HYDROGRAPHIC MAPPING OF THE MATANUSKA-SUSITNA BASIN IN SOUTH CENTRAL ALASKA

Mat-Su salmon PARTNERSHIP · USGS science for a changing world · Saint Mary's University OF MINNESOTA · TerrainWorks (NetMap) · The Nature Conservancy Protecting nature. Preserving life.

Mapping A Community Rich In Aquatic Resources

Encompassing over 25,000 square miles, the Mat-Su basin is rich in aquatic resources and freshwater habitat upon which healthy wild salmon fisheries as well as Alaska's fastest growing human population and economies depend.

However, current mapping of hydrography, along with economic, social and ecological values associated with waters and floodplains in Alaska, is inadequate to support critical needs in community planning, flood mapping, ecological risk assessment and mitigation planning for salmon and other aquatic resources. However, in recent years, significant investments have been made in the Mat-Su basin to secure high resolution topographical data and aerial photography, largely through the Mat-Su LiDAR and Orthoimagery project and the Alaska Statewide Digital Mapping Initiative. These projects make available, for the first time, highly detailed topographic information from which we can measure and map hydrogeomorphic conditions at a fine scale over the 25,500 square mile Mat-Su basin

An Active Collaboration: How The Project Began

In the fall of 2013, The Nature Conservancy, Alaska Chapter initiated a hydrographic mapping and analysis program in the Mat-Su basin using these newly available topographic data to map all lakes, rivers and streams to a level of quality and technical specification suitable for ingest into the USGS National Hydrographic Database and the Alaska statewide hydrographic program. By meeting state and federal mapping standards, we ensure this program is freely available for use by government agencies, private and public organizations to support decisions which affect Mat-Su freshwater resources.

During the winter of 2014, TNC proposed a partnership with several organizations and agencies also interested in hydrographic mapping in the Mat-Su basin. By the spring of 2014, an active collaboration of funding agencies and contracting organizations has grown including the USGS, USFWS, NFWF, private firms, universities and local conservation groups.

It is the intent of this project not only to increase our knowledge of Mat-Su hydrographic resources, but also to create a single, integrated Mat-Su basin-wide hydrography dataset derived from a common methodology that is linked to the basemaps and topography of the recent Mat-Su LiDAR and Orthoimagery project and the Statewide Digital Mapping Initiative.

Designing The Project: Meeting A Wide Spectrum Of User Needs

The flagship products from this work are geometric networks of hydrologic flow as well as a suite of secondary hydrographic datasets to support ecological classification, flood and habitat risk assessment, ecosystem service valuation and decision-support for balancing of conservation and resource development.

The Mat-Su Hydro mapping program consists of two phases; a modeling phase where a network of hydrographic connectivity, or stream network, is developed and a validation phase where the stream network is reviewed for accuracy by an independent third party organization and verified in the field.

