

02/08/2017

Overview:

Mapping the

State of

Alaska

<TARGET><BILL></BILL><SUBJECT>02-08-2017 Overview
Mapping the State of
Alaska</SUBJECT><COMM>SRES30</COMM></TARGET>



MAPPING ALASKA

Resources Committee

Nick Mastrodicasa

Large Project Manager DOT/PF

Deputy Commissioner Fogels, DNR

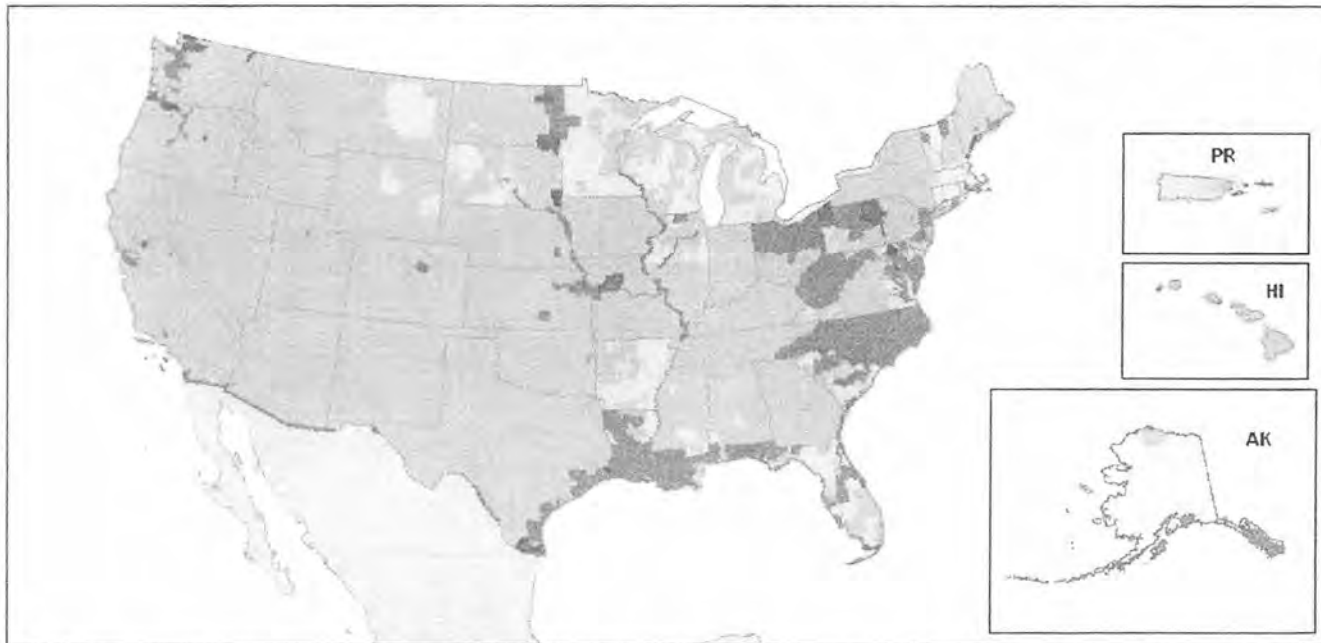
Feb 8, 2017

Where Have We Been?

What have we accomplished?



National Elevation Dataset Source Information



NED is a multi-resolution data collection which provides the best available digital elevation data to the public. 173600 square miles of lower quality 30 meter data were replaced by 10 meter or better source data in 2009.

The NED 1/9-arc-second data layer has increased by 90,000 square miles and now cover 273595 square miles.

The country of Mexico was also added at 30 meter resolution in 2009.

NED RESOLUTION

- High Resolution Data Being Processed
- 1/9 Arc-Second (~3 meter or LIDAR Source)
- 1/3 Arc-Second (~10 meter or better source)
- 1 Arc-Second (~30 meter source)
- 2 Arc-Second - Alaska Only

September 2009



In 2009 Mars Was Better Mapped Than Alaska

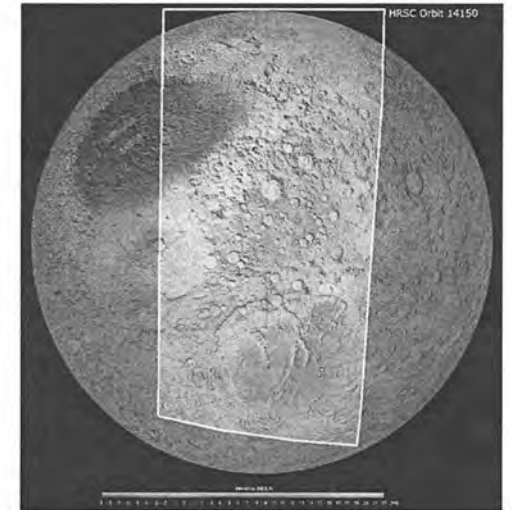
Mars Image Map



Mars Gravity Map



Mars DEM Hillshade Relief









Alaska CIP Funding

| | |
|--------------|---------------------|
| • 2006 | \$ 2,000,000 |
| • 2007 | \$ 2,000,000 |
| • 2008 | \$ 2,000,000 |
| • 2012 | \$ 1,750,000 |
| • 2013 | \$ 3,687,030 |
| • 2014 | \$ 3,000,000 |
| • 2015 | \$ 5,000,000 |
| TOTAL | \$19,437,030 |

IFSAR Partner Contributions

| AGENCY | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | TOTAL |
|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
|  BLM | 216,213 | 20,000 | - | 141,139 | 262,000 | 2,112,149 | 465,837 | 3,217,355 |
|  FWS | - | 250,000 | 300,000 | - | - | 250,000 | 150,000 | 950,000 |
|  NGA | 2,399,895 | - | - | - | - | - | - | 2,399,895 |
|  NPS | 98,091 | 147,143 | 178,533 | 30,000 | - | 931,581 | 690,000 | 2,075,384 |
|  NRCS | 98,090 | 227,287 | 728,095 | 450,000 | 450,000 | 350,000 | 700,000 | 3,003,472 |
|  USFS | - | - | 354,310 | 50,000 | 547,292 | 383,127 | 302,113 | 1,636,842 |
|  USGS | 99,995 | 870,276 | 3,066,402 | 3,608,512 | 2,893,166 | 3,646,683 | 4,777,034 | 19,862,068 |
| FEDERAL SUB TTL | 3,812,301 | 1,514,706 | 4,627,340 | 4,279,651 | 4,152,458 | 7,673,470 | 7,084,984 | 33,144,980 |
| ALASKA SUB TTL | 1,874,918 | - | 4,998,388 | 2,550,000 | 2,617,285 | - | 1,300,000 | 13,340,591 |
| COMBINED TTL | 5,687,219 | 1,514,706 | 9,625,728 | 6,829,651 | 6,769,743 | 7,673,540 | 8,384,984 | 46,485,571 |

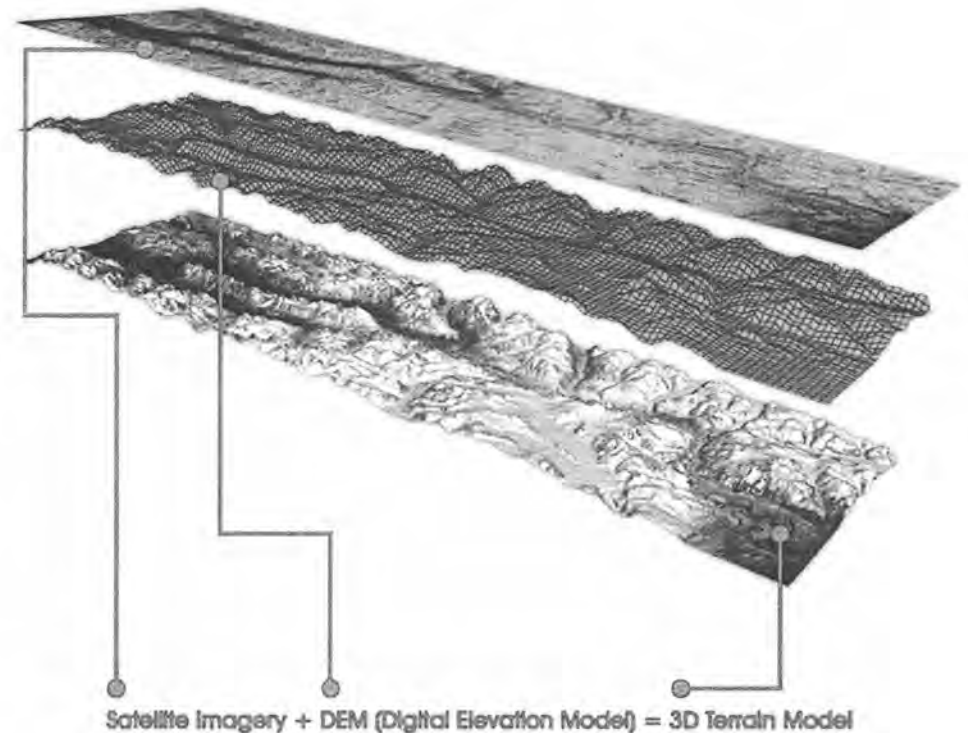
2016 Carry Over **\$1,192,968**

Statewide Digital Mapping Initiative (SDMI)

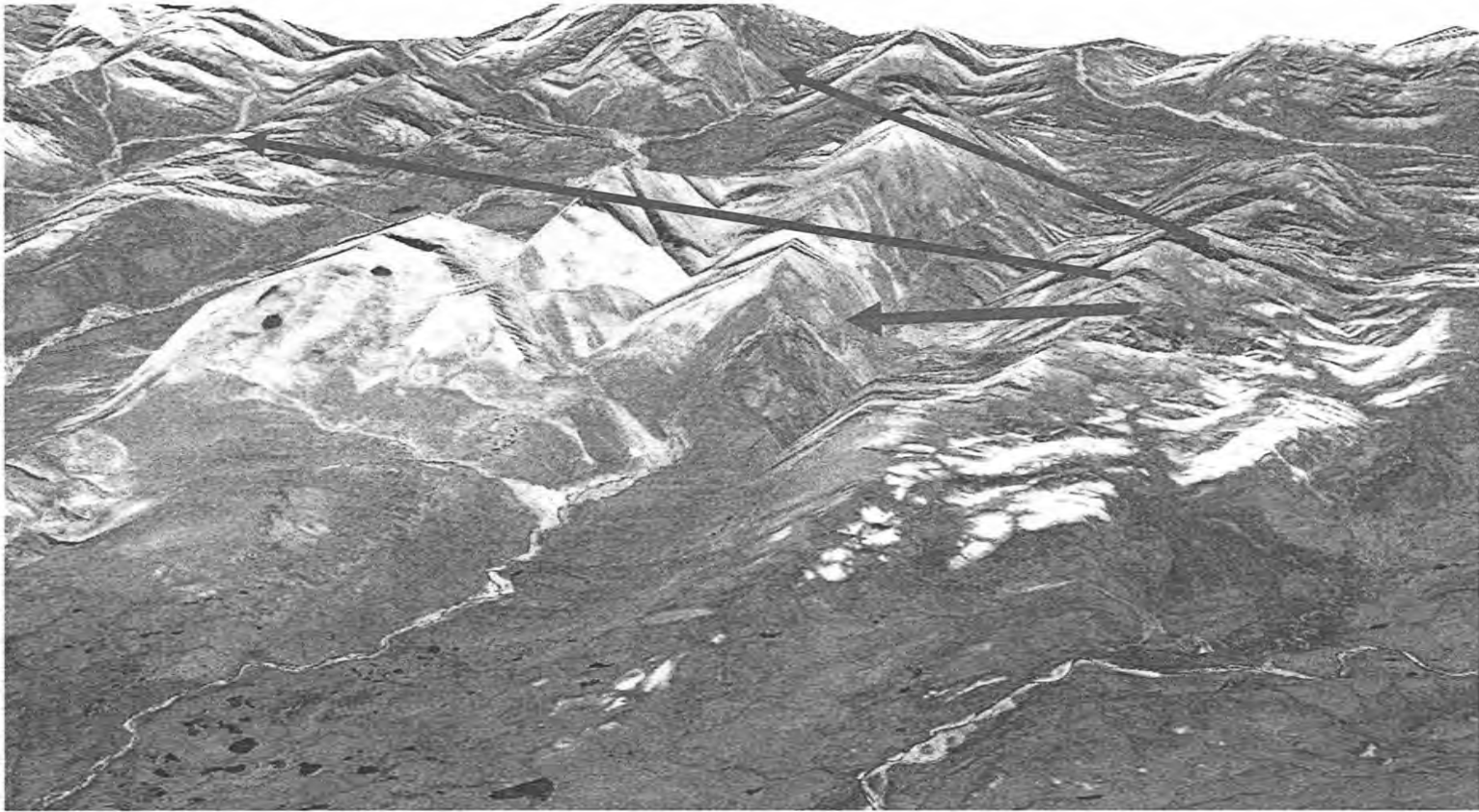
- Established 2006
- Stated Goals: Create an Accurate Basemap of Alaska:

| | <u>Status</u> |
|---------------------------|---------------|
| • Satellite Imagery | 98% \$ 4.5M |
| • Digital Elevation Model | 77% \$46.5M |
| • Co-Registration of Data | |
| • Warehousing of Data | |

- The SDMI became the Alaska Geospatial Council in 2014



Rivers Do Not Flow Uphill

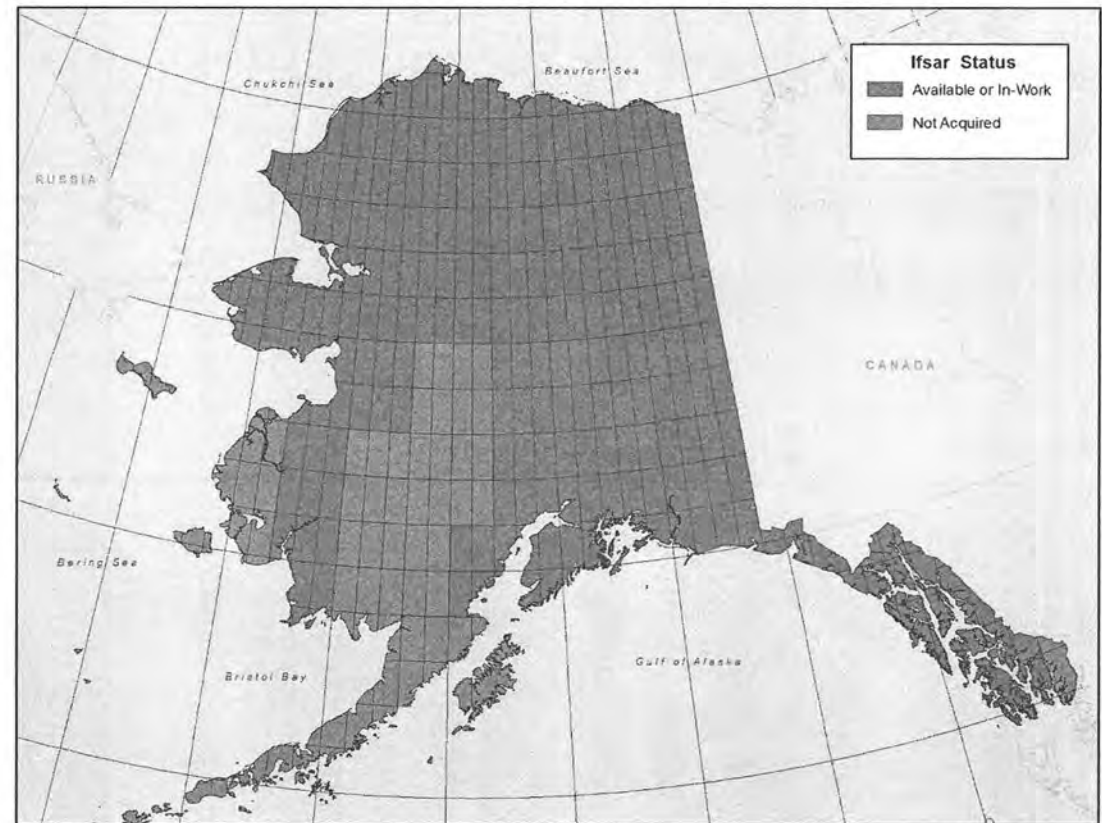


Elevation 77% Complete, in 2016

OLD VS. NEW

- Ridgelines in excess of 100 meters too high or too low
- In one instance a mountain range was horizontally displaced by one mile
- Much higher resolution & accuracy

