



**Geographic Information  
Network of Alaska**

[www.gina.alaska.edu](http://www.gina.alaska.edu)

# **Alaska Statewide Digital Mapping Initiative (SDMI)**

## **Ortho and DEM project status**

**JACIE**

April 18th, 2012

[www.gina.alaska.edu](http://www.gina.alaska.edu) | [www.alaskamapped.org](http://www.alaskamapped.org)

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907-474-6182

# **first a detour**

quick GINA overview

I've only got 100 slides to get through



**Geographic Information**  
**Network of Alaska**

[www.gina.alaska.edu](http://www.gina.alaska.edu)



UNIVERSITY OF  
ALASKA  
FAIRBANKS

# **12 staff**

Jess, Scott, Will, Jason, Jiang, Sarah

Cheryl, Tom, Pete, Greg, Jay

Dayne

**~2 million / year**

80% soft money



# Direct reception

Suomi NPP, Terra,

Aqua, *AVHRR*



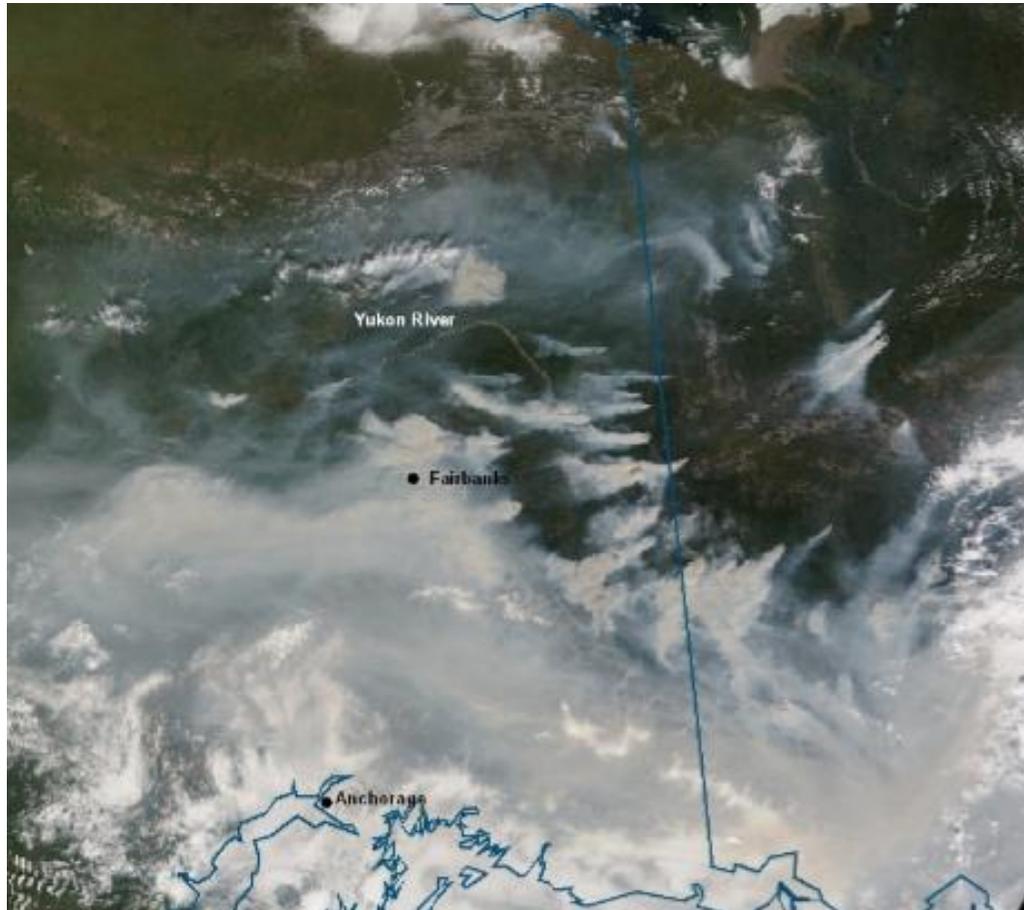
# **Strong NOAA partnership**

GOES-R proving ground member

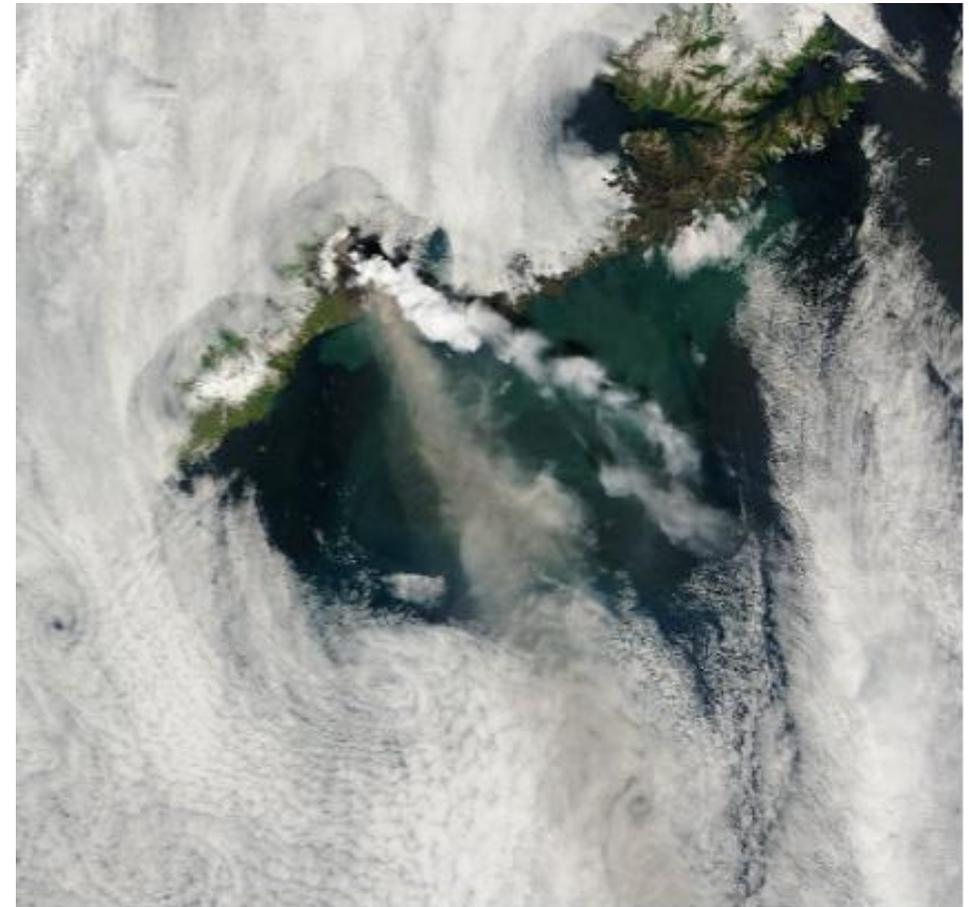