The stream network modeling is an iterative process which maps streams by evaluating terrain conditions such as slope and anthropogenic features such as culverts, bridges and dams. Once the stream network is complete, multiple mapping products are built based on stream locations such as sub-watersheds, floodplains and channel width.
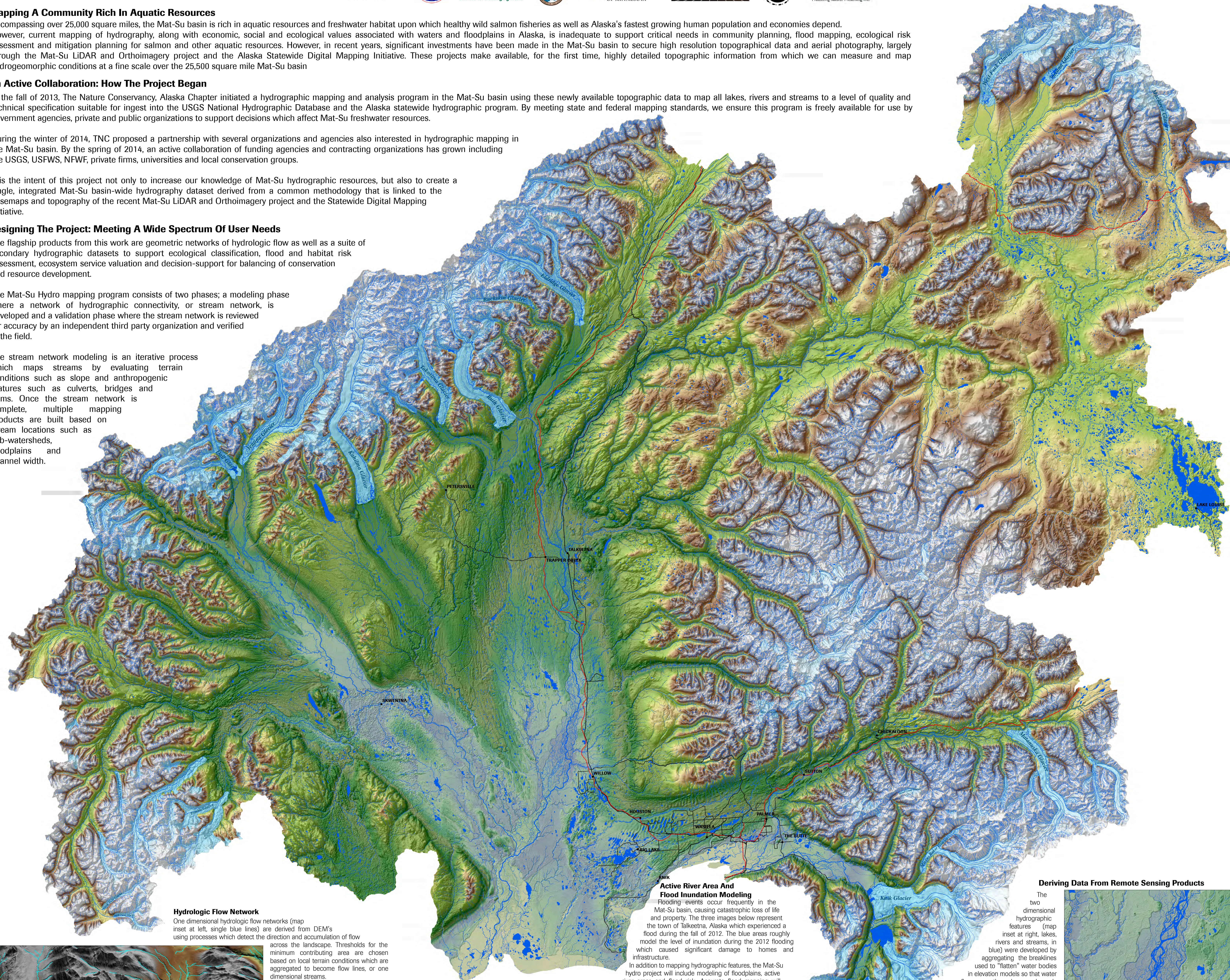
Hydrologic Flow Network

One dimensional hydrologic flow networks (map inset at left, single blue lines) are derived from DEM's using processes which detect the direction and accumulation of flow across the landscape. Thresholds for the minimum contributing area are chosen based on local terrain conditions which are aggregated to become flow lines, or one dimensional streams.

Flow networks are crucial for measuring hydrologic connectivity and modeling sediment transport, upstream contributing basin area, flow paths and more.
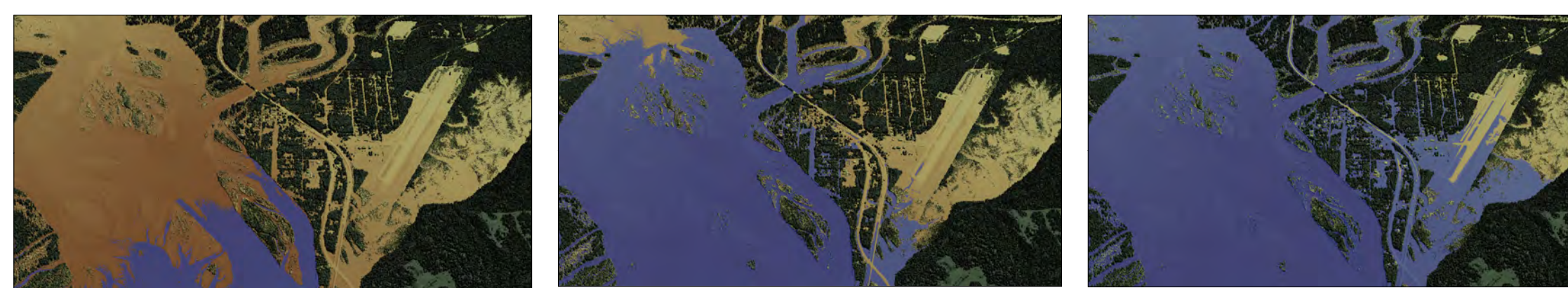
As the Mat-Su hydro network develops, geomorphological attributes such as slope and sinuosity will be assigned to each stream segment for purposes of modeling habitat for salmon and other anadromous fish species.