Alaska IfSAR Elevation Status - 77% Available or In-Work

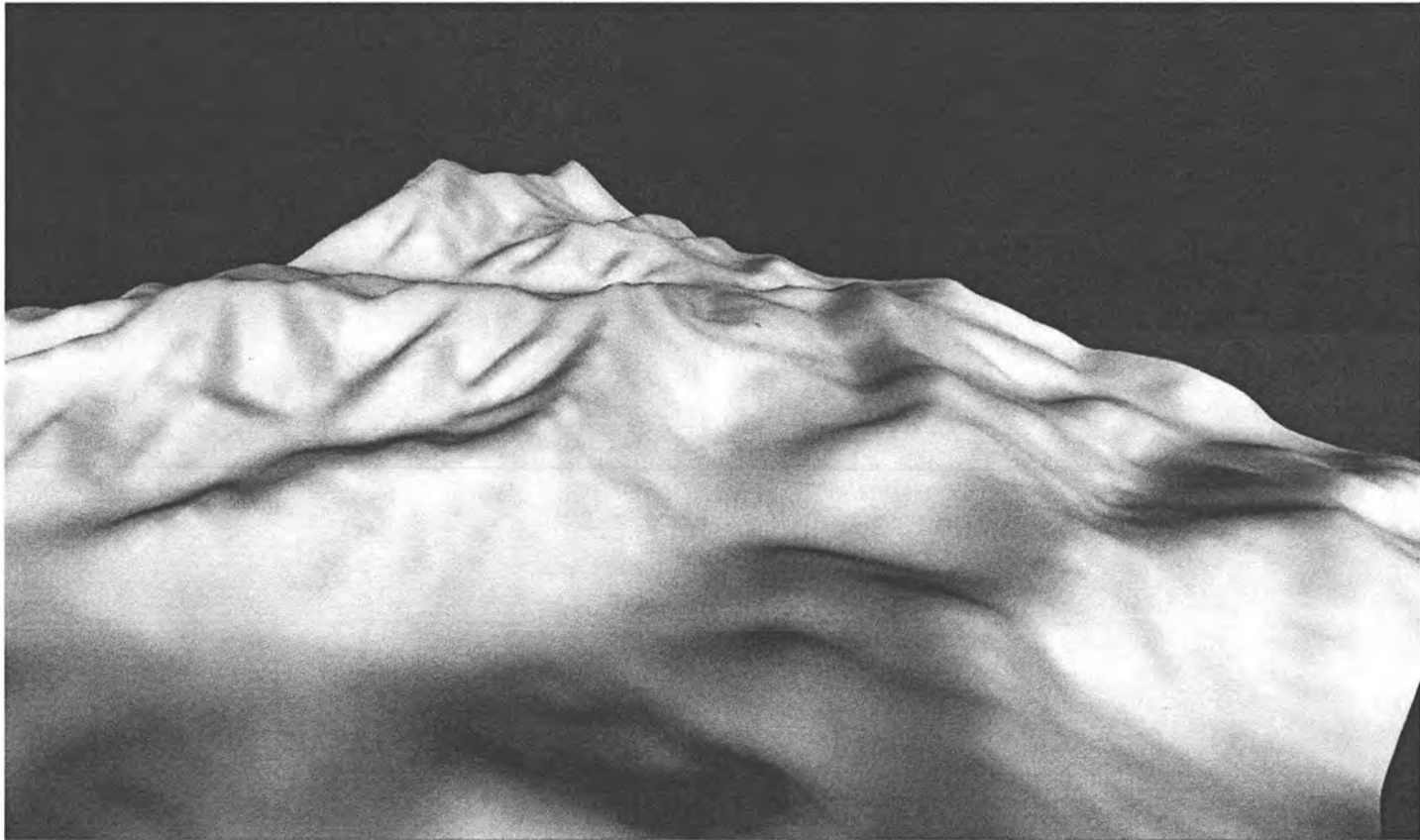


SO, WHAT DID WE GET?

WHAT DID WE FIND?



