

HYDROGRAPHIC MAPPING OF THE MATANUSKA-SUSITNA RIVER WATERSHED IN SOUTH CENTRAL ALASKA

Where Are The Salmon? Mapping Streams First

While pacific salmon have declined dramatically throughout much of North America, salmon habitat in Alaska remains largely intact over vast landscapes, particularly in the Matanuska-Susitna (Mat-Su) basin, located in south central Alaska. 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. Nonetheless, as human development and demands on natural resources continue to increase, Alaska salmon will likely experience the same types of pressure that affected salmon populations elsewhere. 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. To address this challenge, we are working with a multi-agency collaboration called the Mat-Su Salmon Habitat Partnership to improve the fundamental data sources upon which salmon conservation and resource decision-making depend.

Fortunately, the convergence of newly available data, an active collaboration of Alaskans, and an advanced suite of geospatial tools provide a unique opportunity support landscape scale hydrographic mapping and analysis to support a wide spectrum of decisions which affect aquatic resources.

This poster represents a project initiated by TNC Alaska to map hydrographic conditions within an area roughly the size of West Virginia using conventional and newly available GIS tools. 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.

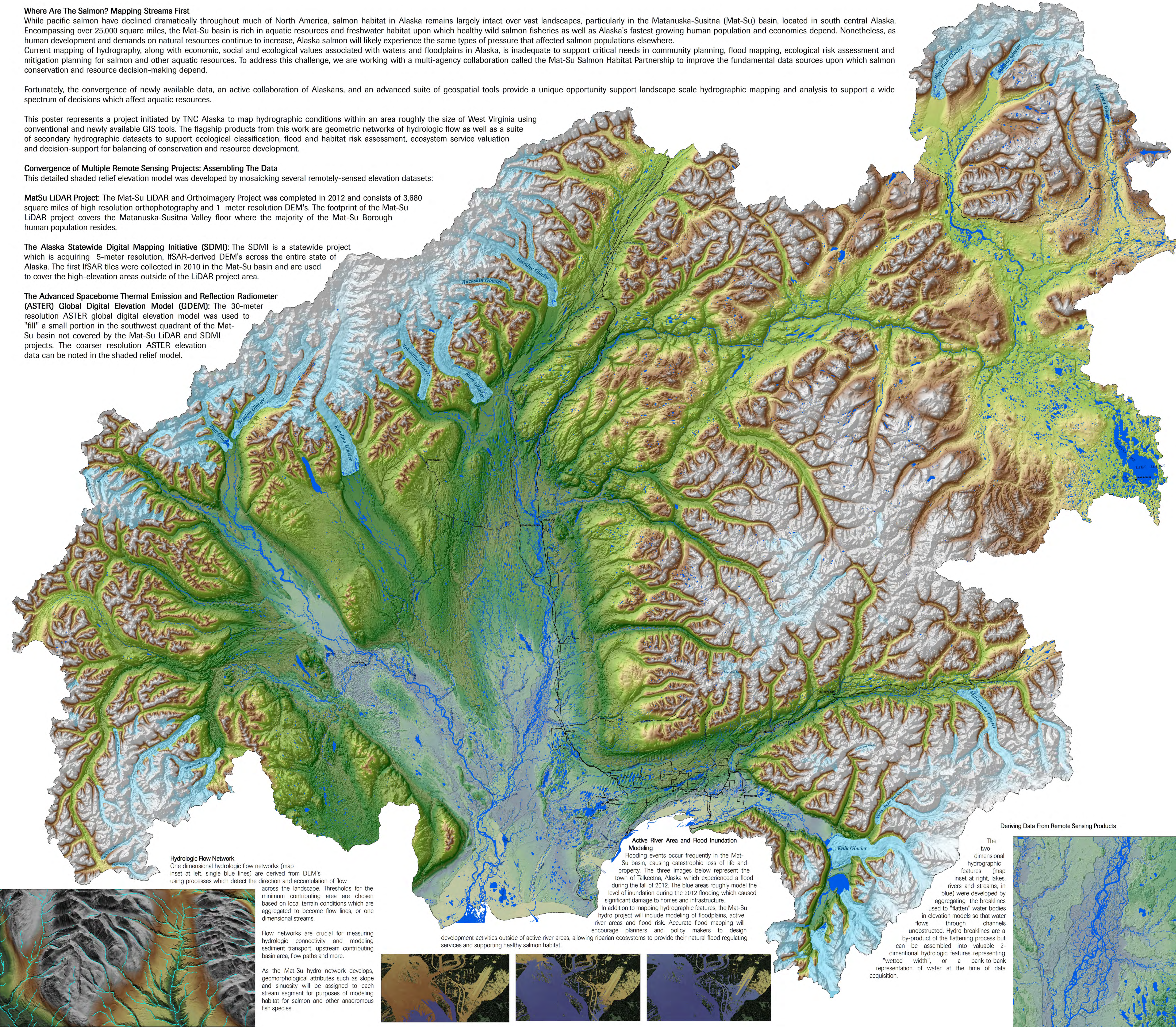
Convergence of Multiple Remote Sensing Projects: Assembling The Data

