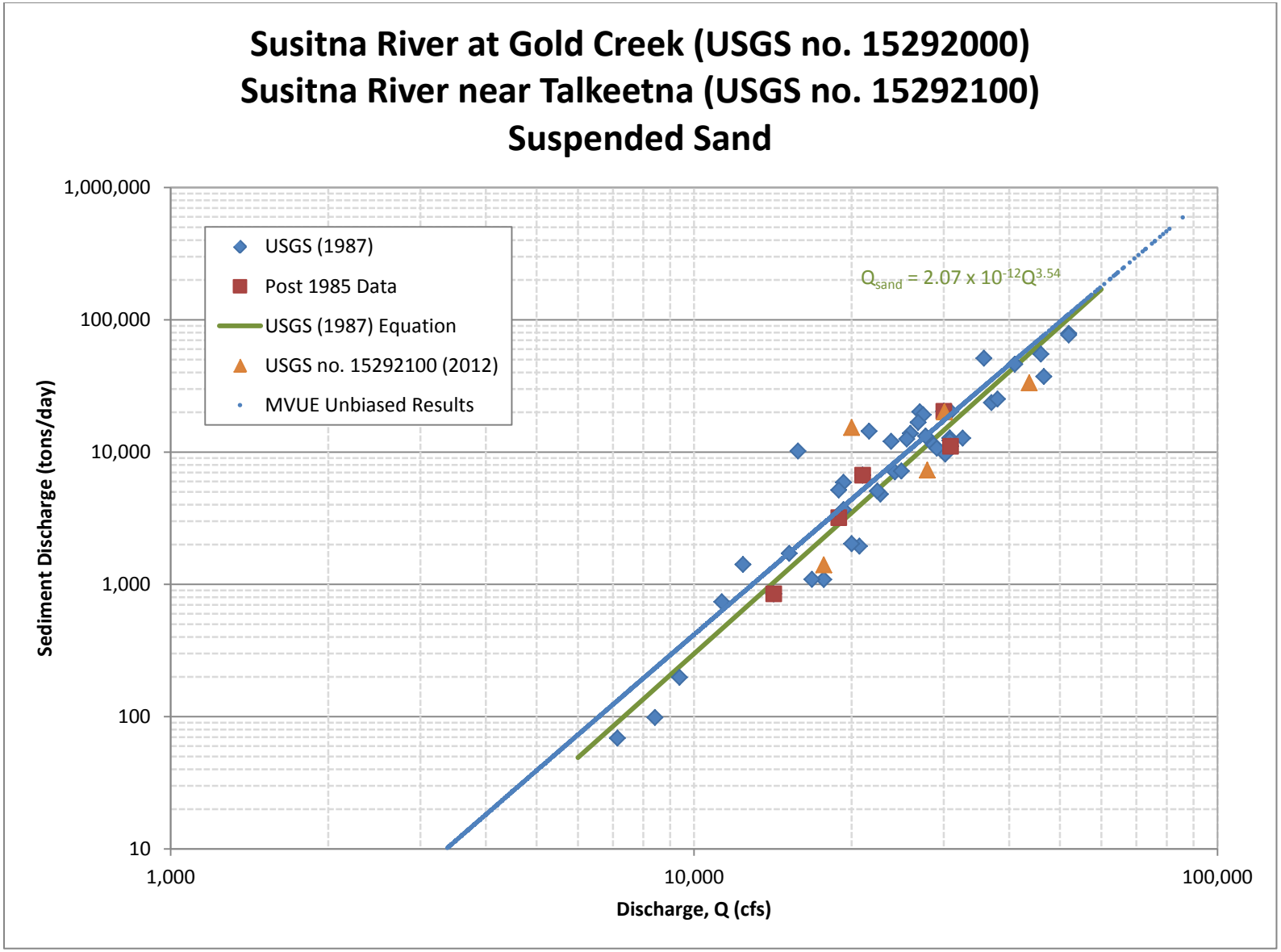


Figure 5.2-2 – Suspended sand sediment-transport data and rating equations for Susitna River at Gold Creek and Susitna River near Talkeetna

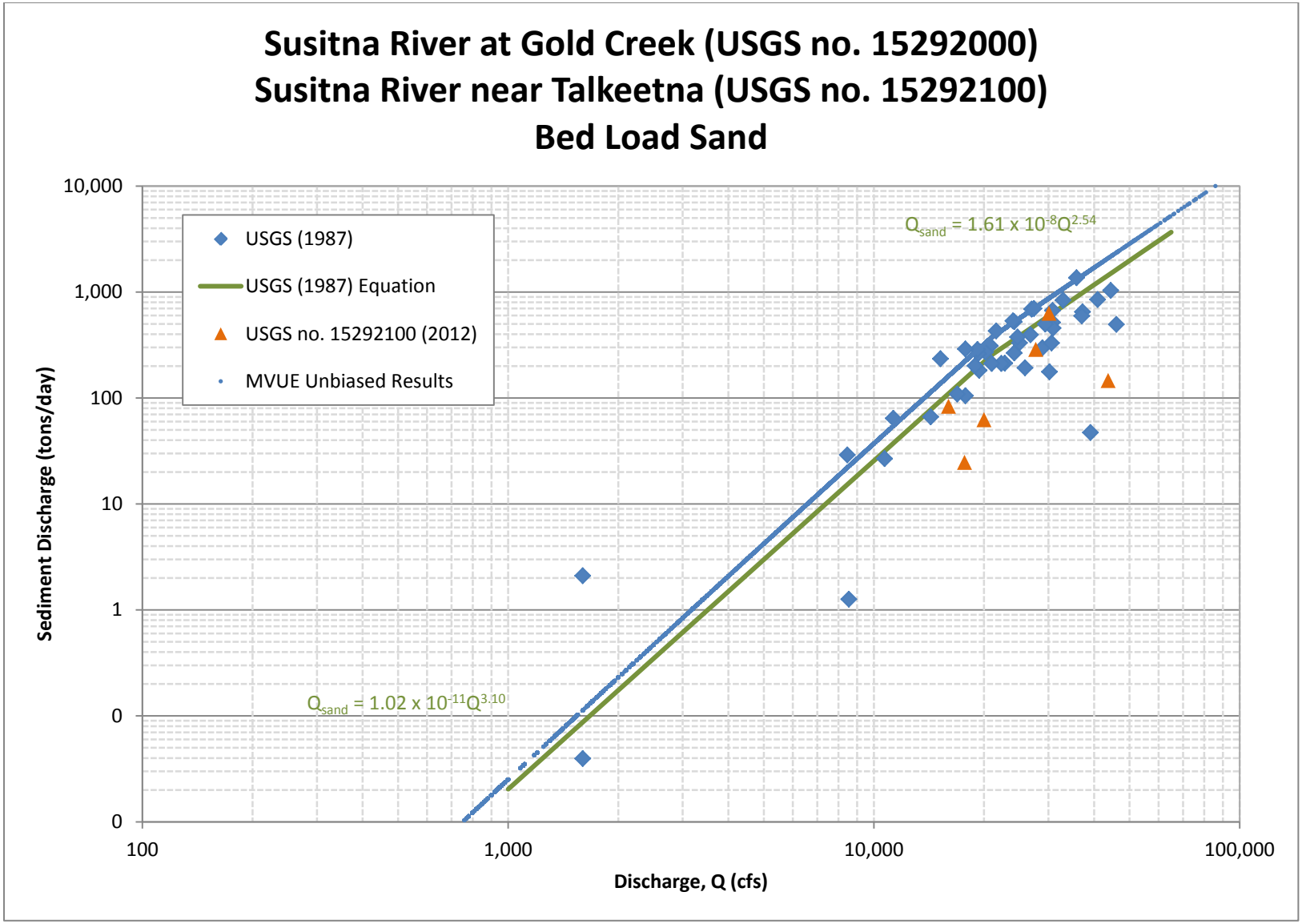


Figure 5.2-3 – Bed load sand sediment-transport data and rating equations for Susitna River at Gold Creek and Susitna River near Talkeetna

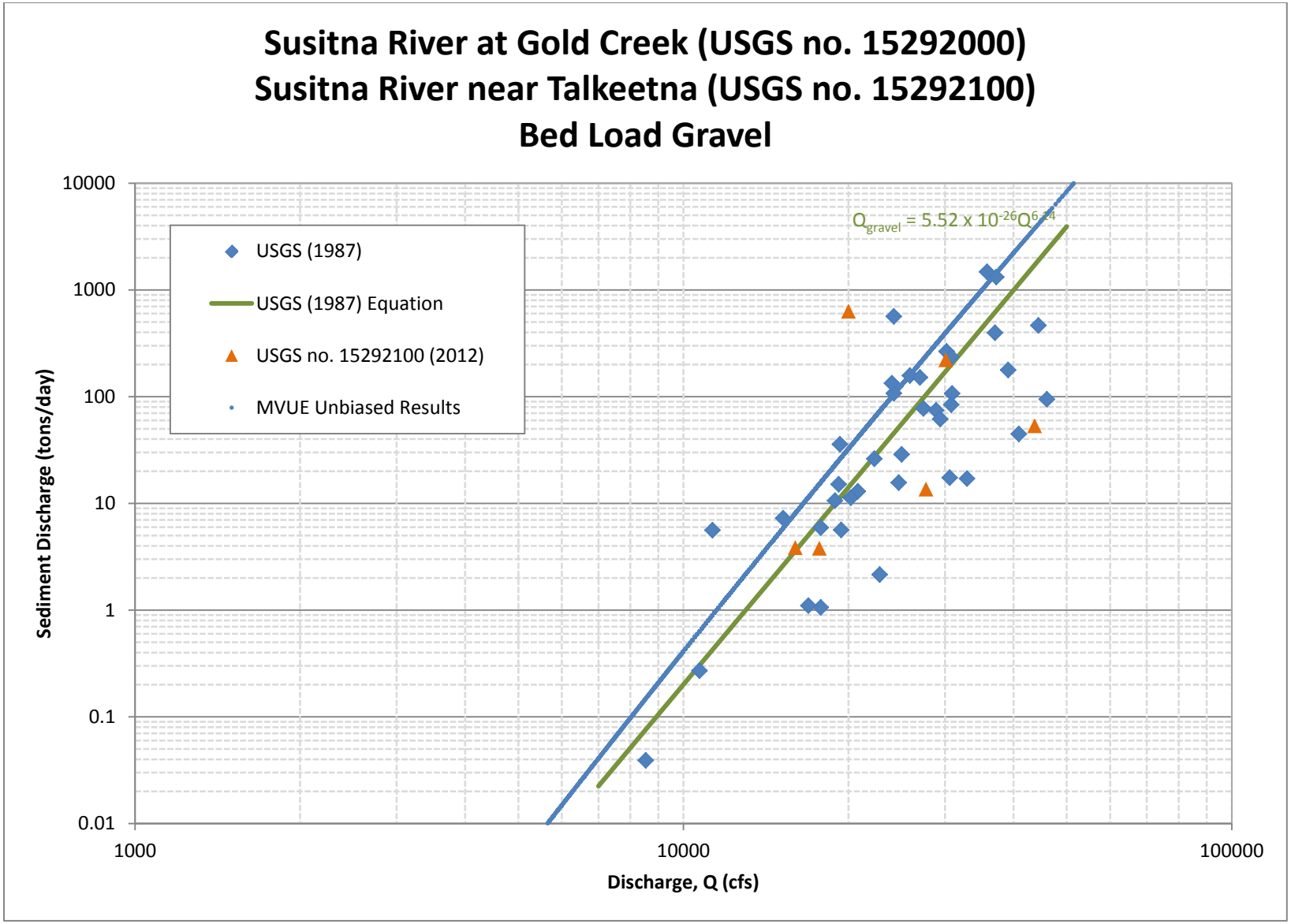


Figure 5.2-4 – Bed load gravel sediment-transport data and rating equations for Susitna River at Gold Creek and Susitna River near Talkeetna

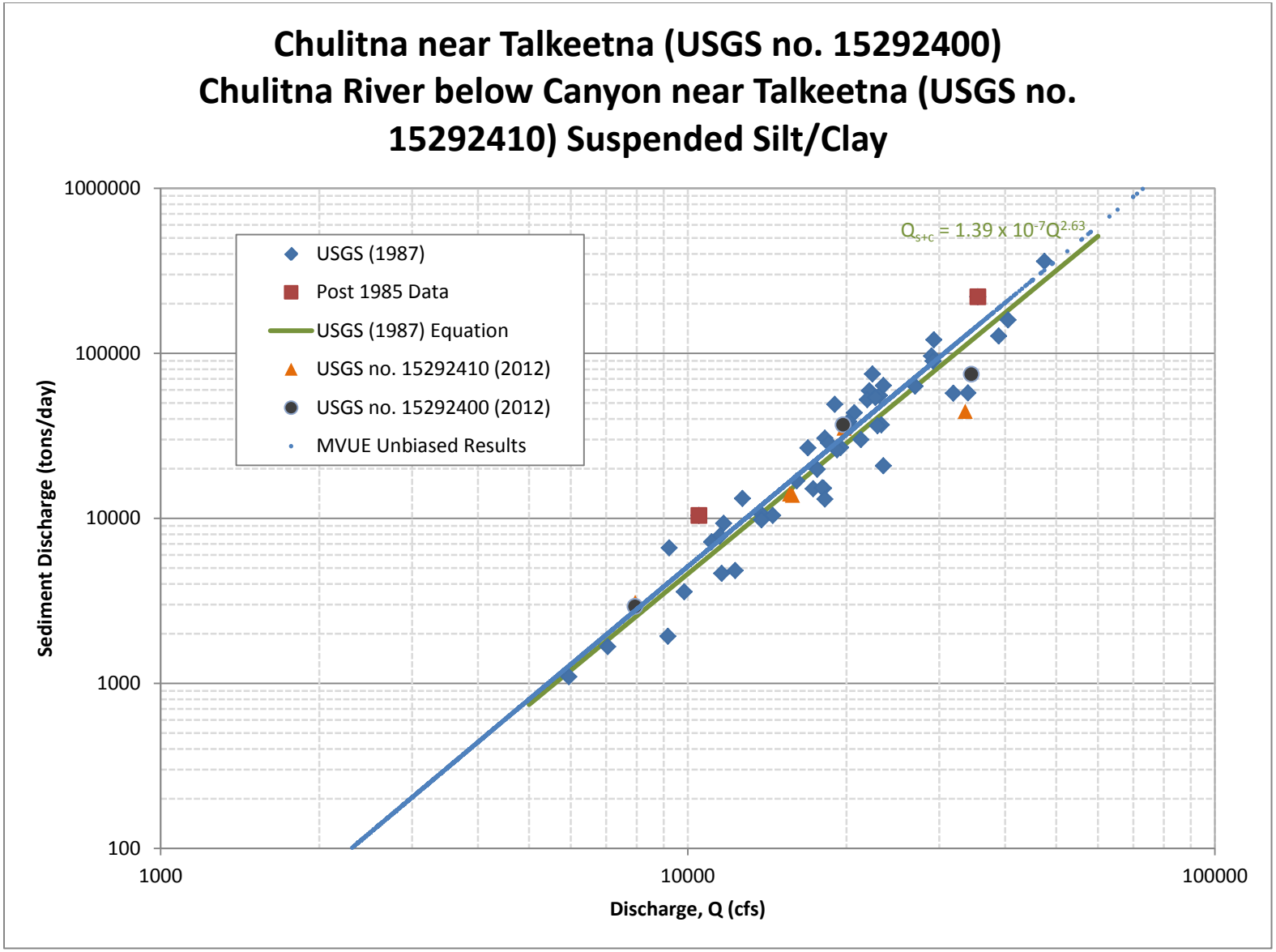


Figure 5.2-5 – Suspended silt/clay sediment-transport data and rating equations for Chulitna River near Talkeetna and Chulitna River below Canyon near Talkeetna

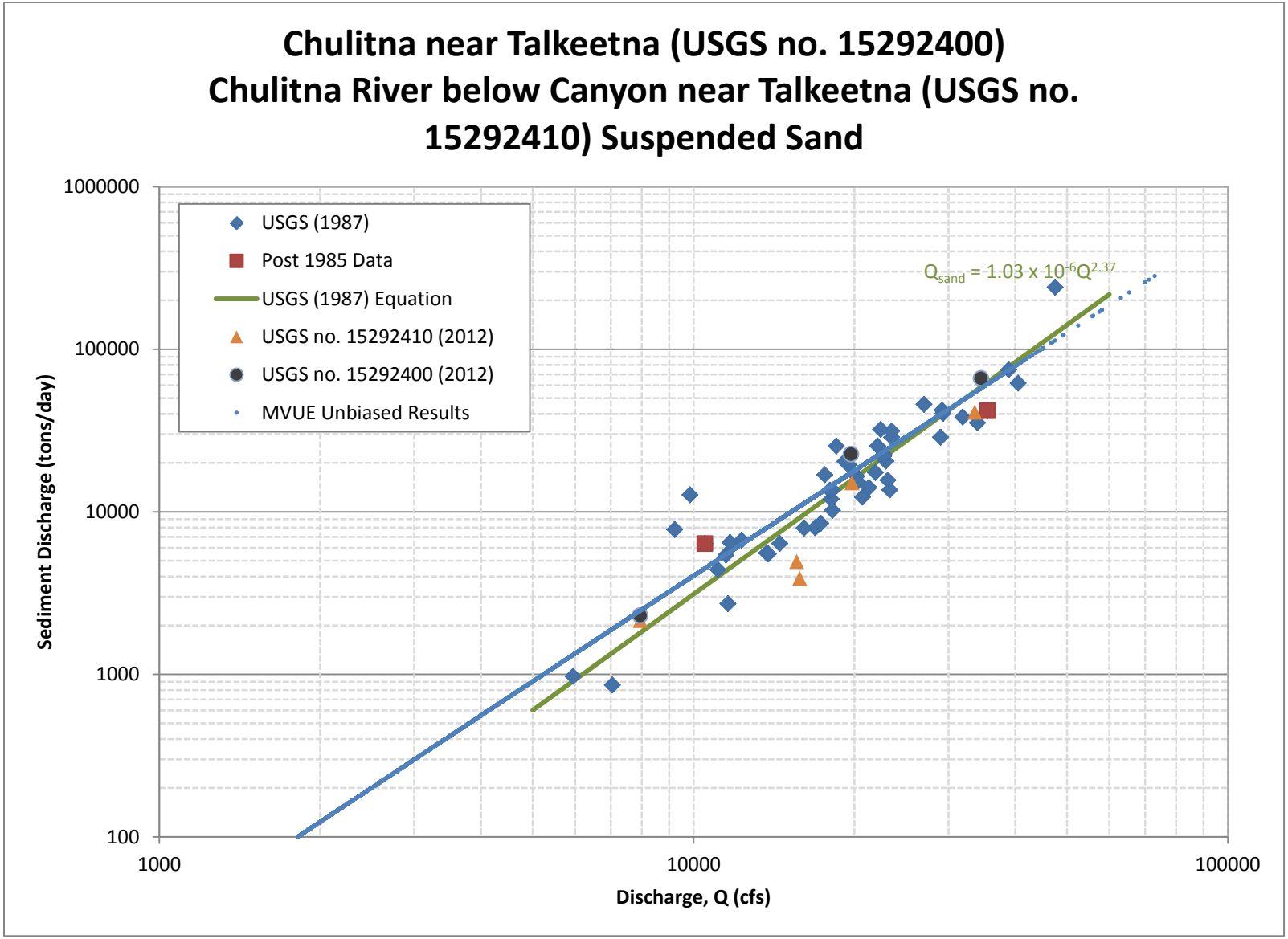


Figure 5.2-6 – Suspended sand sediment-transport data and rating equations for Chulitna River near Talkeetna and Chulitna River below Canyon near Talkeetna

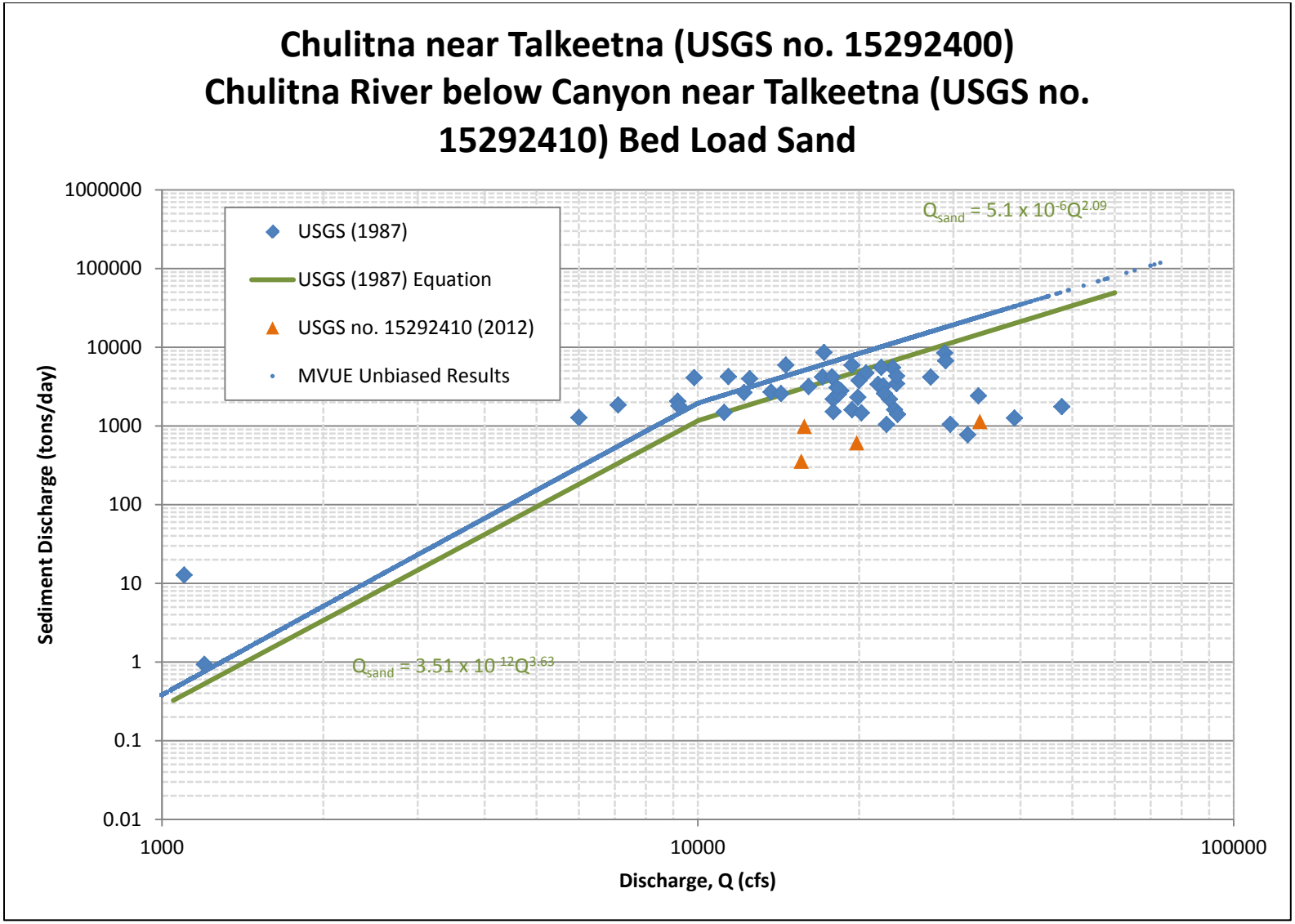


Figure 5.2-7 – Bed load sand sediment-transport data and rating equations for Chulitna River near Talkeetna and Chulitna River below Canyon near Talkeetna

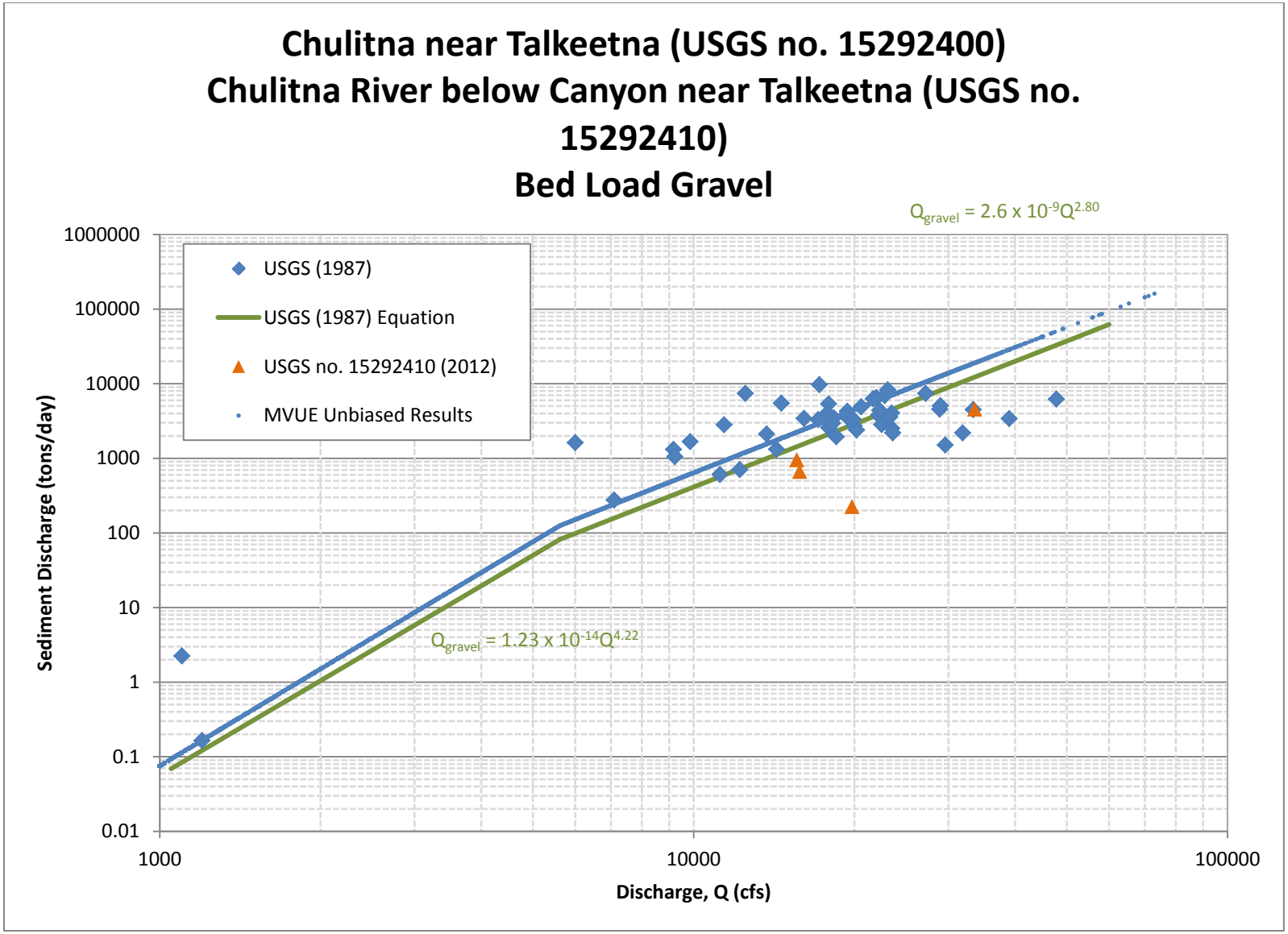


Figure 5.2-8 – Bed load gravel sediment-transport data and rating equations for Chulitna River near Talkeetna and Chulitna River below Canyon near Talkeetna

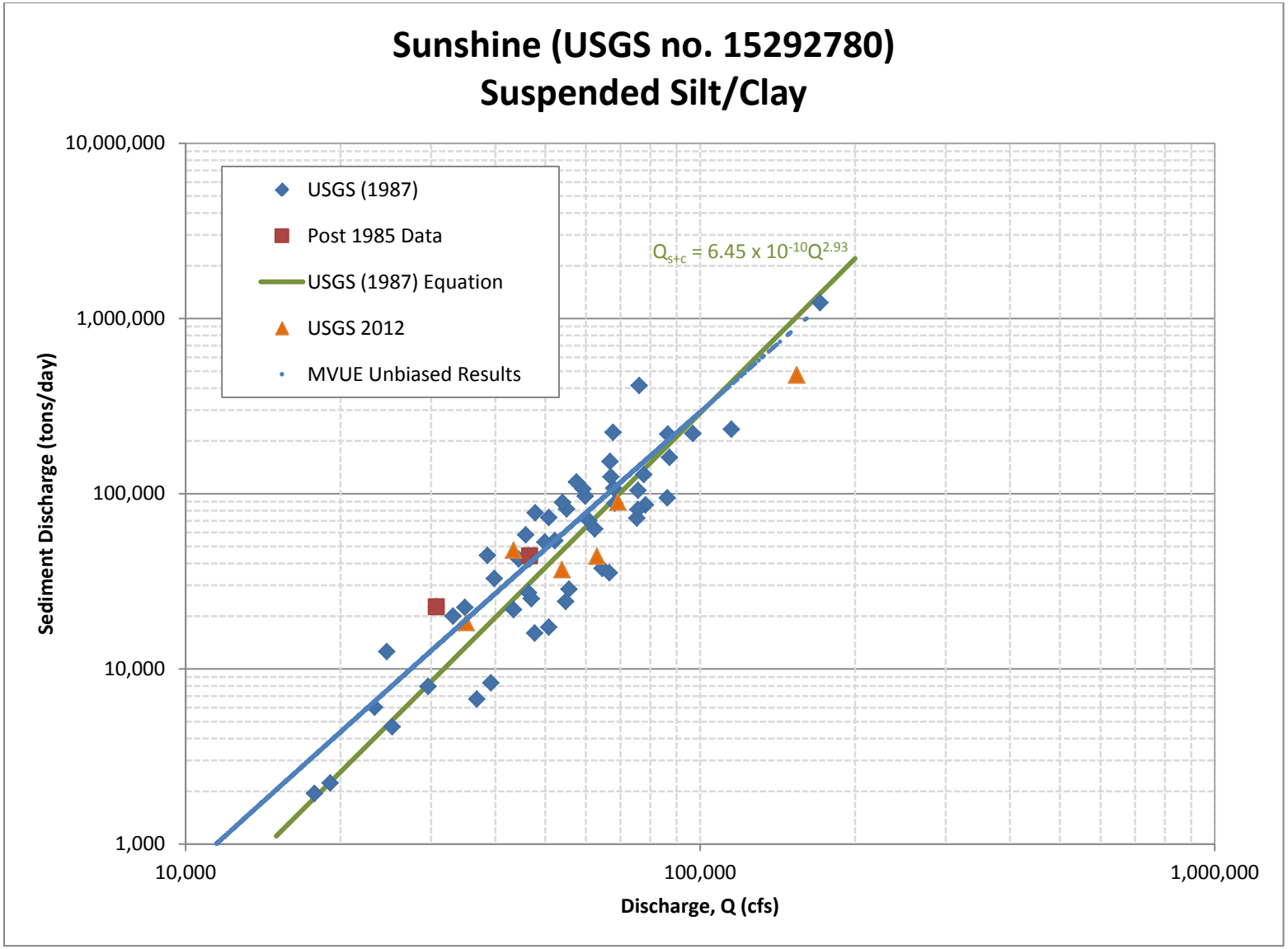


Figure 5.2-9 – Suspended silt/clay sediment-transport data and rating equations for Susitna River at Sunshine