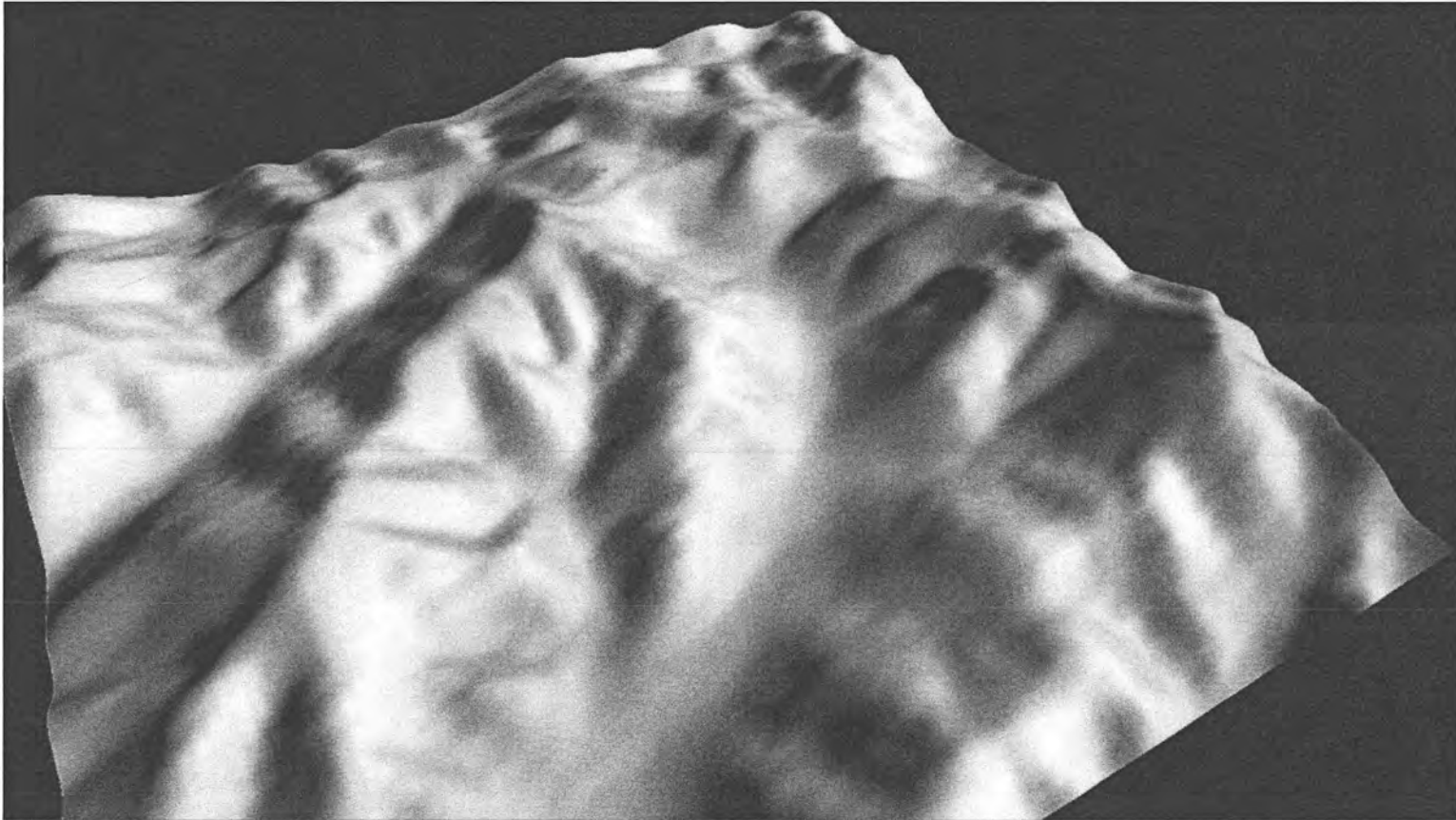
Yukon Koyukuk – Legacy Data



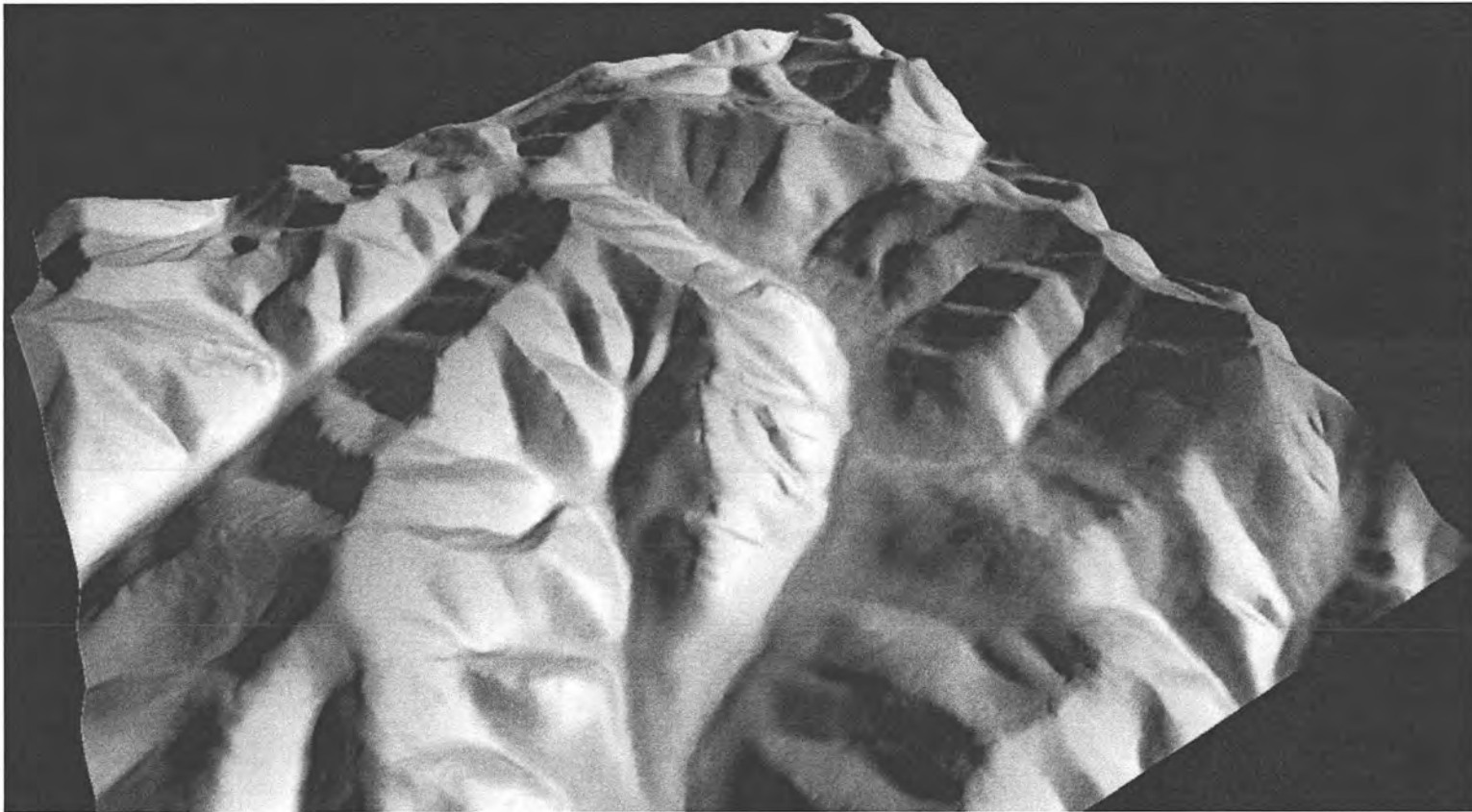
Yukon Koyukuk – IFSAR Data



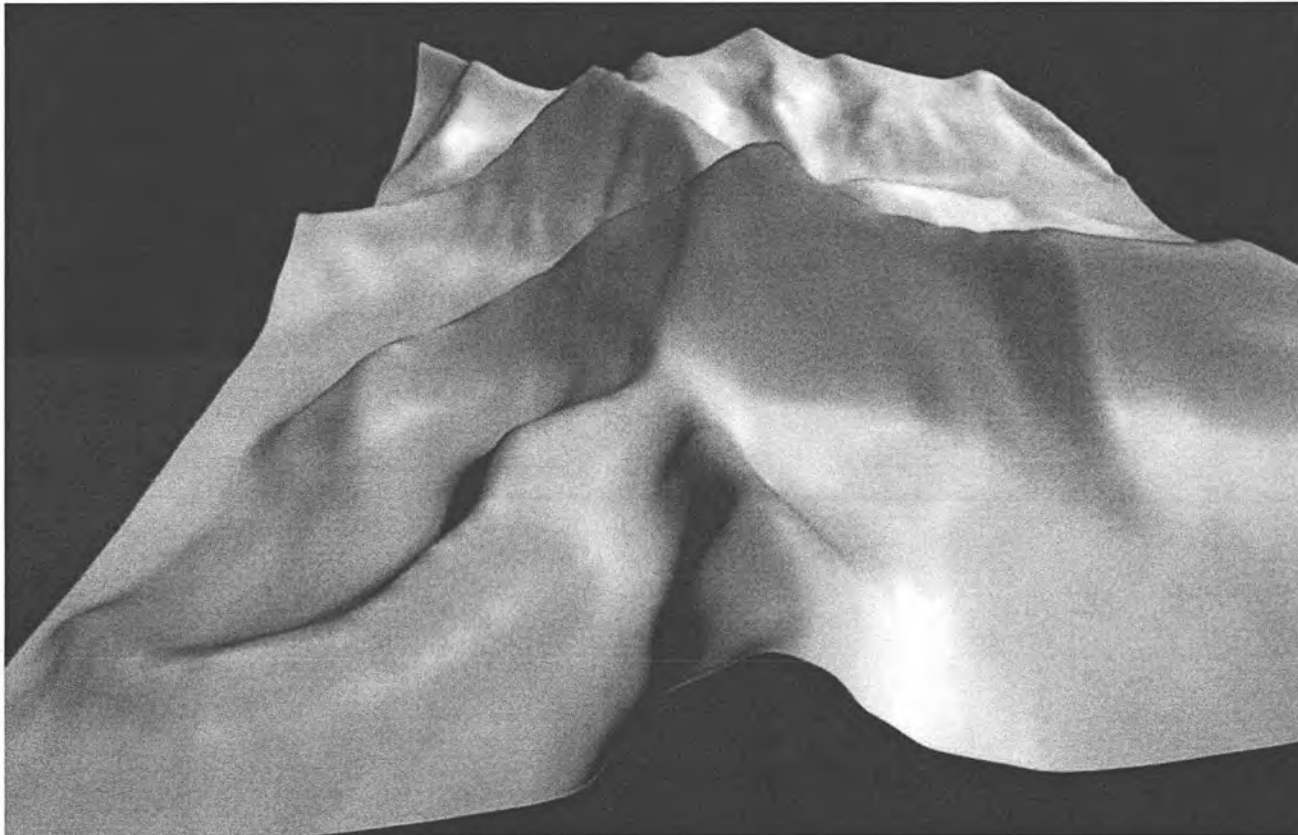
Yukon-Koyukuk, Legacy Data



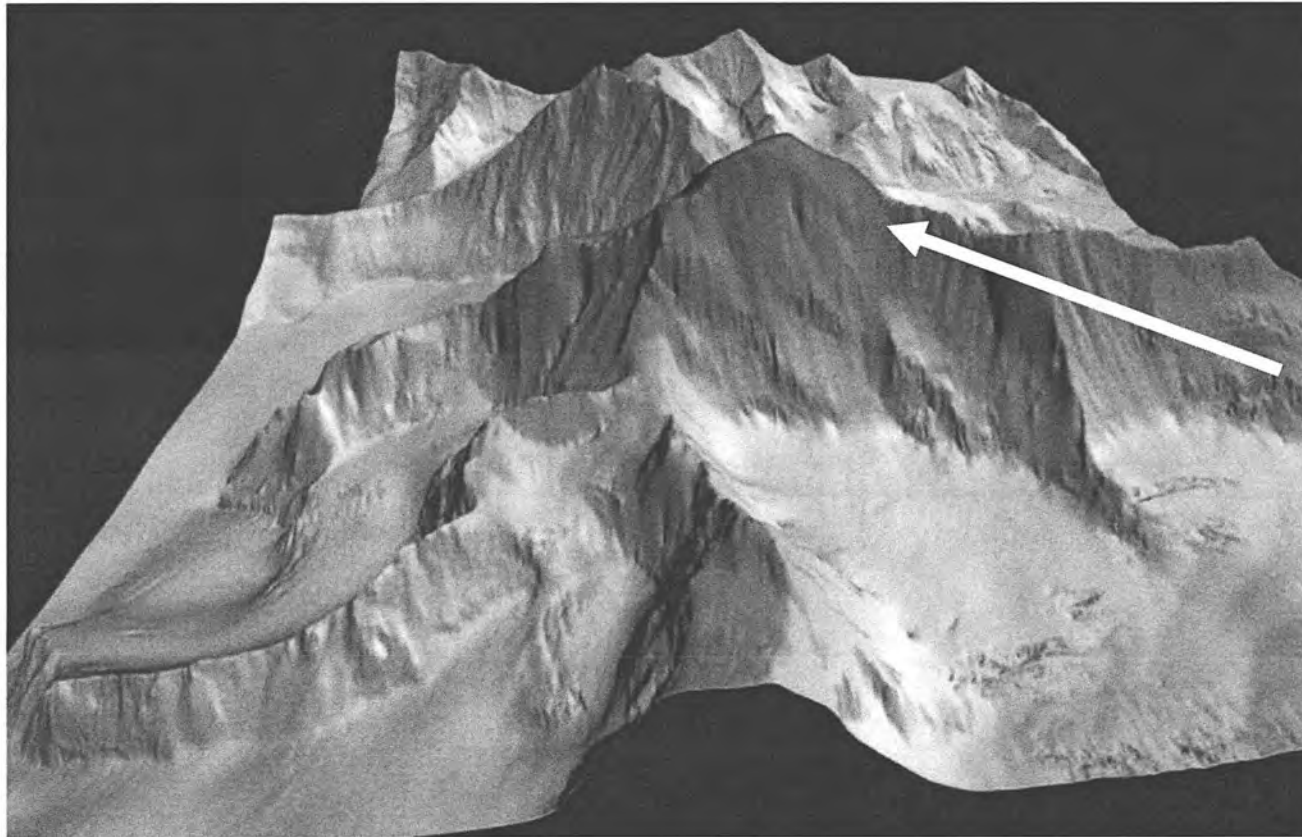
Yukon-Koyukuk, IFSAR Data



Mount Balchen – Legacy Data

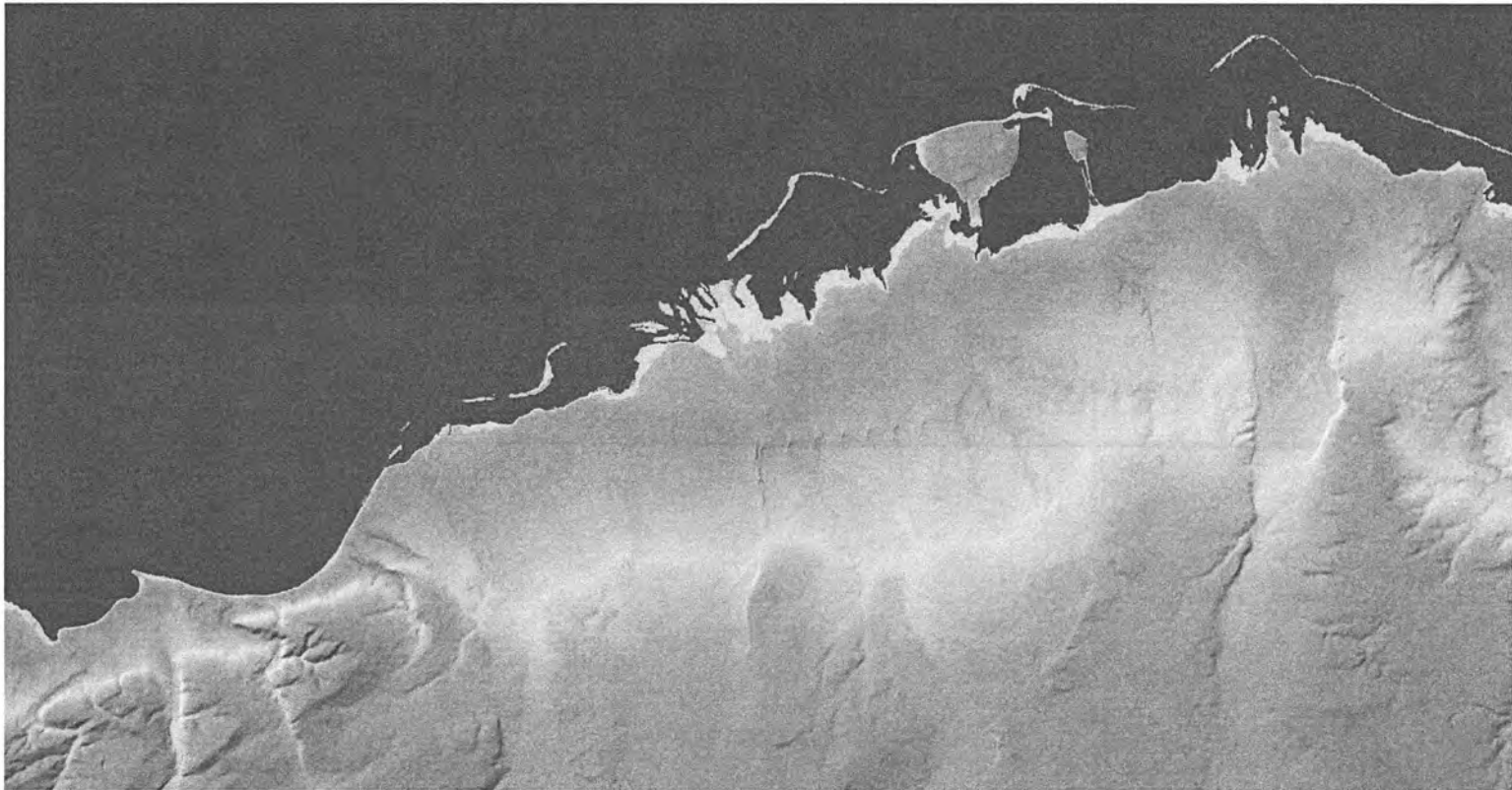


Mount Balchen – IFSAR Data

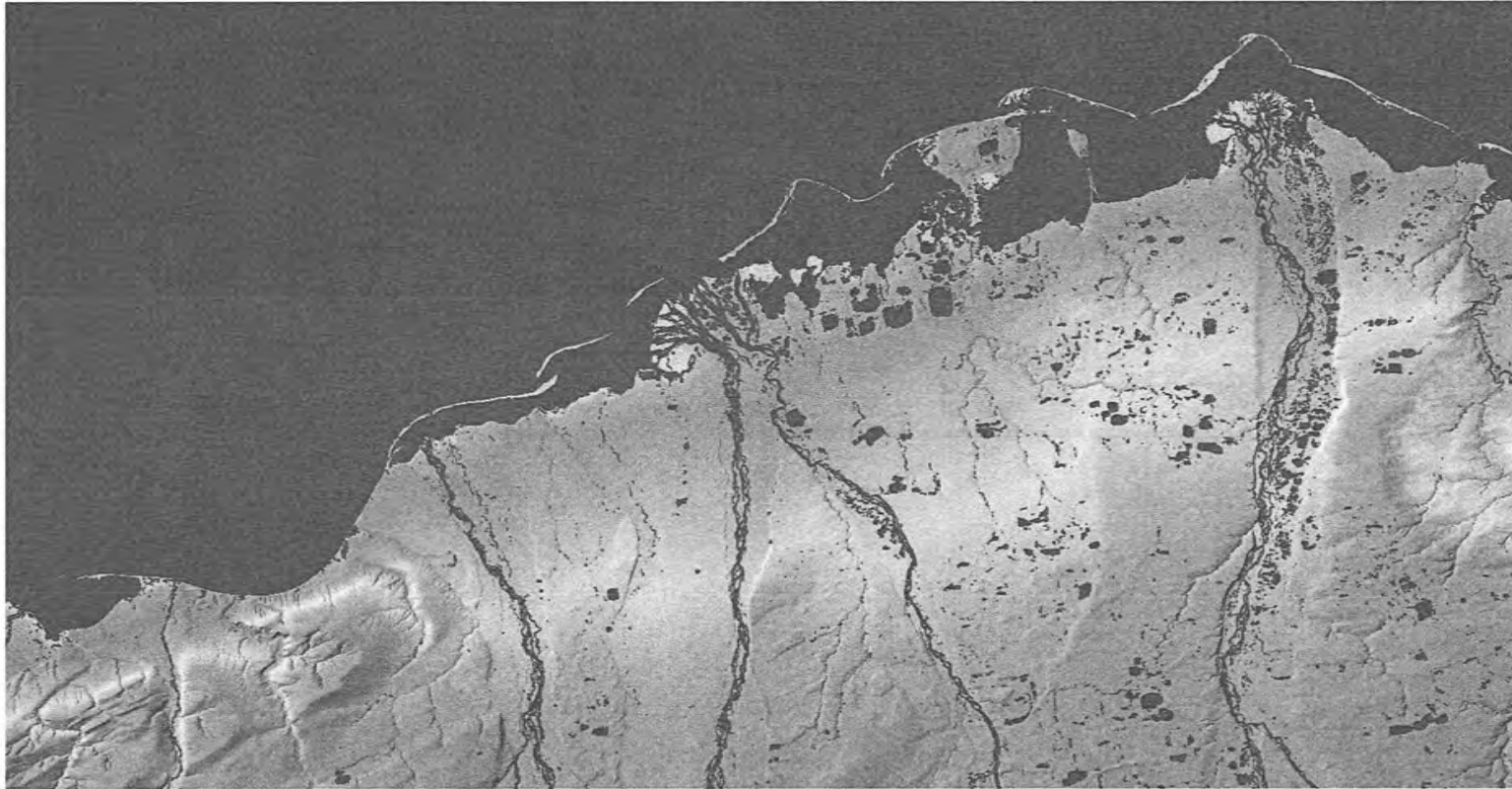


1,200 vertical
feet difference

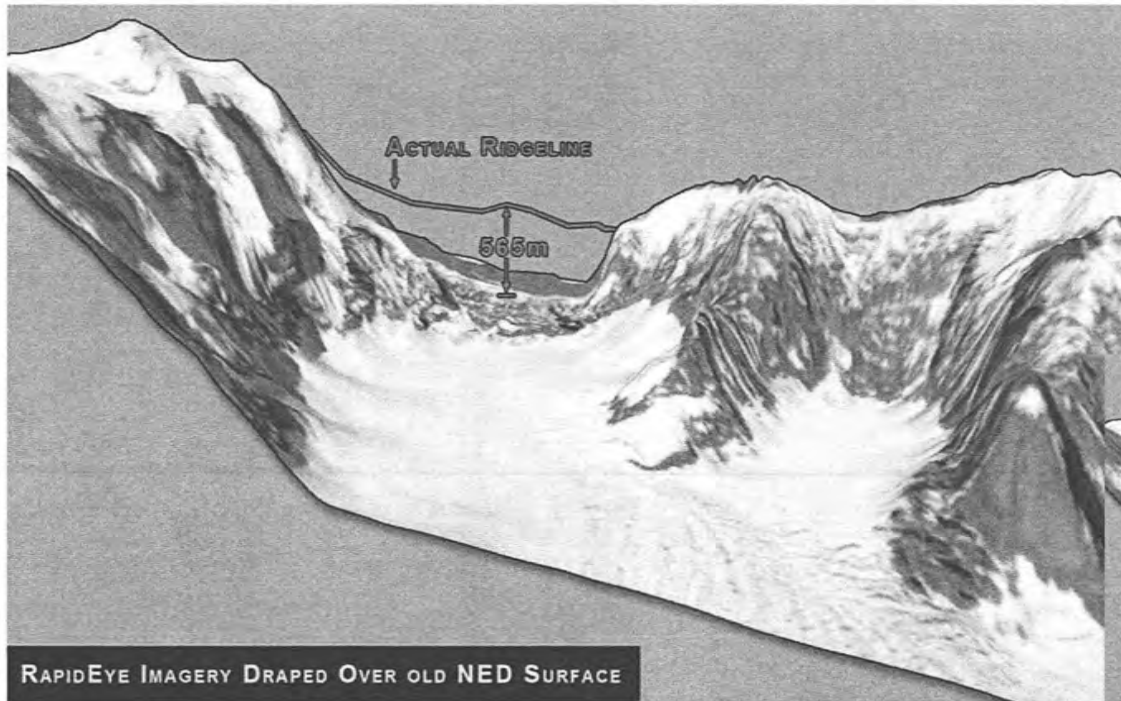
North Slope Borough—Legacy