Mitch (JPSS) funded our upgrade for NPP

work closely with NOAA FCDAS

# Real-time, Operational Products



Fires - smoke



Volcanos - Ash



# North Slope Science Catalog

Data Products & Project Tracking

- Catalog
- News
- Help
- Realtime Data
- Contact Us
- NSSI
- Sign In
- Logout

polar bear

Clear Filters
Filter By
Sort
Export

### Search Results

**Demographics and behavior of polar b...**  
 Type: Project Source: Status:  
 Location: No

**Polar Bear Den Habitat Model (Project ...**  
 This model will ultimately integrate snow physics, high-resolution digital terrain models, and bear biology to produce more refined and accurate maps predicting suitable polar bear den habitat than are...  
 Type: Project Source: Status:  
 Location: Yes

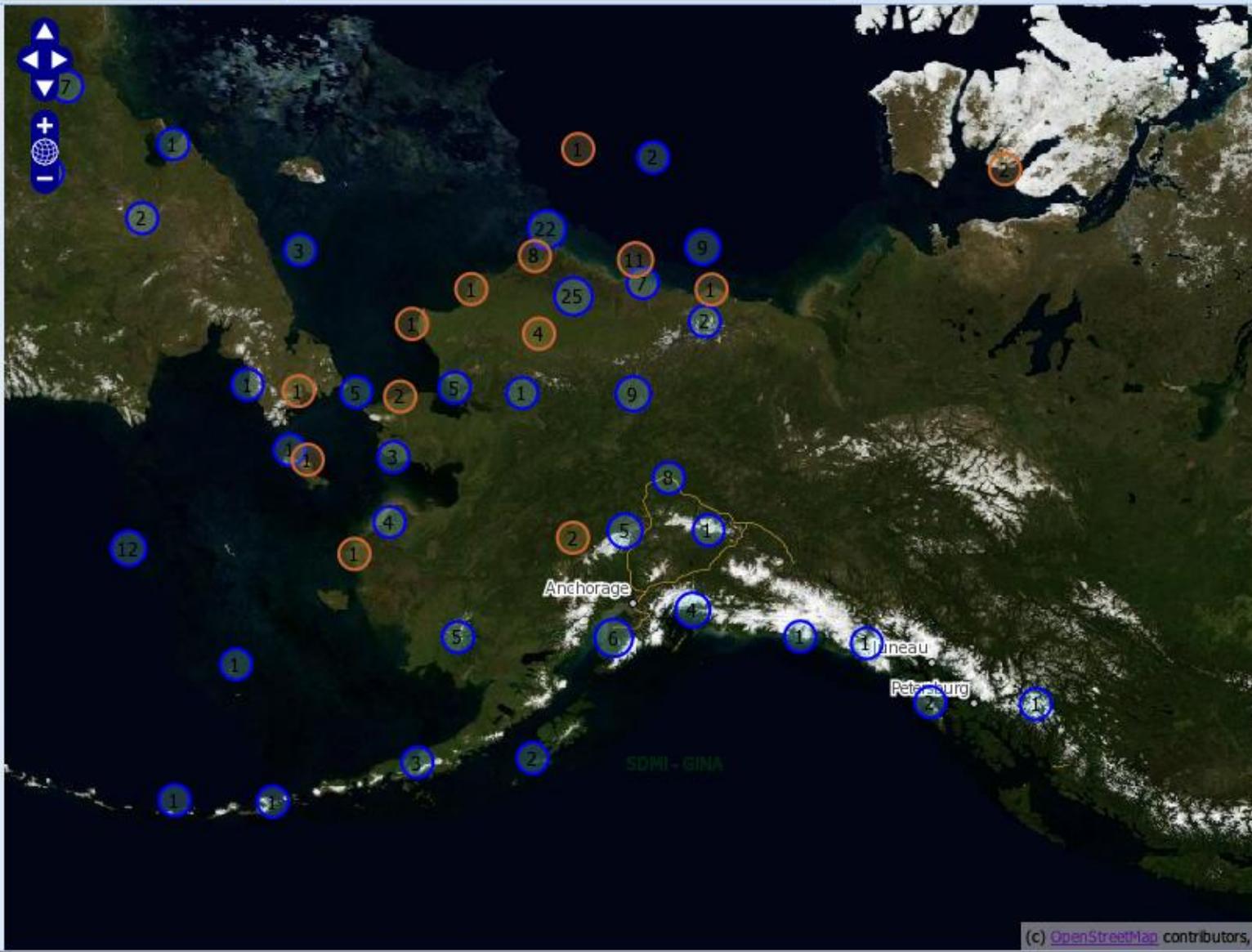
**Denning Locations of Polar Bears Near ...**  
 Use aircraft mounted FLIR for the detection of polar bear maternal dens....  
 Type: Project Source: Status:  
 Location: Yes