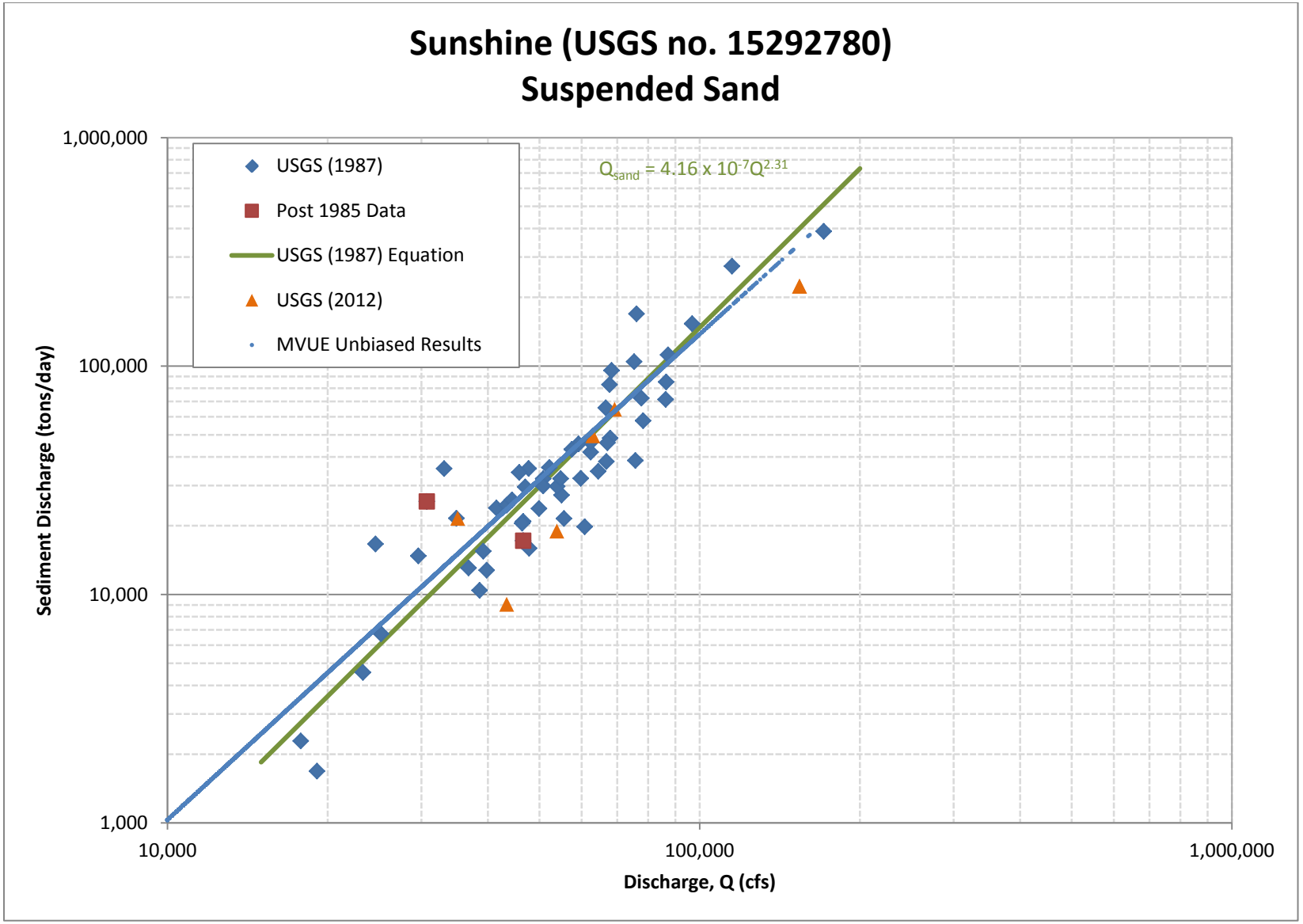


Figure 5.2-10 – Suspended sand sediment-transport data and rating equations for Susitna River at Sunshine

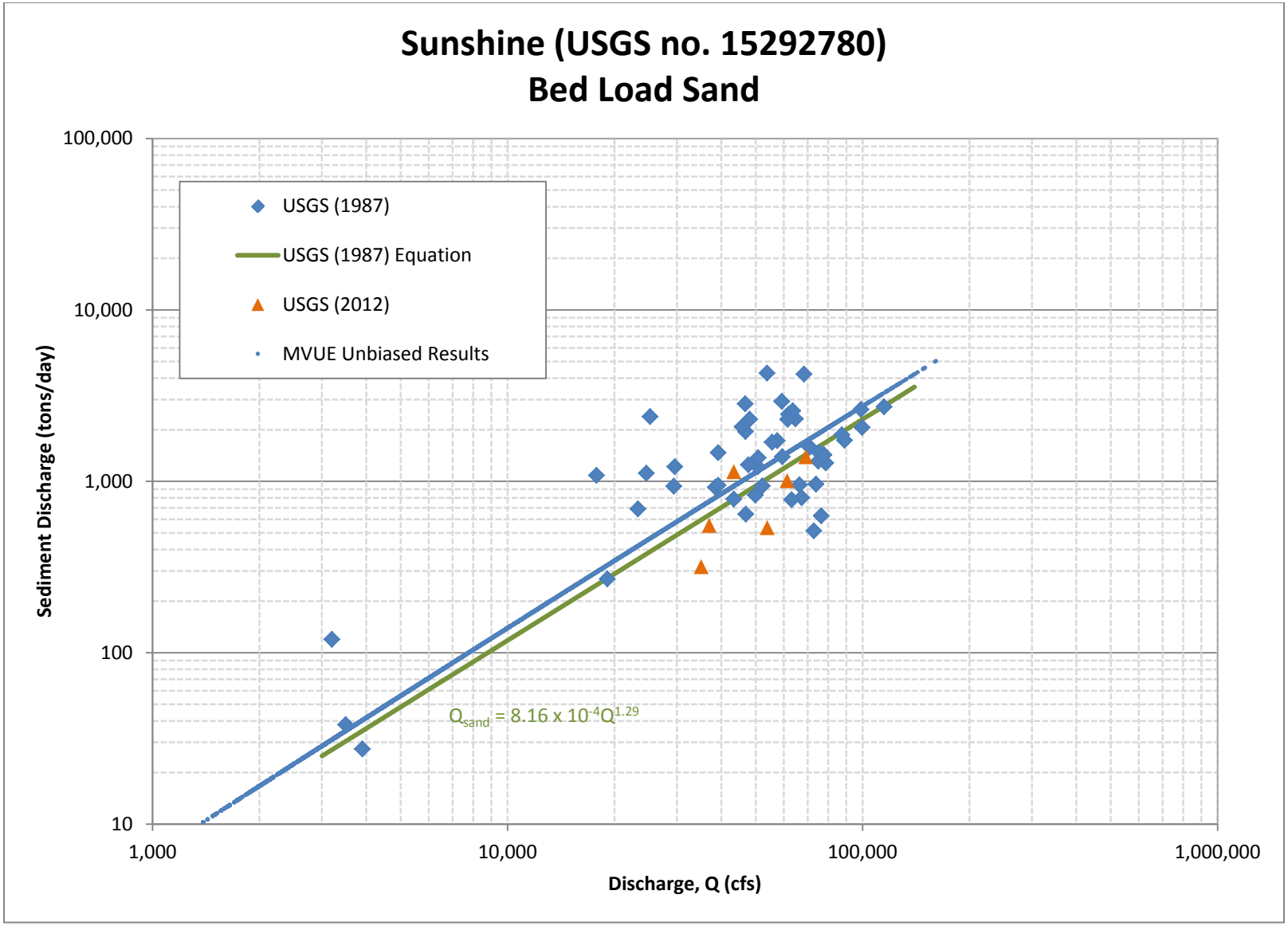


Figure 5.2-11 – Bed load sand sediment-transport data and rating equations for Susitna River at Sunshine

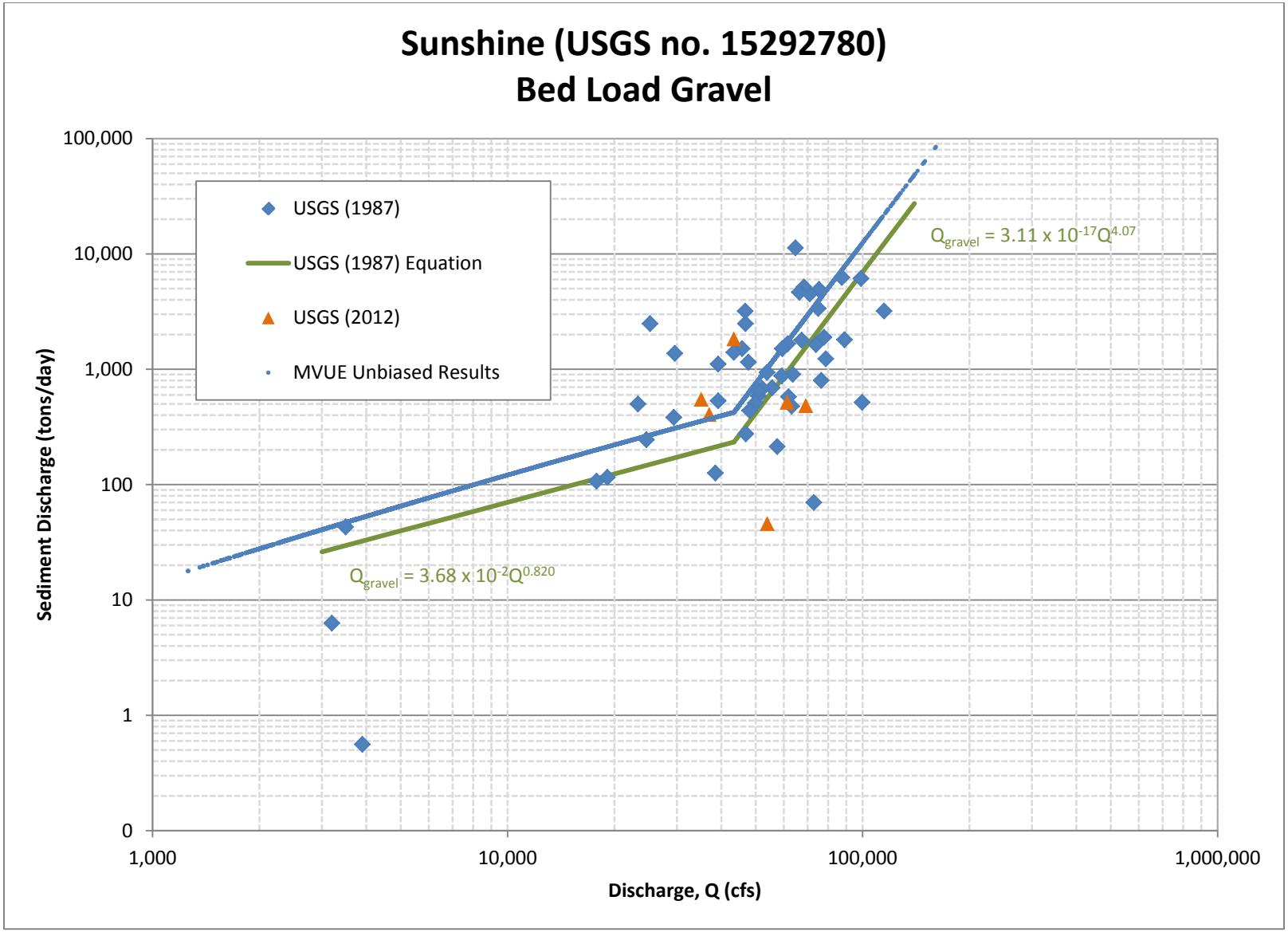


Figure 5.2-12 – Bed load gravel sediment-transport data and rating equations for Susitna River at Sunshine

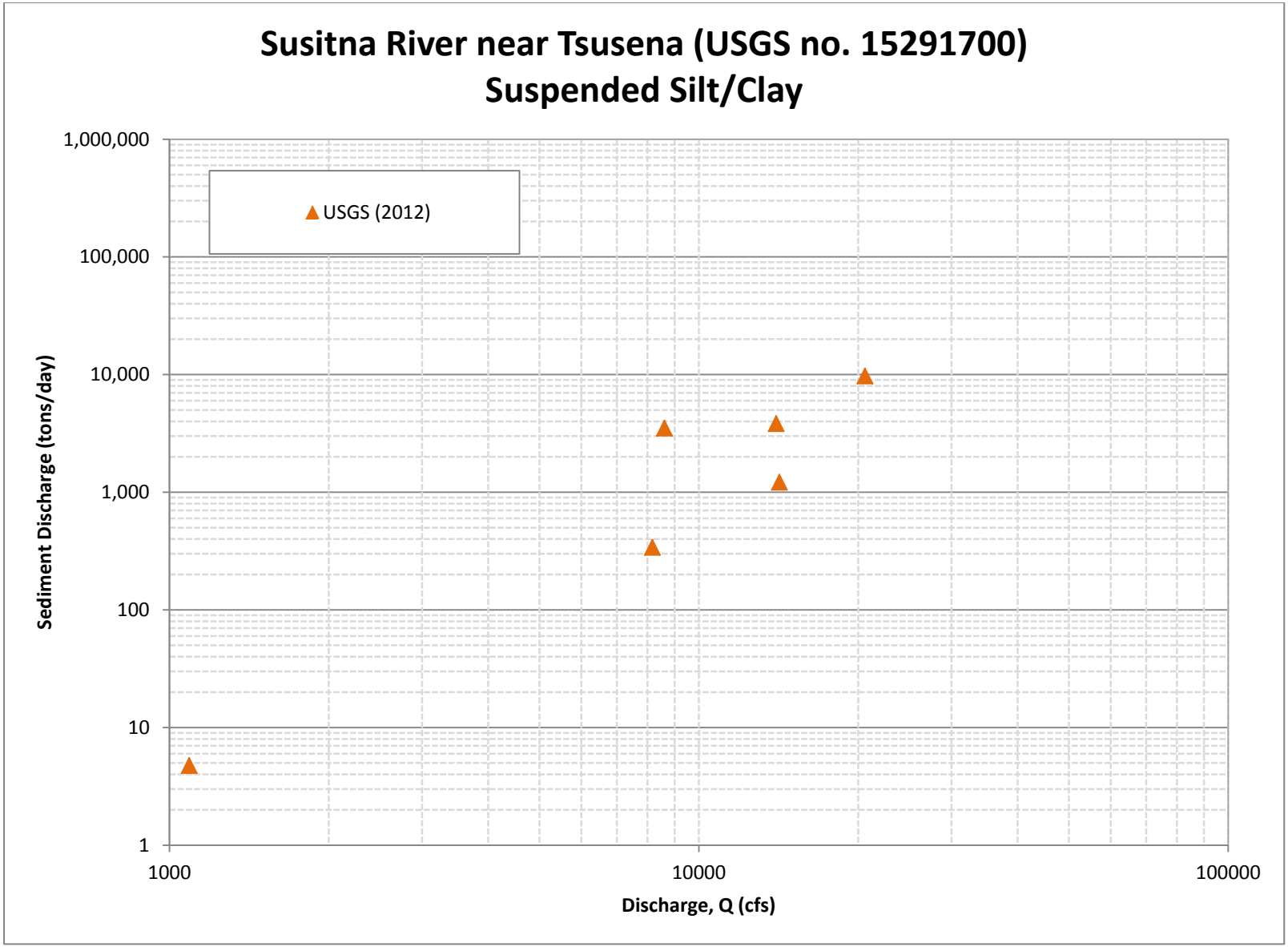


Figure 5.2-13 – Suspended silt/clay sediment-transport data for Susitna River near Tsusena

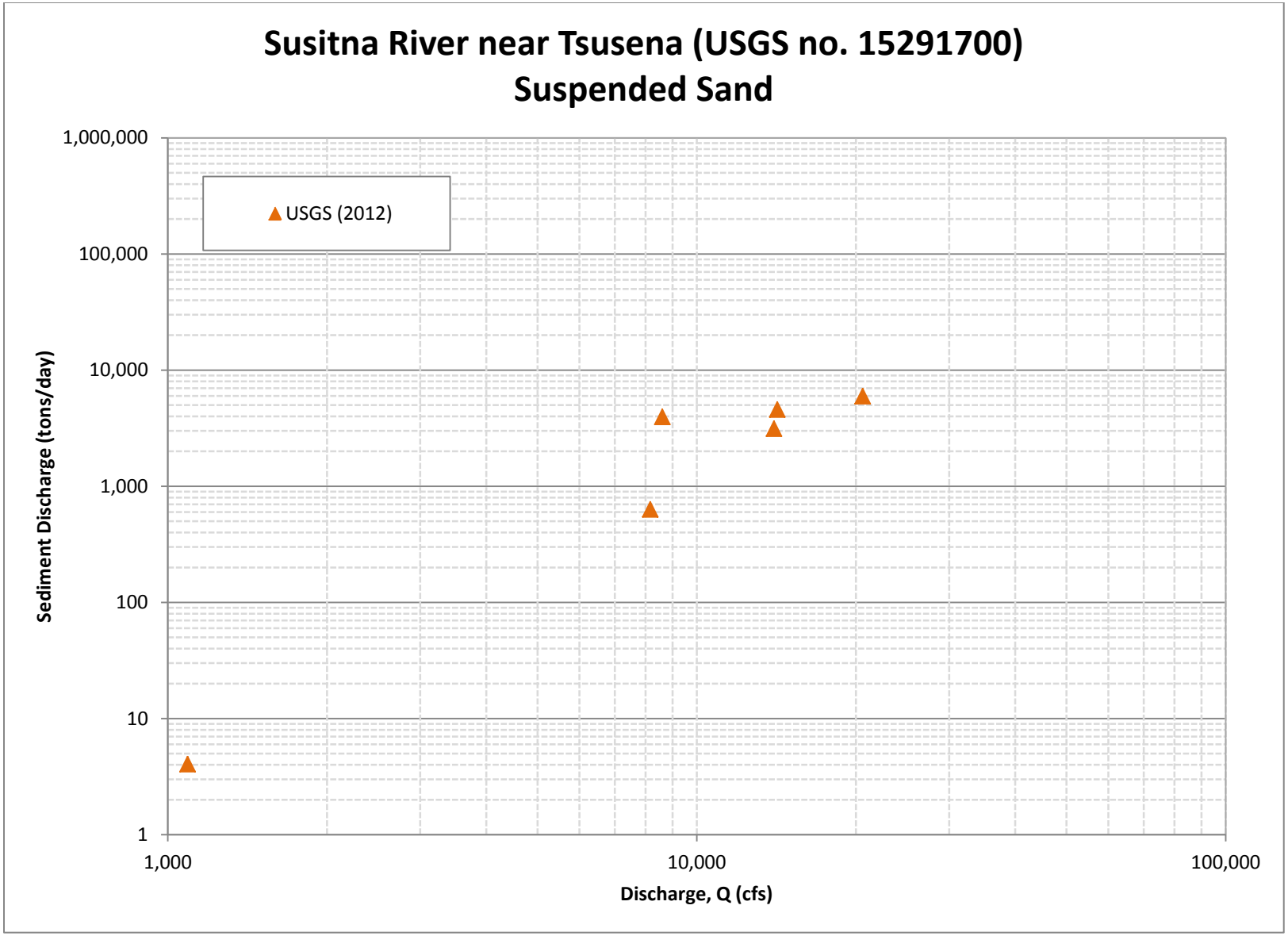


Figure 5.2-14 – Suspended sand sediment-transport data for Susitna River near Tsusena

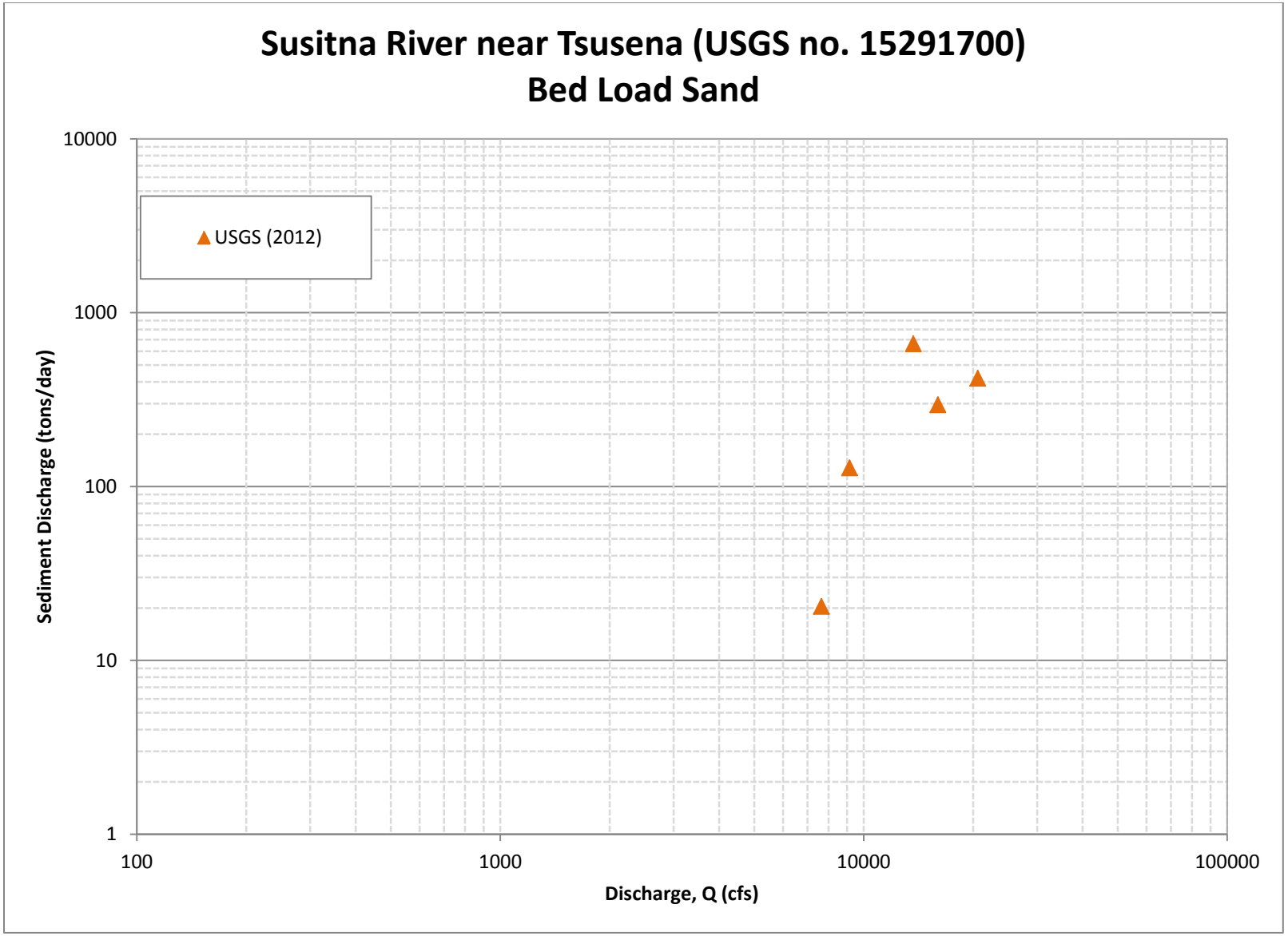


Figure 5.2-15 – Bed load sand sediment-transport data for Susitna River near Tsusena

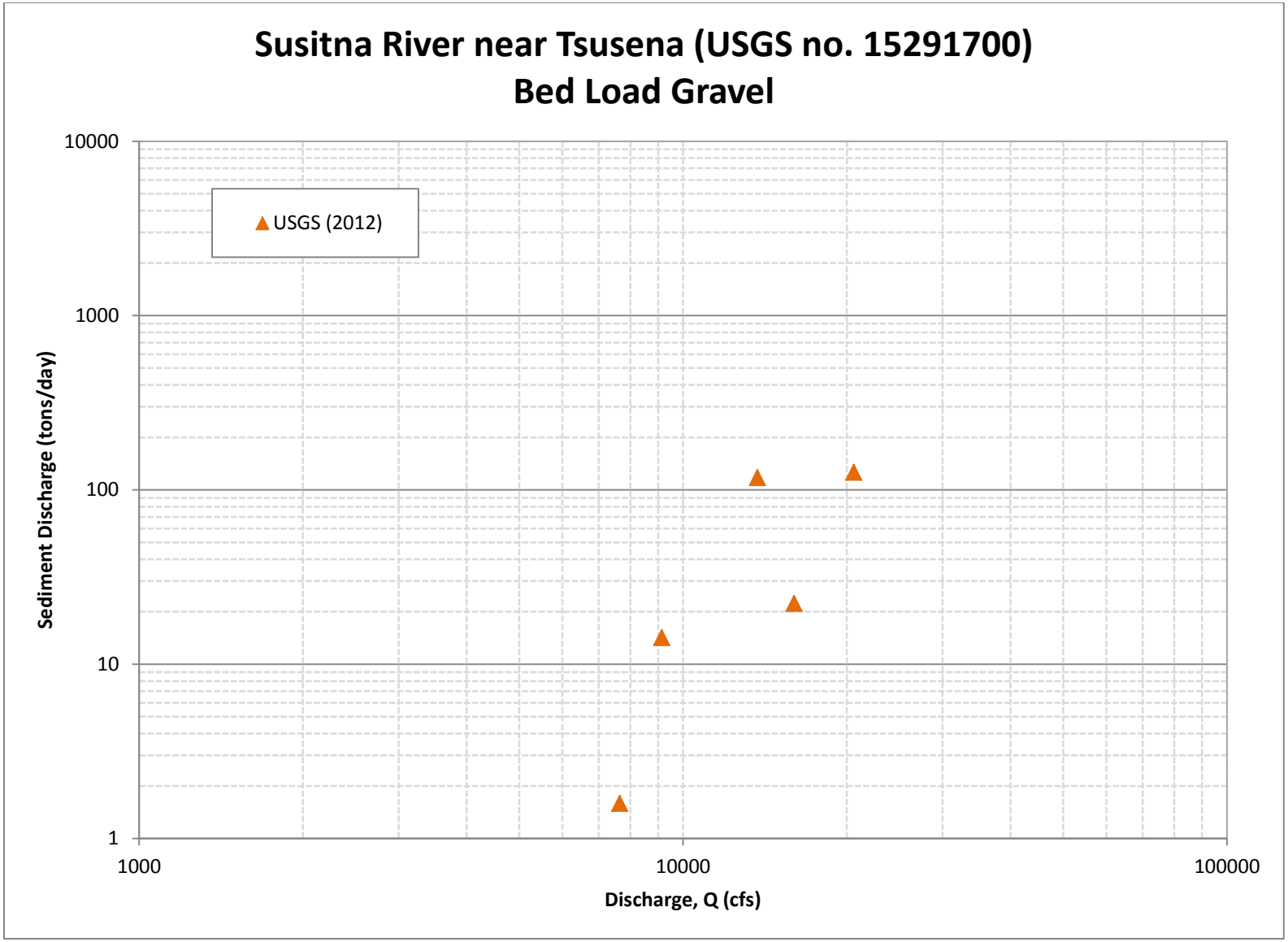


Figure 5.2-16 – Bed load gravel sediment-transport data for Susitna River near Tsusena

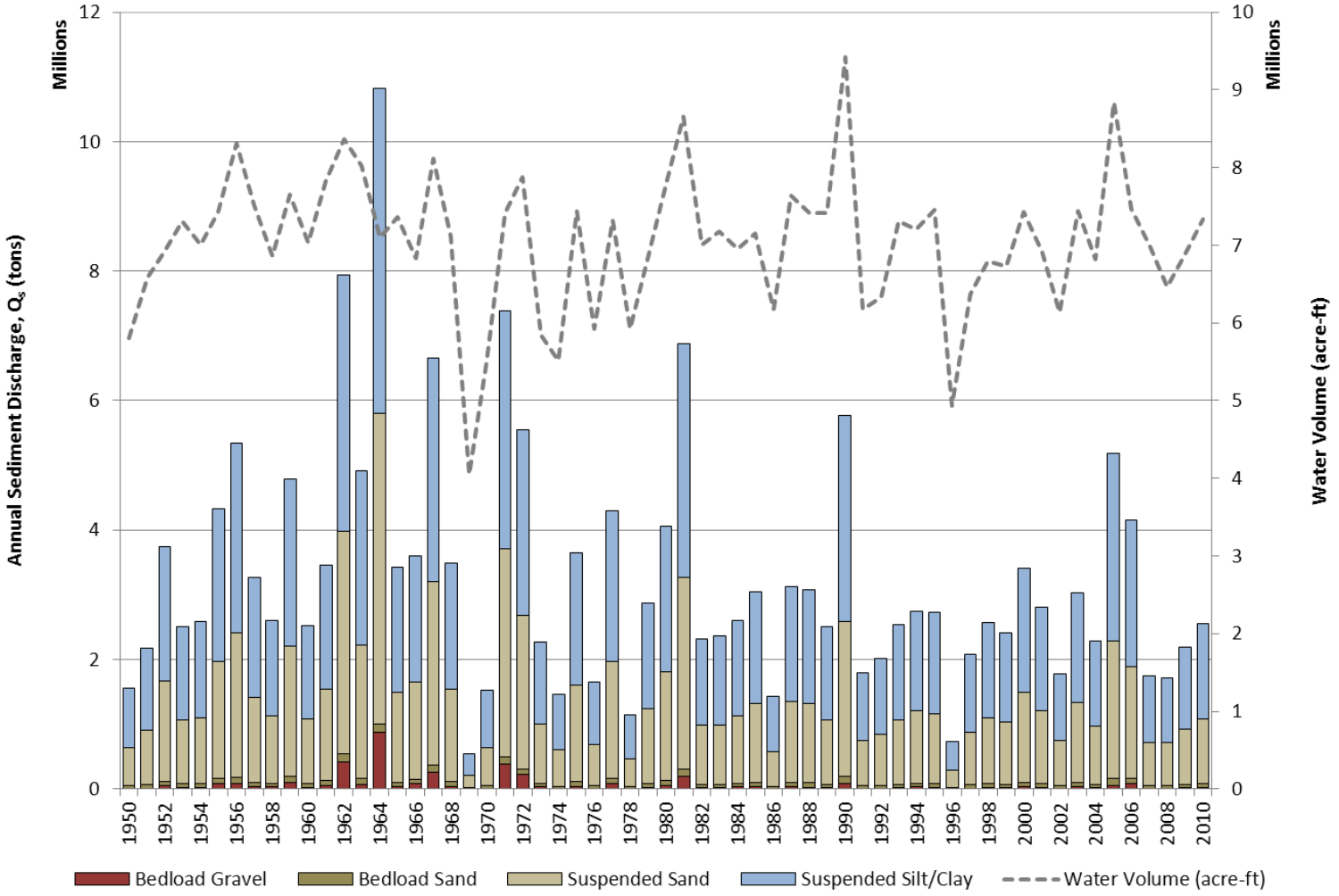
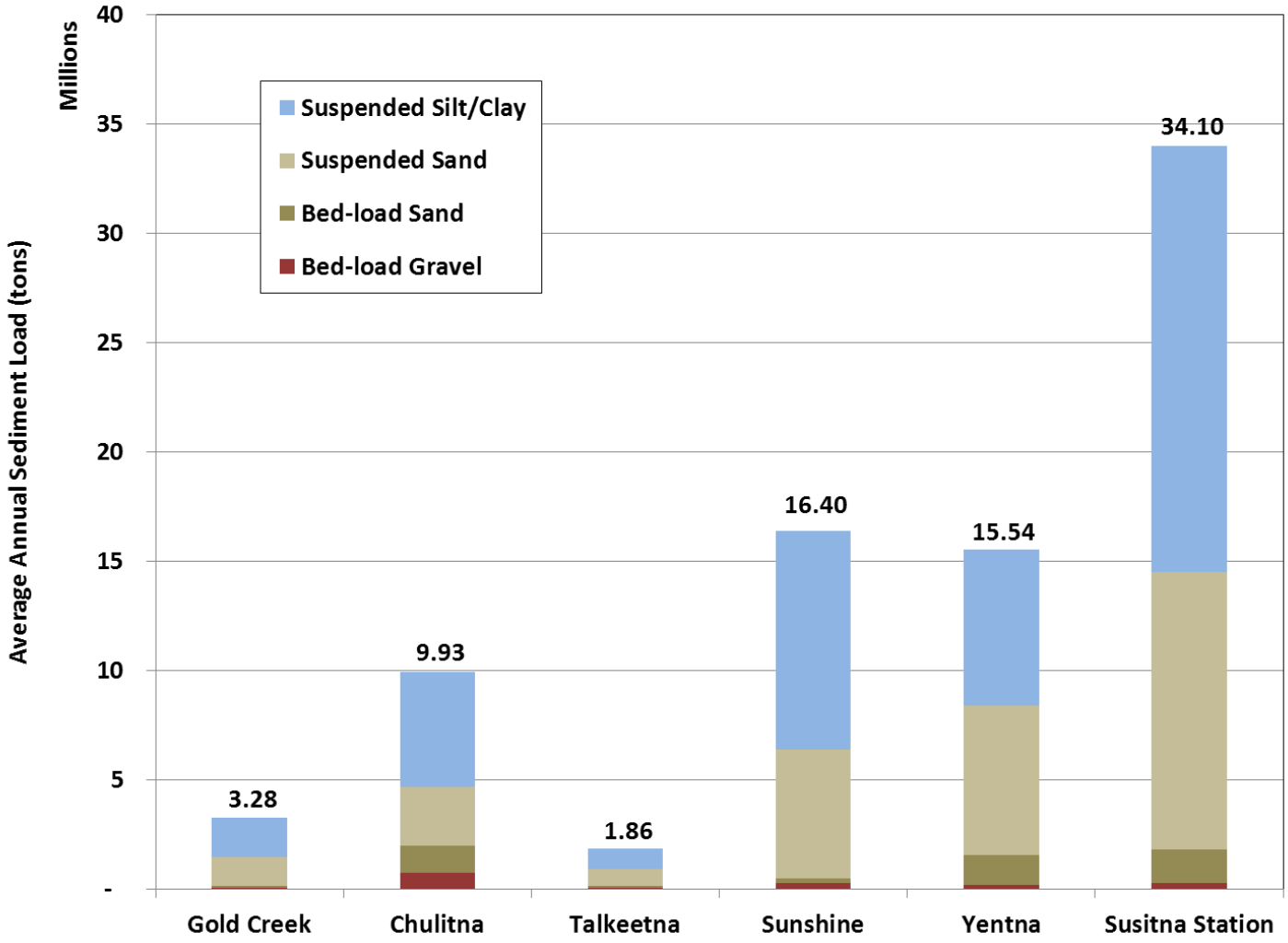


Figure 5.3-1. Estimated annual silt/clay, sand and gravel loads at the Gold Creek (Gage No. 15292000)/Susitna River near Talkeetna (Gage No. 15292100) gage over the 61-year period of flows under pre-Project conditions. Also shown is the annual flow volume for each of the years.