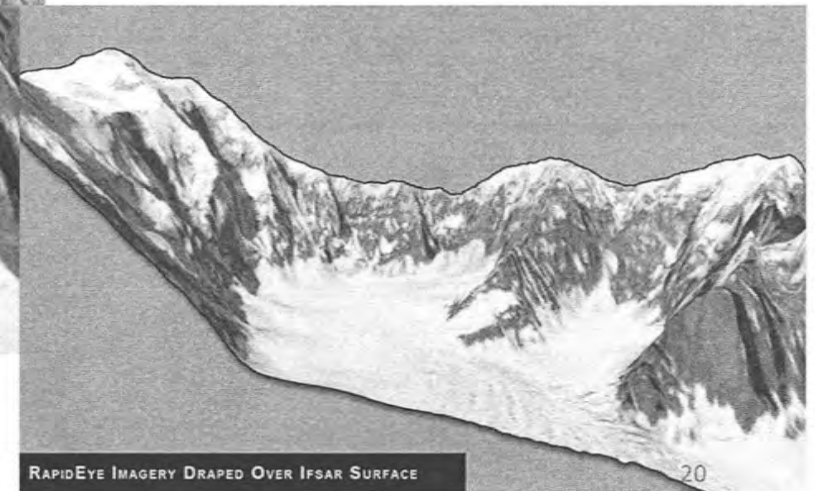
North Slope Borough—IFSAR



Tokasitna

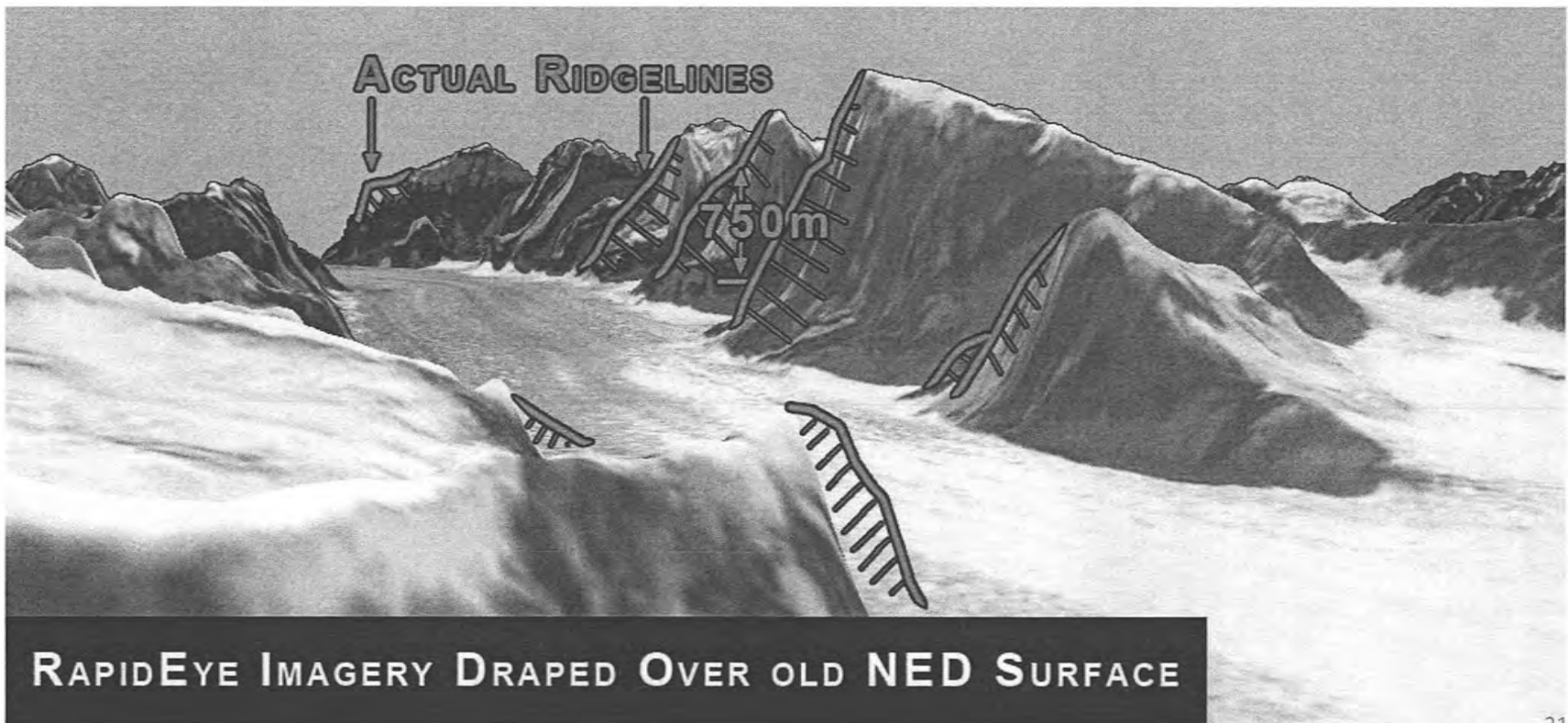


MISSING
RIDGELINE
565m



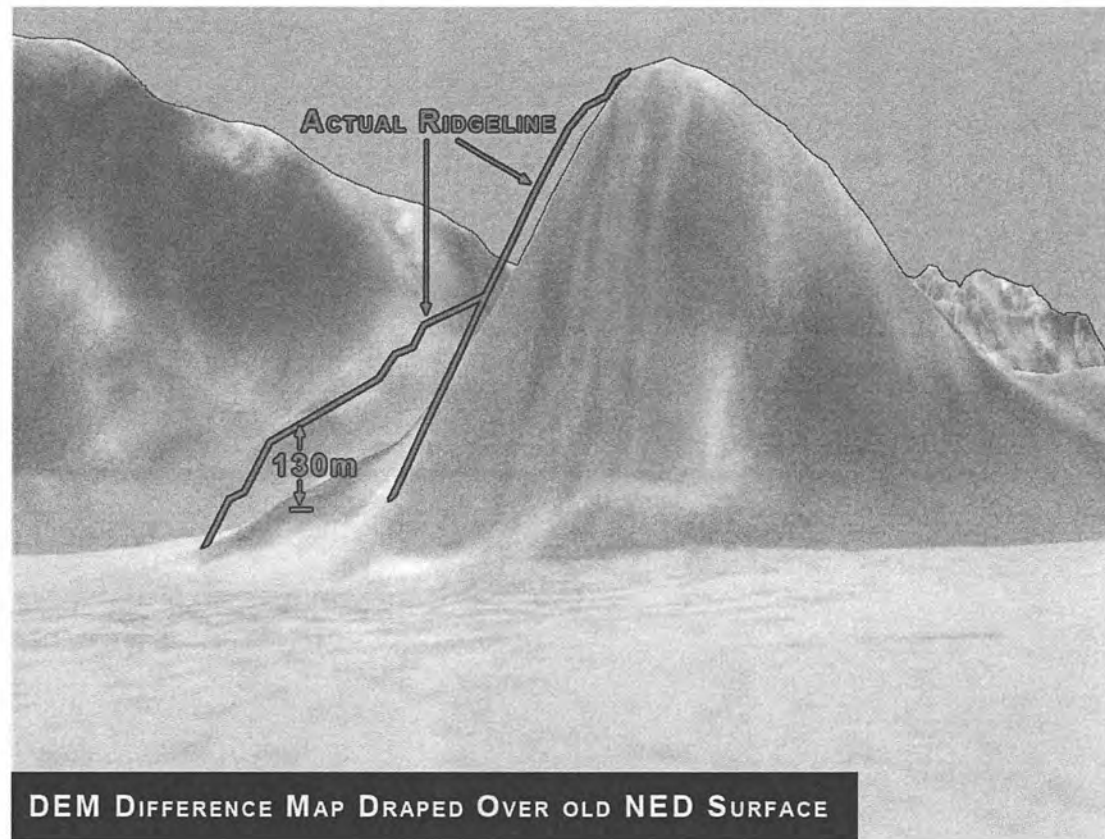
AVIATION SAFETY

Great Gorge – Denali, 750m



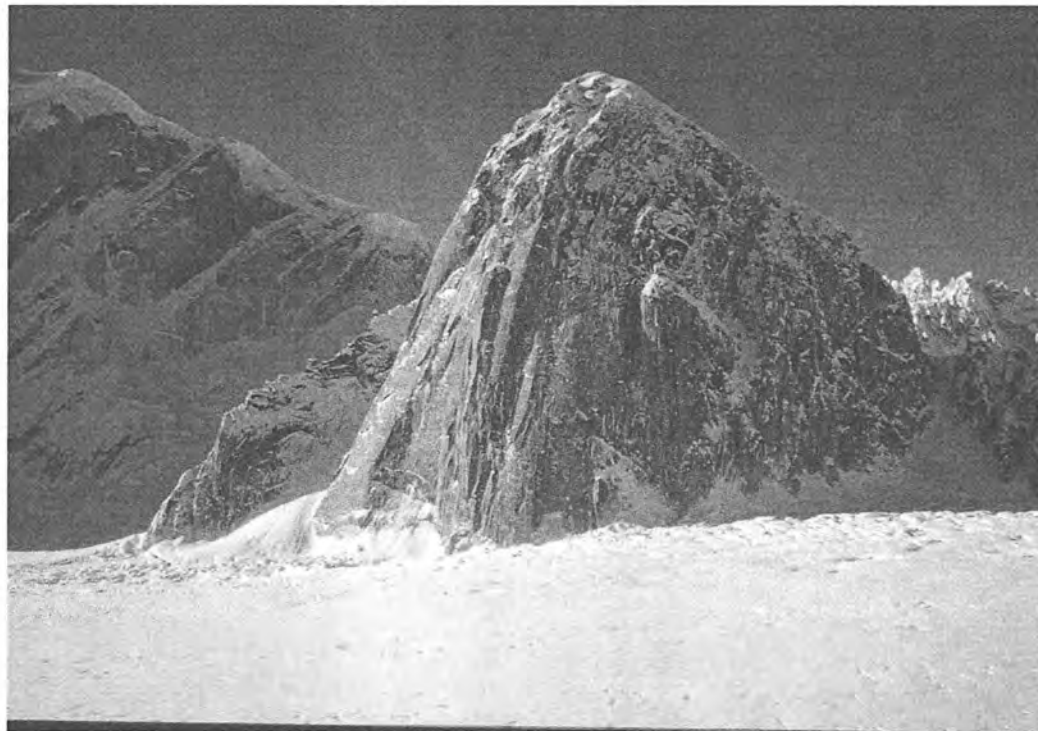
MOUNT DICKEY - DENALI

DEM / IFSAR
Difference
Mount Dickey,
Denali National
Park



MOUNT DICKEY

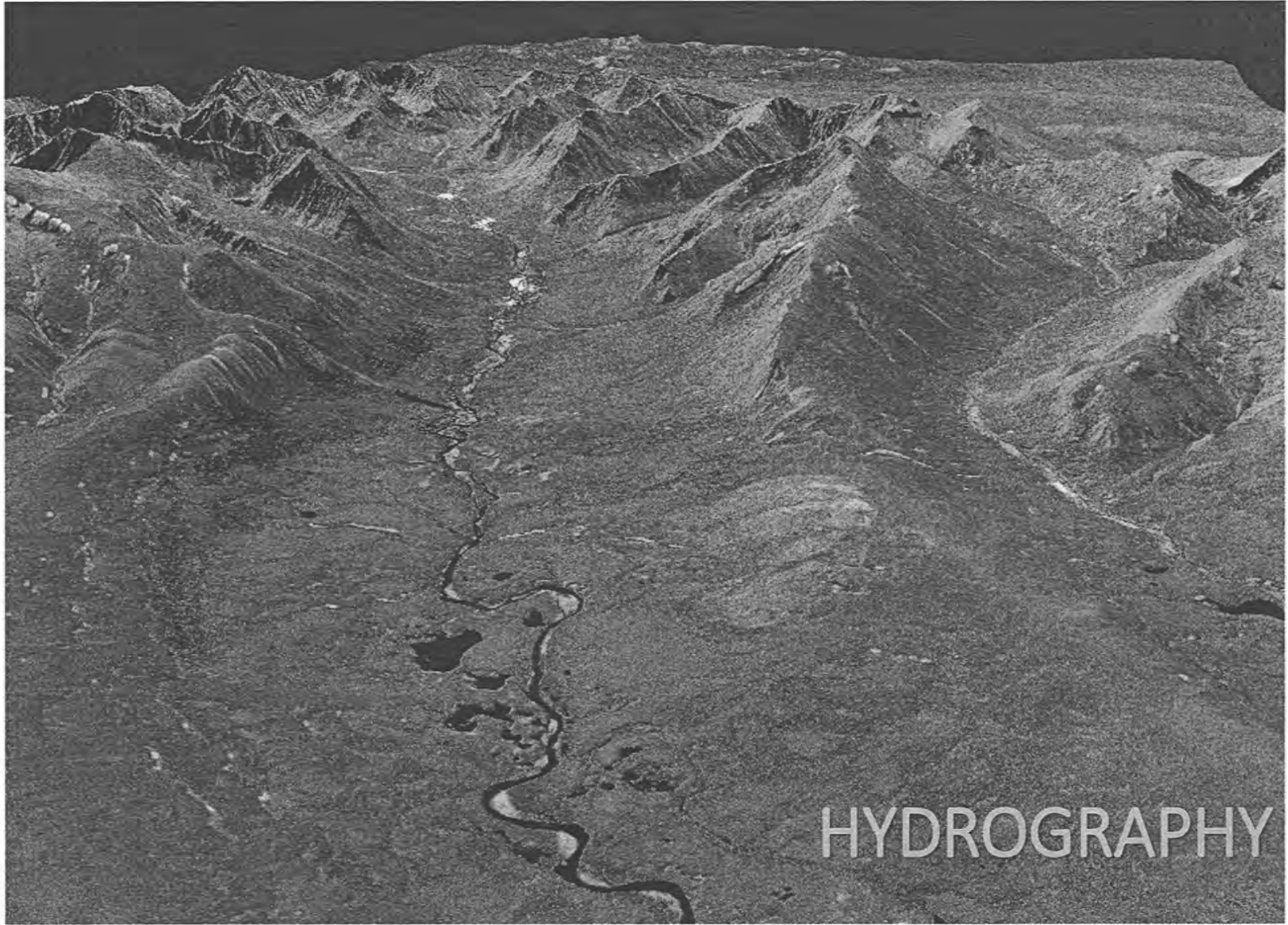
Aerial photo
of Mount
Dickey in the
Ampetheater,
Denali
National Park



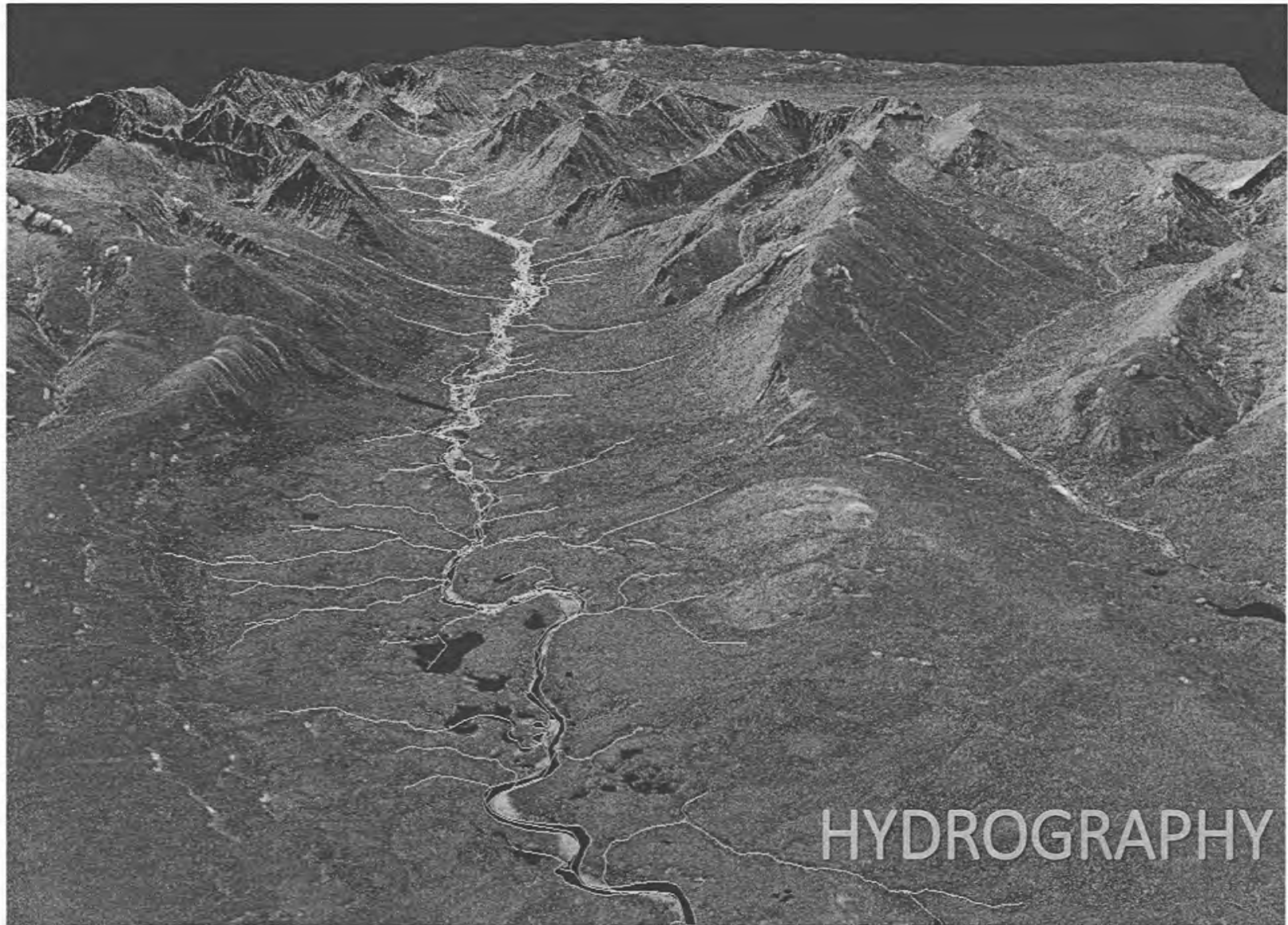
WHAT CAN WE DO WITH IT?