**Polar bear feeding ecology and bear-h...**  
 Develop a baseline of bear-human interaction data, and assist Kaktovik to develop a community-based polar bear awareness and bear-human interaction plan....  
 Type: Project Source: Status:  
 Location: No

Projects: 198 Data: 29 Results: 294

### Filters

Text: polar bear





ALASKA MAPPED



SDMI

Statewide Digital  
Mapping Initiative

# Alaska Statewide Digital Mapping Initiative

# SDMI



ALASKA MAPPED



# Established in 2006

Cooperative program endorsed by the Governor  
implemented by six state Departments and the  
University

# SDMI members

- University of Alaska (UA)
- Natural Resources (DNR)
- Military Veteran's Affairs (DMVA)
- Transportation and Public Facilities (DOTPF)
- Environmental Conservation (DEC)
- Fish and Game (DFG)
- Commerce Community and Economic Development (DCCED)



ALASKA MAPPED



# **Governed by Executive Team of senior managers from the agencies**

Informed by agency Technical Advisory Group  
made up of technical members from the agencies



ALASKA MAPPED



SDMI

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# Primary Goals

Acquire new and better maps for Alaska

Make existing map products more easily  
available



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# Statewide

SDMI seeks to make ongoing improvements to Alaska maps on a **broad, statewide scale.**

# Alaska mapping status

Alaska is the only state in the nation lacking current, accurate, high-resolution maps.

Shout out to Hawaii our historical partner in being excluded in National mapping activities



# ***Alaska statewide base-maps***

USGS DRGs - the 1950's to 1980's

*source for most of the NED in alaska*

NASA's AHAP (spy plane) 1978-1986

*not digitized, mosaiced, or orthoed*

NASA BlueMarble NG 2004



0 700 km





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## **2007 SDMI established**

Inventory data already purchased but not accessible to others.

Partnered with Feds to uplift datasets too restricted to be useful outside of the group or project.



**ALASKA MAPPED**

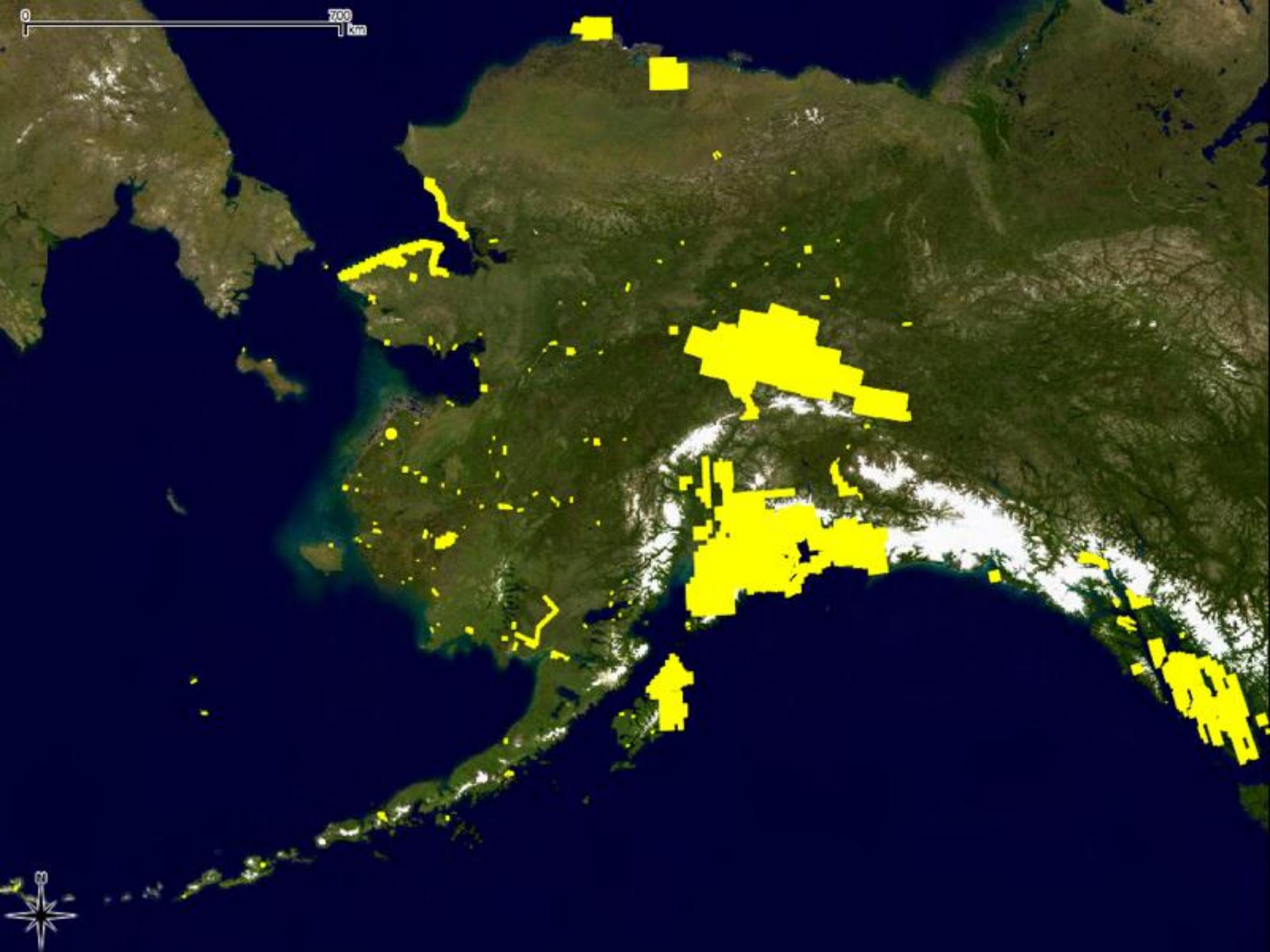


# **Create public archive**

Take the appropriately licensed data collected, archive it, and create an interface that lets users discover and download the data from the archive