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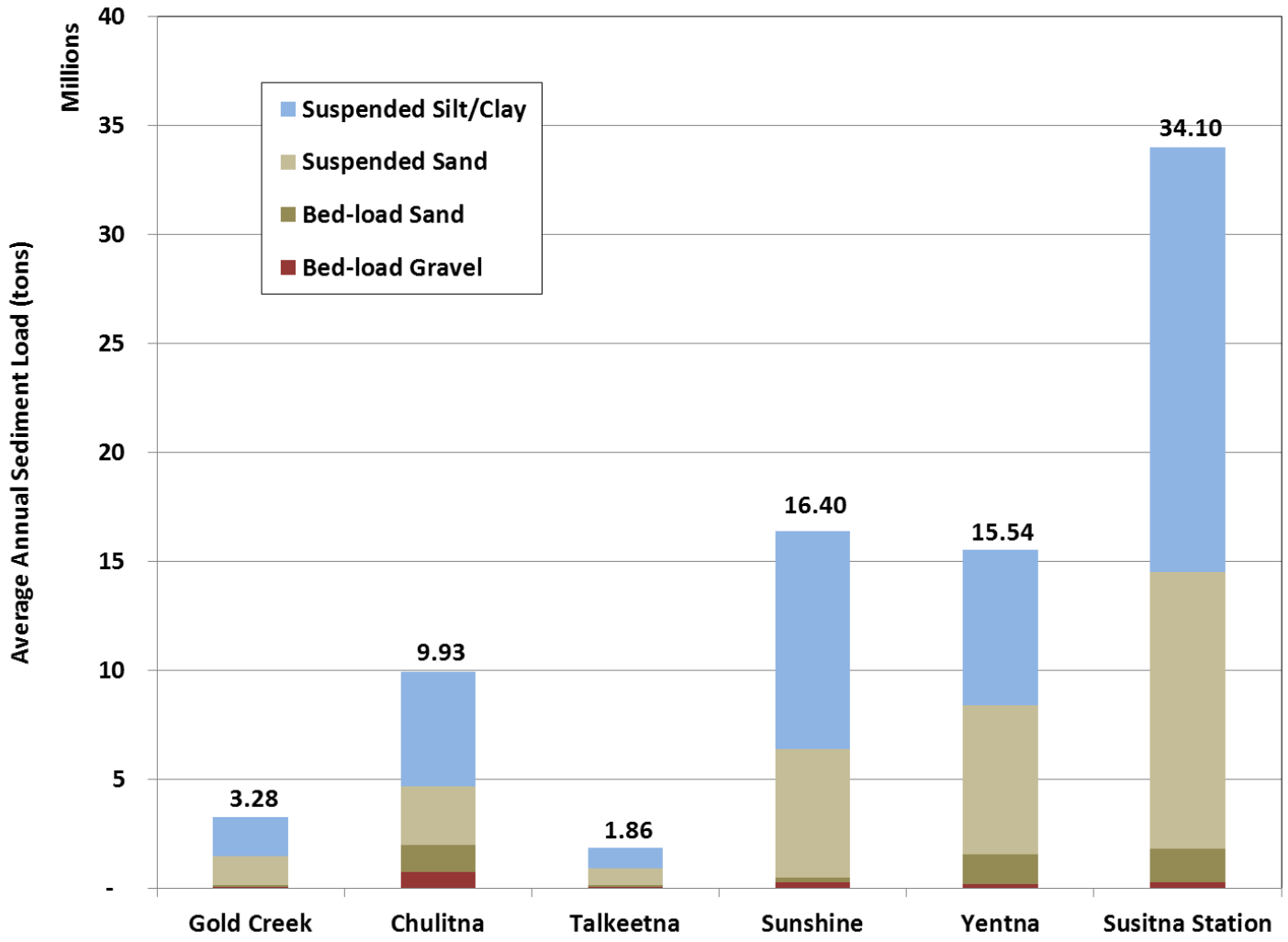

Figure 5.3-2. Average annual silt/clay, sand and gravel loads under pre-Project conditions for the three mainstem gages and three major tributary gages considered in the analysis.

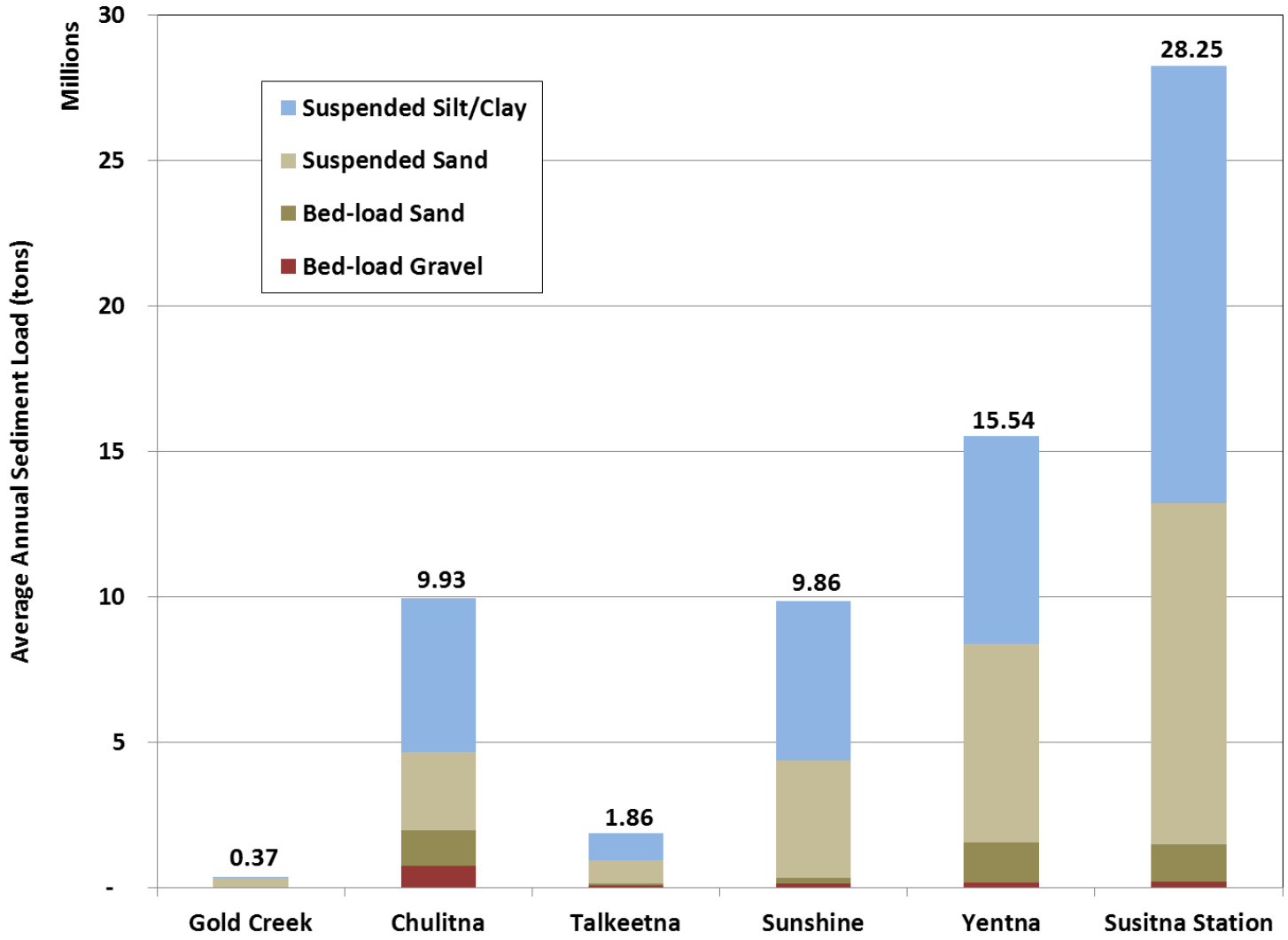

Figure 5.3.4. Average annual silt/clay, sand and gravel loads under Maximum Load Following OS-1 conditions for the three mainstem gages and three major tributary gages considered in the analysis. Note that the tributary loads are the same as pre-Project conditions.

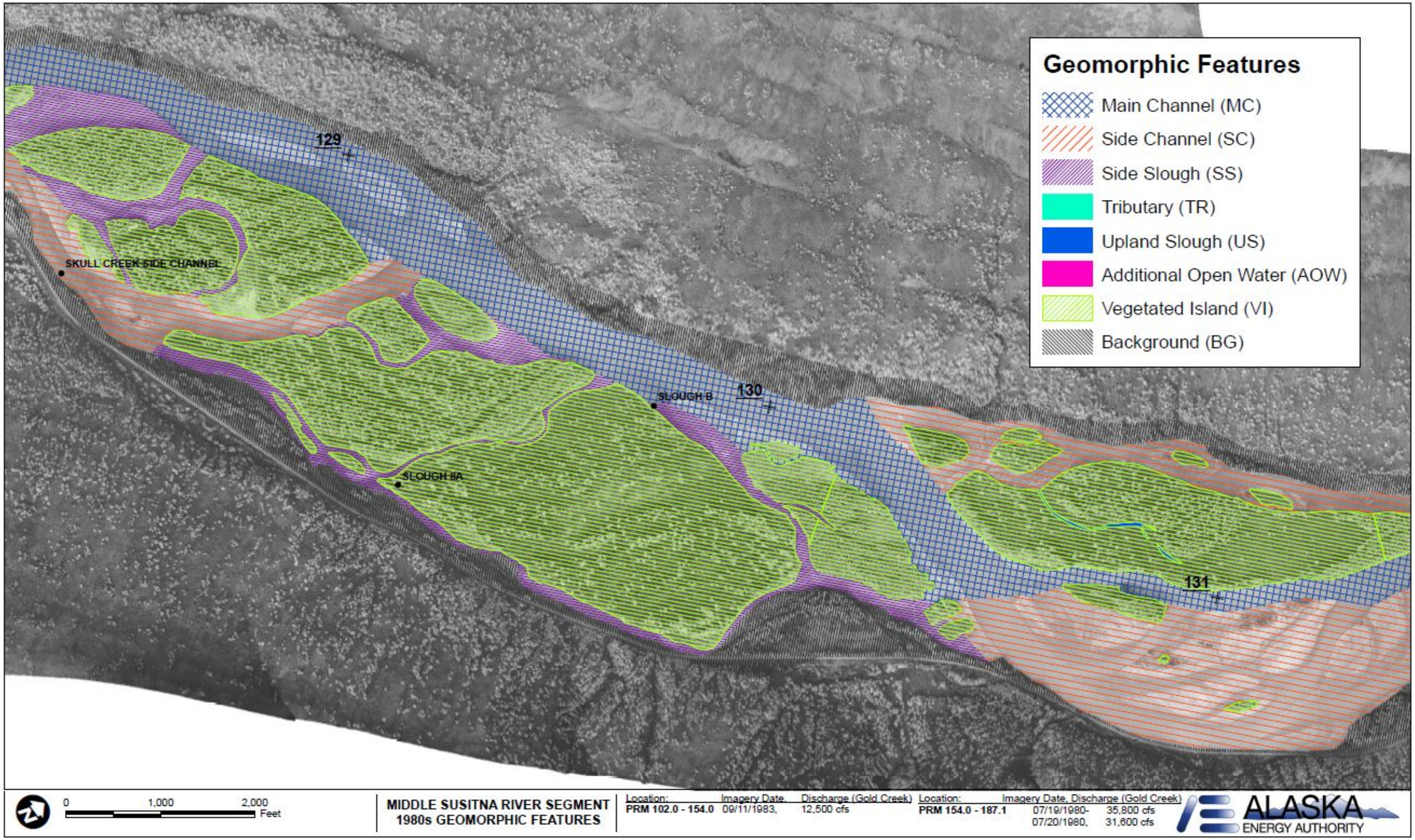

Figure 5.4-1: Example of 1980s Geomorphic Feature Mapping of the Middle River.

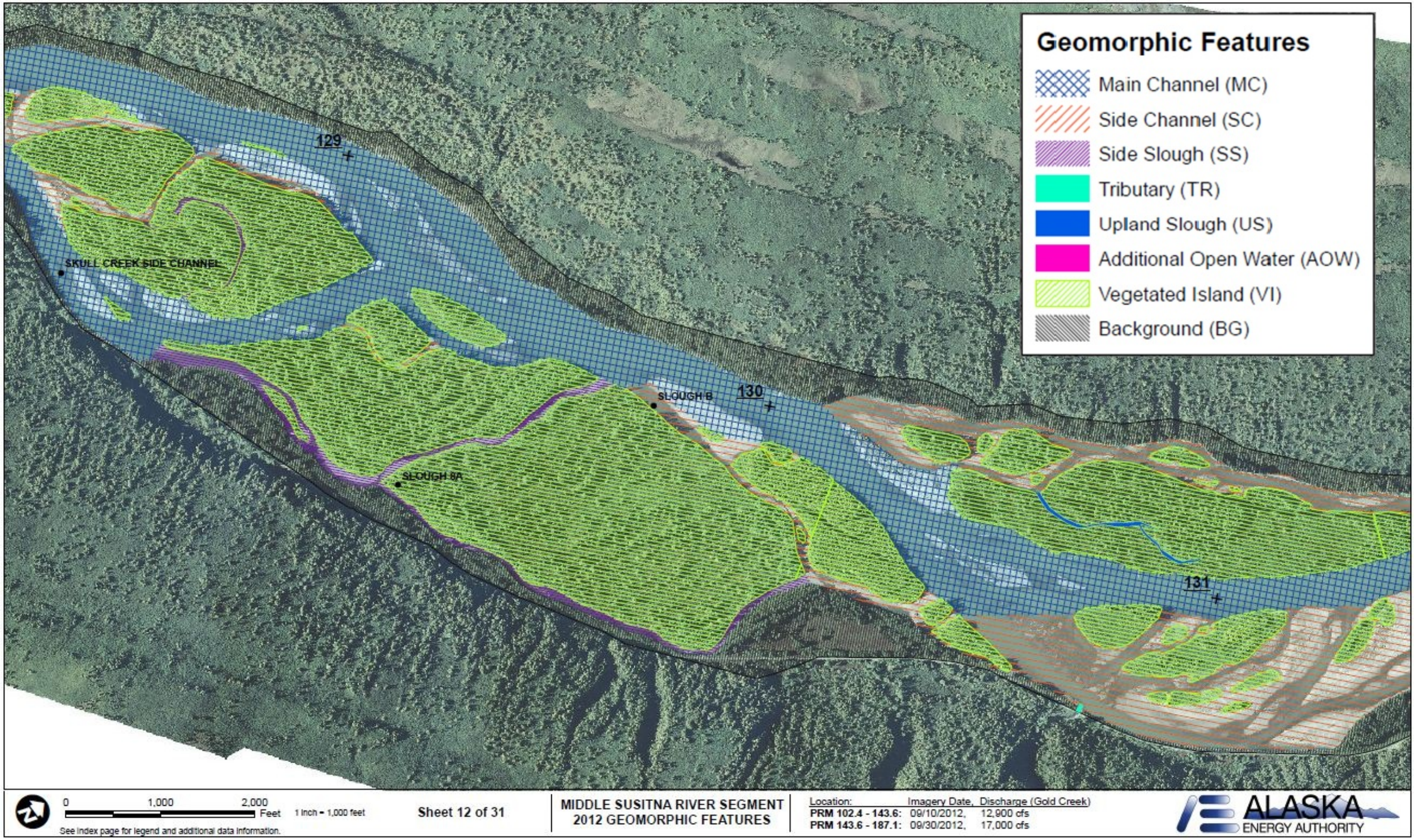

Figure 5.4-2: Example of 2012 Geomorphic Feature Mapping of the Middle River.

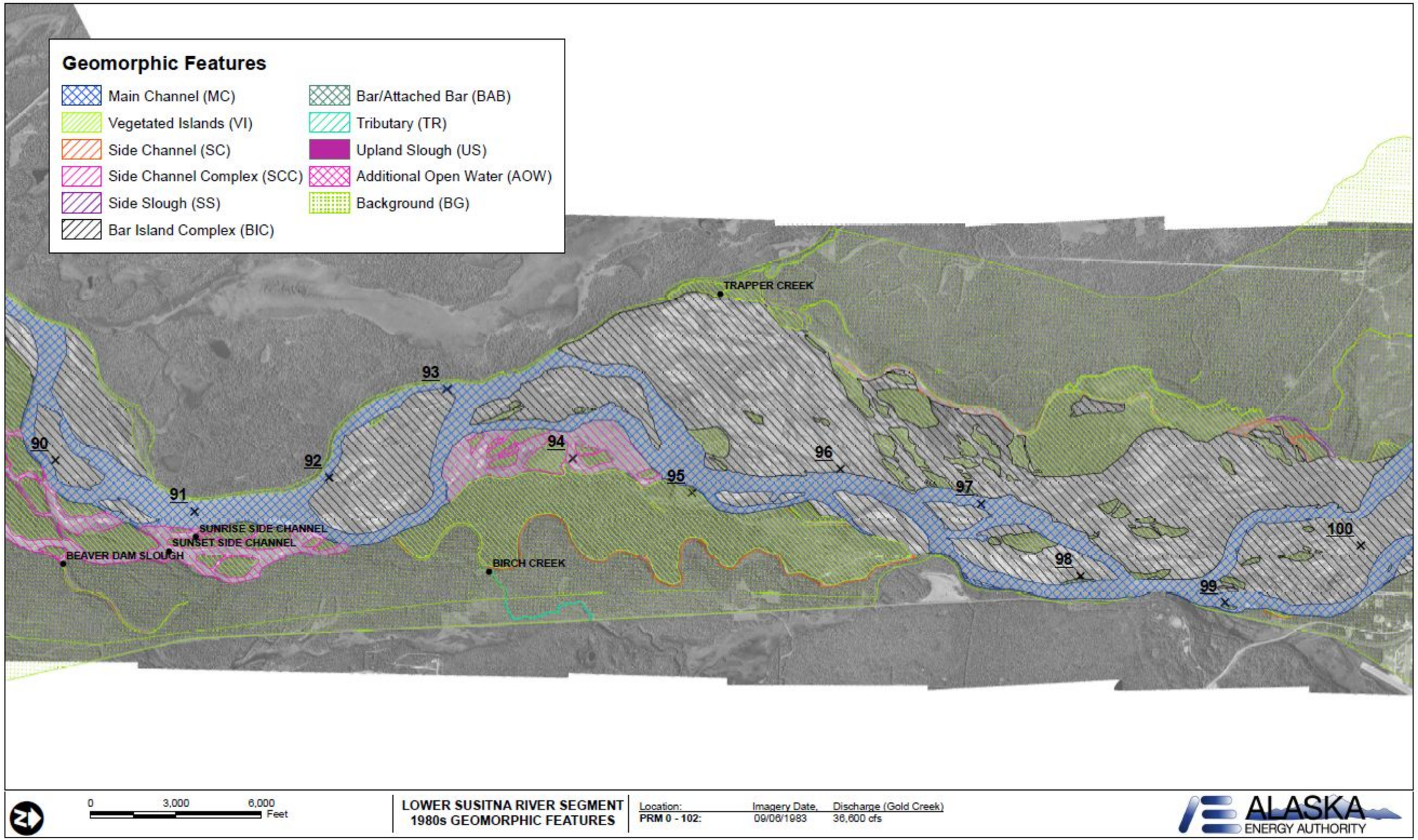

Figure 5.4-3: Example of 1980s Geomorphic Feature Mapping of the Lower River.

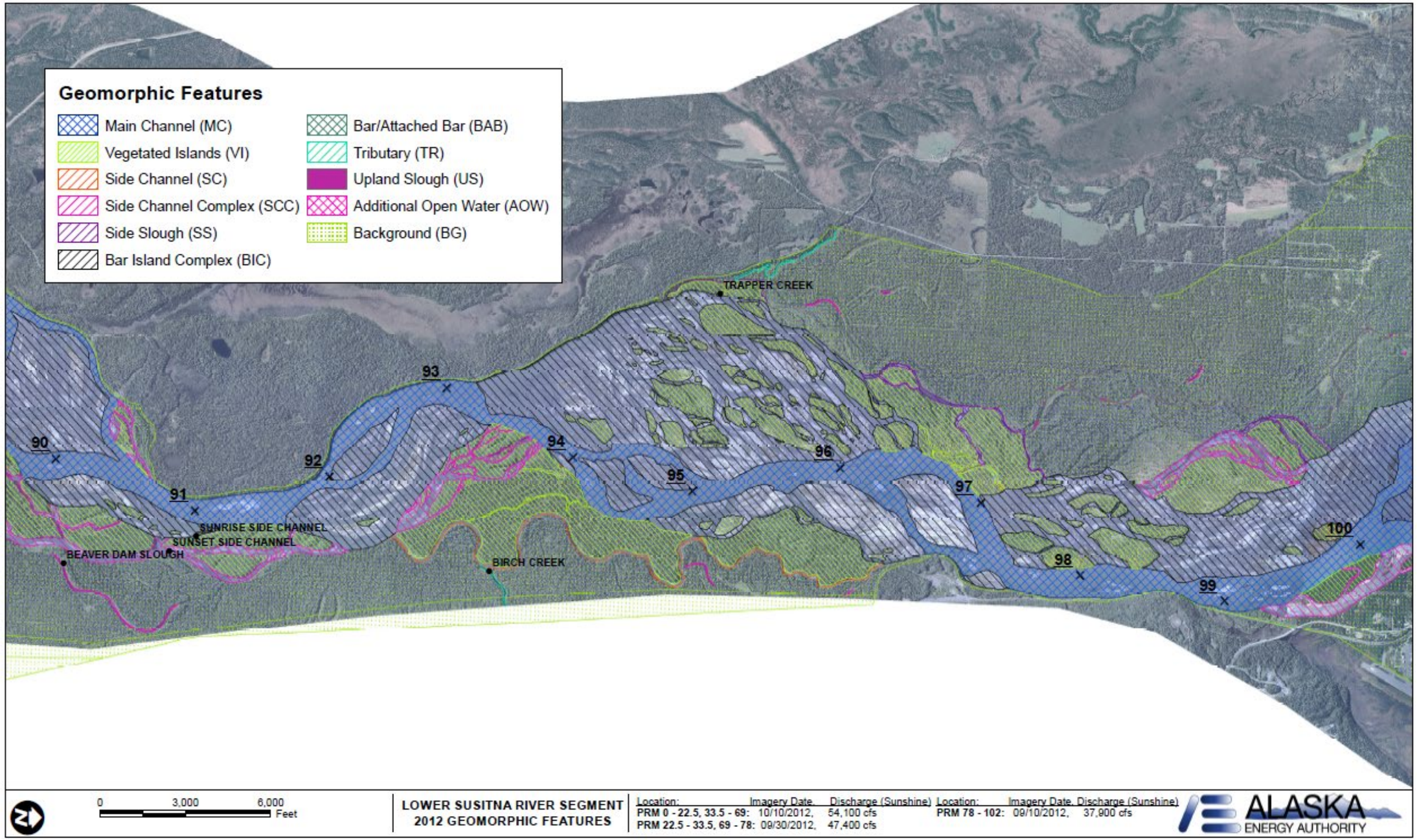

Figure 5.4-4: Example of 2012 Geomorphic Feature Mapping of the Lower River.

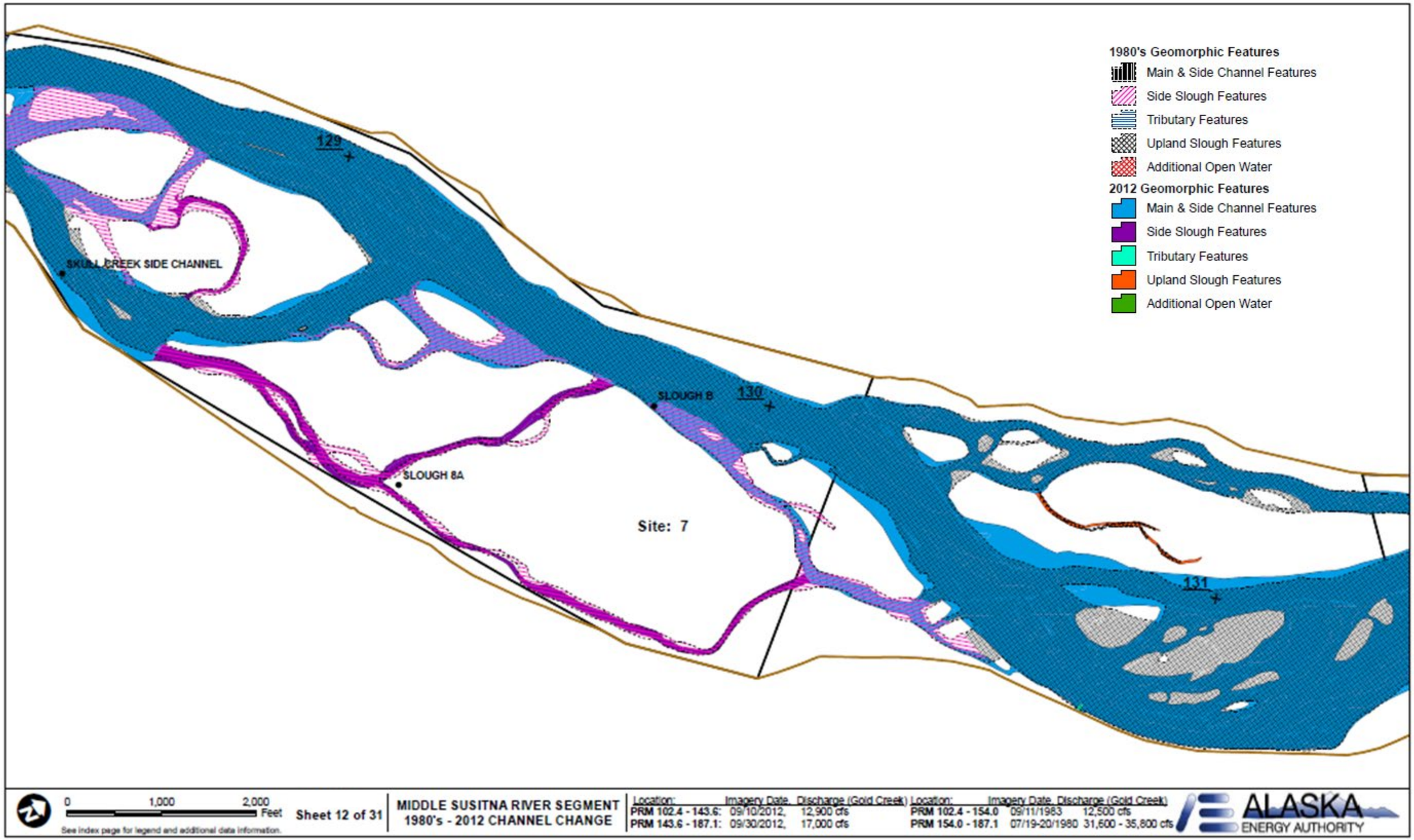

Figure 5.4-5: Example of 1980s Geomorphic Feature Overlay Mapping of the Middle River.