HOW WILL WE USE IT?

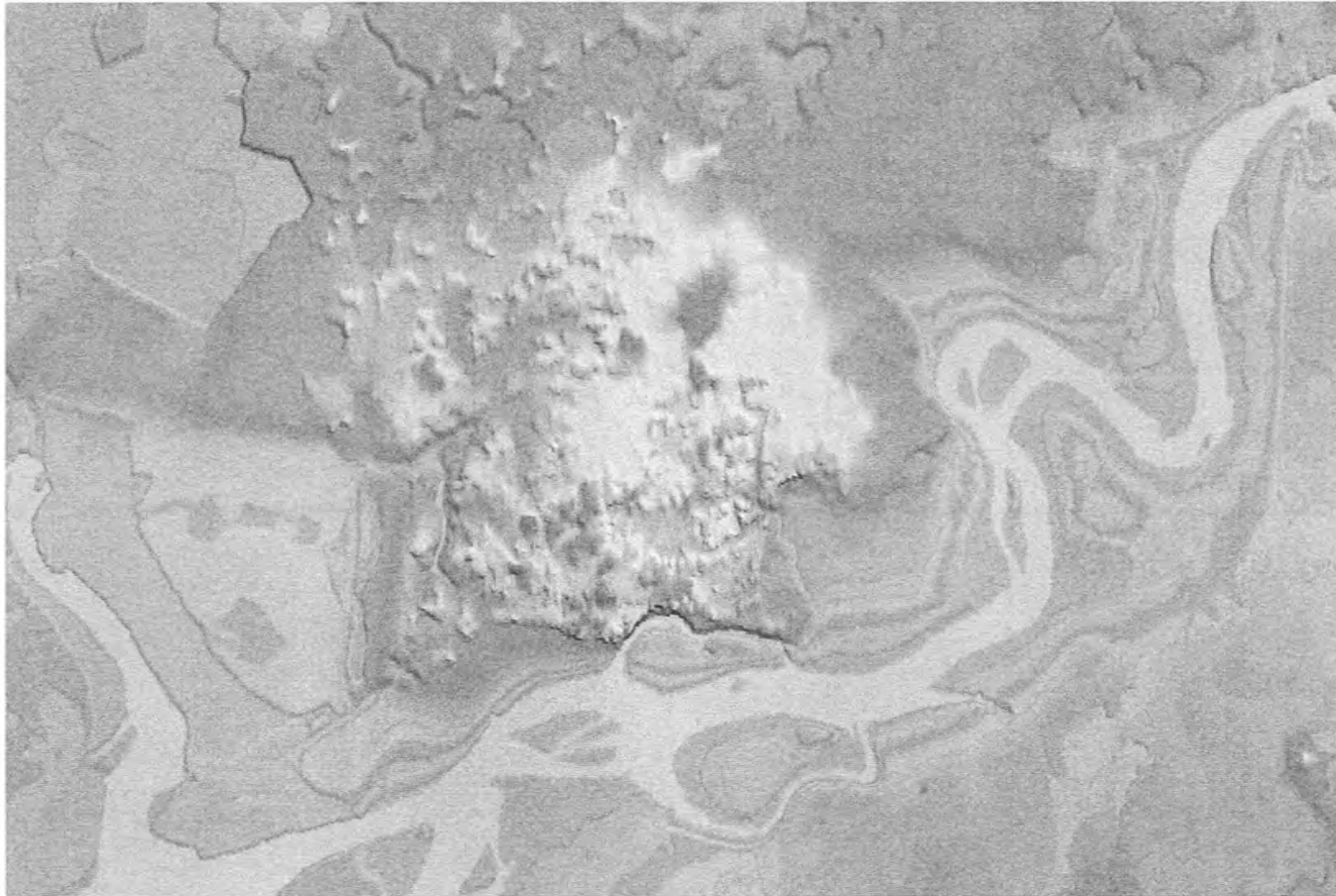




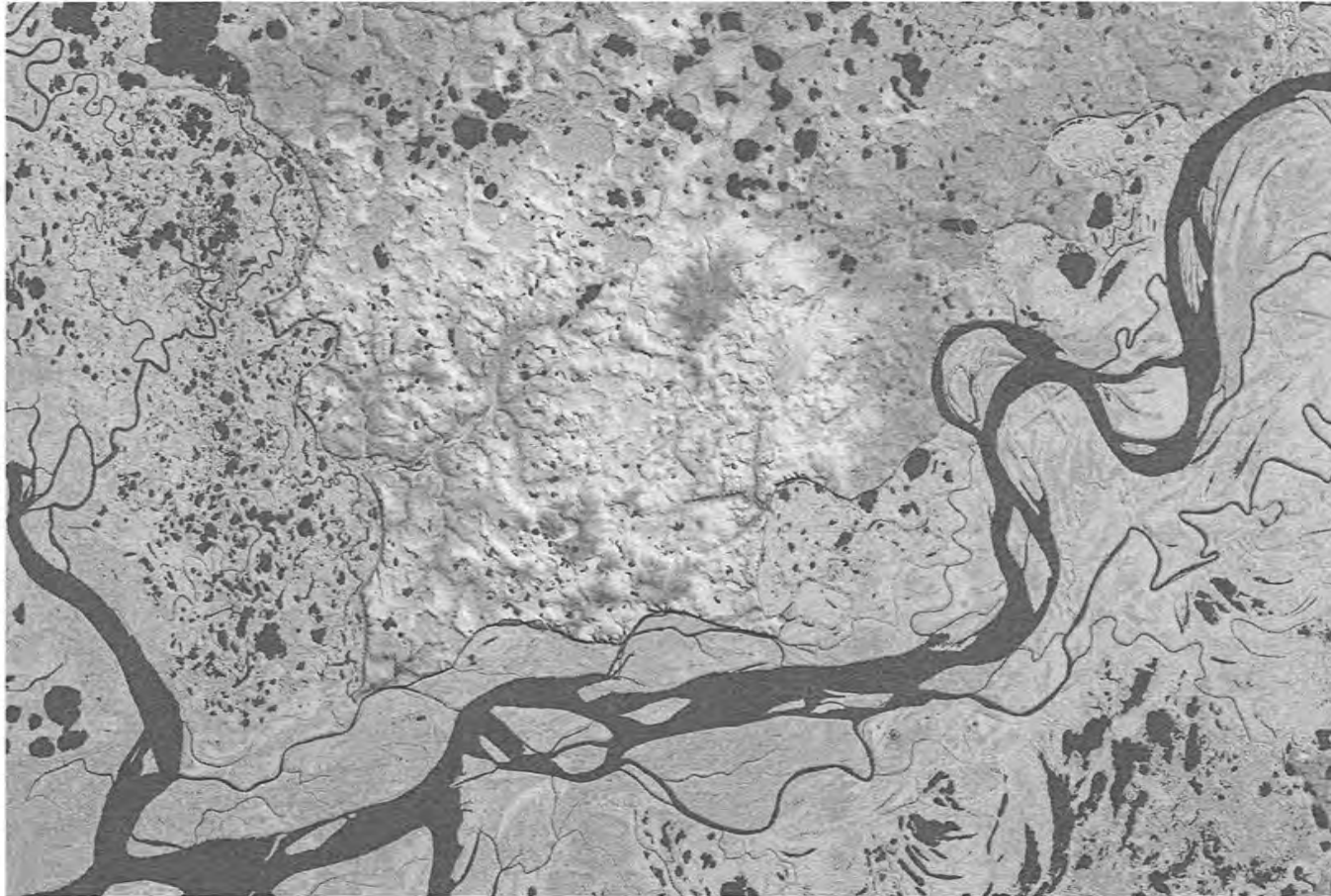
HYDROGRAPHY



Hydro – Old Legacy NED Data



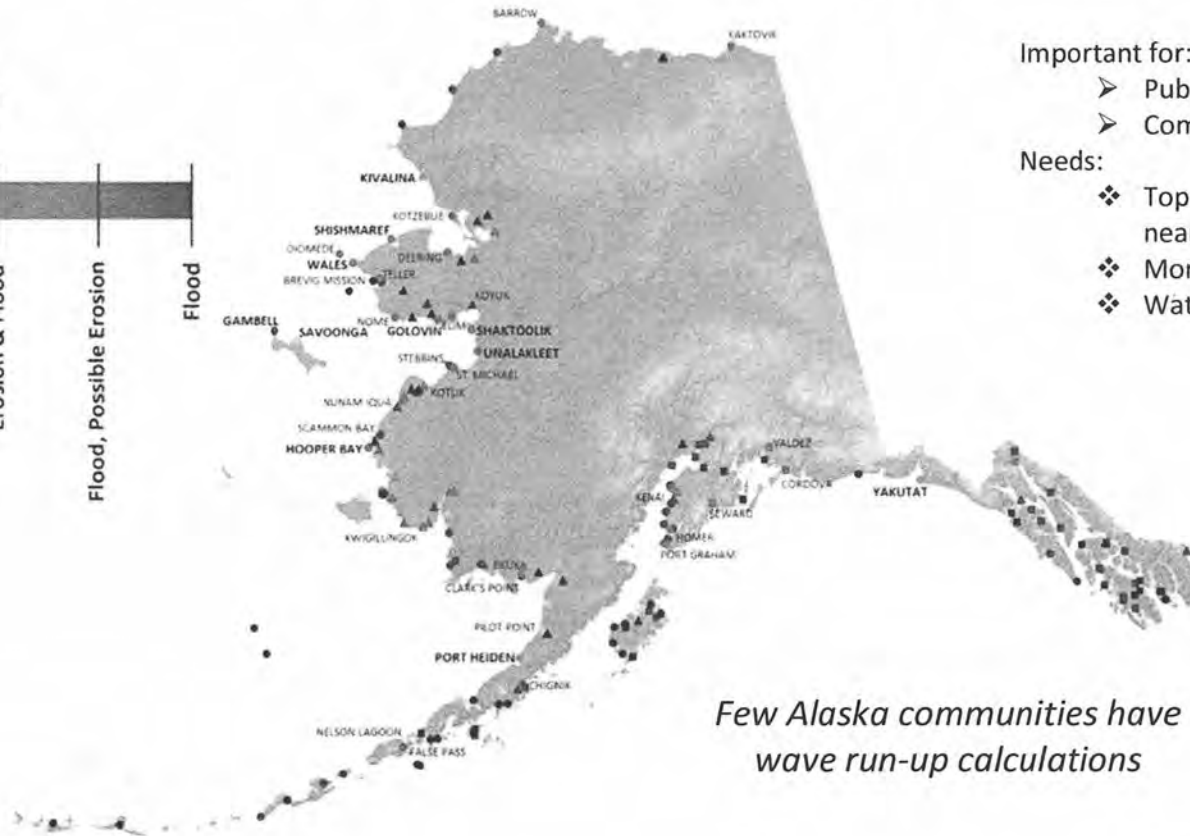
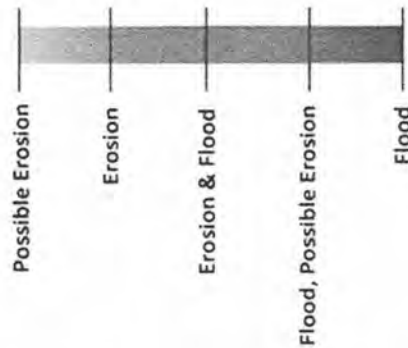
Hydro – New IFSAR Data



Storm Surge Analysis

Key

- Exposed Coast
- Sheltered Coast
- ▲ Riverine Coast



Important for:

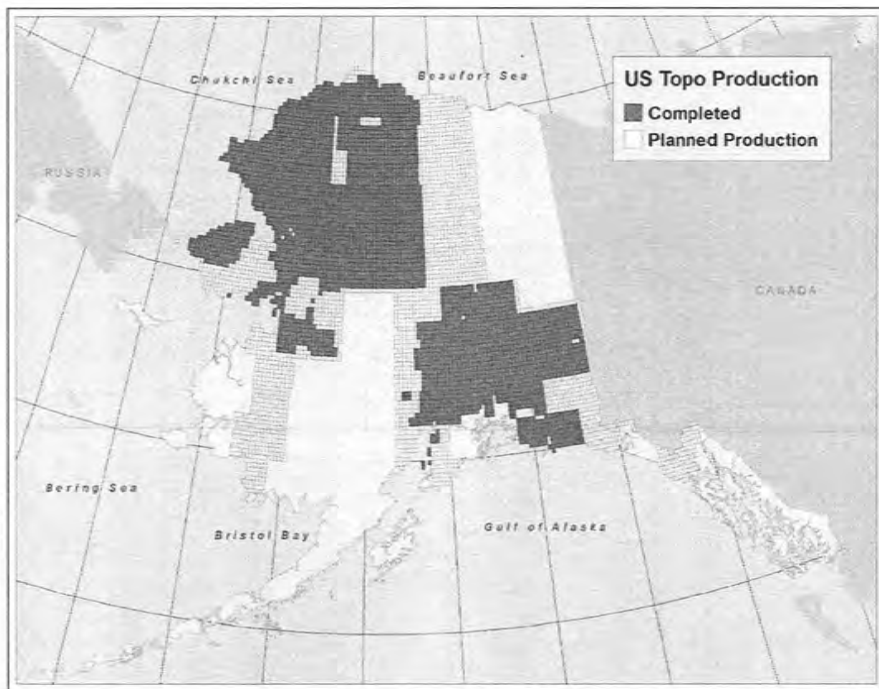
- Public safety
- Community resilience

Needs:

- ❖ Topobathy collections near communities
- ❖ More tidal gauges
- ❖ Water level network

Few Alaska communities have wave run-up calculations

Topographic Line and Base Mapping



Tsunami Inundation Studies

Status of Tsunami Inundation Mapping

- Completed
- In progress
- Needed

Important for:

- Public safety
- Safe evacuation routes
- Community resilience

Needs:

- ❖ Continued funding



Avalanches / Slope Analysis

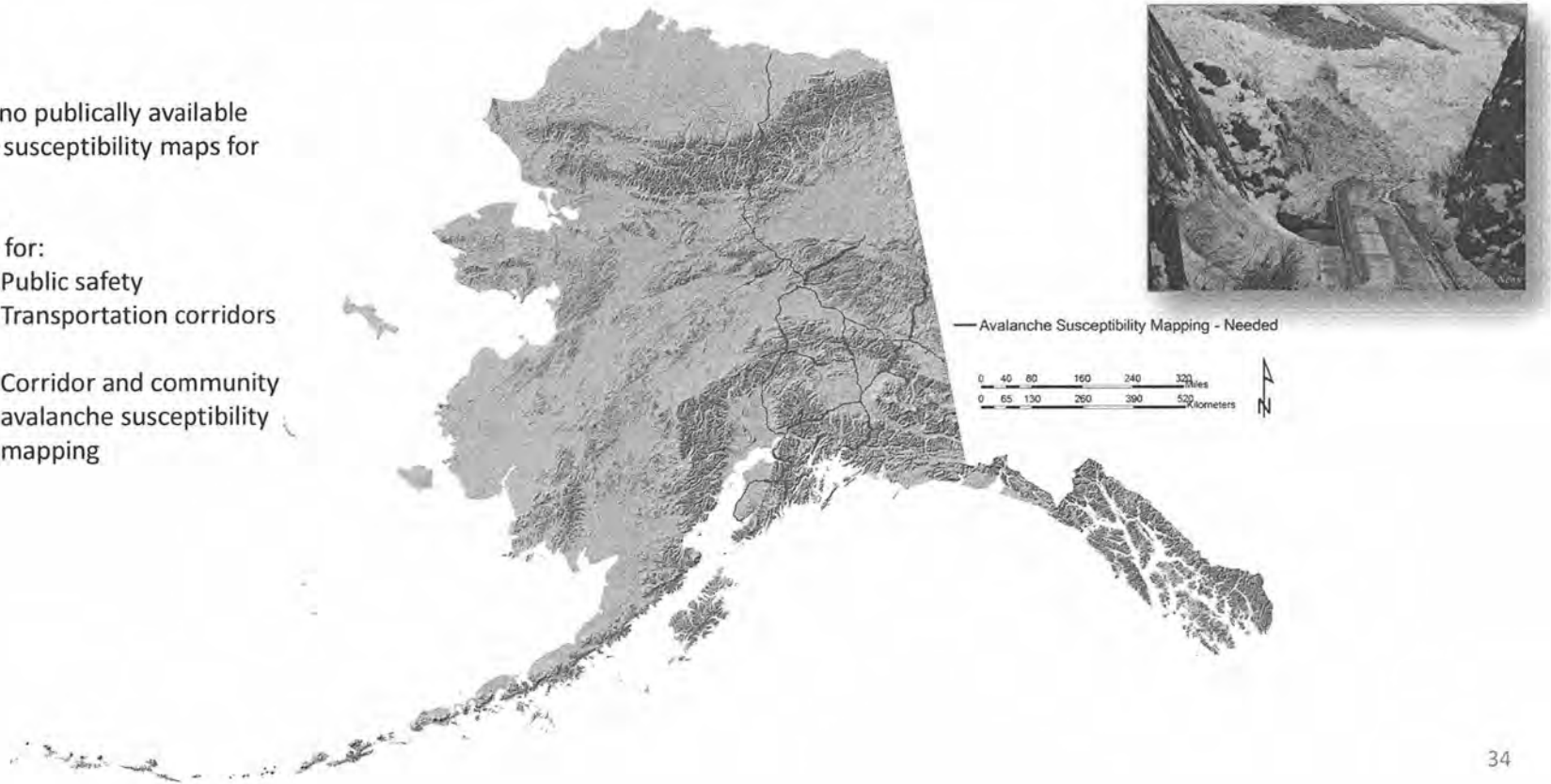
There are no publically available avalanche susceptibility maps for Alaska

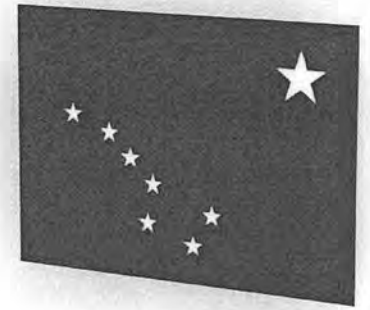
Important for:

- Public safety
- Transportation corridors

Needs:

- ❖ Corridor and community avalanche susceptibility mapping





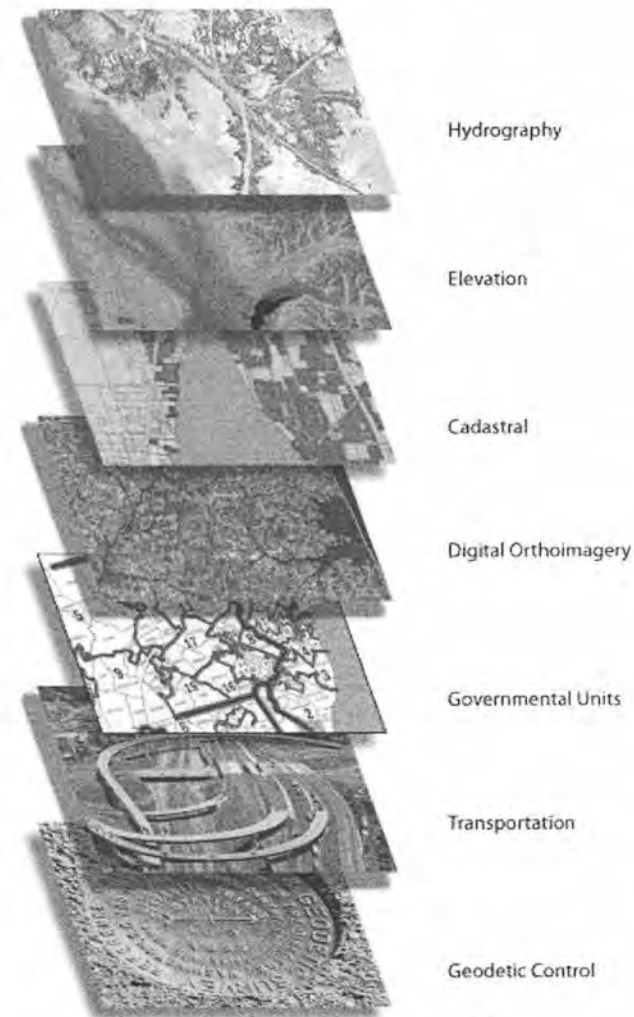
WHERE WE NEED TO GO

GEOSPATIAL SUPPORTS INFORMED PUBLIC POLICY

Statewide mapping

Framework data

Framework Themes



Data Acquisition Accomplishments

Winter 2016

| Theme | Metric | Status |
|---------------------------|---|---------------------------|
| Elevation | % IfSAR acquired | 77% complete |
| Imagery | % coverage within 5 yrs | 72% current |
| Hydrography | % updated to 1:24k National Hydrography Dataset standards | 15% updates complete |
| Wetlands | % updated to 1:24k National Wetlands Inventory standards | Unknown |
| Transportation | % road network complete | 100% complete |
| Administrative Boundaries | % boundaries updated to 1:24k map accuracy | Unknown |
| Cadastral | % cadastral complete | Unknown |
| Geodetic Control | % area within 250km of 3 CORS | 74% coverage; 47% at risk |
| GRAV-D | % GRAV-D acquired | 50% complete |
| Coastal Mapping | % AK shoreline updated | 43% complete |
| Bathymetric Mapping | % submerged lands mapped | Unknown |



Thank You To All Of Our Partners

Collaboration = Doing together what no one can do alone.

A rising tide lifts all boats



John Wesley Powell

2nd Director, US Geological Survey

1881 – 1894 13 years



“A Government cannot do any scientific work of more value to the people at large than by causing the construction of proper topographic maps of the country.”



The Alaska Mapping Initiative

Past Successes and Future Prospects

Kevin Gallagher
USGS Associate Director
February 8, 2017

Alaska Mapping History - Beginnings

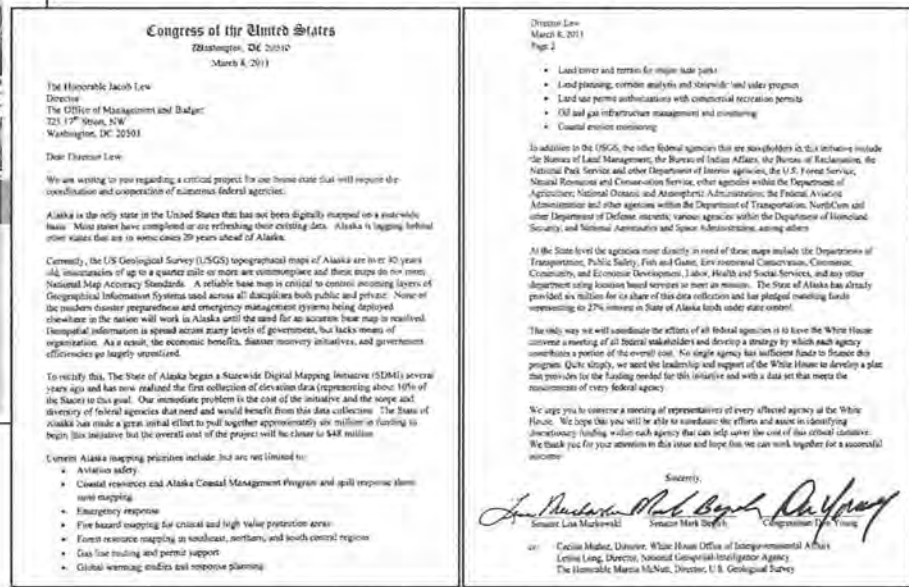
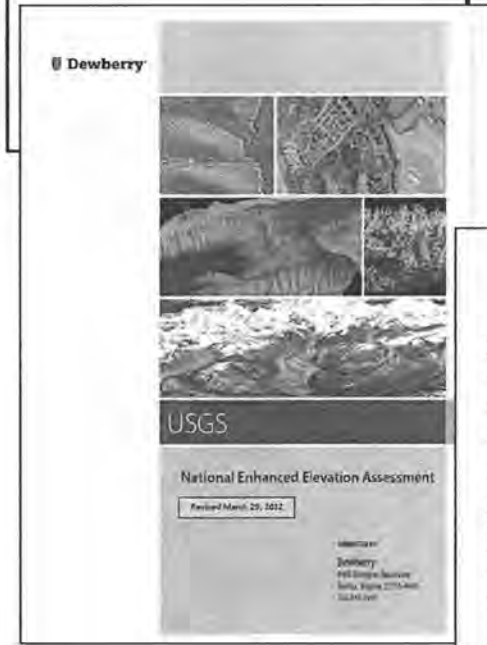


Alaska Digital Elevation Model Funding and Implementation Plan, May 2009, Dewberry

- Stressed the need for new elevation data for Alaska .
- Airborne radar data (IfSAR), was selected as the best possible technology to produce accurate and consistent 5-meter DEMs statewide for Alaska.

National Enhanced Elevation Assessment, March 2012, USGS/Dewberry

- Drew similar conclusions to the 2009 Alaska DEM study, supporting the requirement for IfSAR as the optimum cost/benefit solution.
- The 3D Elevation Program (3DEP) was developed in response to the NEEA study, and actively supports and tracks the acquisition of 5-meter IfSAR data for Alaska as a priority objective.
- Benefits of statewide Alaska IfSAR are conservatively estimated in the NEEA report at over \$19M annually.



The 2011 letter from the US Congressional Delegation from Alaska to the Office of Management and Budget set in motion the activities that would address Alaska's mapping needs.

Alaska Mapping History – Formation of the Alaska Mapping Executive Committee (AMEC)

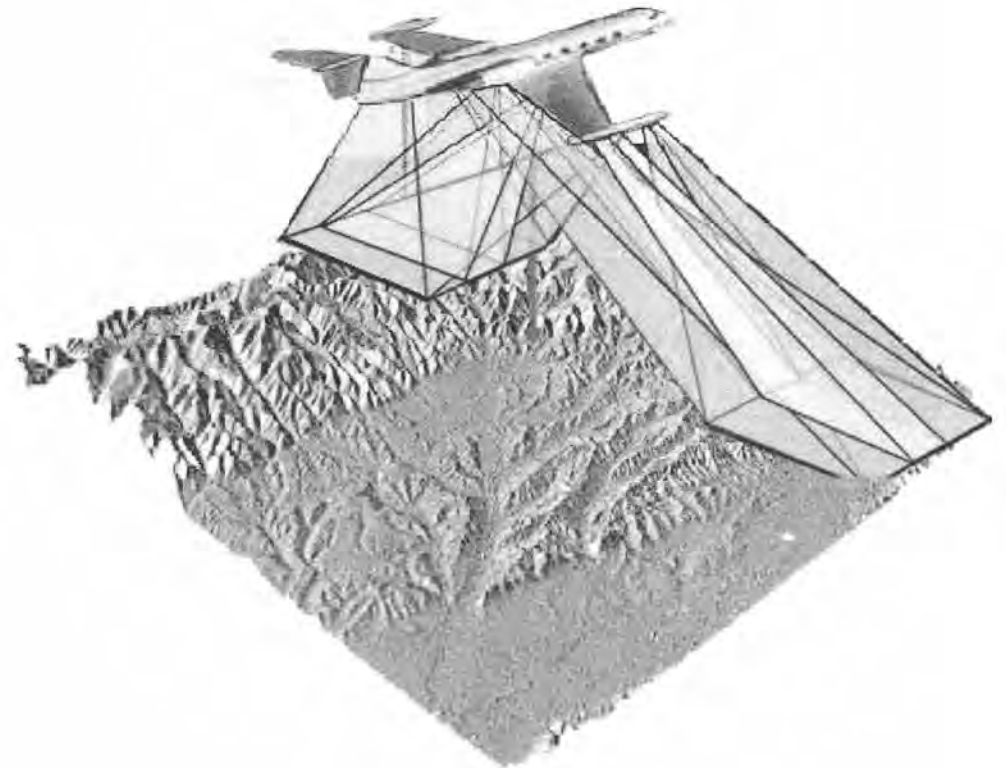
- In June of 2012, the Alaska Mapping Roundtable was held in Washington, D.C., where Executives from the State and over 20 Federal agencies, bureaus, and departments met to promote Alaska mapping .
- The Roundtable led to the formation of the Alaska Mapping Executive Committee (AMEC).
- AMEC executive representatives have met at least twice annually since November 2012, coordinating major Alaska mapping objectives.



Alaska Is Being Mapped With IfSAR

Airborne radar technology called IfSAR, short for *Interferometric Synthetic Aperture Radar*, is being used to collect 5-meter resolution elevation data for Alaska almost statewide.

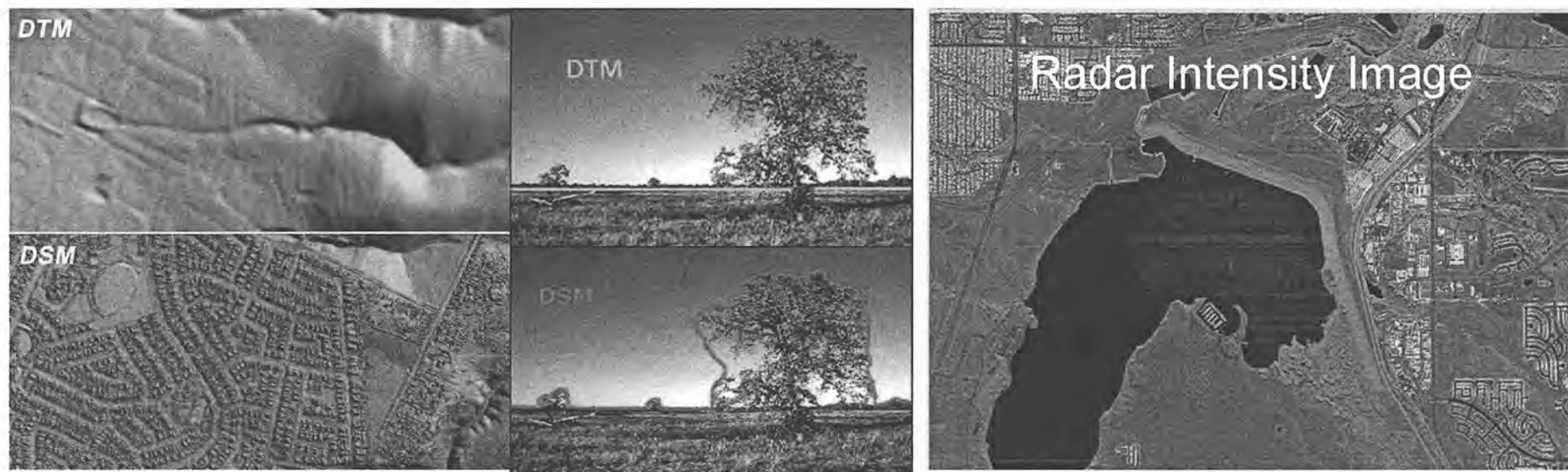
Radar penetrates clouds, smoke, and haze. Alaska IfSAR is collected at the height of summer to avoid non-perennial snow.