This detailed shaded relief elevation model was developed by mosaicking several remotely-sensed elevation datasets:

MatSu LiDAR Project: The Mat-Su LiDAR and Orthoimagery Project was completed in 2012 and consists of 3,680 square miles of high resolution orthophotography and 1 meter resolution DEM's. The footprint of the Mat-Su LiDAR project covers the Matanuska-Susitna Valley floor where the majority of the Mat-Su Borough human population resides.

The Alaska Statewide Digital Mapping Initiative (SDMI): The SDMI is a statewide project which is acquiring 5-meter resolution, IfSAR-derived DEM's across the entire state of Alaska. The first IfSAR tiles were collected in 2010 in the Mat-Su basin and are used to cover the high-elevation areas outside of the LiDAR project area.

The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM): The 30-meter resolution ASTER global digital elevation model was used to "fill" a small portion in the southwest quadrant of the Mat-Su basin not covered by the Mat-Su LiDAR and SDMI projects. The coarser resolution ASTER elevation data can be noted in the shaded relief model.



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.

development activities outside of active river areas, allowing riparian ecosystems to provide their natural flood regulating services and supporting healthy salmon habitat.

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 services and supporting healthy salmon habitat.

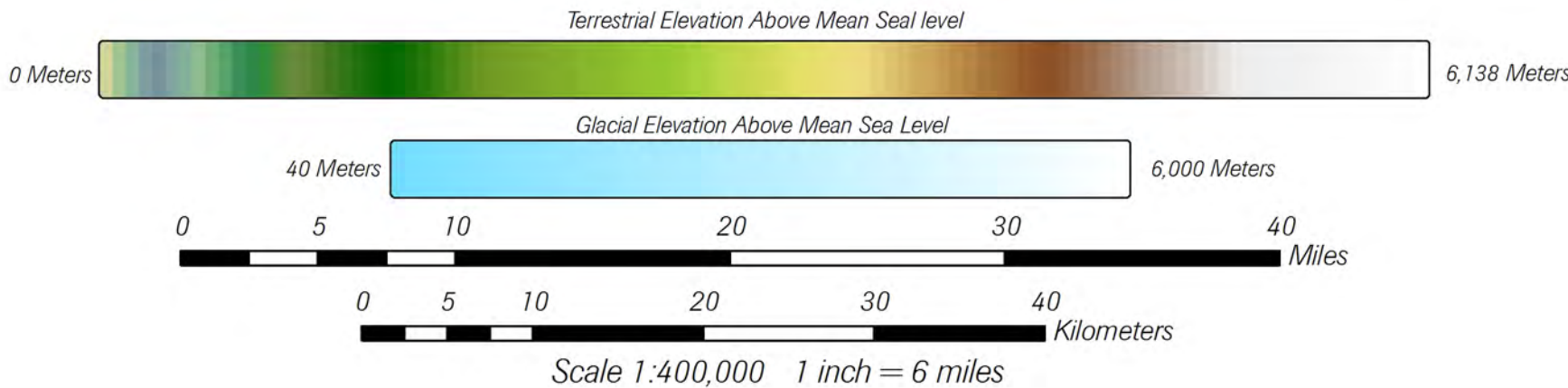
Deriving Data From Remote Sensing Products

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-dimensional hydrologic features representing "wetted width", or a bank-to-bank representation of water at the time of data acquisition.

Data Sources:
Mat-Su LiDAR and Orthoimagery Project
State of Alaska Statewide Digital Mapping Initiative
The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)
Global Digital Elevation Model (GDEM)
USGS National Hydrographic Database
Map Created By: The Nature Conservancy, Alaska Chapter, November, 2013.

LEGEND

● PLACE NAMES
— MAJOR ROADS
++++ ALASKA RAILROAD



LOCATION MAP



The Nature Conservancy
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