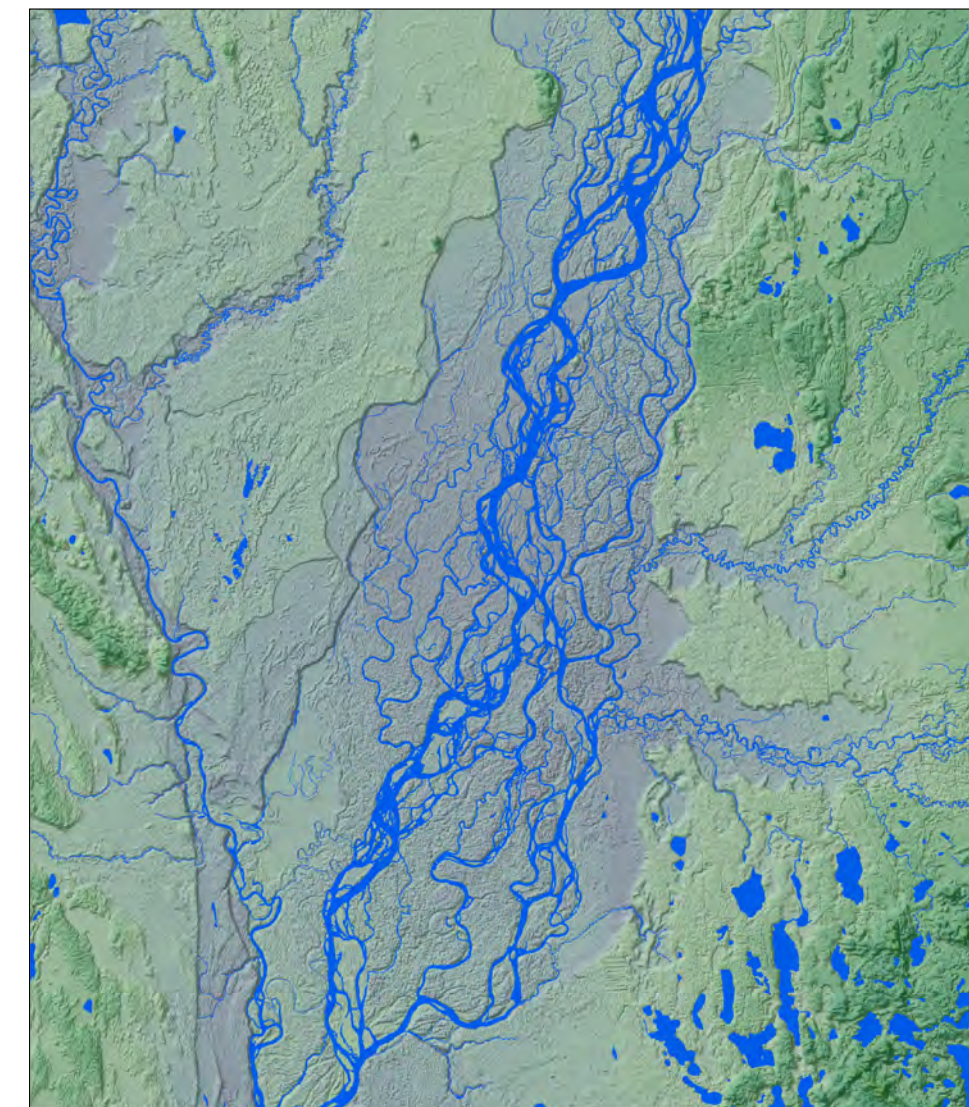### Active River Area And Flood Inundation Modeling

Flooding events occur frequently in the Mat-Su basin, causing catastrophic loss of life and property. The three images below represent the town of Talkeetna, Alaska which experienced a flood during the fall of 2012. The blue areas roughly model the level of inundation during the 2012 flooding which caused significant damage to homes and infrastructure.