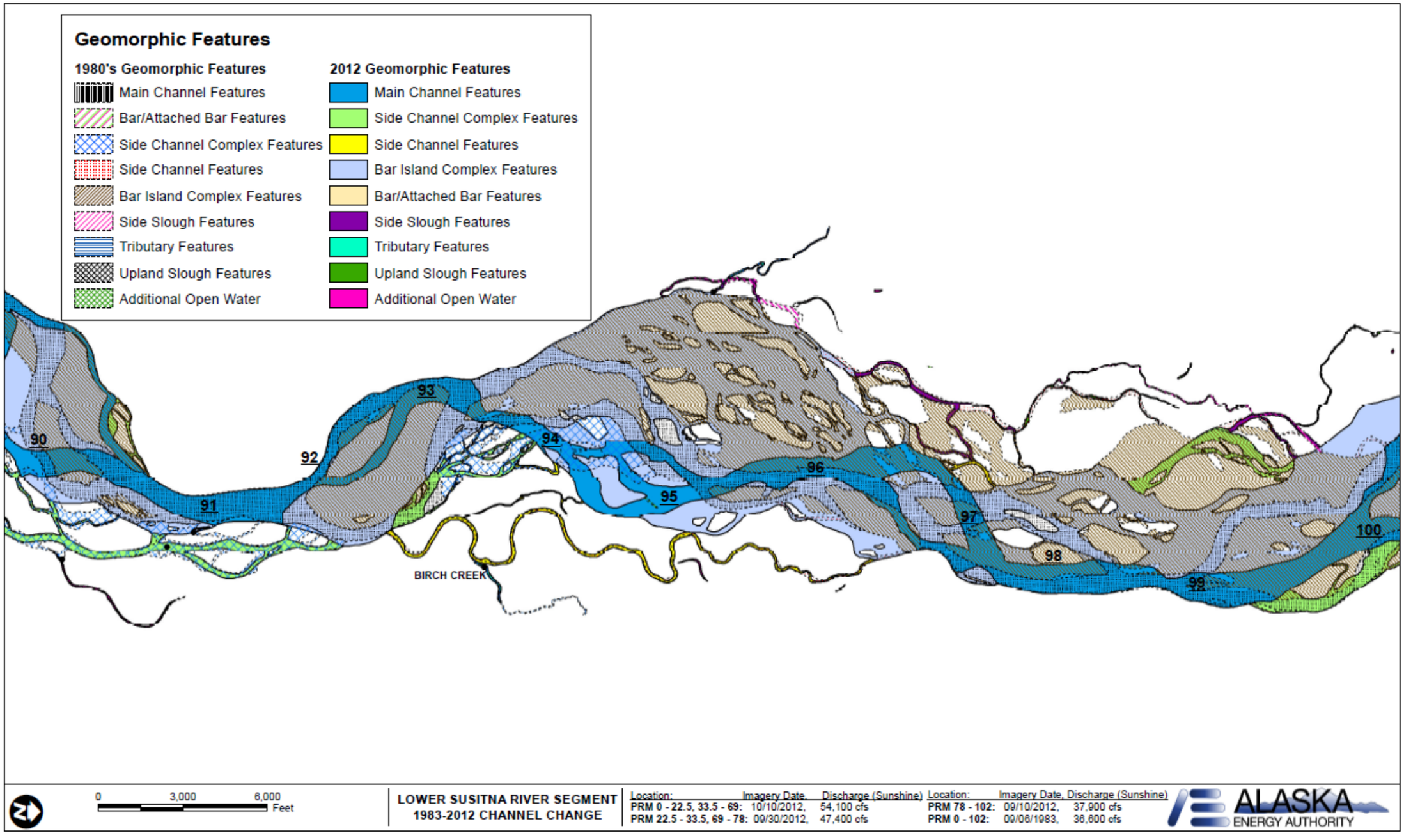

Figure 5.4-6: Example of 1980s Geomorphic Feature Overlay Mapping of the Lower River.

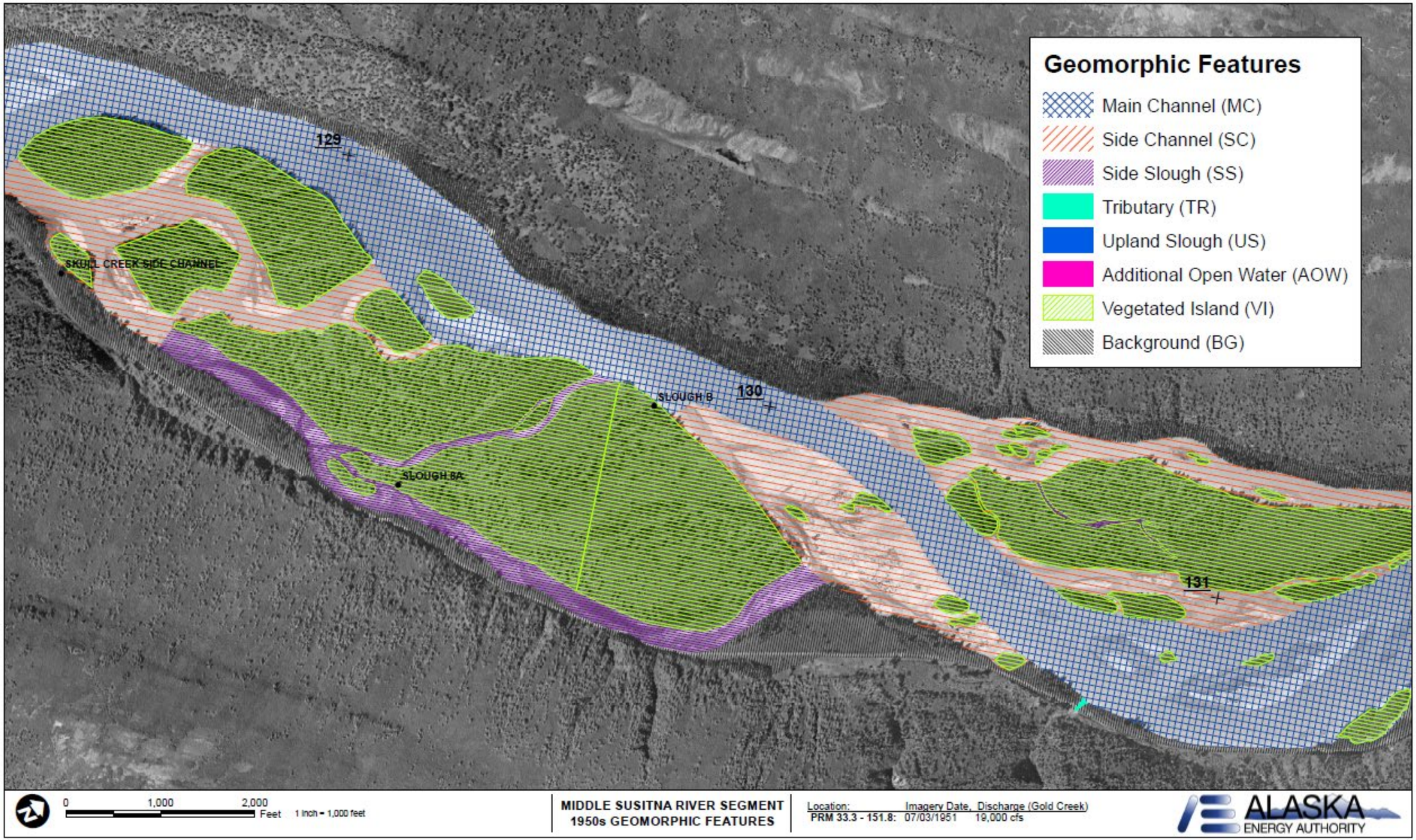

Figure 5.4-7: Example of 1950s Geomorphic Feature Mapping of the Middle River.

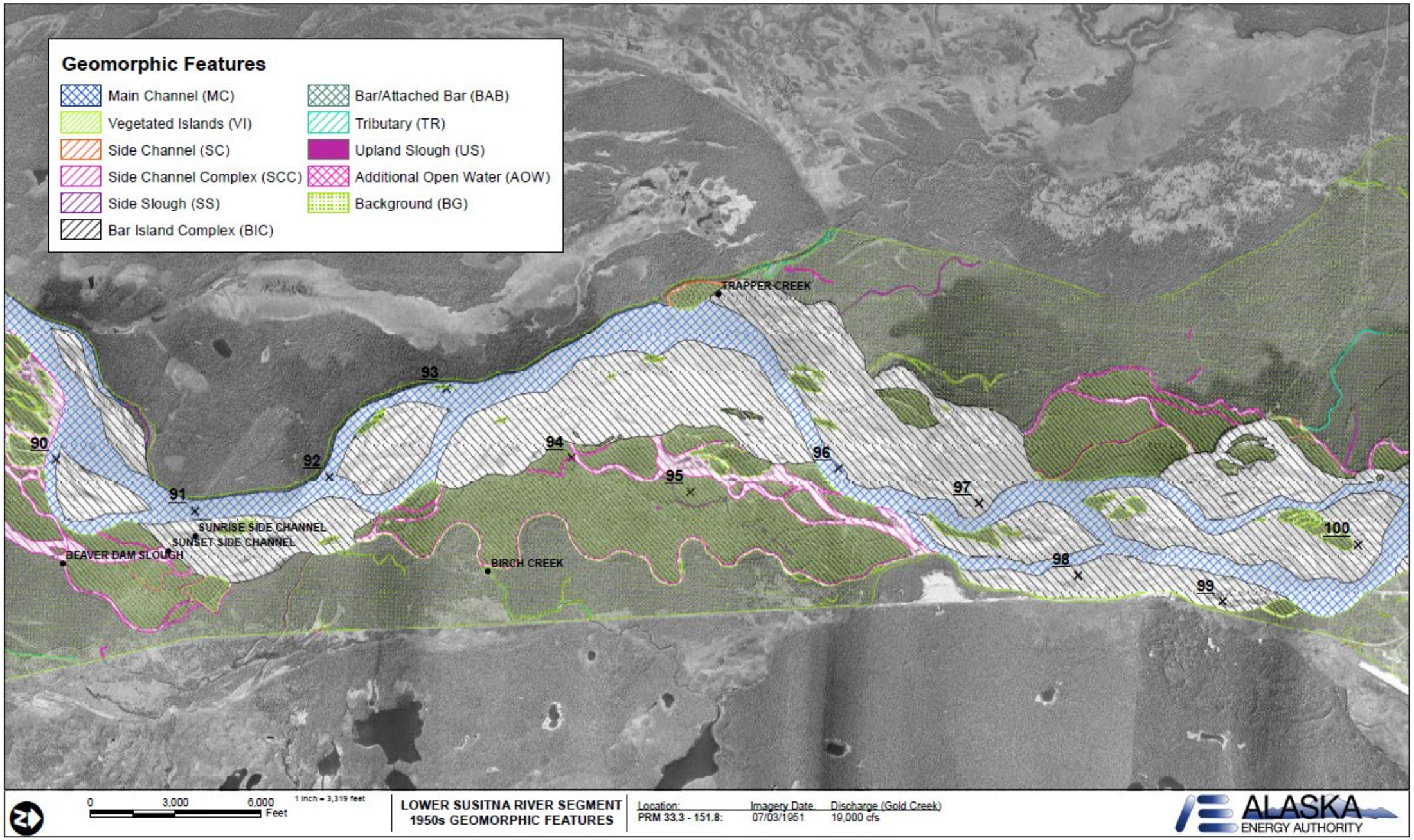

Figure 5.4-8: Example of 1950s Geomorphic Feature Mapping of the Lower River.

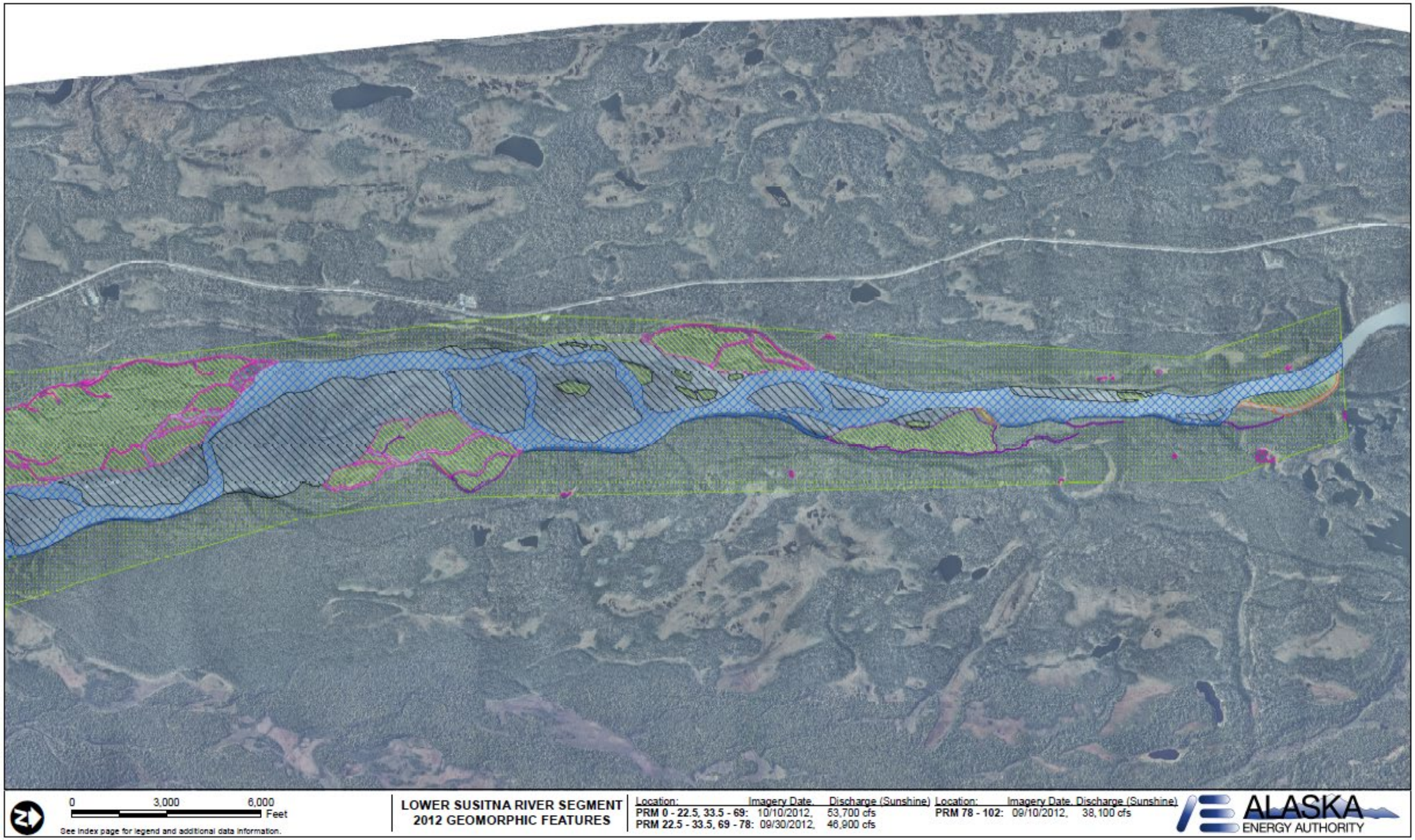

Figure 5.4-9: Extended 2012 Geomorphic Feature Mapping of the Chulitna River.

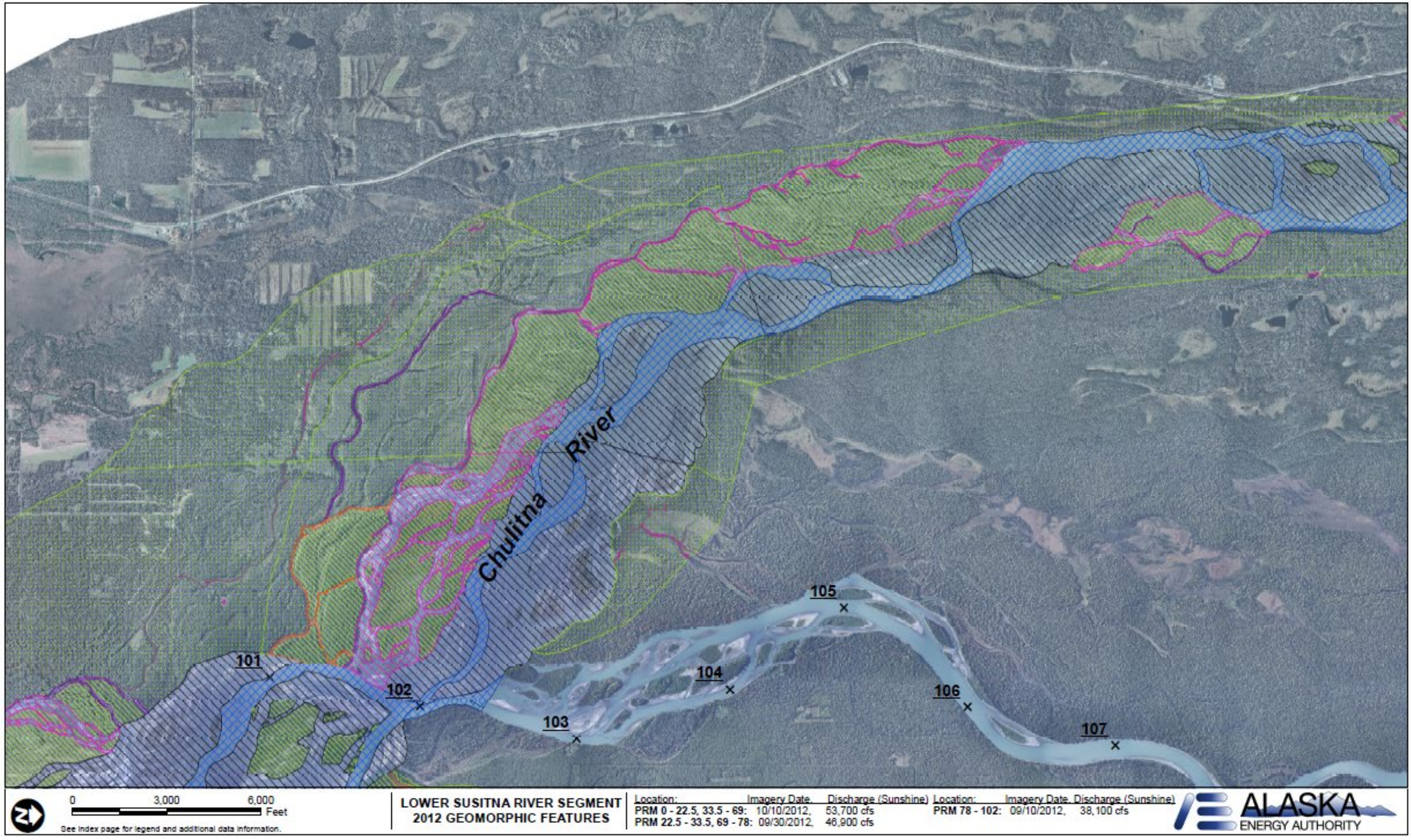

Figure 5.4-10: Extended 2012 Geomorphic Feature Mapping of the Chulitna River.

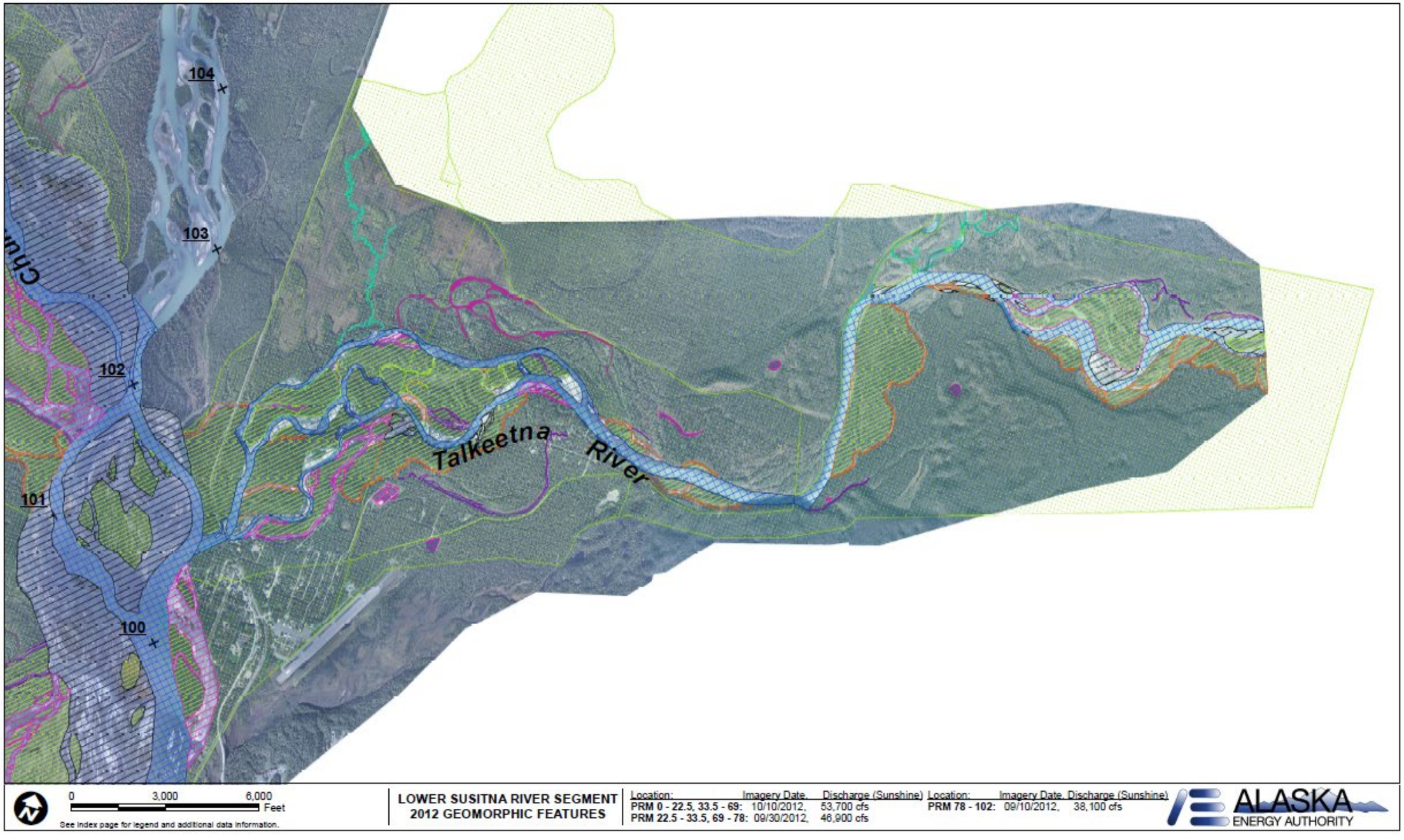

Figure 5.4-11: Extended 2012 Geomorphic Feature Mapping of the Talkeetna River.

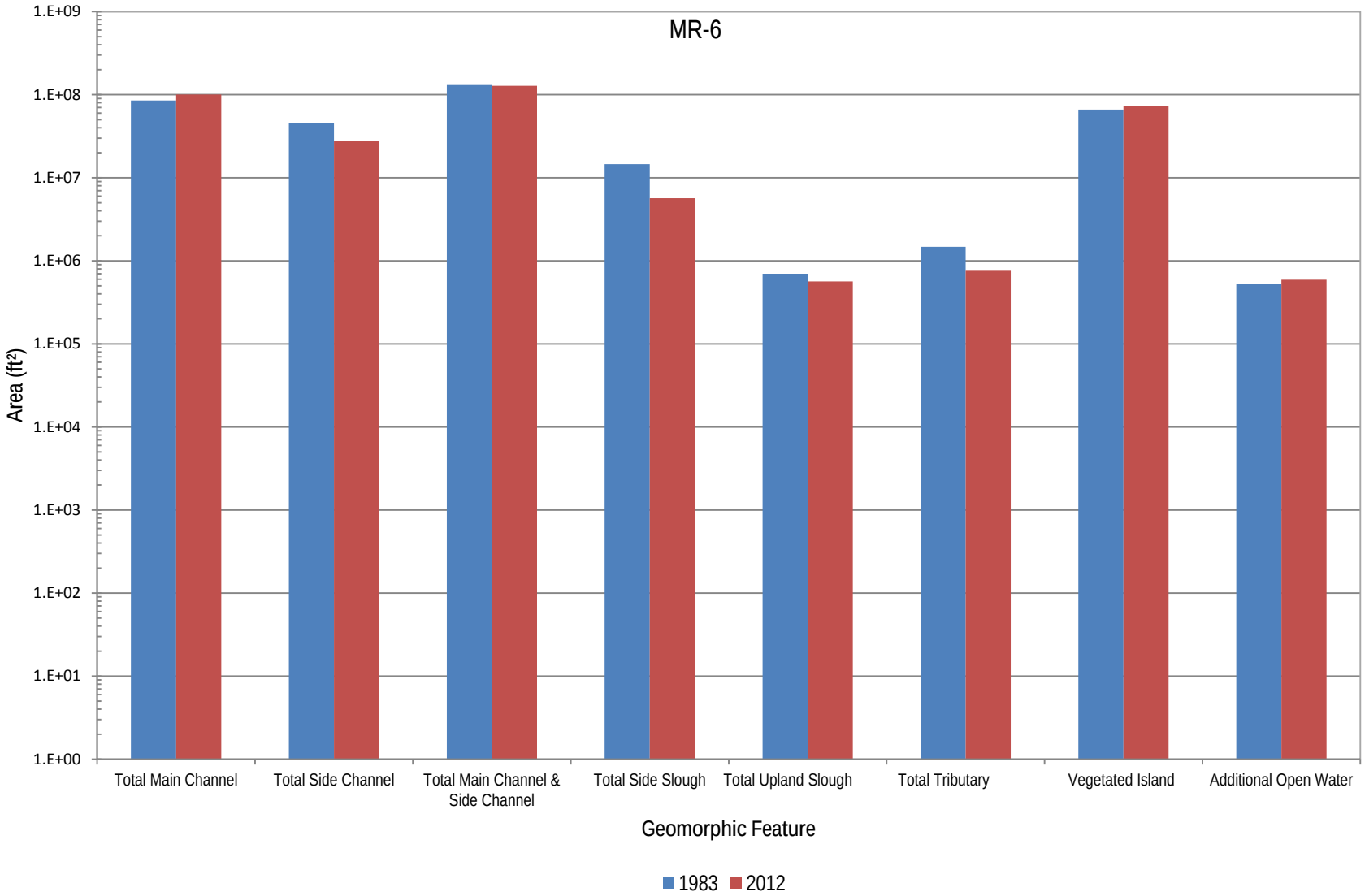

Figure 5.4-12: Middle River Geomorphic Reach 6 comparison of 1980s and 2012 mapped geomorphic feature areas (sq. ft.) on a logarithmic axis.

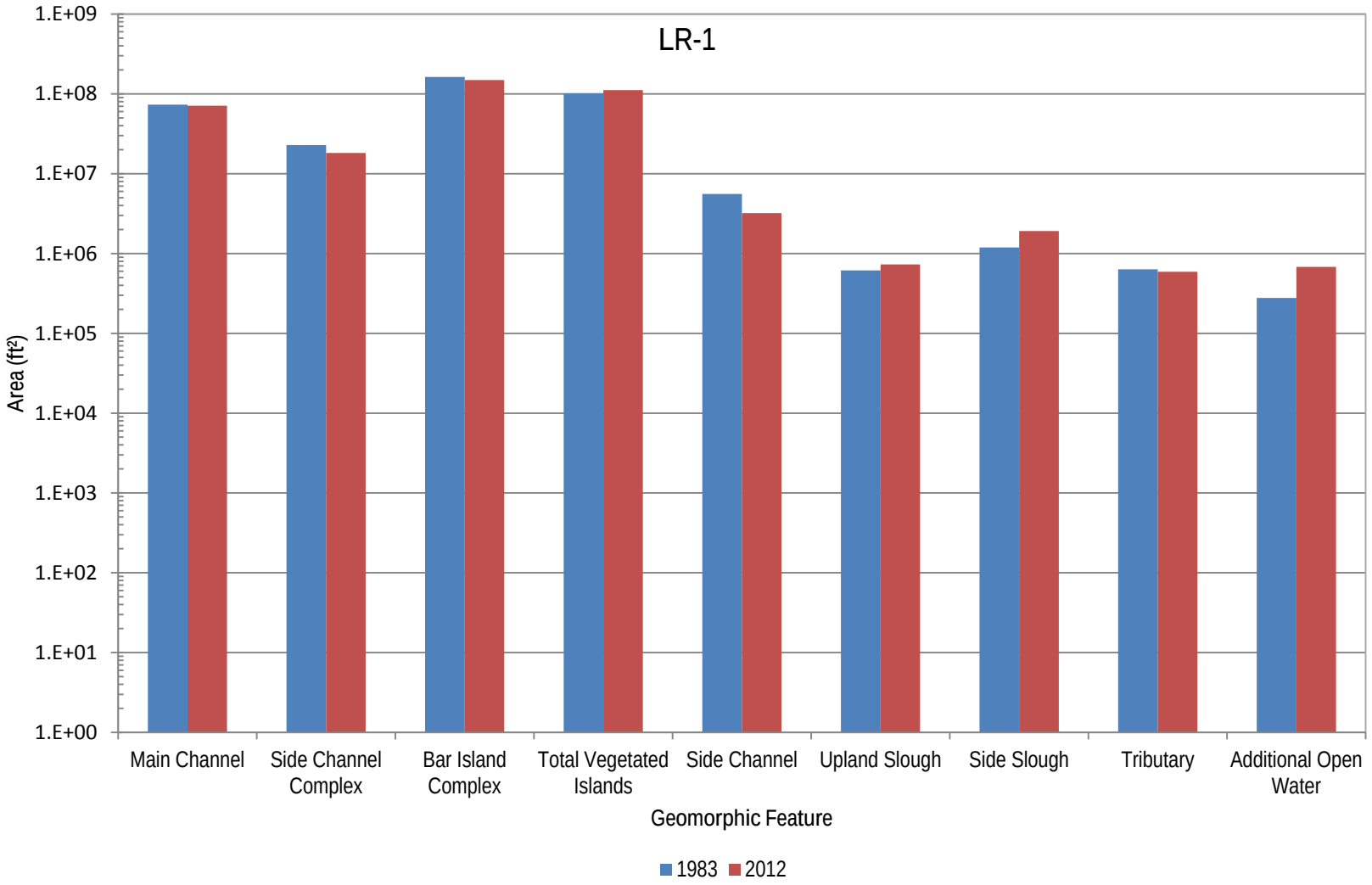

Figure 5.4-13: Lower River Geomorphic Reach 1 comparison of 1980s and 2012 mapped geomorphic feature areas (sq. ft.) on a logarithmic axis.