USGS Alaska Mapping Objectives

PRIORITY 1: Complete Statewide IfSAR Coverage

- IfSAR provides three required deliverables:
 - Digital Terrain Model (DTM) – 5-meter bare earth elevation grid.
 - Digital Surface Model (DSM) – 5-meter ‘first return’ or ‘tops of trees and buildings’ grid.
 - Radar Intensity Image - 0.62 cm resolution pseudo image used in many applications to augment color imagery.



USGS Alaska Mapping Objectives

PRIORITY 1: Complete Statewide IfSAR Coverage

USGS and the AMEC partner members are committed to completing IfSAR for the main body of Alaska because it meets the requirements listed in the 2009 Dewberry study.

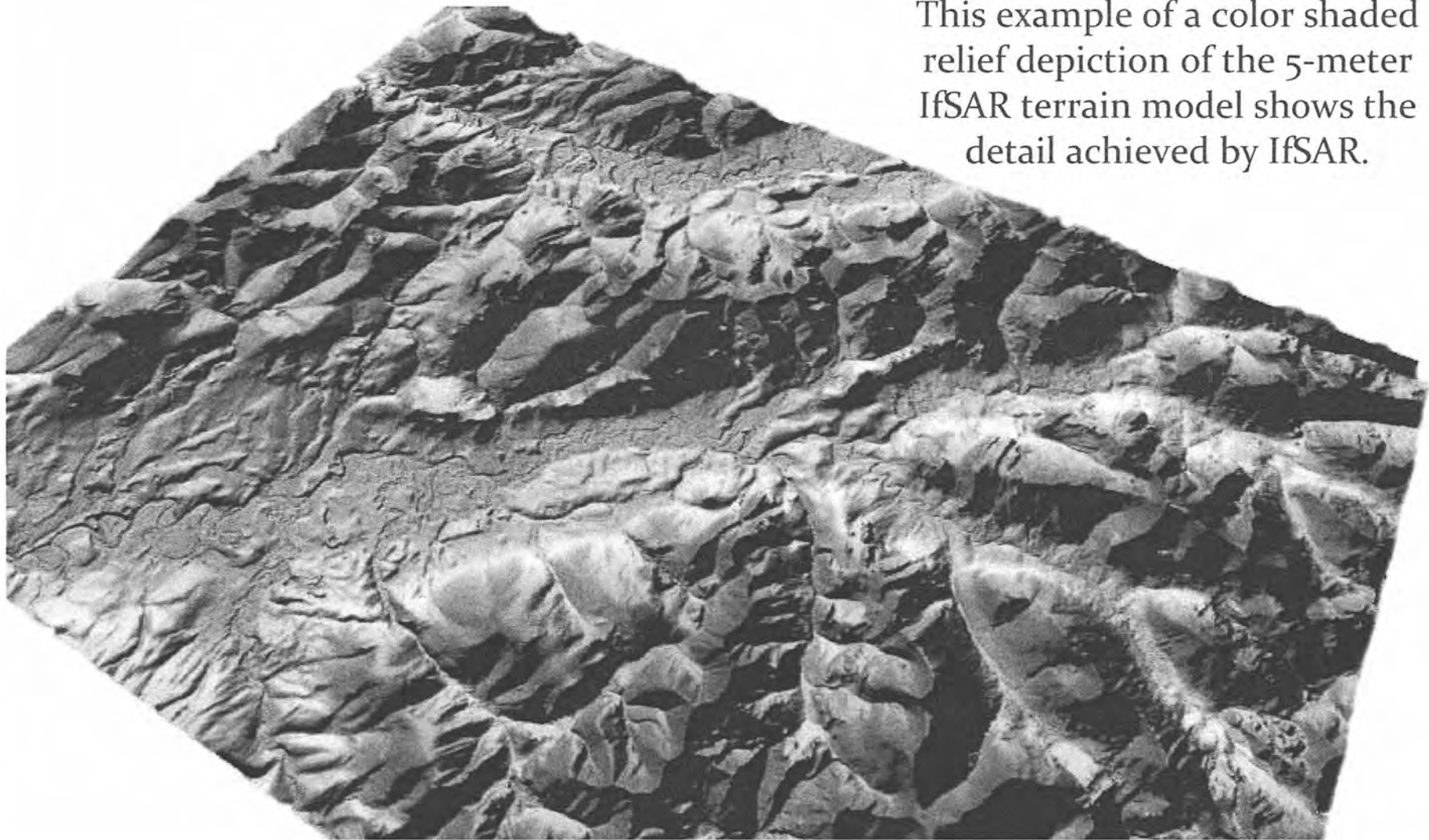
- 5-meter resolution IfSAR replaces 60-meter legacy elevation grid.
- IfSAR collection under the USGS contract occurs only during summer 'snow off' season to get to true ground.
- IfSAR penetrates clouds and smoke, limiting data voids.
- IfSAR is highly processed after initial collection to ensure topographic integrity.

IfSAR APPLICATIONS

- Emergency Response
- Aviation Safety
- Minerals Assessment
- Seismic Risk Analysis
- Wildlife Management
- Infrastructure
- Terrain Mapping

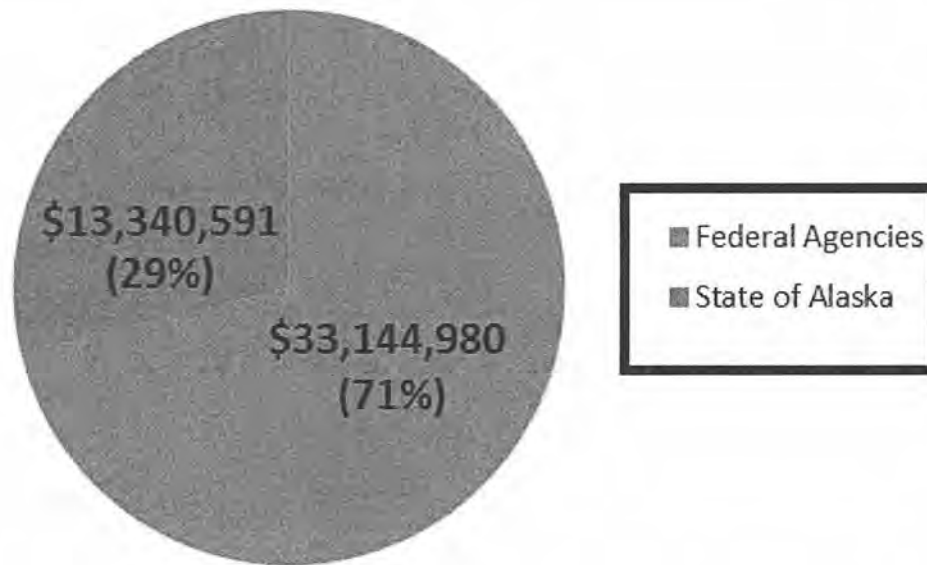
IfSAR Example – 5m DEM

Cutler River, Noatak National Preserve



This example of a color shaded relief depiction of the 5-meter IfSAR terrain model shows the detail achieved by IfSAR.

IfSAR Funds Contributed FY2010-FY2016



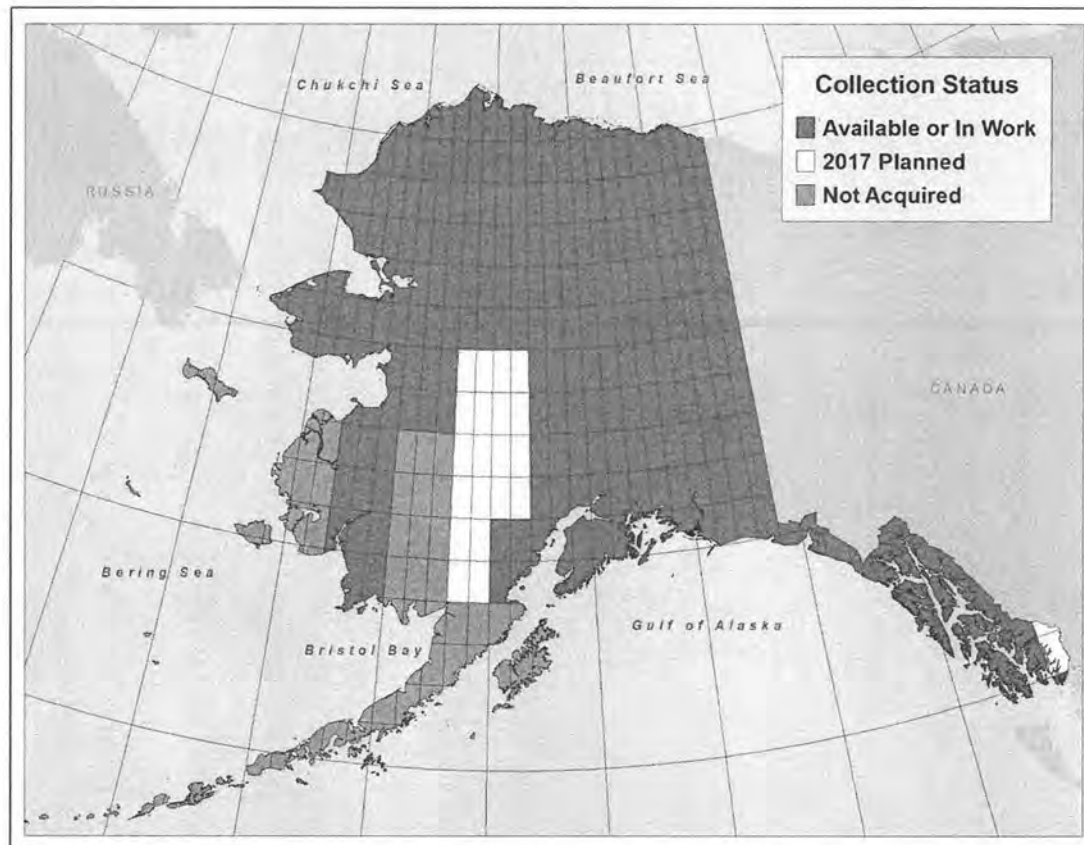
Current contribution mix is close to the 66/33 ratio sought at project outset.

IfSAR and Alaska Economic Growth

- Over \$33M Federal dollars have been spent acquiring IfSAR over the past seven years.
- These funds support many local Alaska businesses and individuals that are employed directly during data collection and processing phases.
- Commercial industry benefits from revenue associated with Post-acquisition data analysis and distribution.

Alaska IfSAR Status and 2017 Plan

- 77%: Percent of Alaska IfSAR that is complete or in work.
- 47,000 square miles: estimated 2017 collection over SE and Central Alaska.
- 82%: estimated total IfSAR coverage at end of 2017.
- \$14M: estimated amount to complete remaining 23% of Alaska IfSAR.
- Alternative technologies are being considered for coverage over the Aleutian Islands and other remote areas, where collection of IfSAR is cost prohibitive

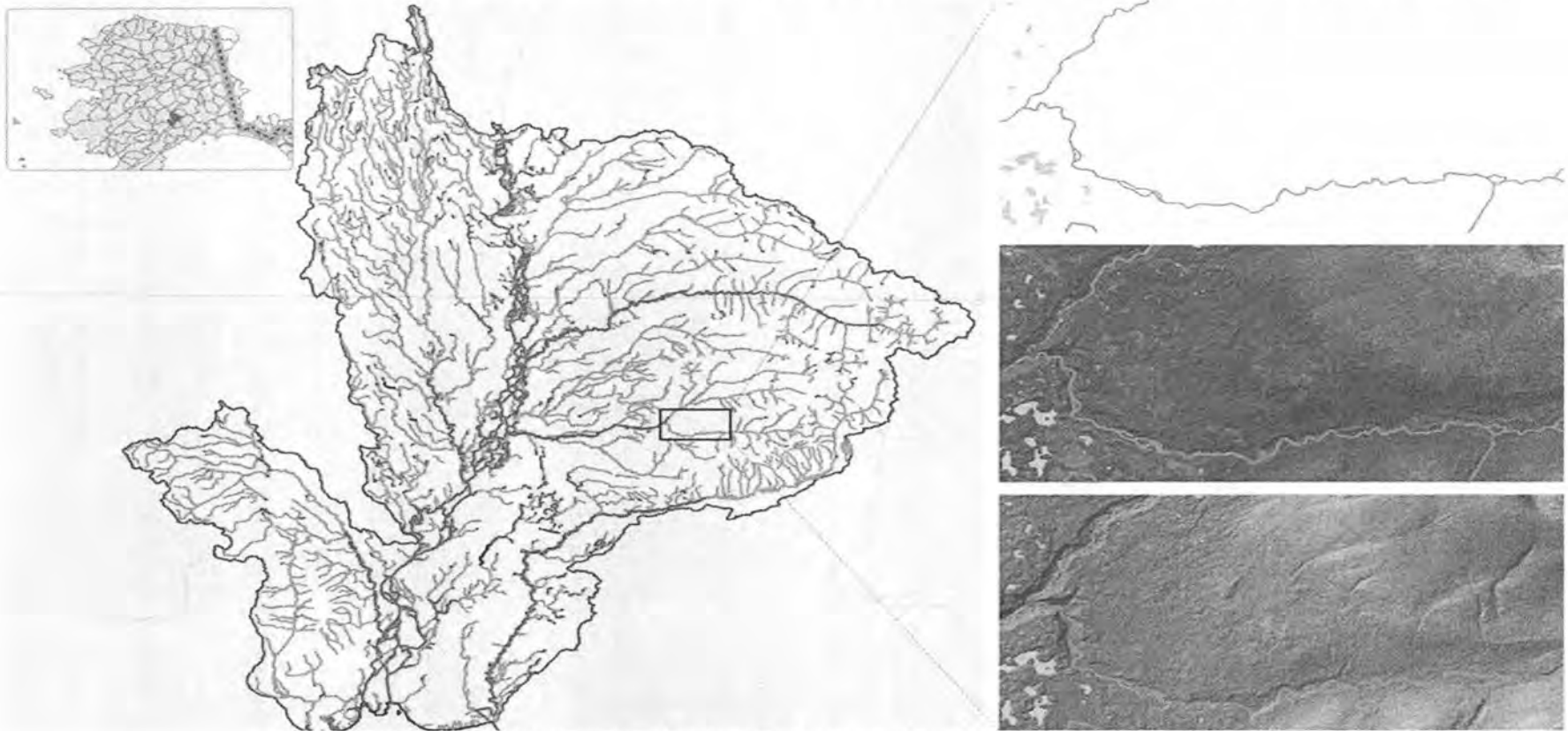


USGS Alaska Mapping Objectives

10

PRIORITY 2: Update Alaska Hydrography Dataset to meet modern mapping specifications