In addition to mapping hydrographic features, the Mat-Su hydro project will include modeling of floodplains, active river areas and flood risk. Accurate flood mapping will encourage planners and policy makers to design development activities outside of active river areas, allowing riparian ecosystems to provide their natural flood regulating services and supporting healthy salmon habitat.
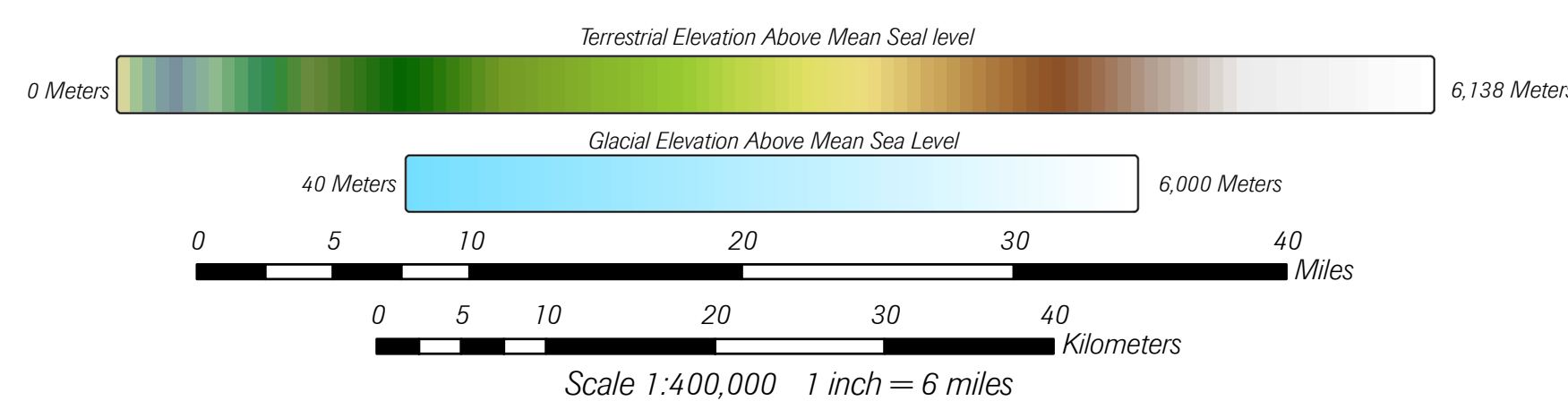

Deriving Data From Remote Sensing Products

The two dimensional hydrographic features (map inset at right, lakes, rivers and streams, in blue) were developed by aggregating the breaklines used to "flatten" water bodies in elevation models so that water flows through channels unobstructed. Hydro breaklines are a by-product of the flattening process but can be assembled into valuable 2-dimentional hydrologic features representing "wetted width", or a bank-to-bank representation of water at the time of data acquisition.

Place Names:
PETERSVILLE, TALKEETNA, TRAPPER CREEK, SKWENTNA, WILLOW, HOUSTON, KNIK, BIG LAKE, WASILLA, PALMER, THE BUTTE, SUTTON, CHICKALOON, LAKE LOUISE, Knik Glacier

Terrestrial Elevation Above Mean Sea level
0 Meters — 6,138 Meters

Glacial Elevation Above Mean Sea Level
40 Meters — 6,000 Meters

40 Meters   0   5   10   20   30   40 Miles
0   5   10   20   30   40 Kilometers
Scale 1:400,000   1 inch = 6 miles

LEGEND

- Place Names
- Alaska Railroad
- Major Roads
- Highways

LOCATION MAP