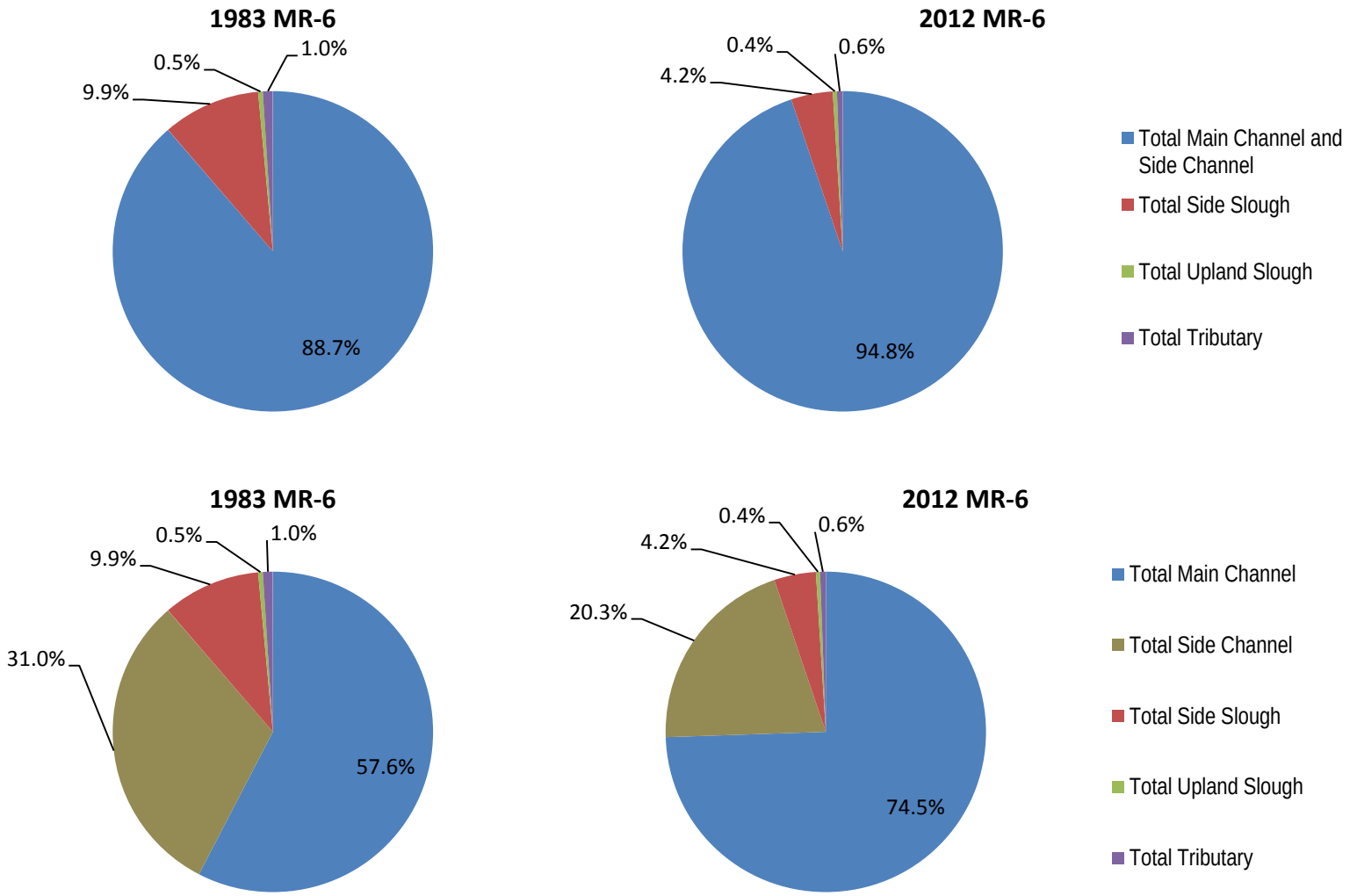

Figure 5.4-14: Relative proportion of geomorphic features in MR-6 of the Middle Susitna River Segment for 1983 and 2012 (top charts main channels and side channels combined / bottom charts main channels and side channels tracked separately).

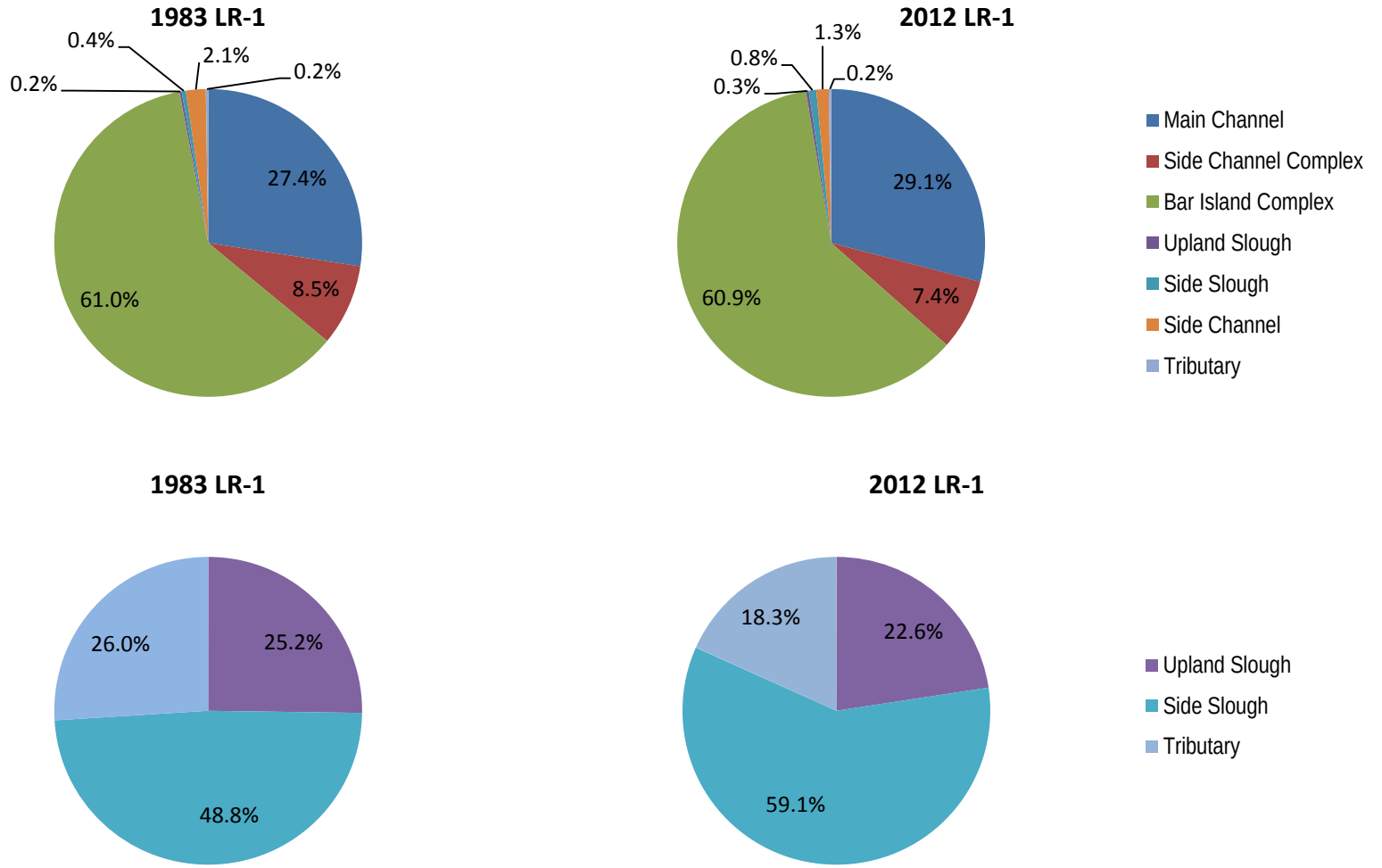

Figure 5.4-15: Relative proportion of geomorphic features in LR-1 of the Lower Susitna River Segment for 1983 and 2012 (top charts are geomorphic features with wetted and exposed regions / bottom charts are geomorphic features with primary aquatic habitat).

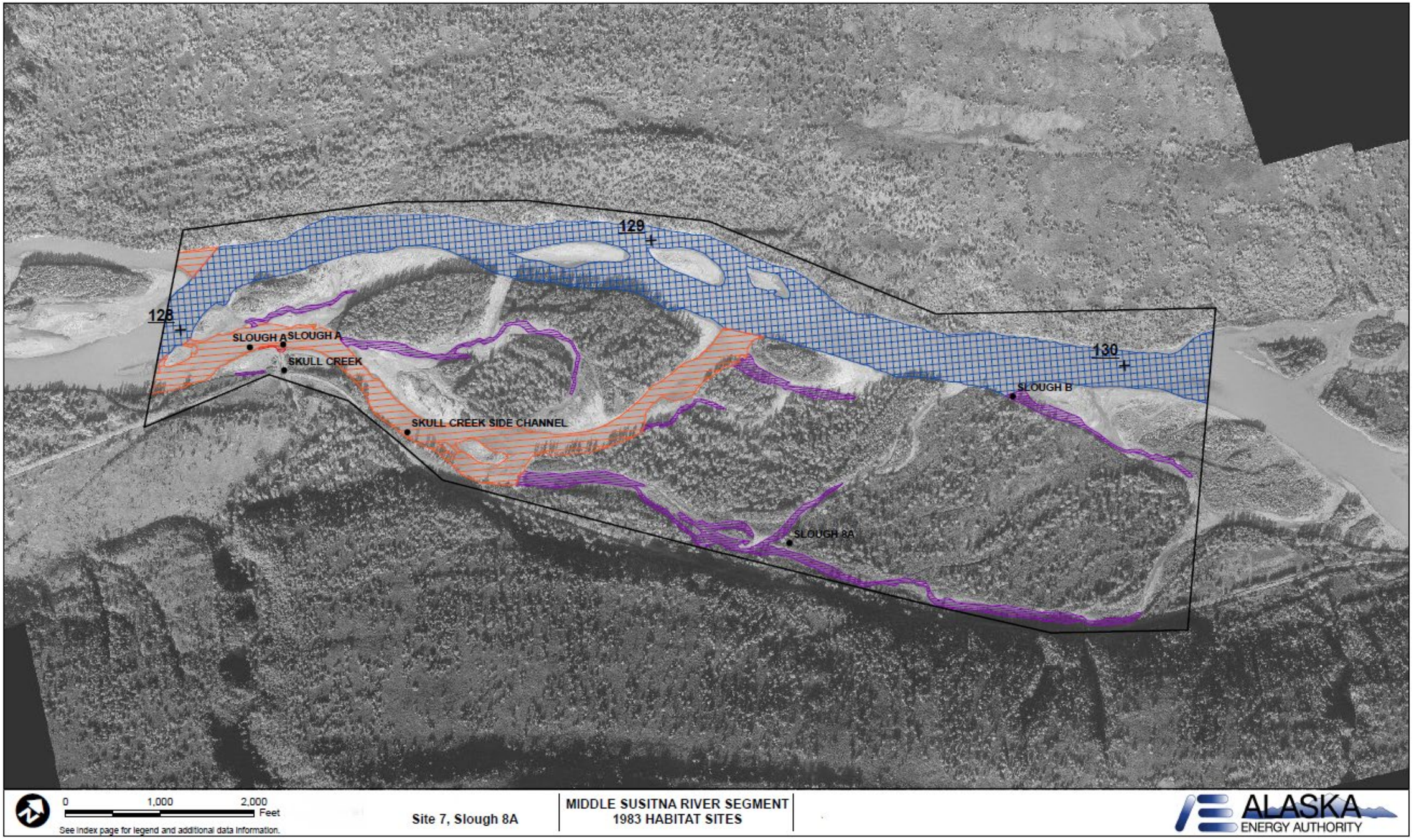

Figure 5.5-1. 1980s aquatic macrohabitat types at the Slough 8A habitat site

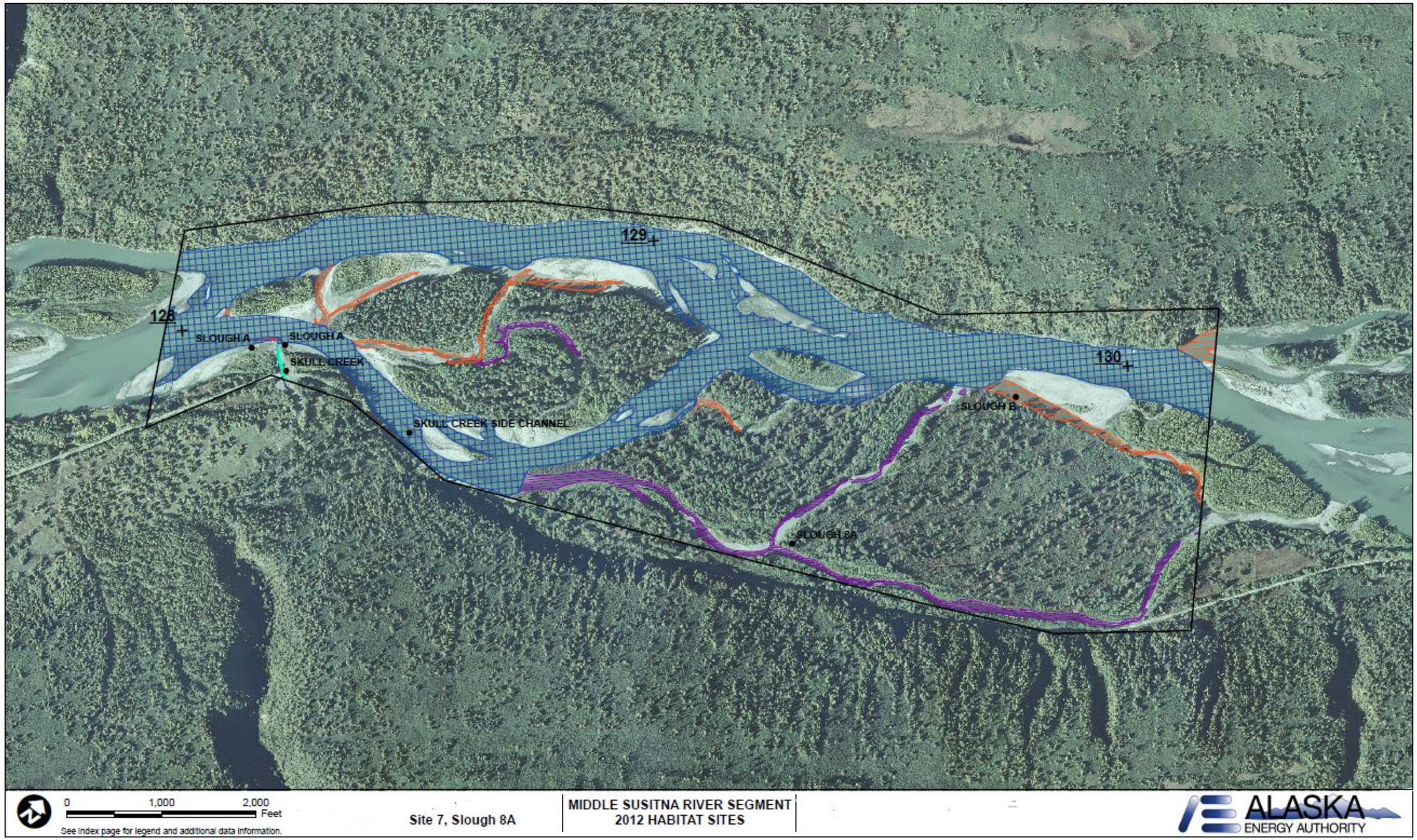

Figure 5.5-2. 2012 aquatic macrohabitat types at the Slough 8A habitat site

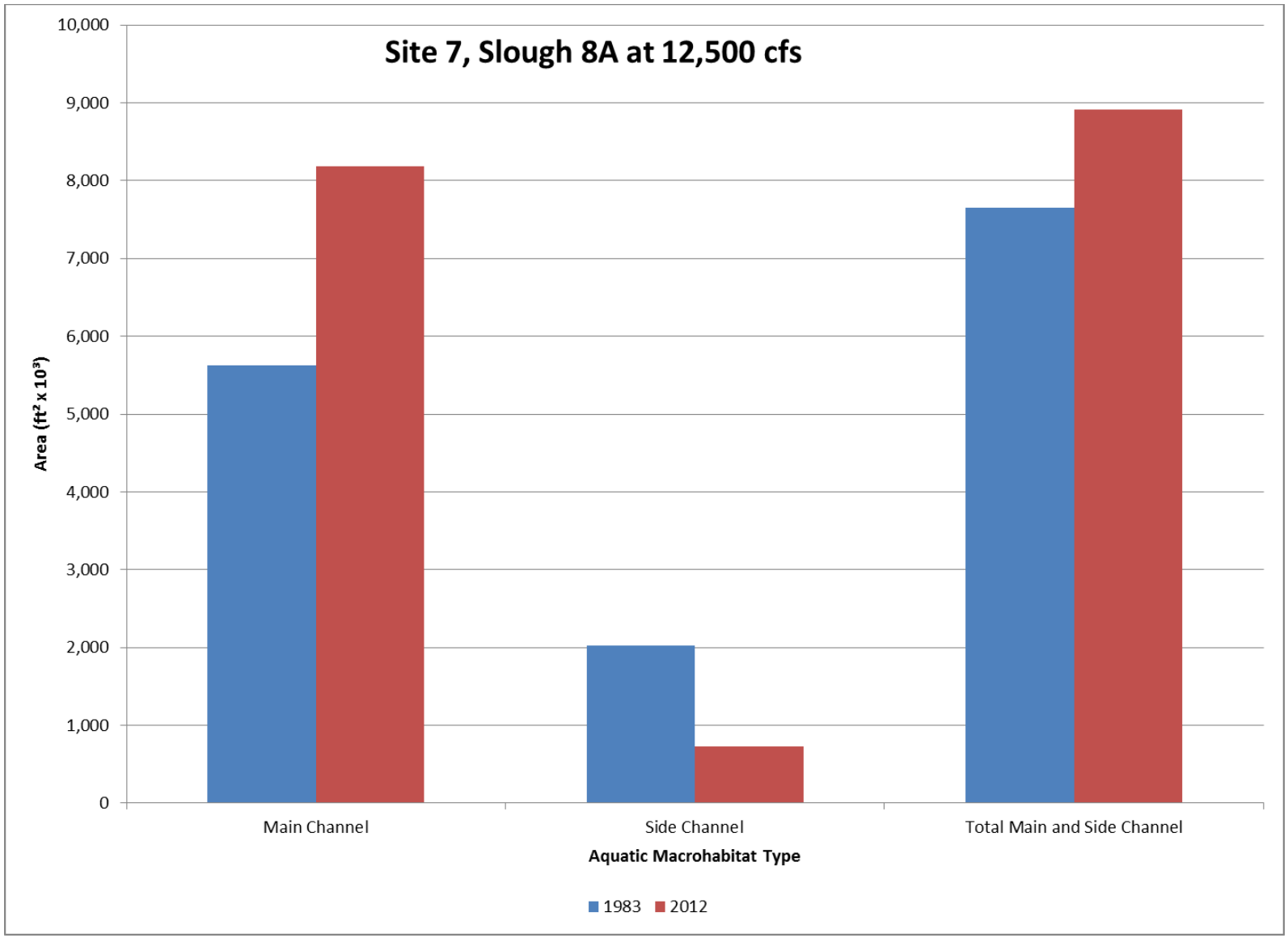

Figure 5.5-3. Comparison of mapped areas of main and side channel aquatic macrohabitat types from 1983 to 2012 at Slough 8A.

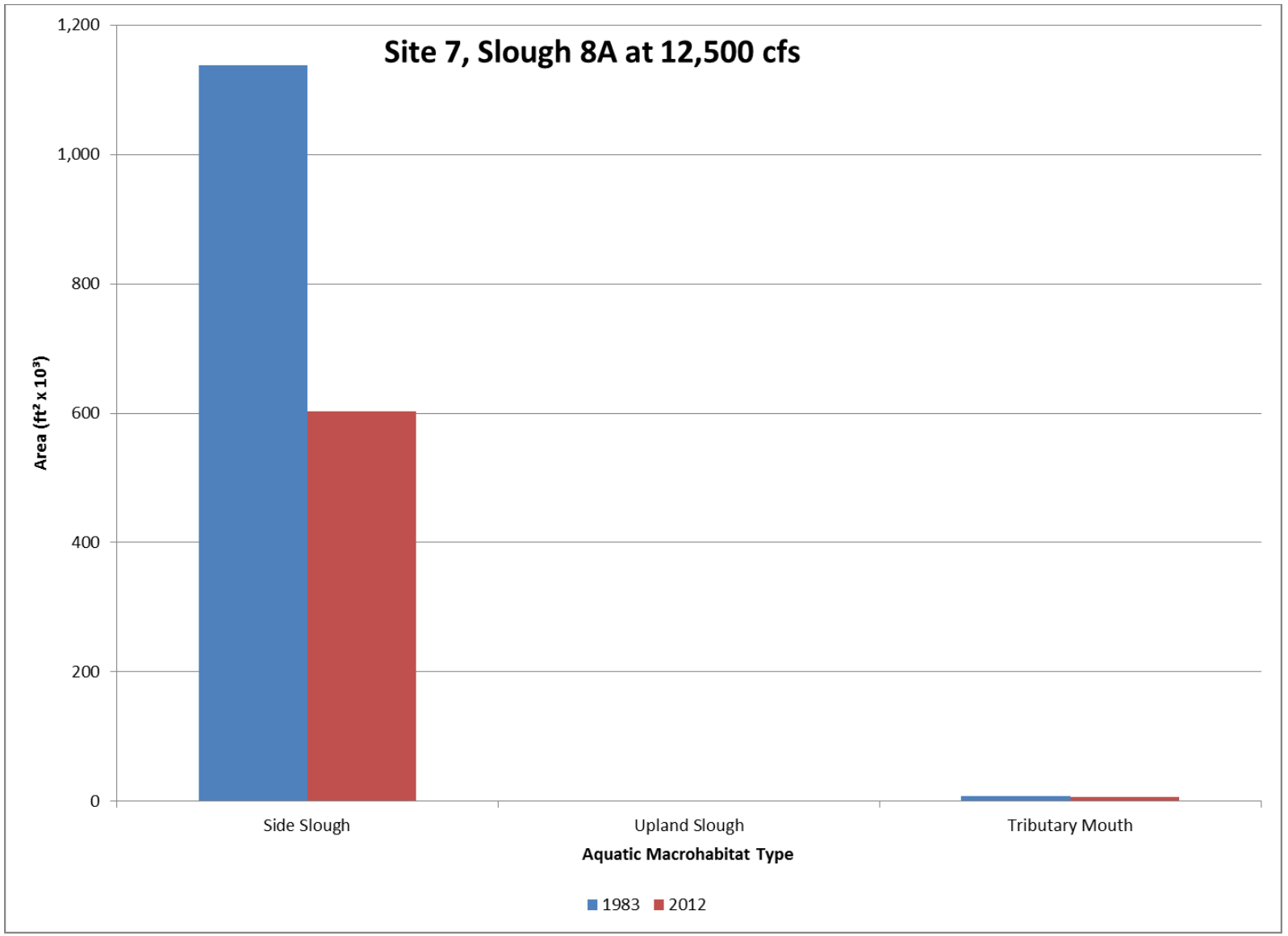

Figure 5.5-4. Comparison of mapped areas for side slough, upland slough and tributary mouth aquatic macrohabitat types from 1983 to 2012 at Slough 8A.

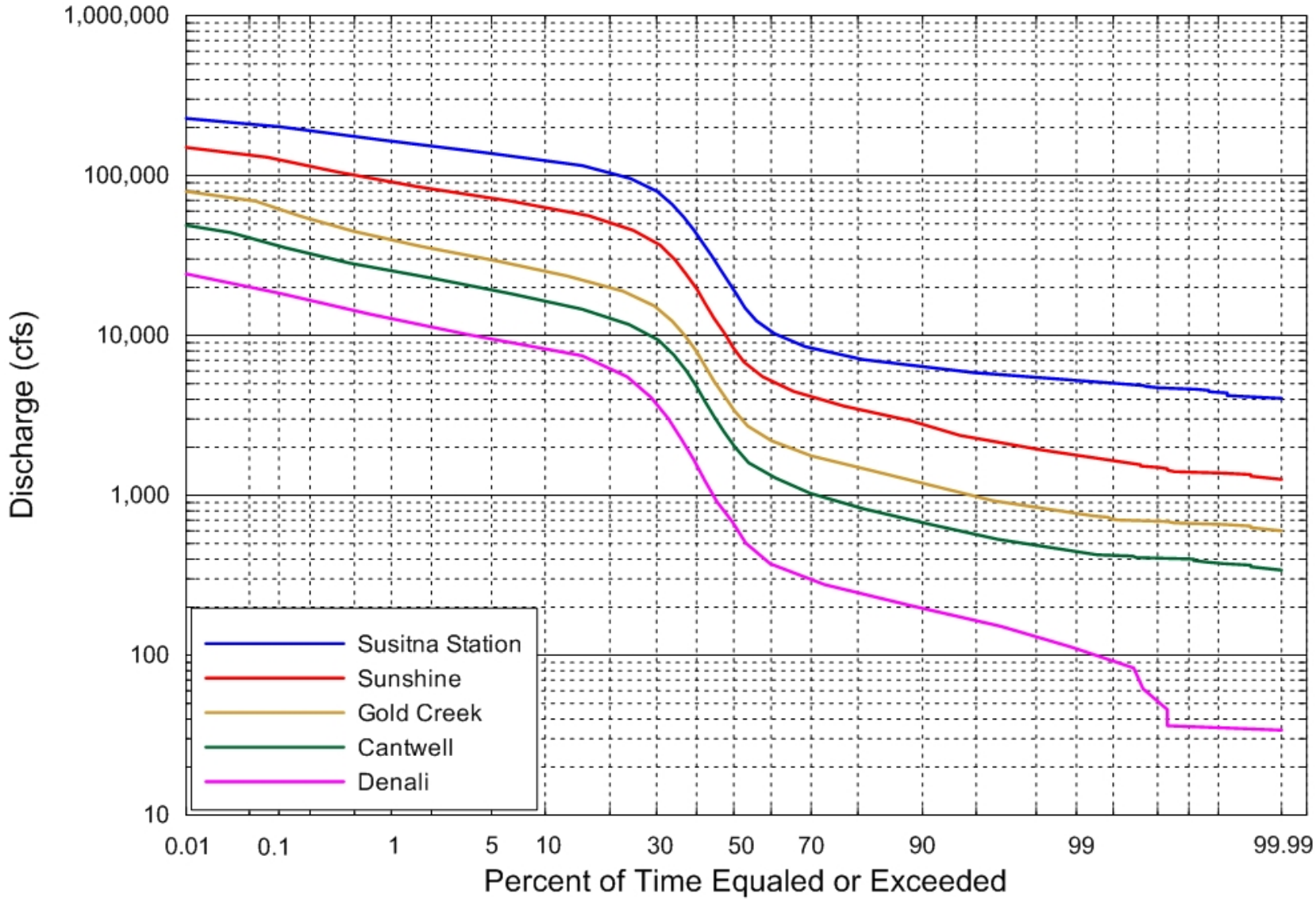

Figure 5.6.1. Annual flow-duration curves for mainstem gages for pre-Project conditions based on the USGS extended record (Tetra Tech 2013d)

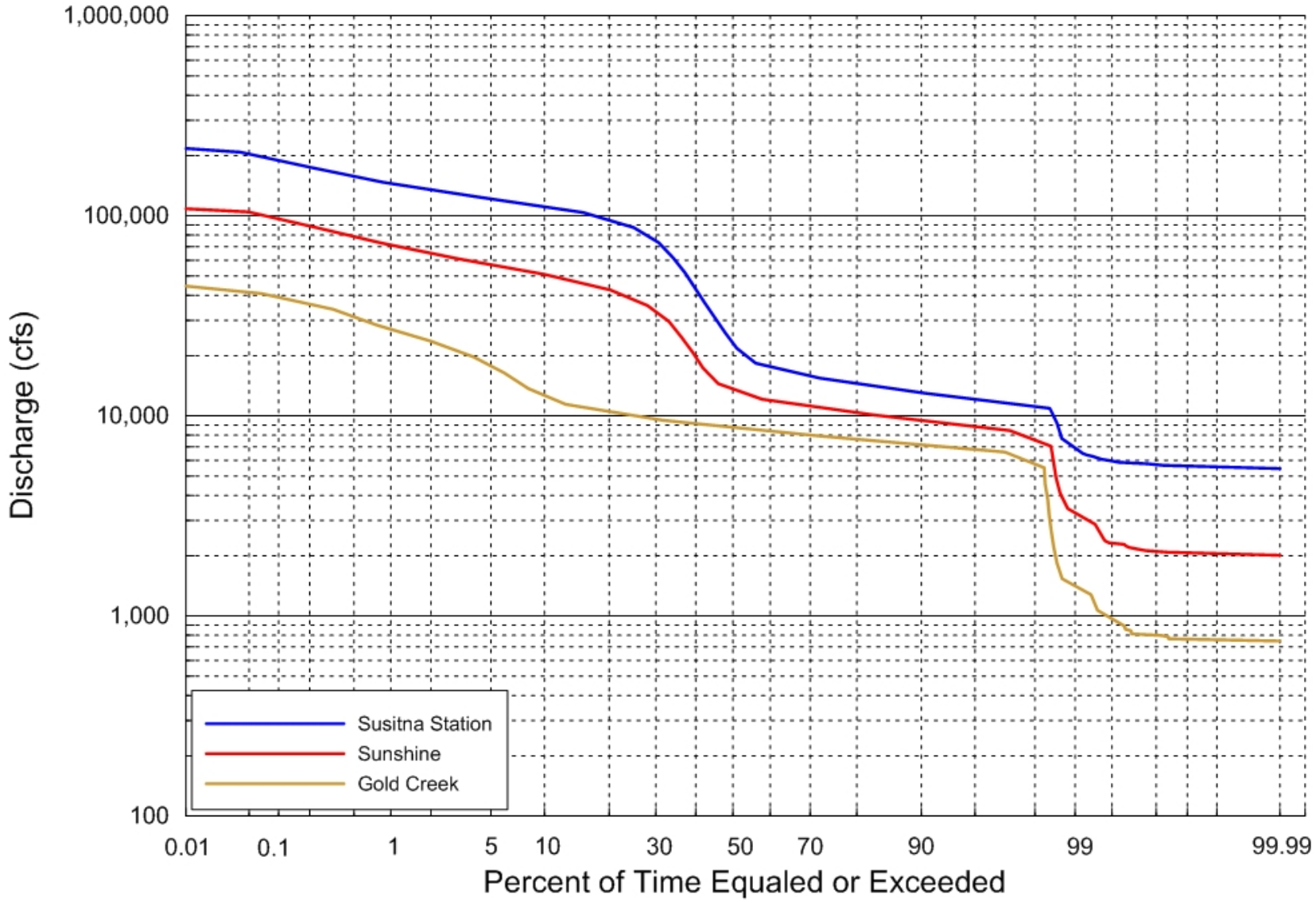

Figure 5.6-2. Annual flow-duration curves for three mainstem gages for Maximum Load Following OS-1 Conditions based on HEC-ResSim model. (Tetra Tech 2013d)

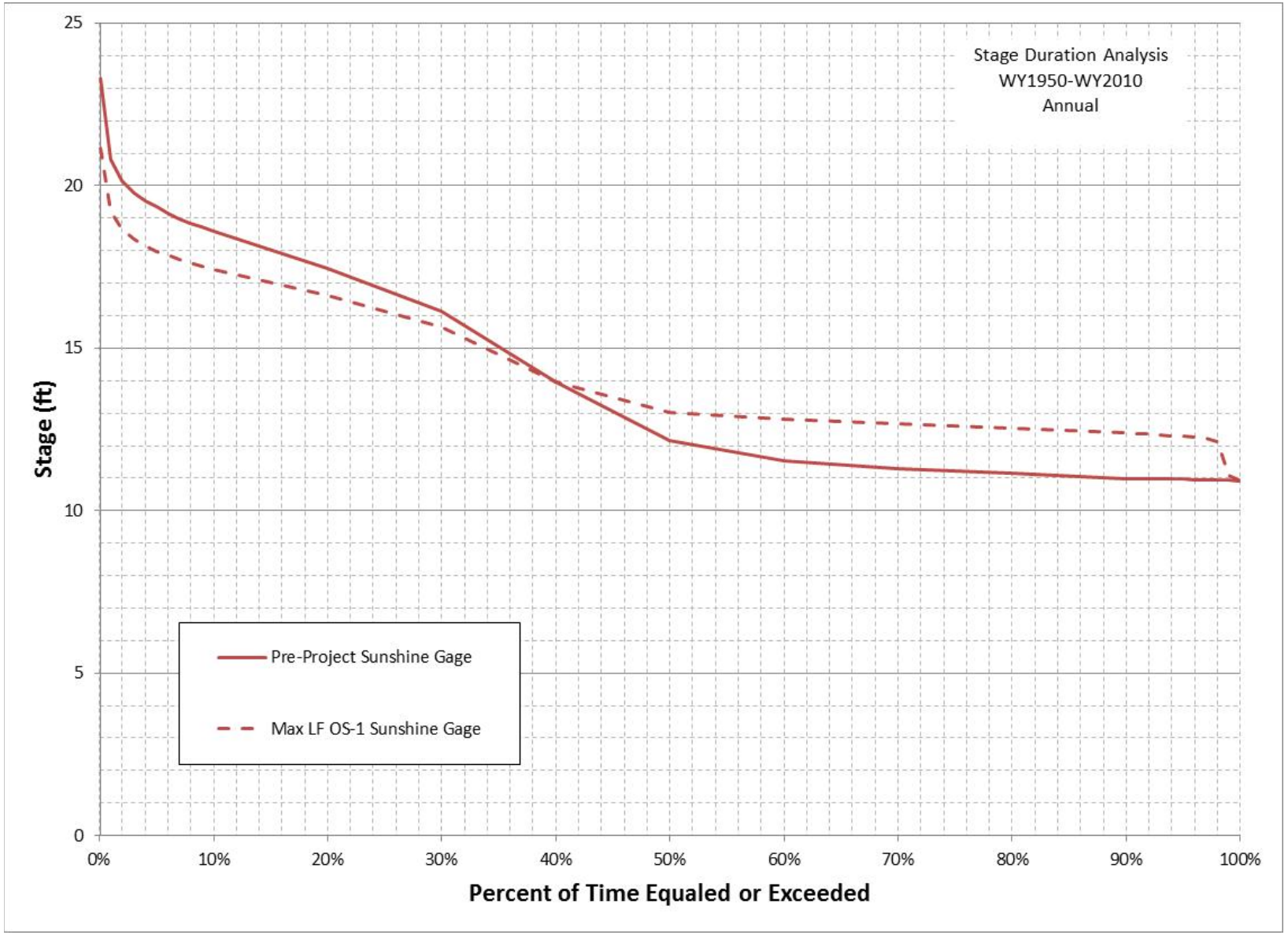

Figure 5.7-1. Annual Stage-Exceedance Relationships for pre-Project and Max LF OS-1 Conditions, Sunshine Gage (Tetra Tech, Inc. 2013d).