**[browse.alaskamapped.org](http://browse.alaskamapped.org)**







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# Shout out to NRCS

Their DOQQ work was one of the biggest contributors to the archive and they were very helpful on the uplift front



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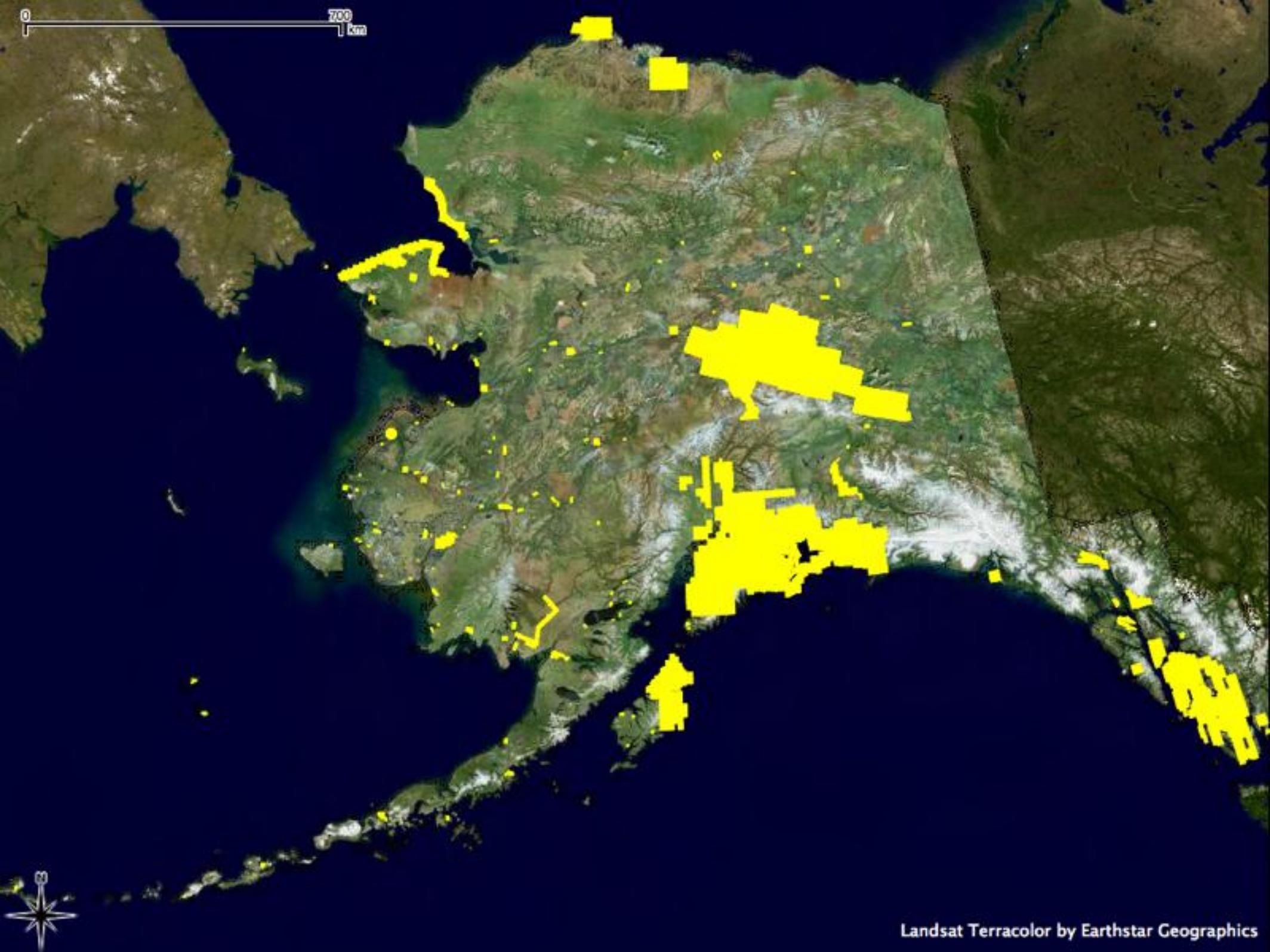
# Create a public basemap

BlueMarble NG + a newly licensed copy of the Landsat TerraColor 2007 gave us a start.

Then start layering on the high resolution archive.

0 700 km





0 700 km





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# elevation data too

USGS NED, ASTER GDEM v1 (and now v2), random LIDAR, IfSAR, SPOT HRS

Served as rasters via WMS and gridded data via WCS



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# SDMI BDL

Best *available* Data Layer  
*imagery base layer*



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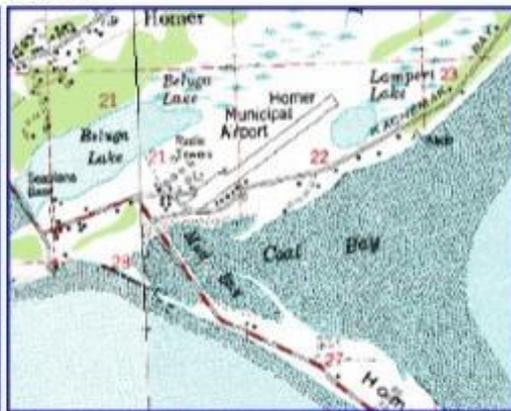
drg\_24k



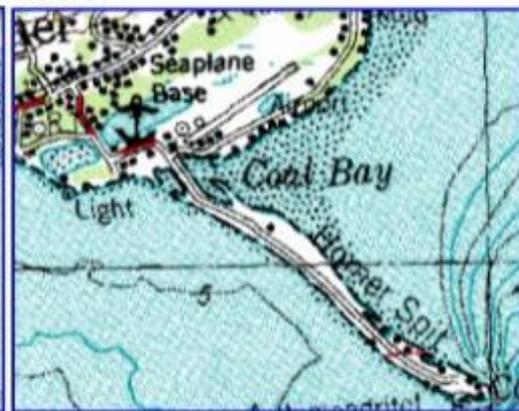
drg\_25k



drg\_63k



drg\_250k



## Best Data Layer

- Scale-dependent
- SDMI ortho integration
- Great Alaskan baselayer

USGS DRG (topos)