The initial National Hydrography Dataset (NHD) for Alaska was compiled from decades-old data at a moderate scale



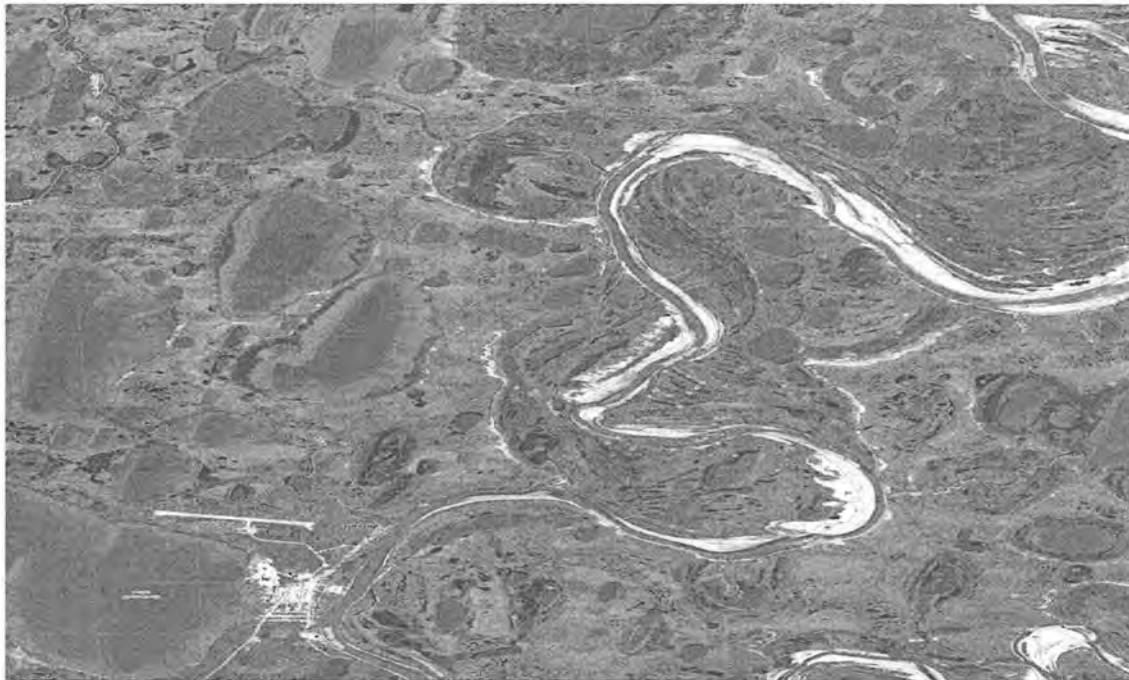
National Hydrography Dataset, Lower Susitna Subbasin

USGS Alaska Mapping Objectives

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PRIORITY 2: Update Alaska Hydrography Dataset to meet 1:24,000-scale mapping specifications

- 15% of Alaska hydrography has been updated since 2010.
- The estimated cost to update the remaining 85% is \$8.5M.
- The recent USGS-sponsored Hydrography Requirements and Benefits Study conservatively estimates that an updated hydrography dataset for Alaska would provide an annual benefit of at least \$17.9M.

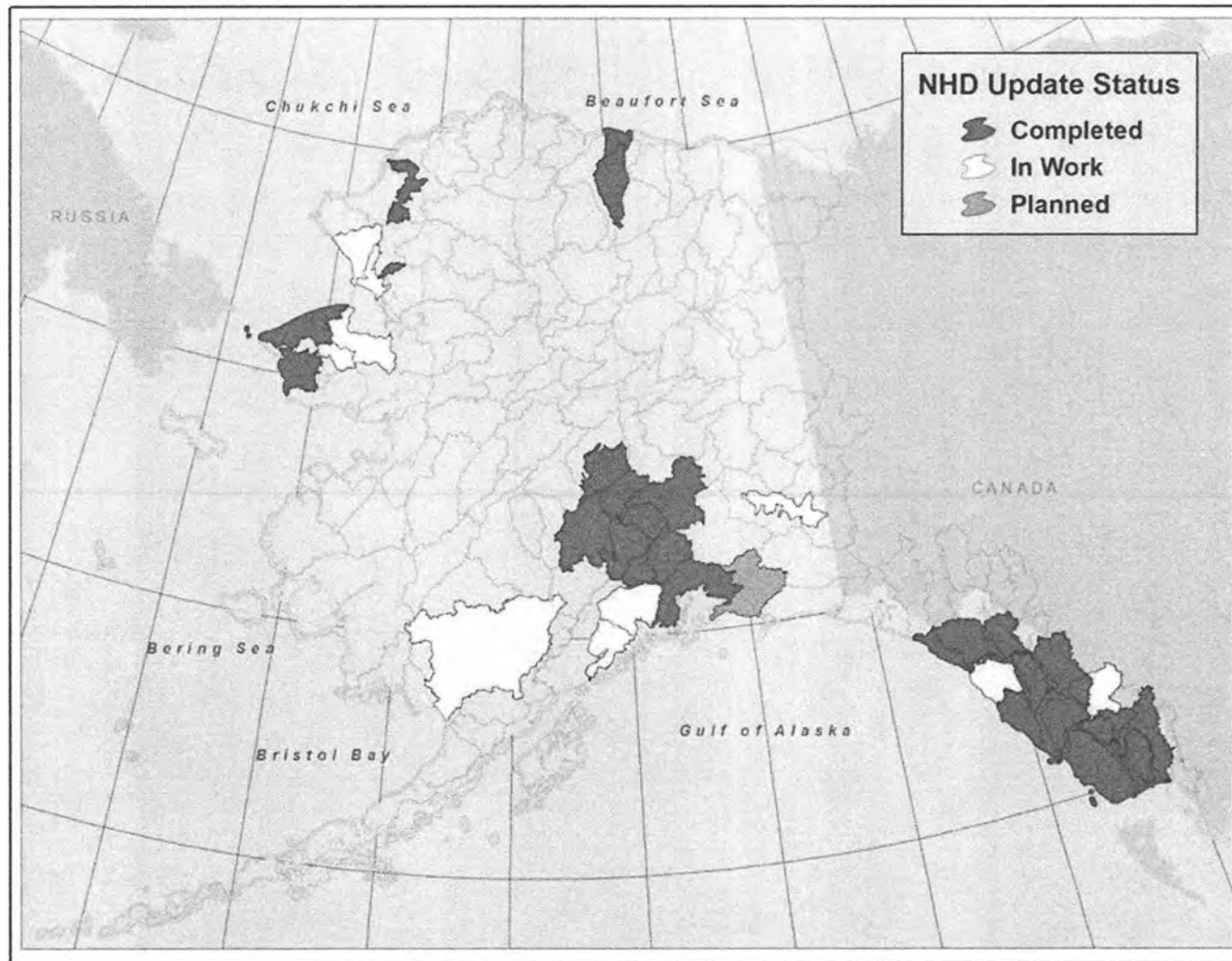


HYDROGRAPHY APPLICATIONS

Fishery Management
Water Quality
Flood Mitigation
Agriculture
Cartography
Pollution Control
Groundwater Analysis

Alaska Hydrography Status and 2017 Plan

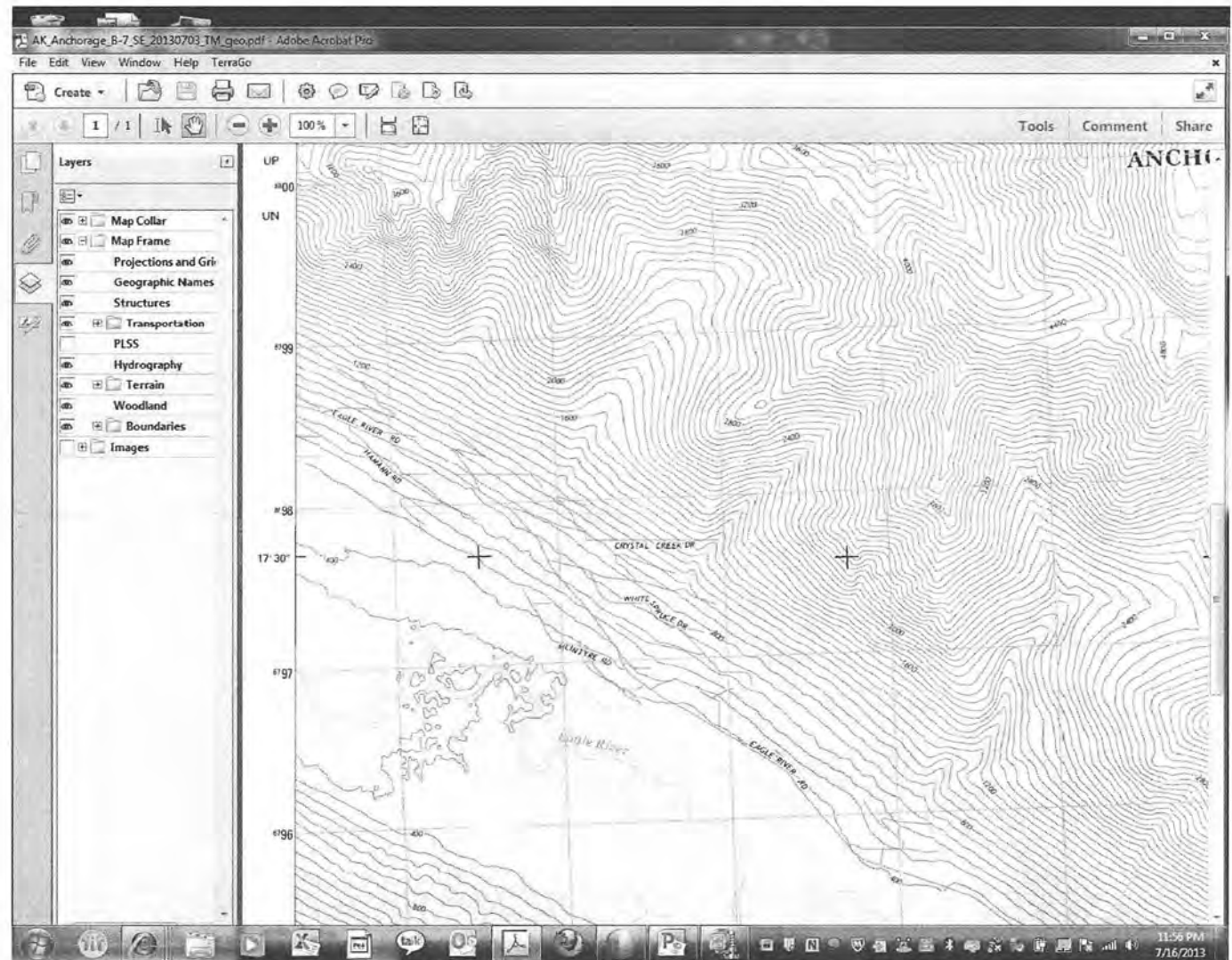
Hydrography will be updated for more than 52,000 square miles in Alaska in 2017



USGS Alaska Mapping Objectives

PRIORITY 3: Create a new series of Alaska topographic maps

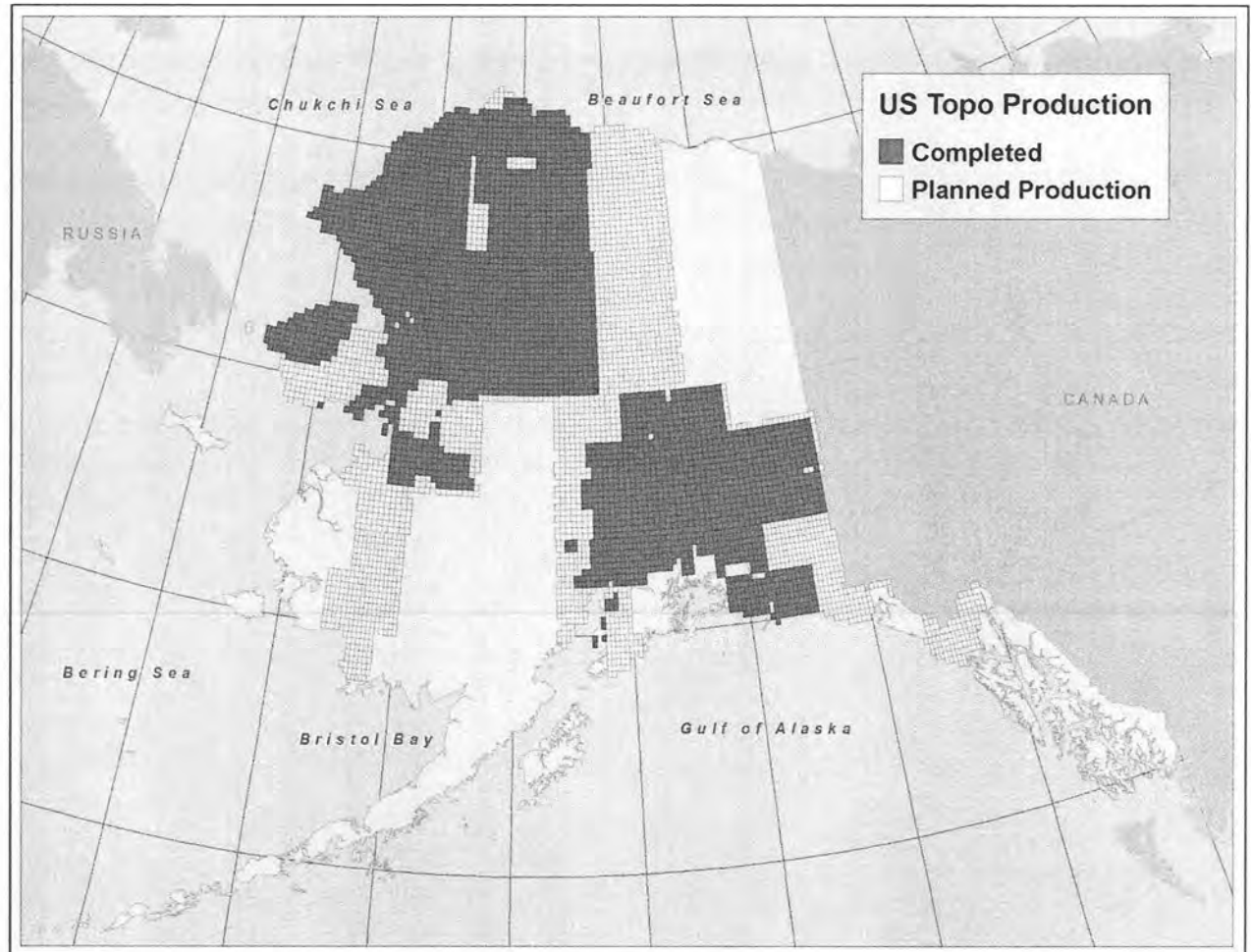
Replace the decades old moderate-scale paper maps with updated landscape-scale digital maps statewide using updated source information.



US Topo Map Production Status

14

- 11,275 new Alaska maps will be published at 1:25,000 scale
- 3731 new maps were published from 2013-2016
- 3038 new maps are scheduled for 2017 production
- By October 2017, 60% of the State will have updated topographic maps



Alaska Mapping: A significant achievement, with more work ahead

15

- USGS will focus its efforts on completing IfSAR, NHD editing, and US Topo map generation for Alaska over the next three years.
- AMEC is also considering future Alaska mapping needs. Examples include geologic mapping, permafrost mapping, bathymetry mapping, lidar acquisitions (very high resolution elevation data), and a statewide imagery update.

Thank you!