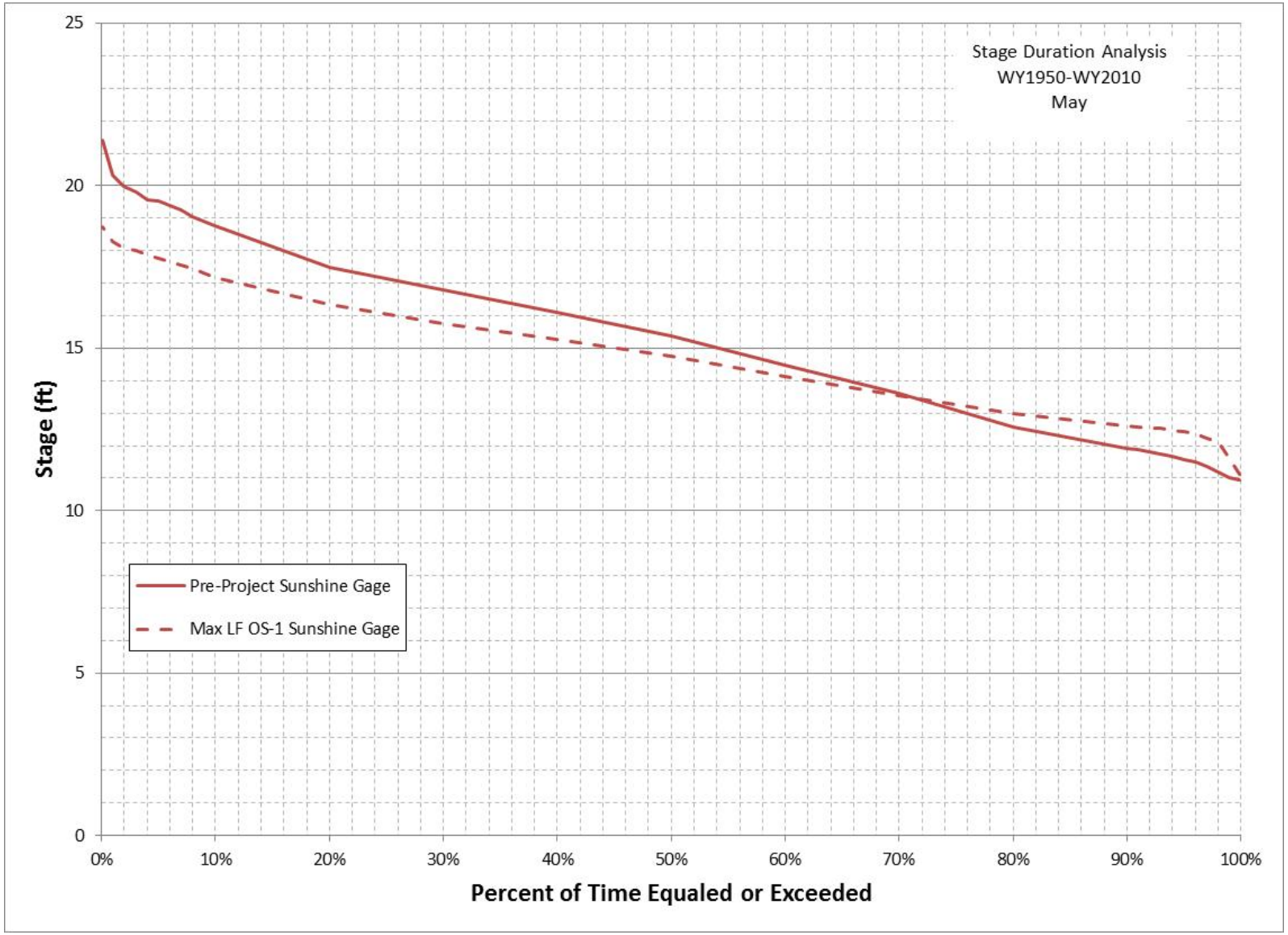

Figure 5.7-2. Monthly Stage-Exceedance Relationships for May for pre-Project and Max LF OS-1 Conditions, Sunshine Gage (Tetra Tech, Inc. 2013d).

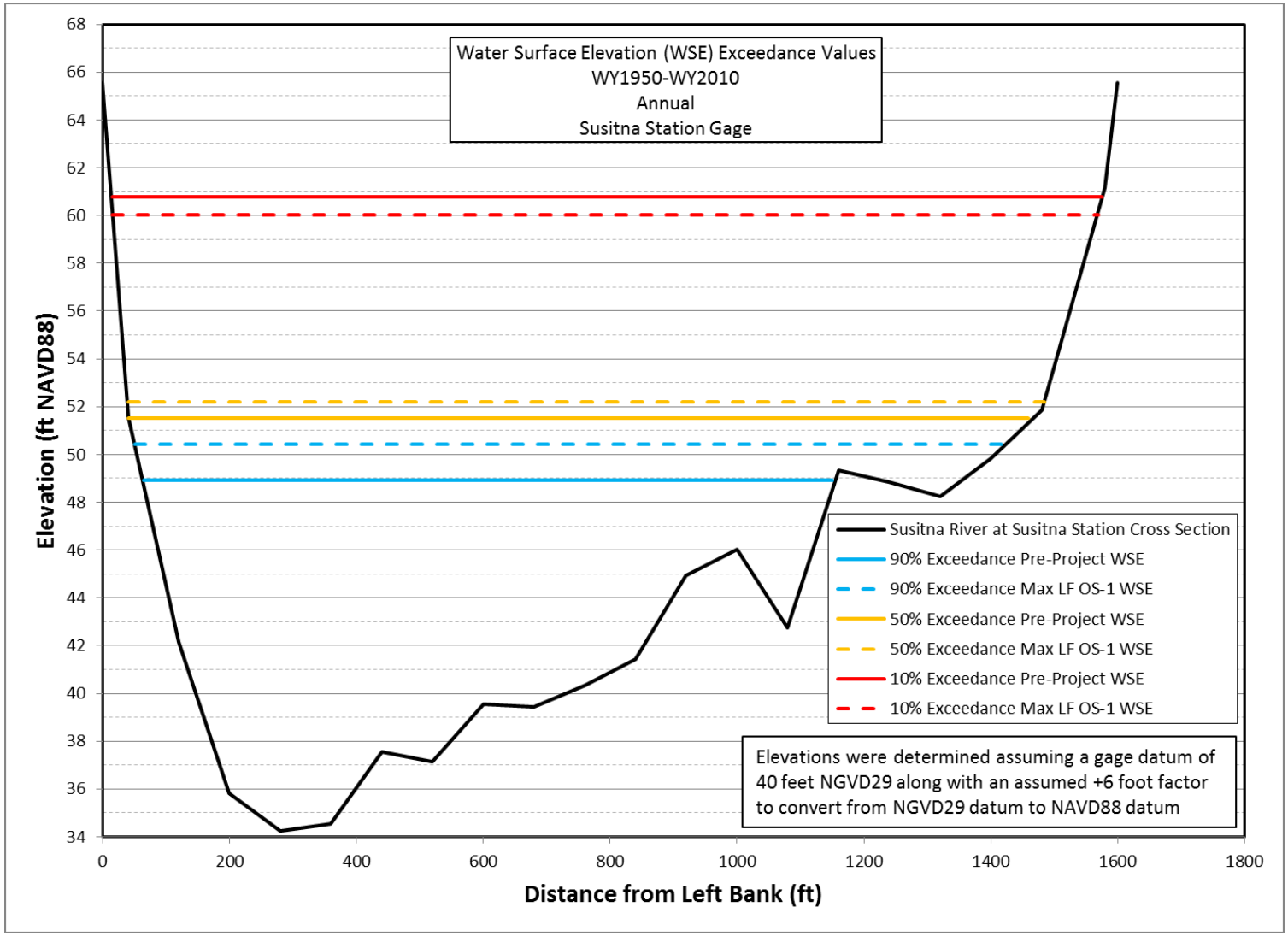

Figure 5.7-3. Select Annual Water-Surface Elevation Exceedance Values for pre-Project and Max LF OS-1 Conditions, Susitna Station Gage(Tetra Tech, Inc. 2013d).

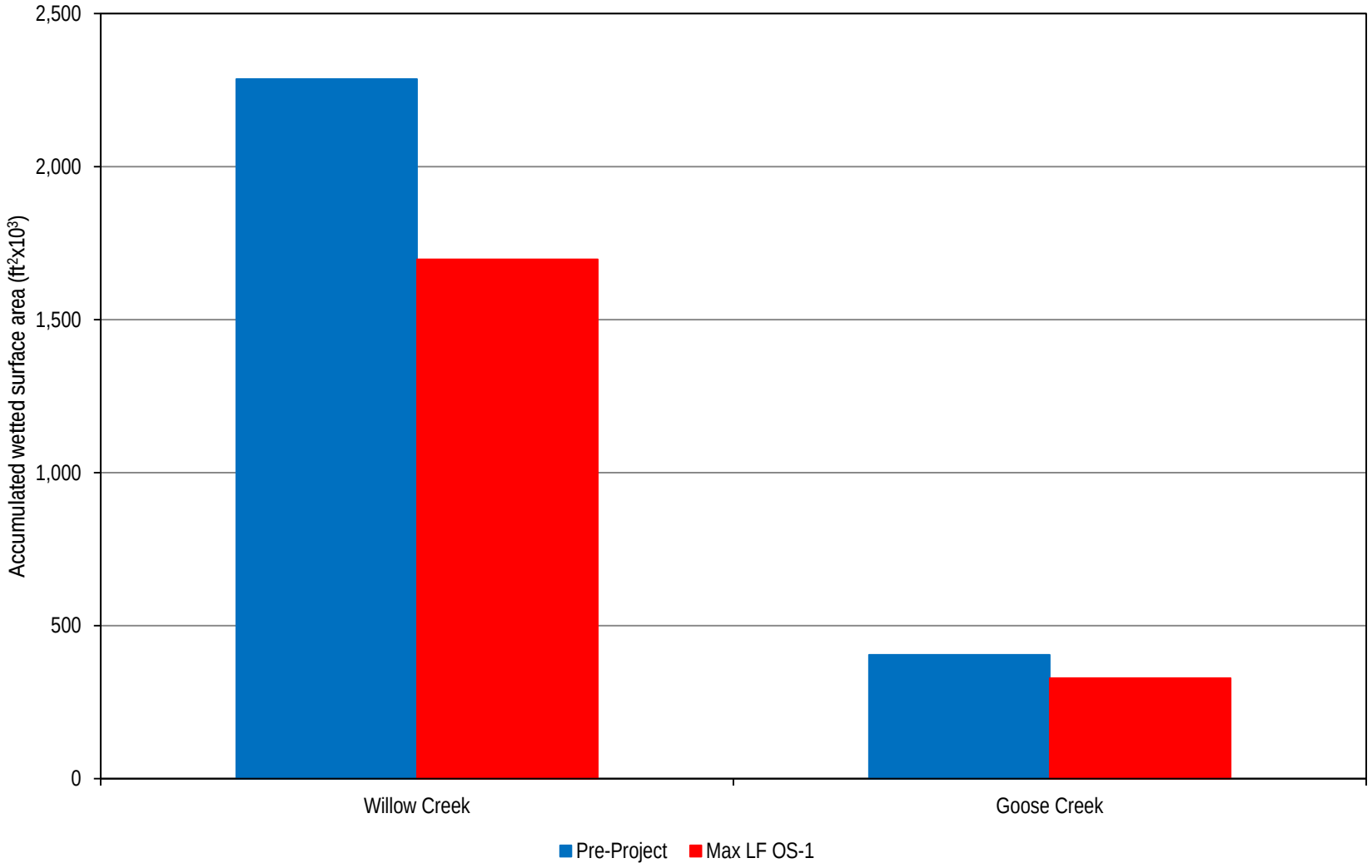

Figure 5.7-4. Accumulated wetted surface area (ft2x103) computed over June-September for the median monthly discharge at Sunshine gage presented for the tributary mouth habitat (Tetra Tech, Inc 2013e)

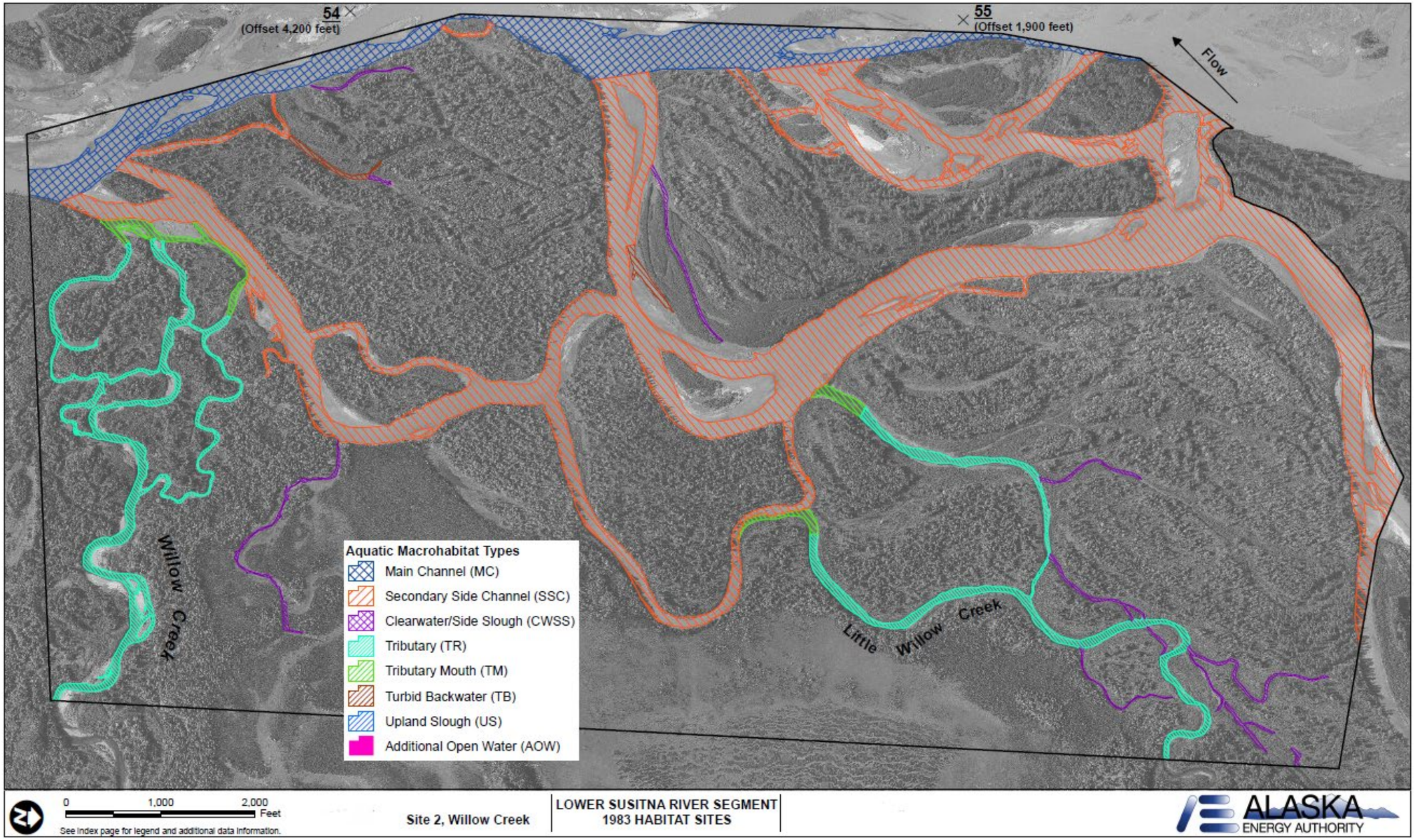

Figure 5.7-5. 1980s Aquatic macrohabitat types in the Willow Creek habitat site (Tetra Tech, Inc. 2013f).

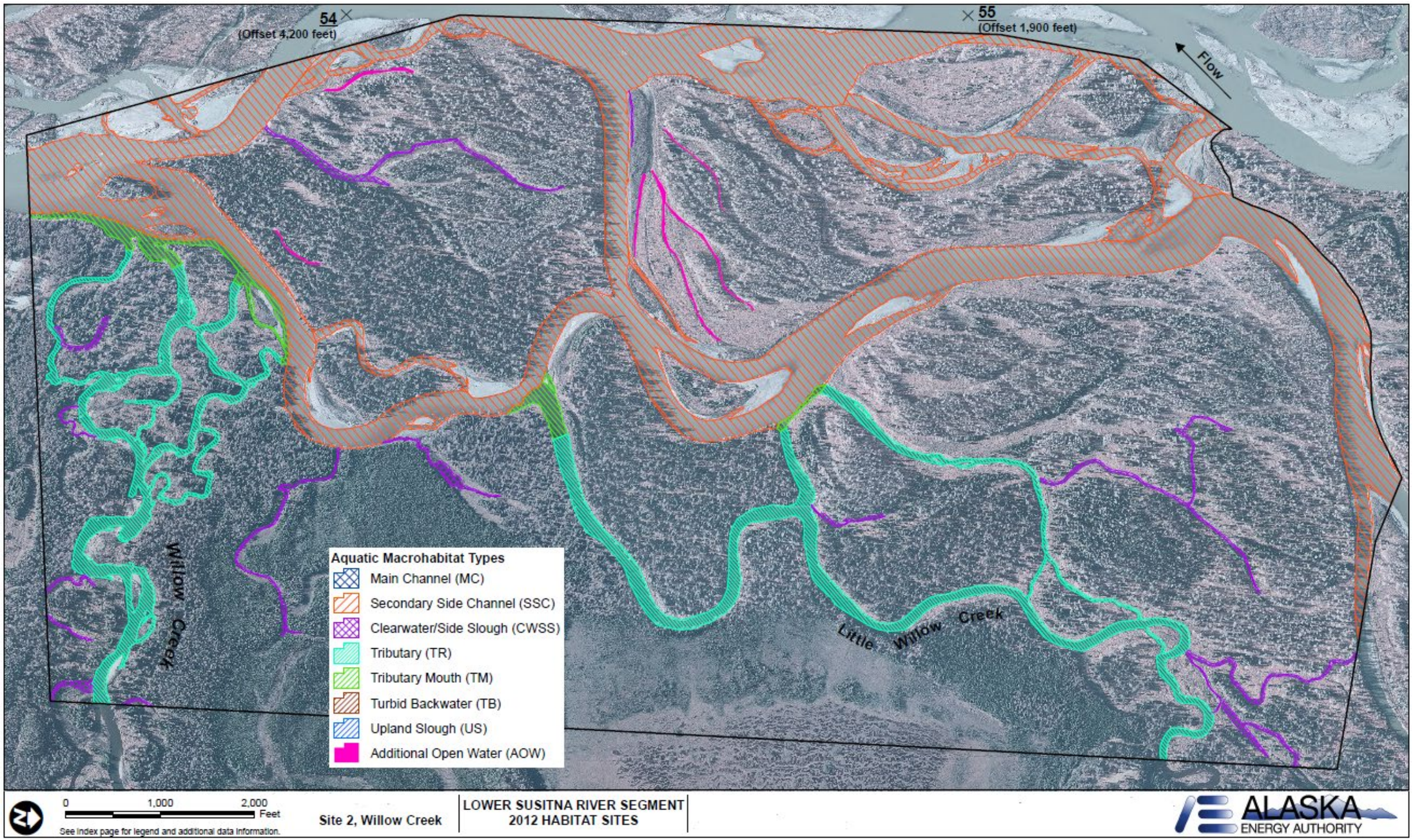

Figure 5.7-6. 2012 Aquatic macrohabitat types in the Willow Creek habitat site (Tetra Tech, Inc. 2013f).

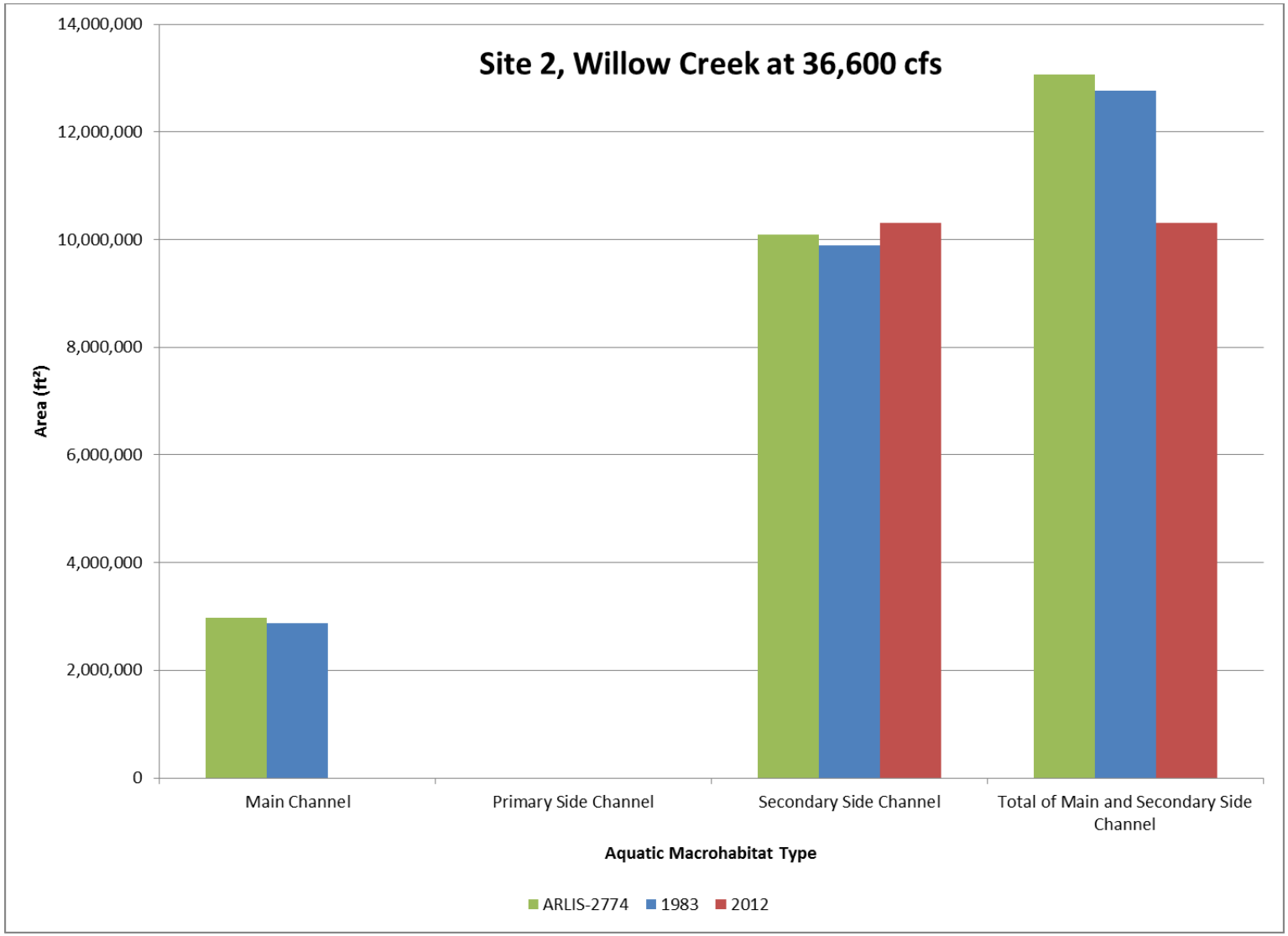

Figure 5.7-7. Comparison of aquatic macrohabitat types from 1983 to 2012 at Willow Creek, main channel and side channel habitats (Tetra Tech, Inc. 2013f).

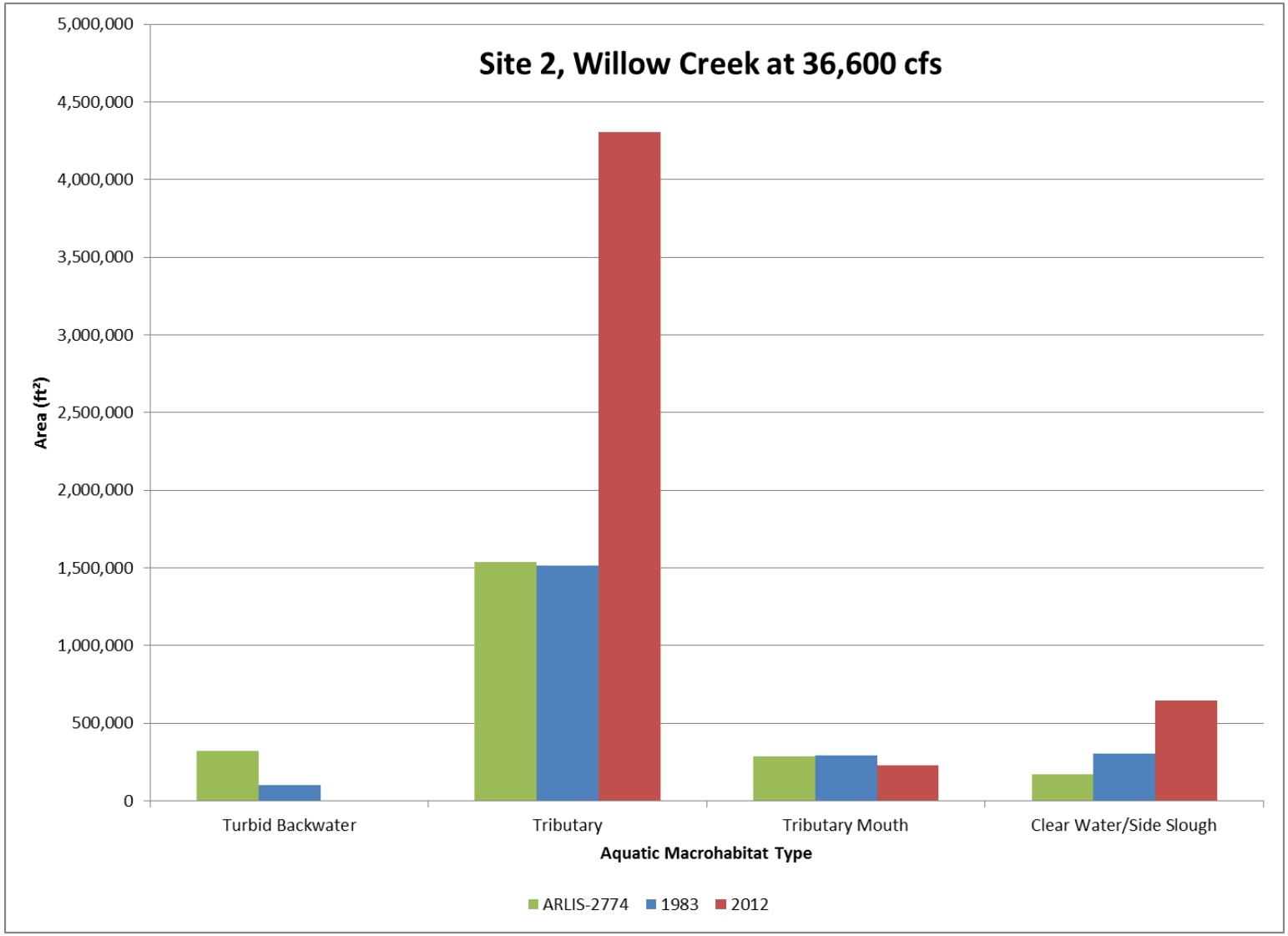

Figure 5.7-8. Comparison of aquatic macrohabitat types from 1983 to 2012 at Willow Creek, tributary and side slough habitats (Tetra Tech, Inc. 2013f).