Pseudo-color Landsat 15-m

Landsat pan 15-m

## Shaded relief NED

NOAA raster nautical charts

Blue Marble

AVHRR 1-km

MODIS 250-m

Shaded relief ASTER GDEM

Kenai Lidar

*plus others....*

**OGC**

**WMS**

**Web**

**KML**

**WCS**

**Services**

**WFS**

**Tiles**

Google Maps  
ESRI ArcGIS Online  
Microsoft Bing  
OpenLayer



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was that useful?

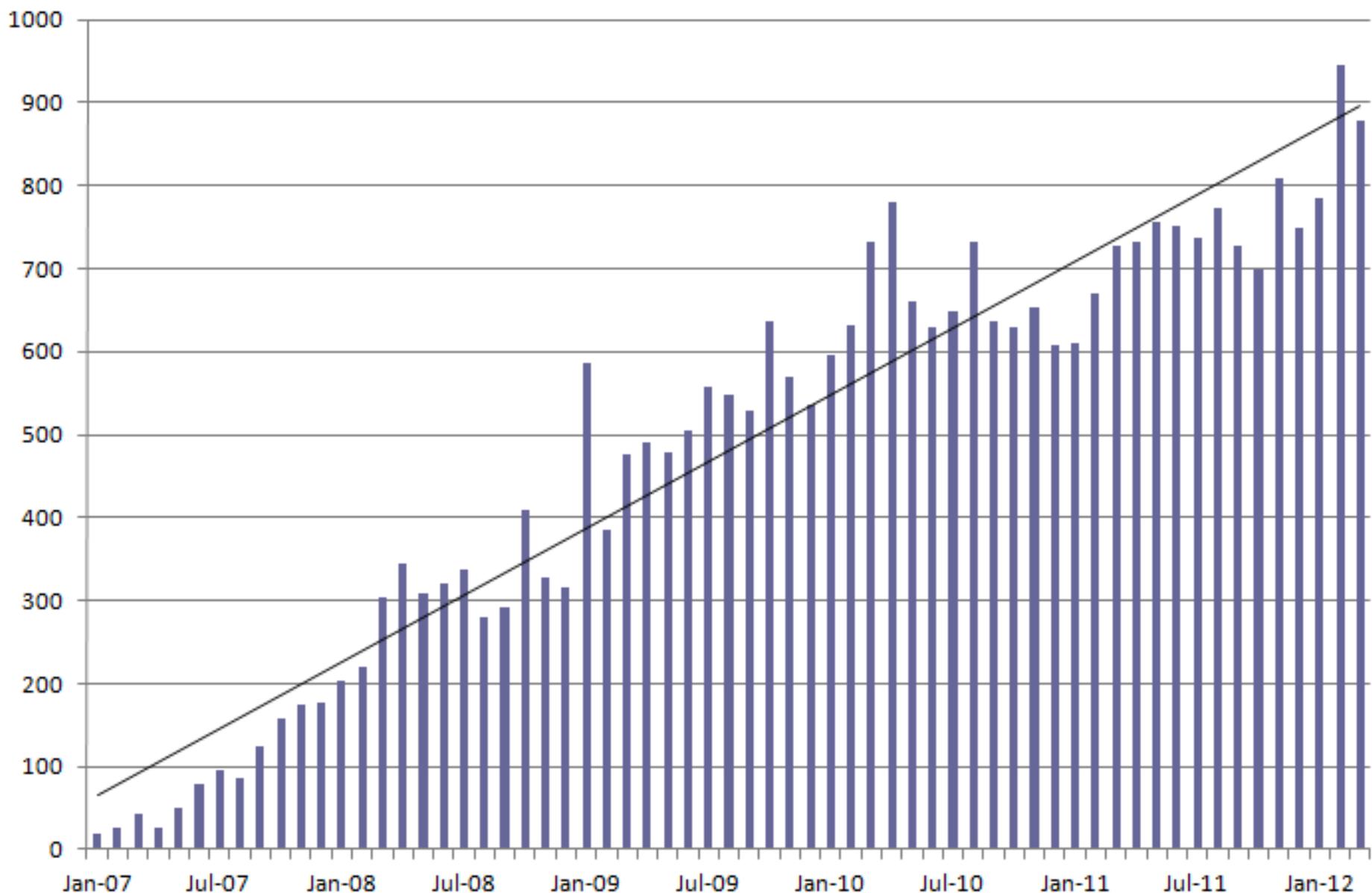


# count number of unique IPs using the WMS

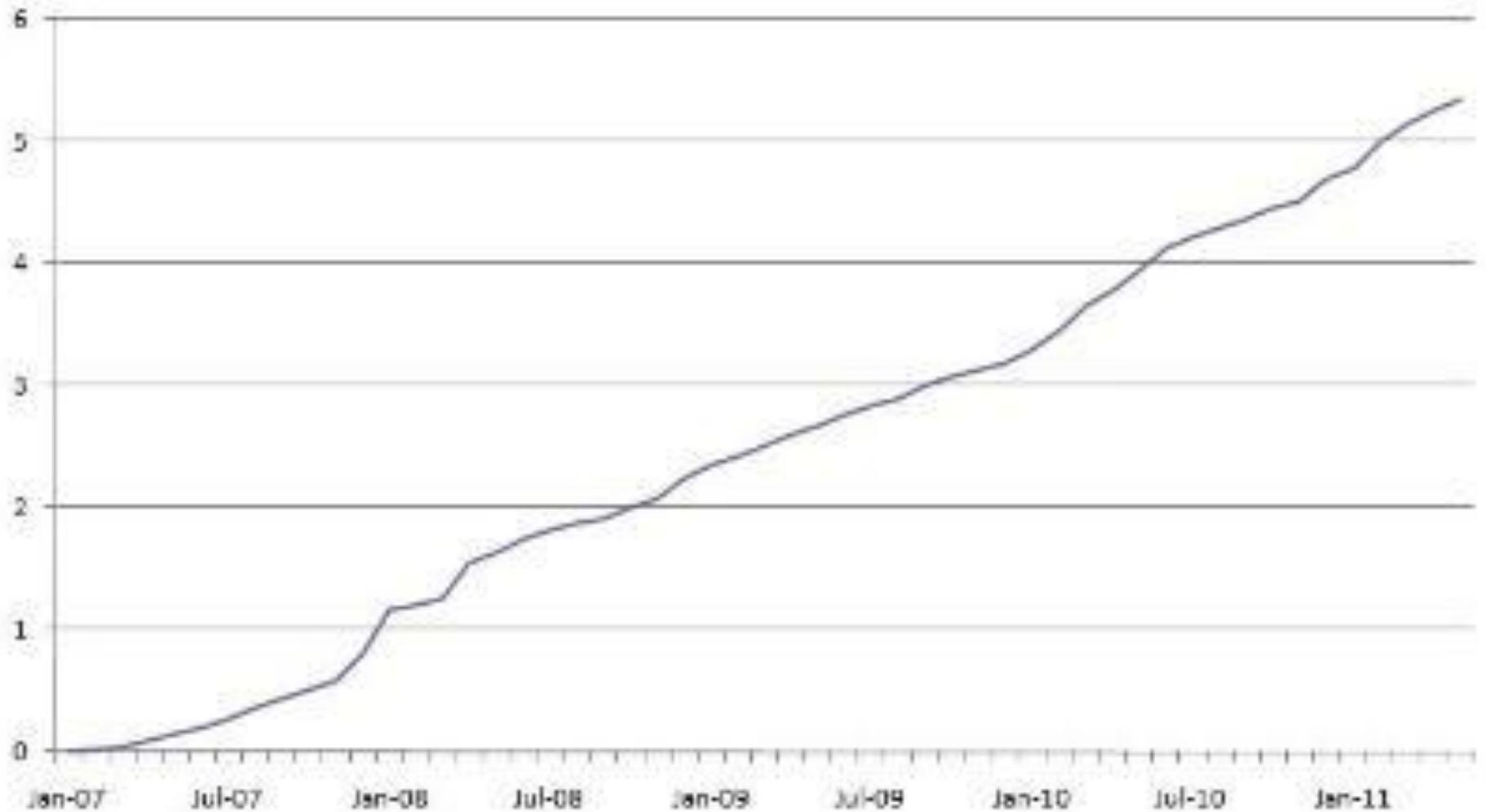
Flawed because all of the State of Alaska users show up as a single IP but whatever

# Web Mapping Service (WMS) Unique Internet (IP) Addresses -- by month

■ IPs Seen  
— Linear (IPs Seen)



## WMS Cumulative data served (terabytes) - 10.2 million total requests served





16,758 WMS requests

109,000 tiles served

in the first week of April

2012



so far just an archive  
and some useful  
services



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# Tackling the basemap

Get user and stakeholder feed back



# 2008 User survey

Imagery, elevation, control all needed

Refresh cycle (3 year imagery, 10+ elevation)

Access to data and metadata

Methods to pool resources for better leveraging



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# 2008 DEM workshop and whitepaper



ALASKA MAPPED



# 2009 Imagery workshop and whitepaper



# SDMI ortho and DEM programs launched

Split remaining capital funds between a  
statewide ortho mosaic program  
and an elevation collection

# 2010 elevation collection

Money from

NGA

State of Alaska

USGS

NRCS, BLM, and NPS

# 2010 USGS task order

- ORIs with  $\leq 5$ -meter pixels; 1:24,000-scale horizontal accuracy
- DSMs and DTMs with 5-meter posts; DTM vertical accuracy:
  - LE90 = 3m for 0-10°, 6m for 10-20°, 9m for 20-30°, 12m for >30° slopes
- Hydro-enforced lakes, double-line drains (monotonic), coastal waters, shorelines and islands
- Resampled 30' x 30' quarter cells and 15' x 15' tiles
- Second format (HRTe3) for NGA
- FGDC compliant metadata (3 formats)
- For \$ available, maximize 1-degree cells based on government priorities; initial goal was for  $\geq 20$  cells
- Intense “coopetition” with three “best and final” quotes from Fugro and Intermap allowed 28 1° cells to be mapped