Figure 5.8-2: Typical bank profile with armored toe and mid-bank, FA-104. Flow in the river was approximately 24,000 cfs.

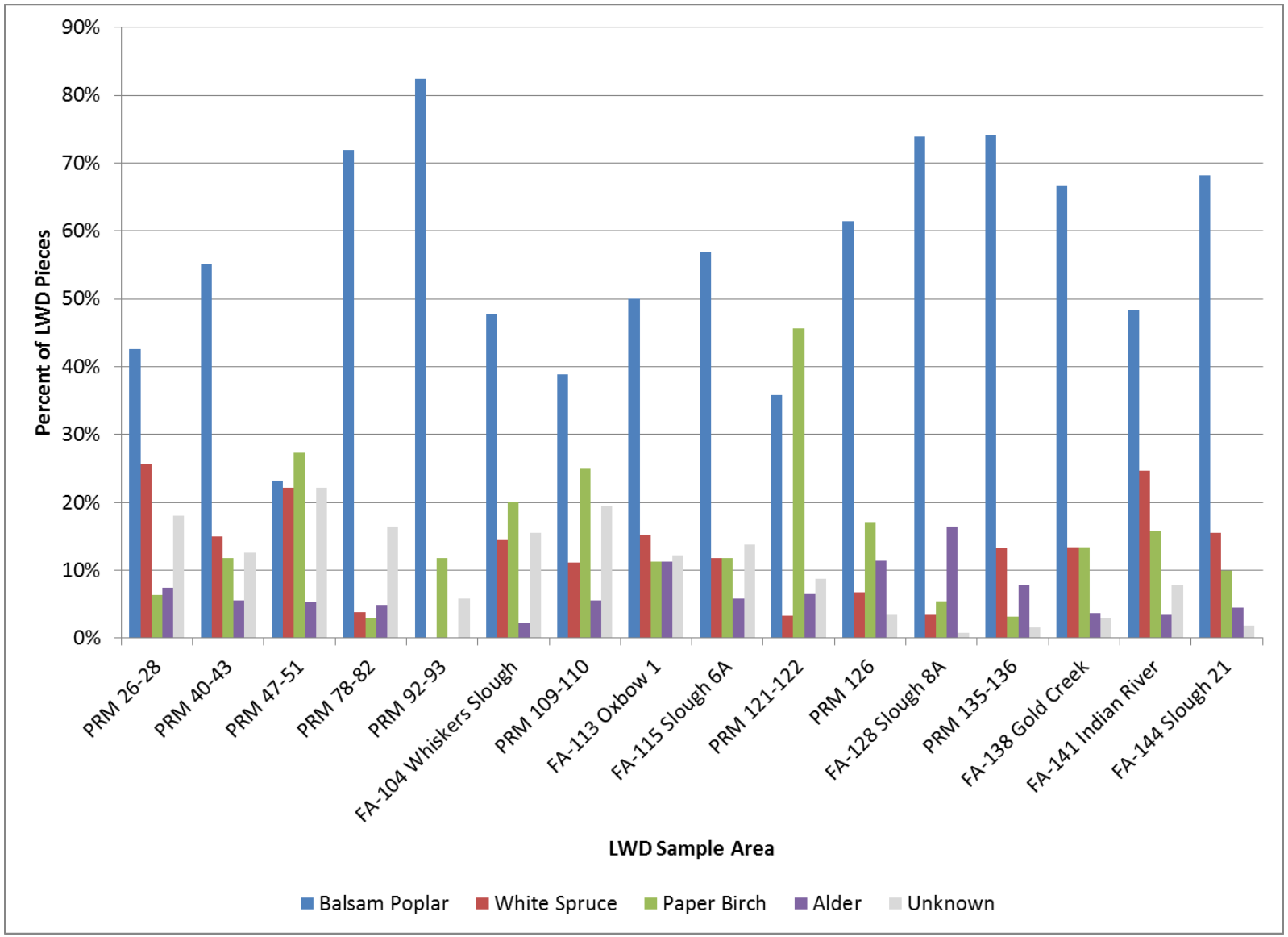

Figure 5.9-1. Large Woody Debris (LWD) by Species, 2013 Field Inventory.

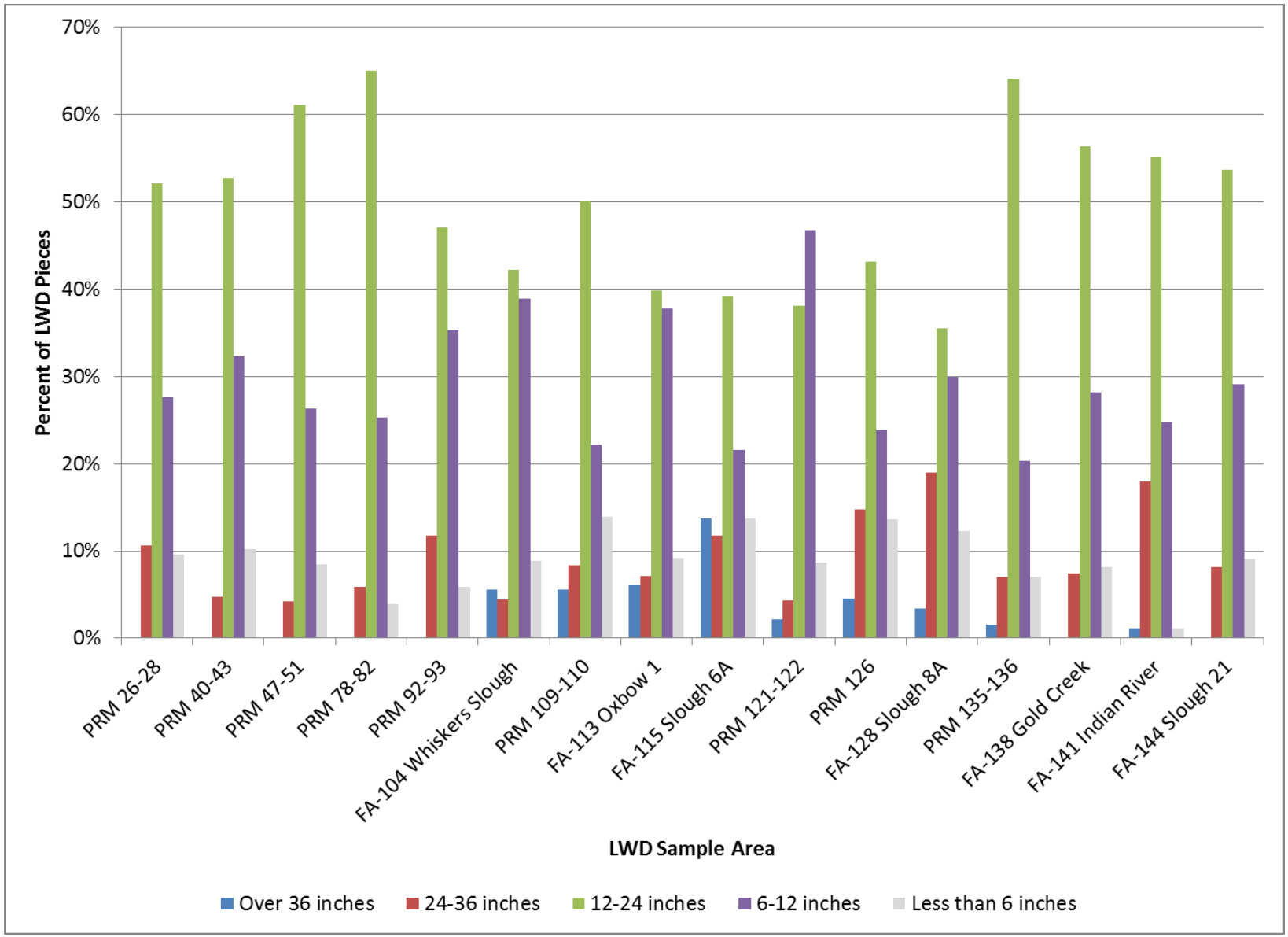

Figure 5.9-2. Large Woody Debris (LWD) by Diameter, 2013 Field Inventory

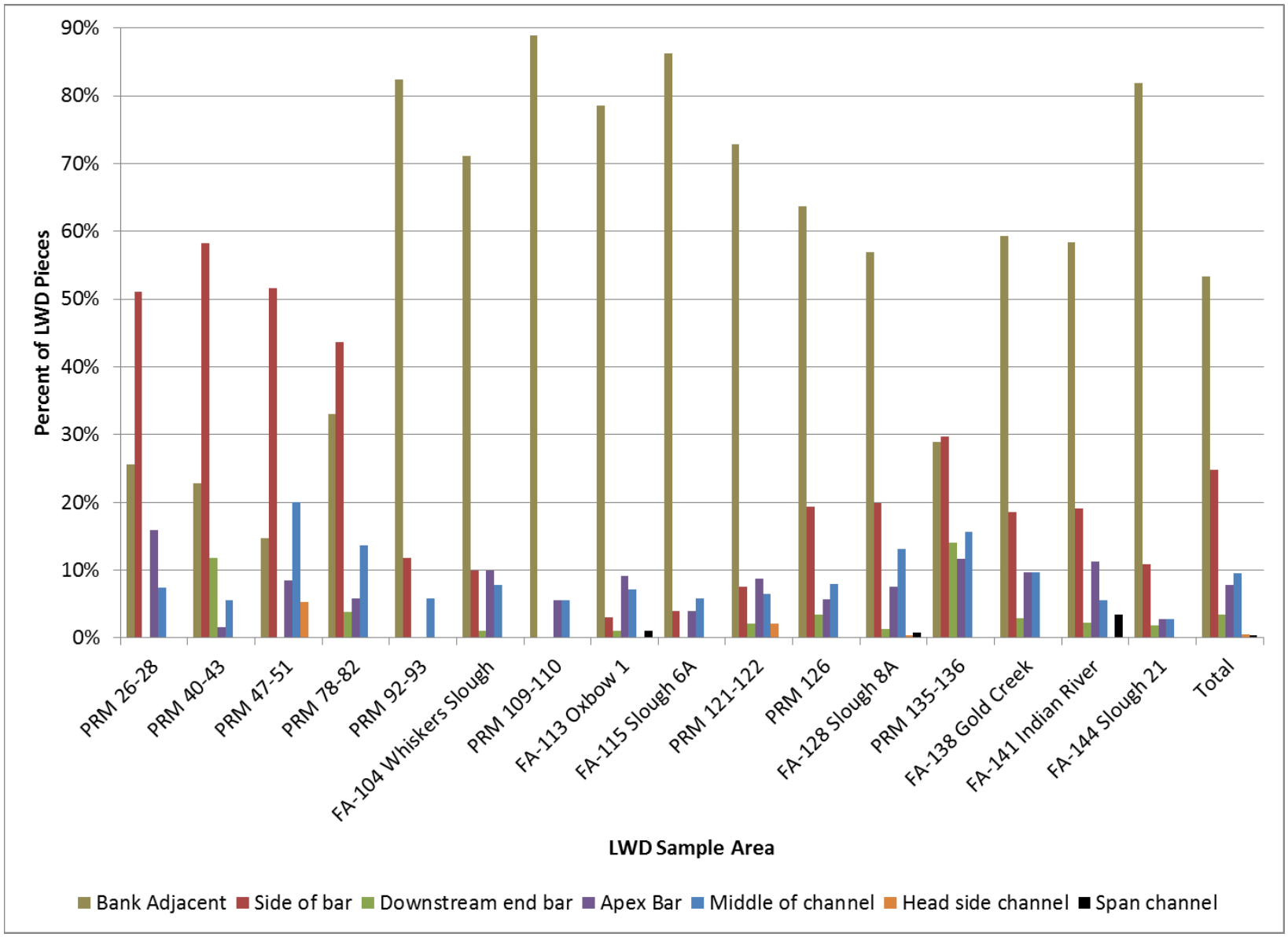

Figure 5.9-3. Large Woody Debris (LWD) by Channel Position, 2013 Field Inventory.

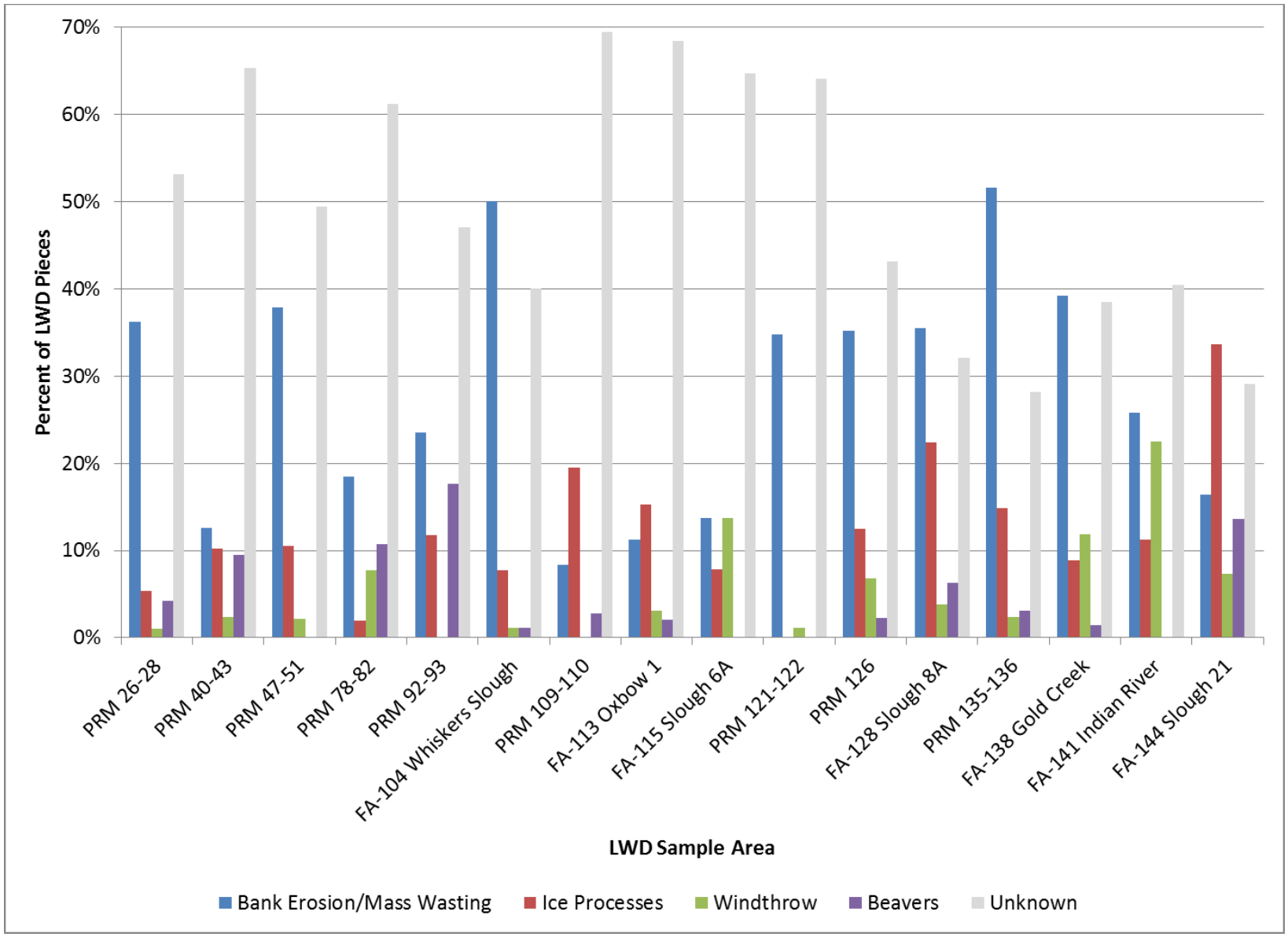

Figure 5.9-4. Large Woody Debris (LWD) by Input Process, 2013 Field Inventory.

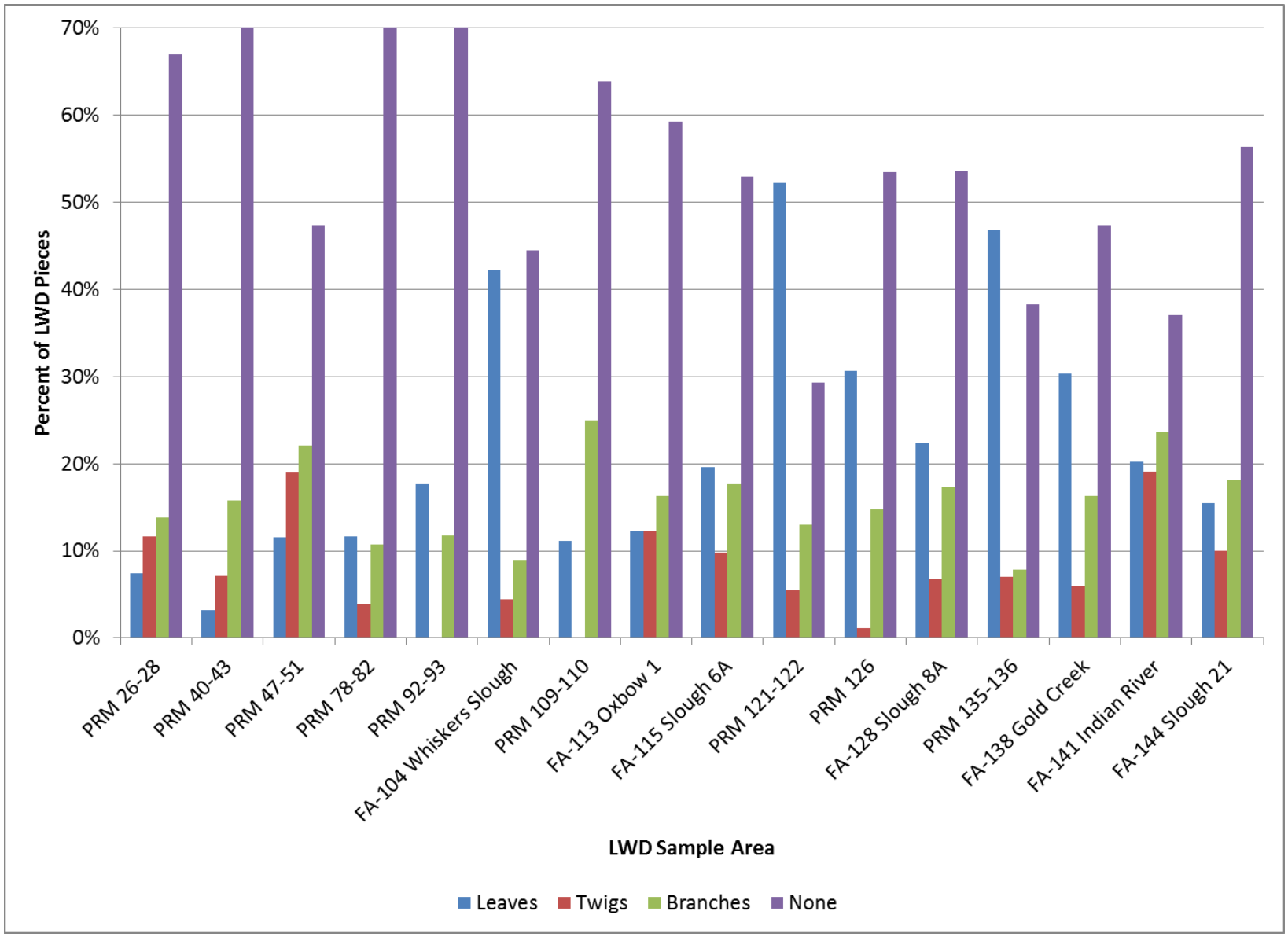

Figure 5.9-5. Large Woody Debris (LWD) by Freshness of Wood, 2013 Field Inventory.

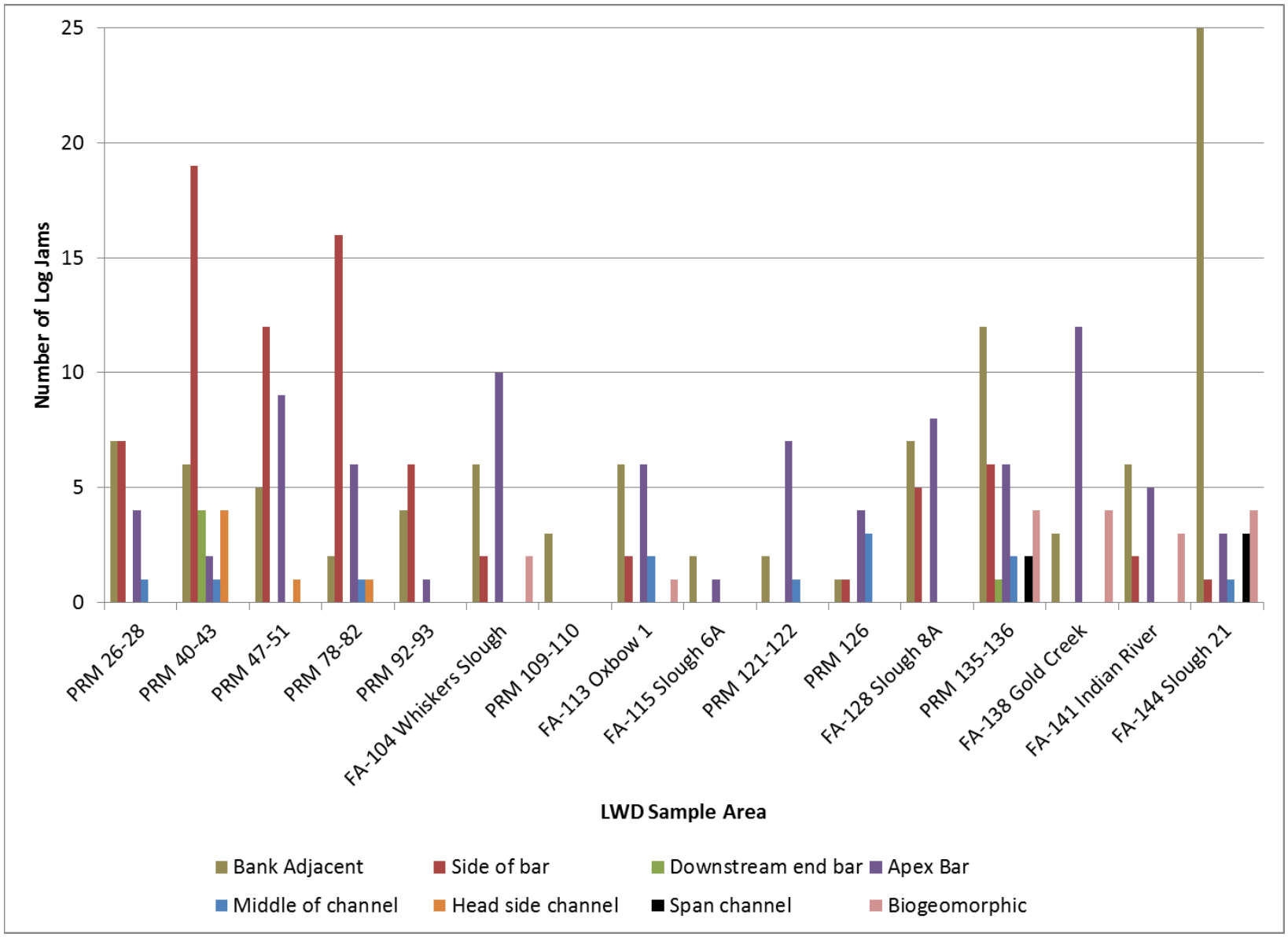

Figure 5.9-6. Log Jams by Channel Position, 2013 Field Inventory.

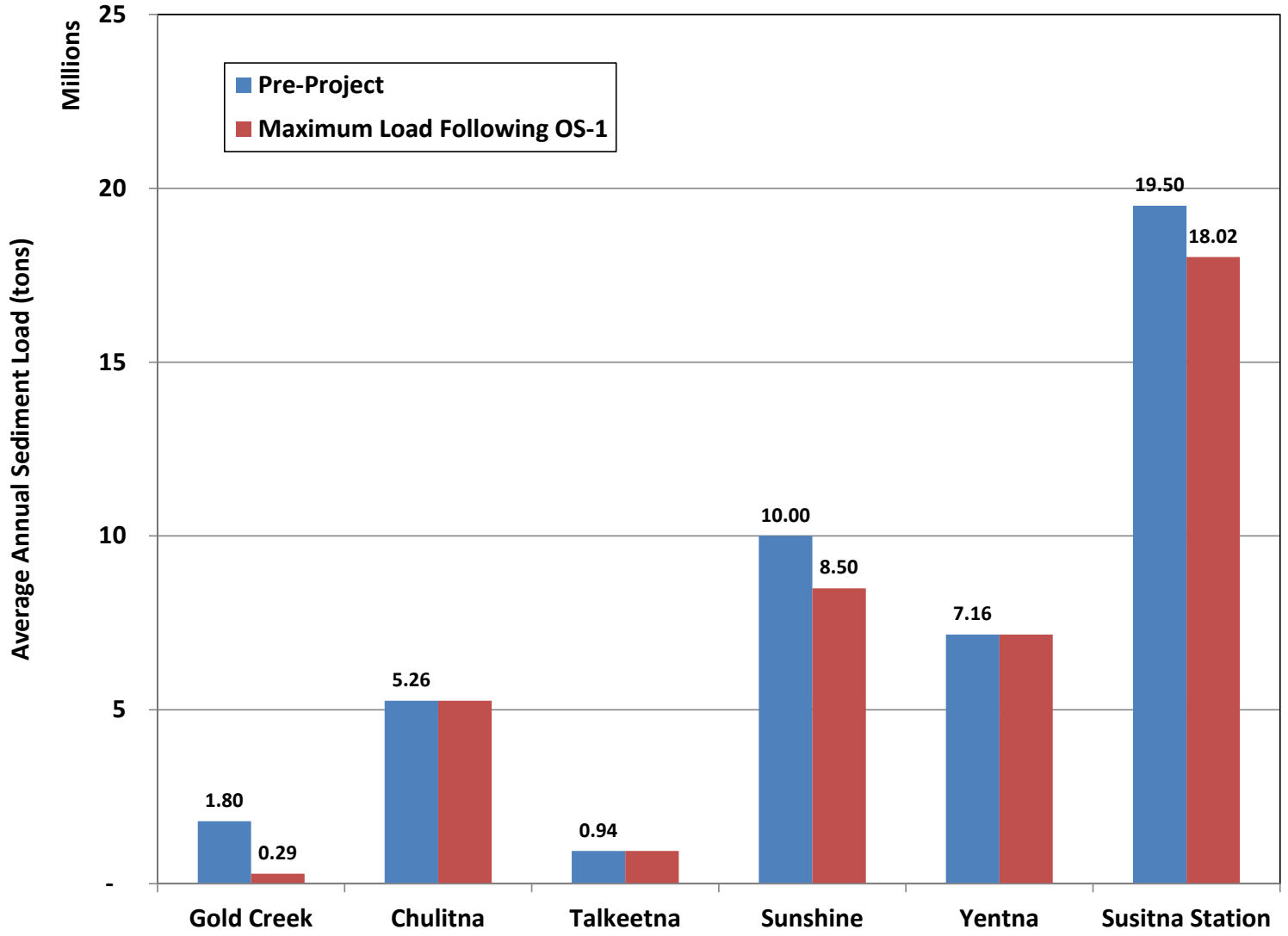

Figure 6.3-1. Average annual silt/clay loads at the three mainstem gages and the three primary tributary gages under pre-Project and Maximum Load Following OS-1 conditions.

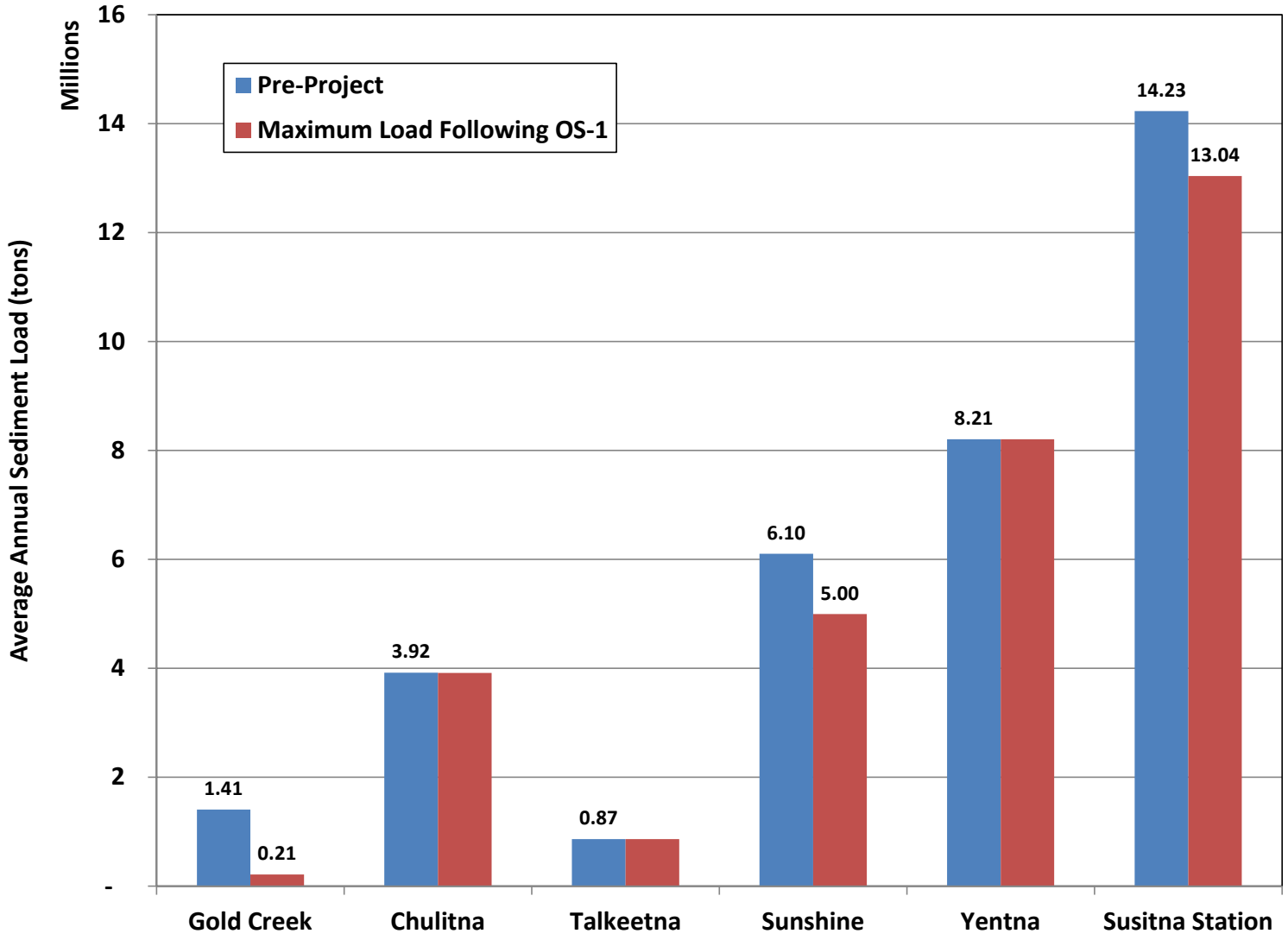

Figure 6.3-2. Average annual sand loads at the three mainstem gages and the three primary tributary gages under pre-Project and Maximum Load Following OS-1 conditions.