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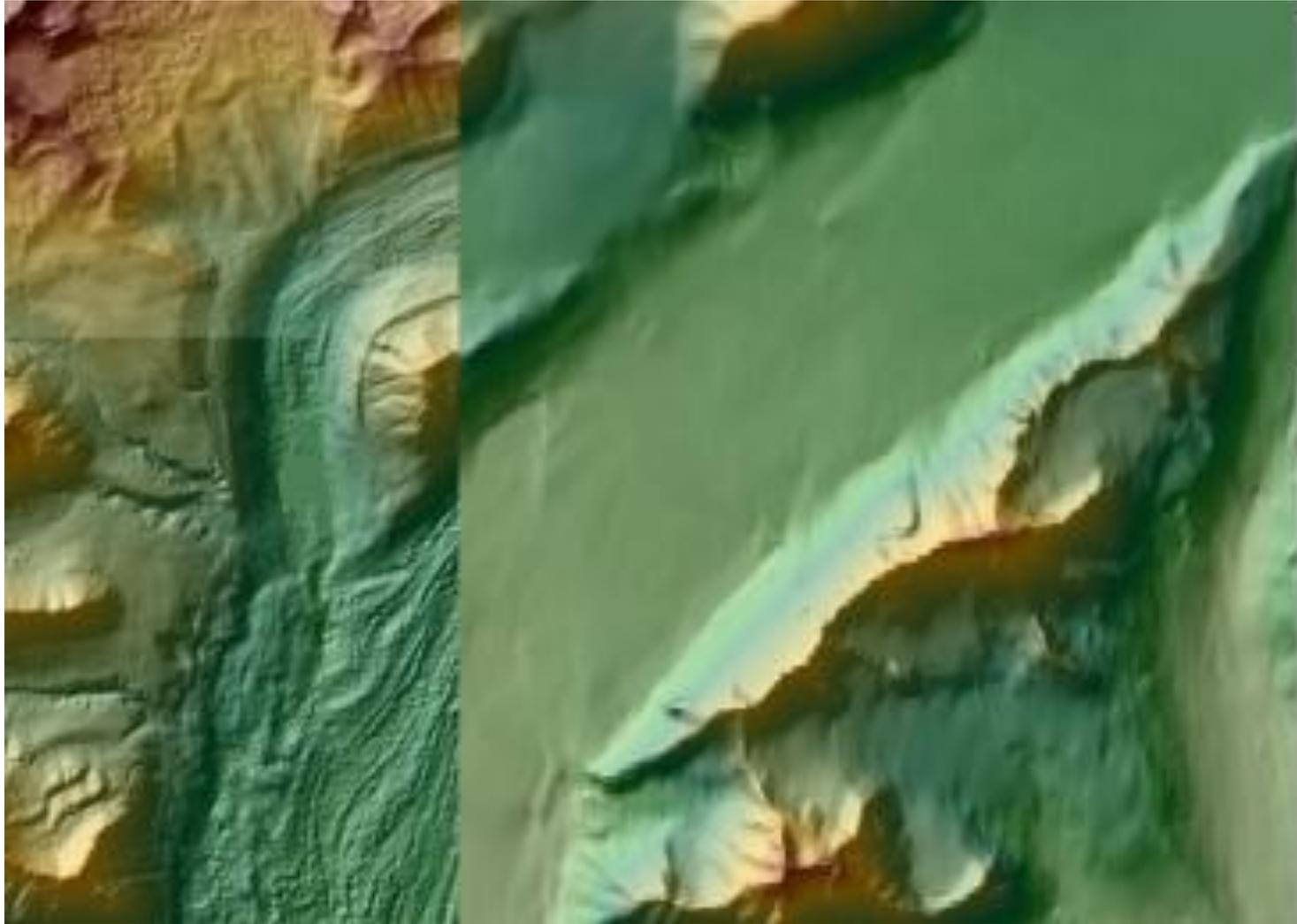
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Mapping Initiative

# SDMI 2010 IFSAR

Dewberry prime

Intermap and Fugro tasked with the work

# Resolution/content significantly better than the National Elevation Dataset (NED)

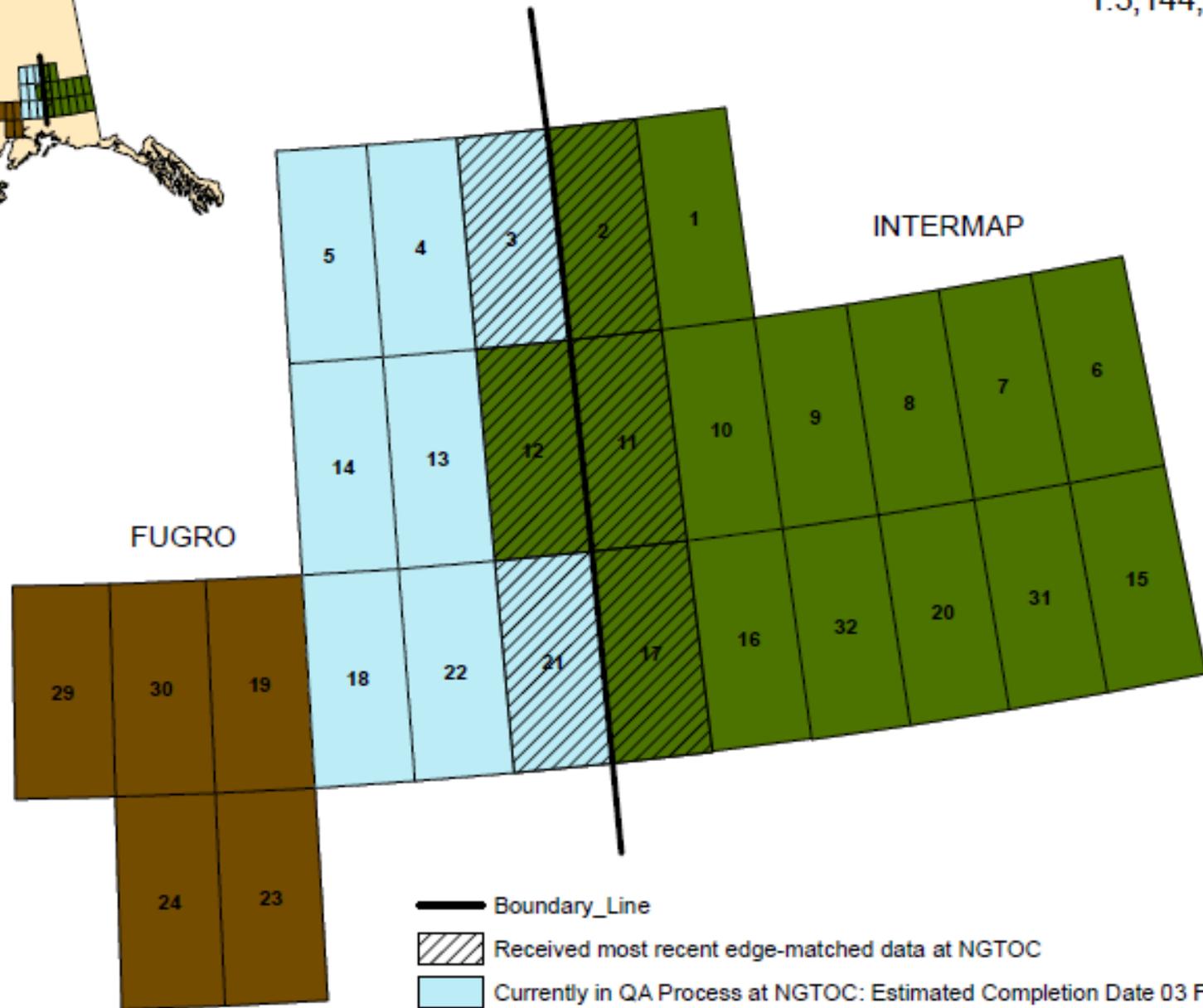
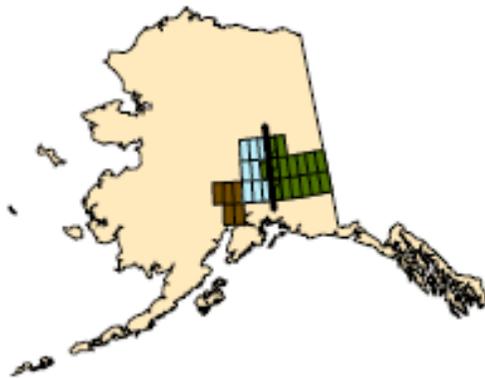