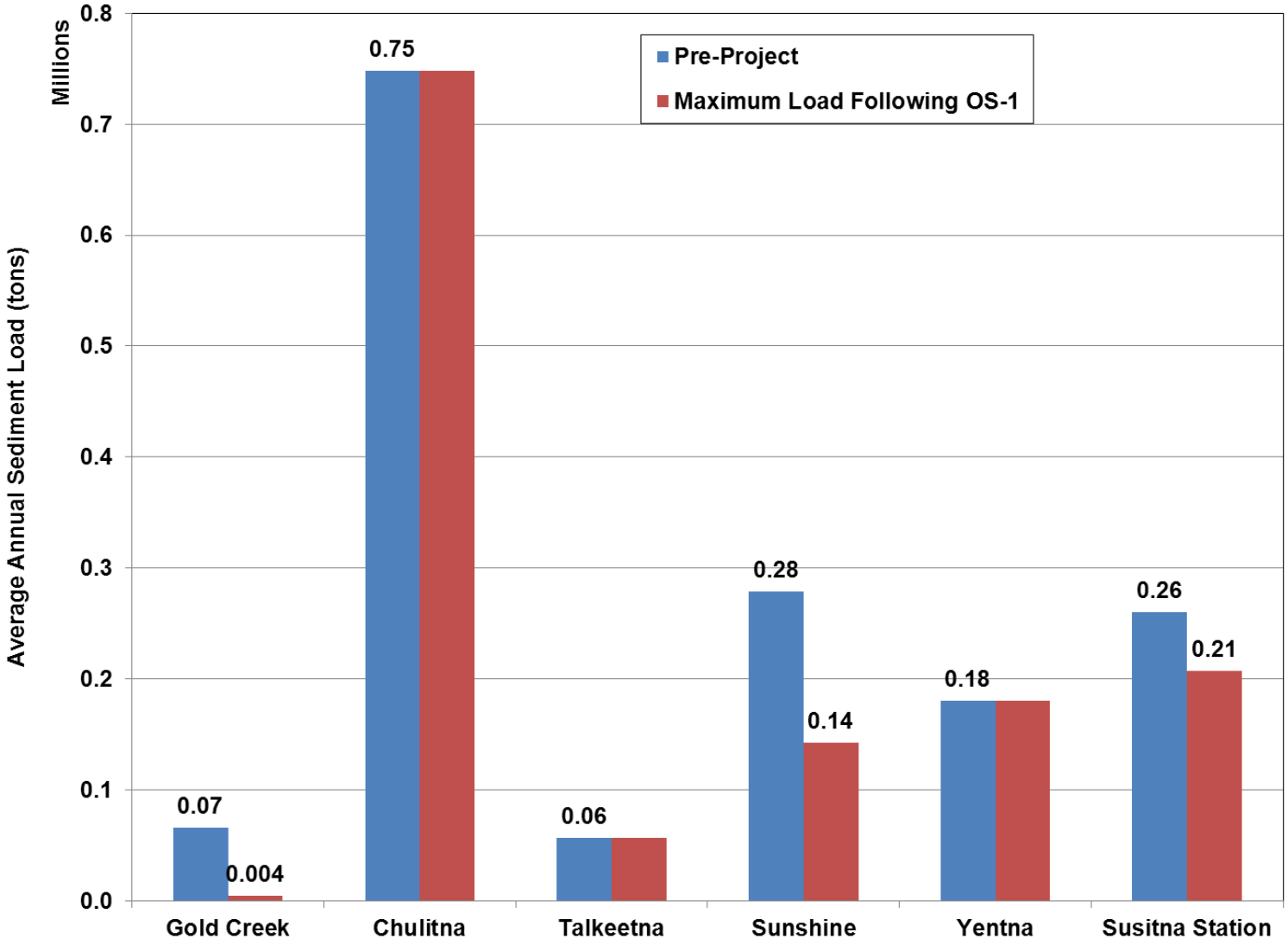

Figure 6.3-3. Average annual gravel loads at the three mainstem gages and the three primary tributary gages under pre-Project and Maximum Load Following OS-1 conditions.

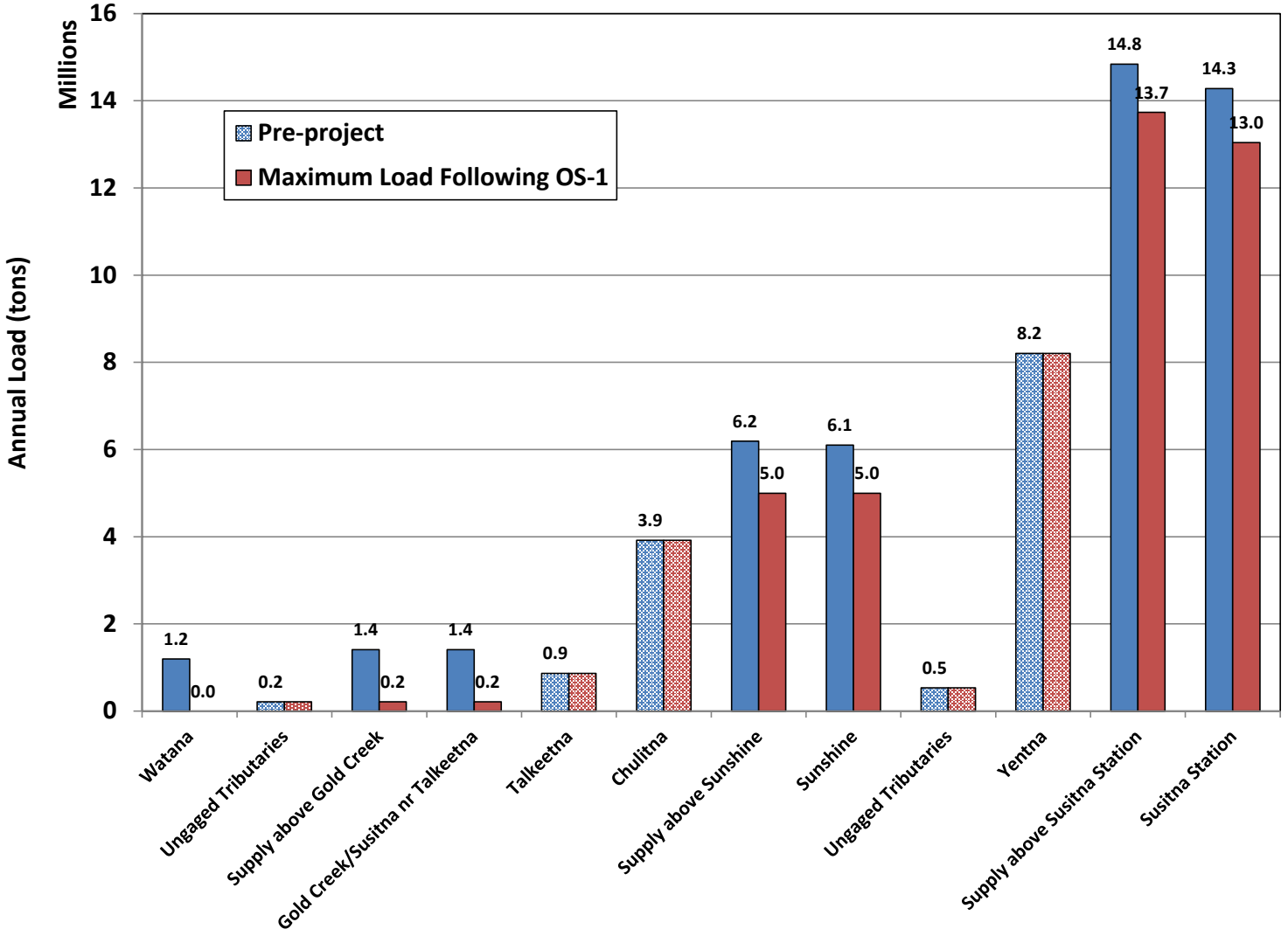

Figure 6.3-4. Average annual sand loads at the mainstem and tributary gages, along with the estimated annual sand load from ungaged tributaries, under pre-Project and Maximum Load Following OS-1 conditions. Also shown is the accumulated sediment supply to key points along the reach based on the gaged and ungaged sand loads.

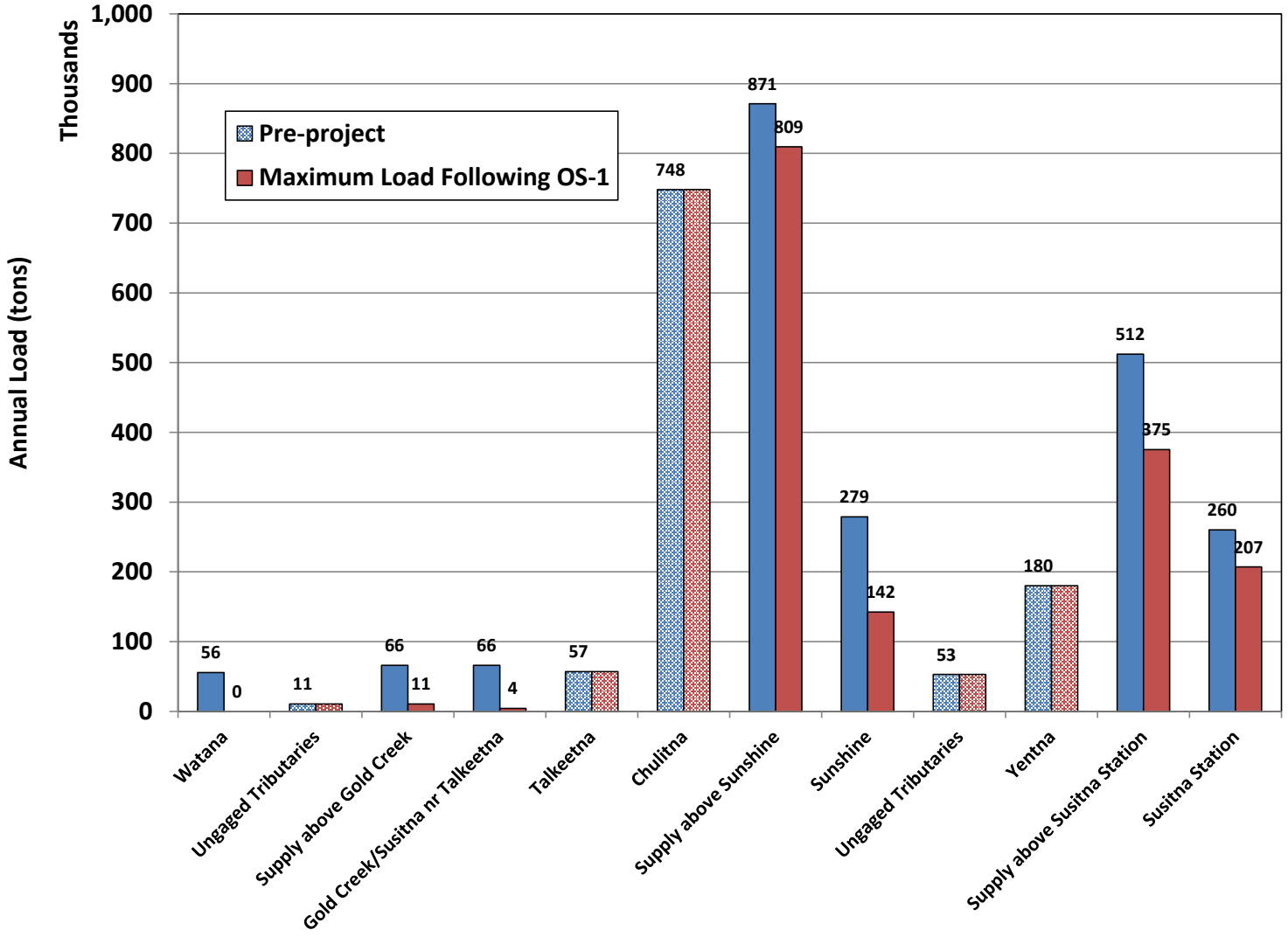

Figure 6.3-5. Average annual gravel loads at the mainstem and tributary gages, along with the estimated annual gravel load from ungaged tributaries, under pre-Project and Maximum Load Following OS-1 conditions. Also shown is the accumulated sediment supply to key points along the reach based on the gaged and ungaged gravel loads.

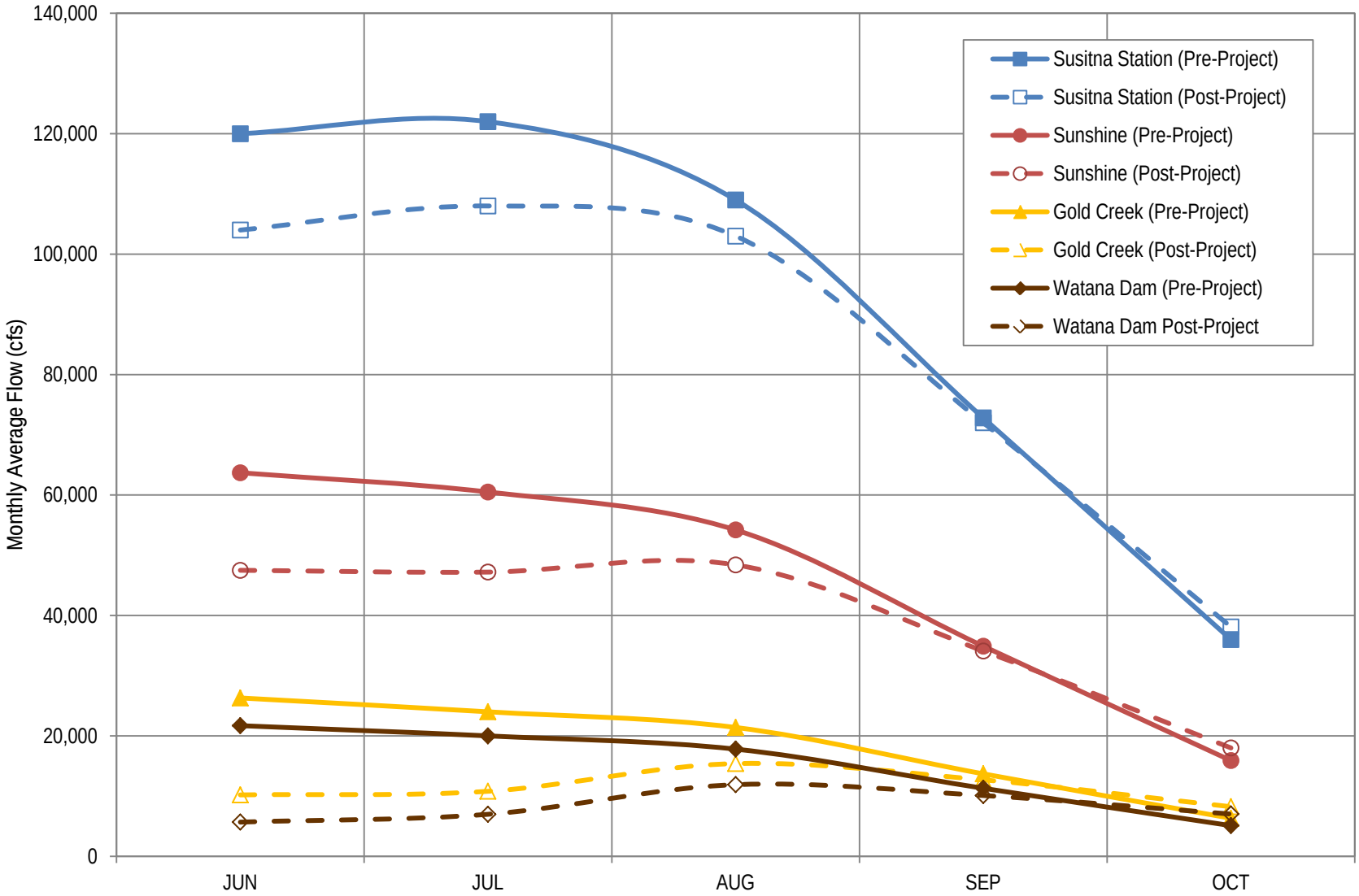

Figure 6.6.1. Average monthly flows (cfs) during the open-water period in the Susitna River watershed for pre-Project and Maximum Load Following OS-1 conditions. (Tetra Tech 2013d).

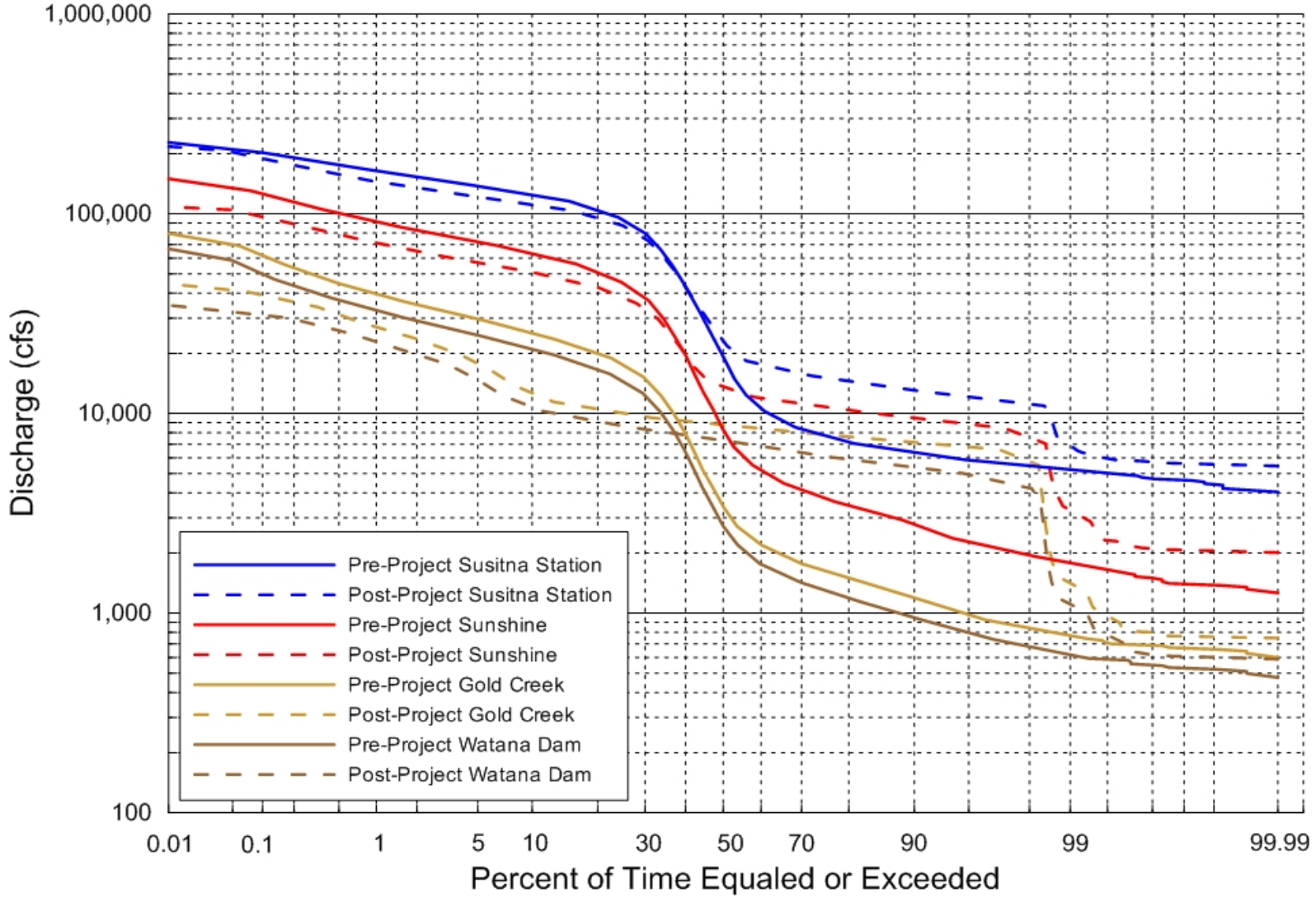

Figure 6.6.2. Annual flow-duration curve comparison for Pre-Project and Maximum Load Following OS-1 conditions.

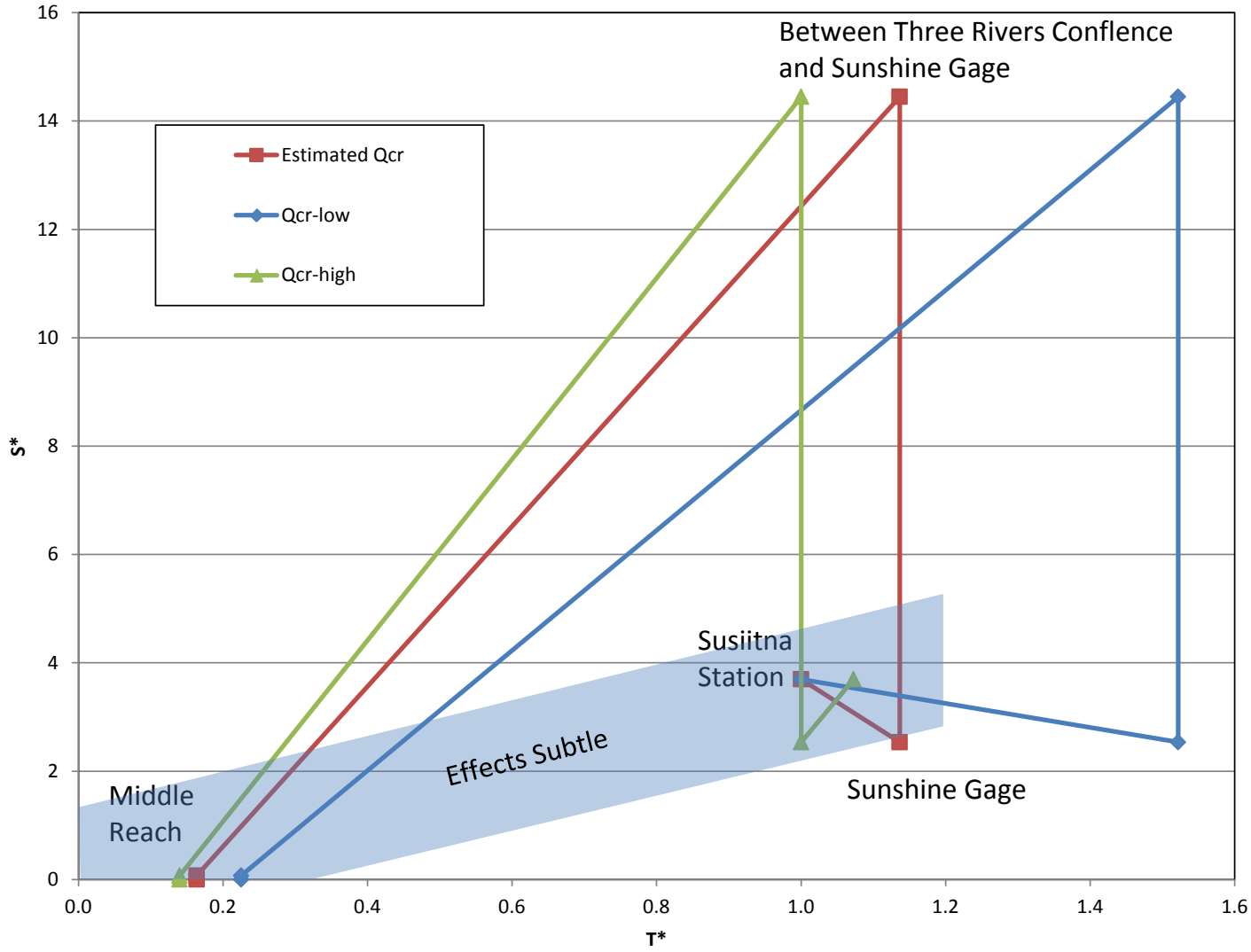

Figure 6.6.3. S* and T* on the Middle and Lower Susitna River Reaches.

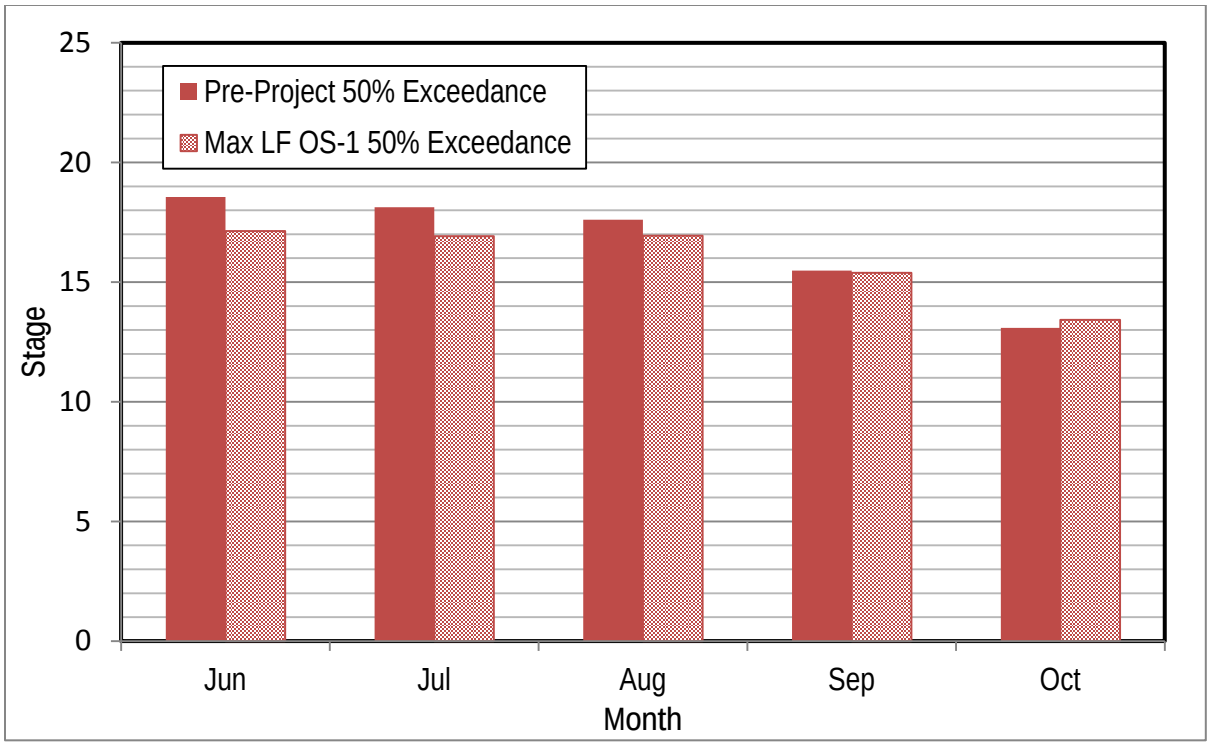

Figure 6.7-1. Monthly 50 percent pre-Project and Max LF OS-1 Stage-Exceedance Values at Sunshine Gage during the open-water period (Tetra Tech, Inc. 2013d).

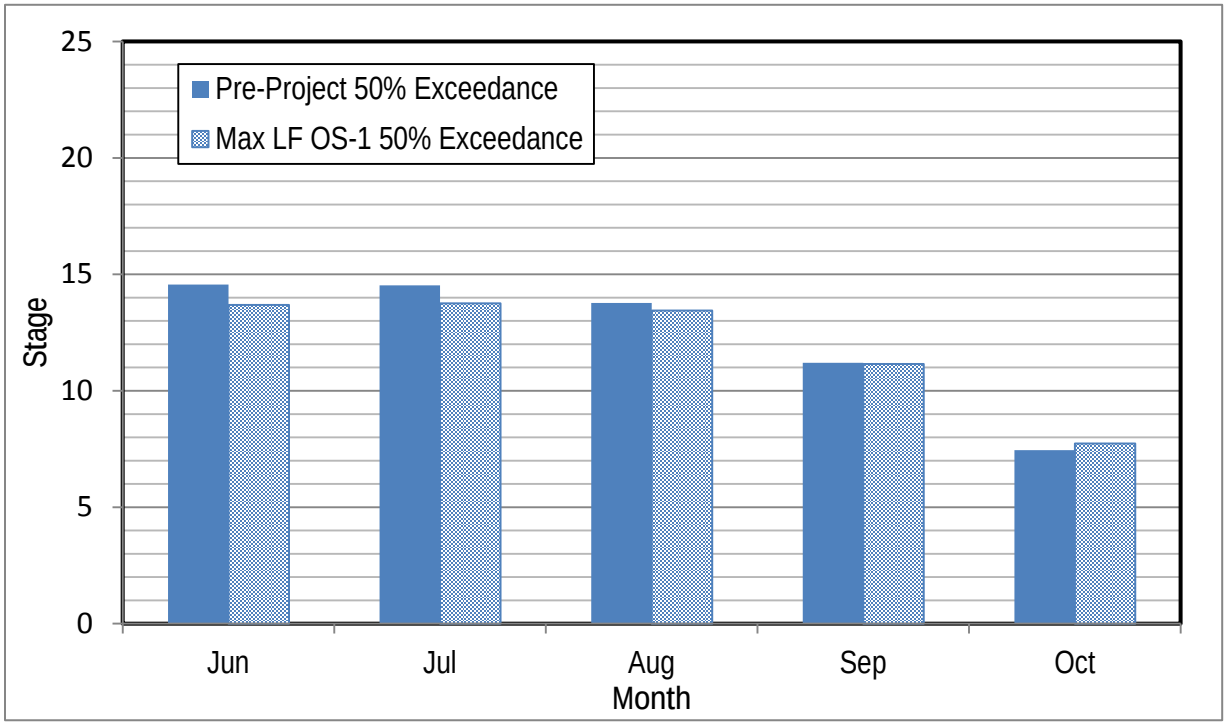

Figure 6.7-2. Monthly 50 percent pre-Project and Max LF OS-1 Stage-Exceedance Values at Susitna Station Gage during the open-water period (Tetra Tech, Inc. 2013d).