IFSAR (left) and NED (right)

slide from Dave Maune

# Alaska IFSAR Tracking

1:3,144,573



## Legend

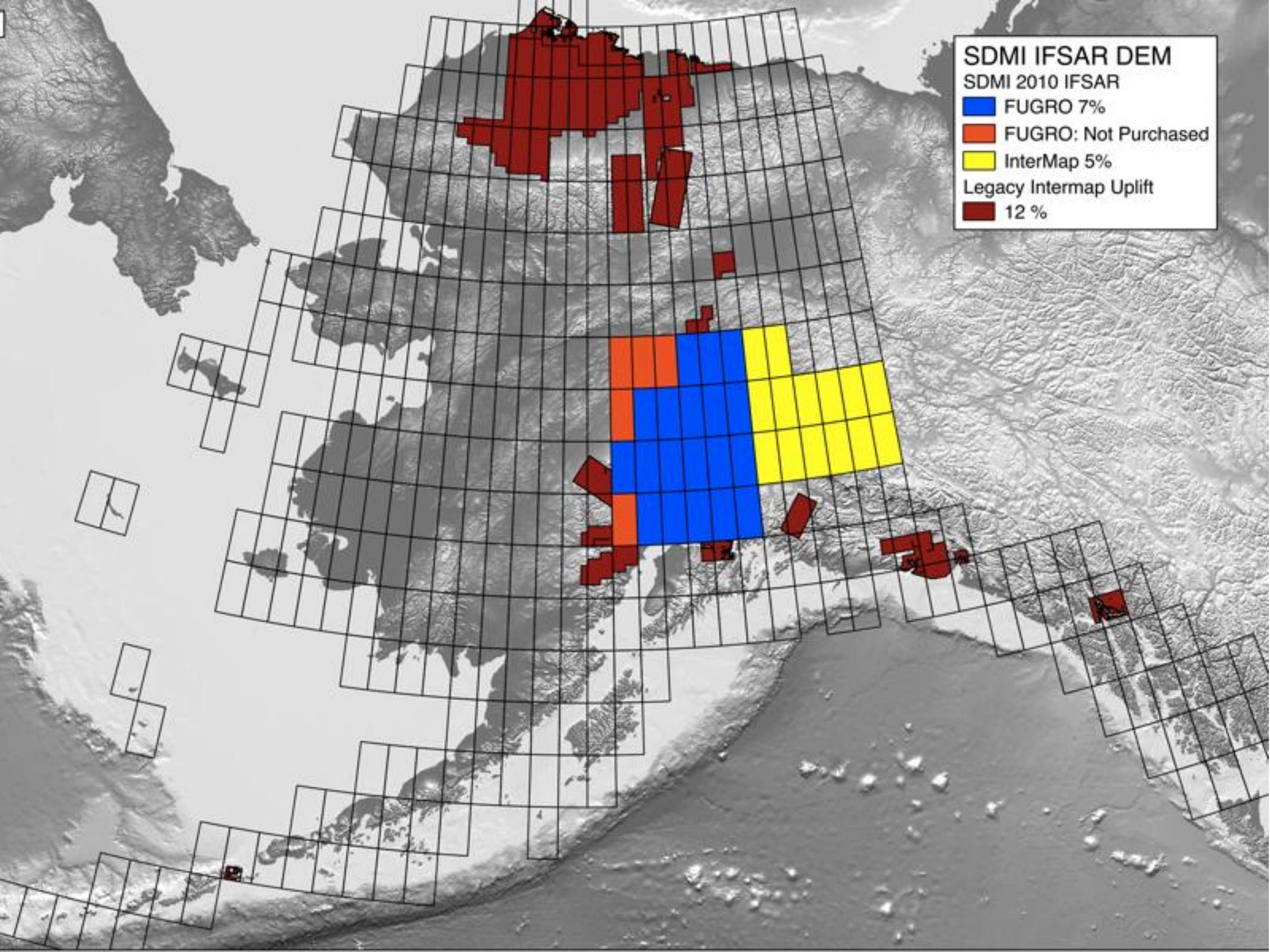
- Boundary\_Line
- Received most recent edge-matched data at NGTOC
- Currently in QA Process at NGTOC: Estimated Completion Date 03 February 2012
- Currently in QA Process at NGTOC: Estimated Completion Date 28 February 2012
- Accepted Cells

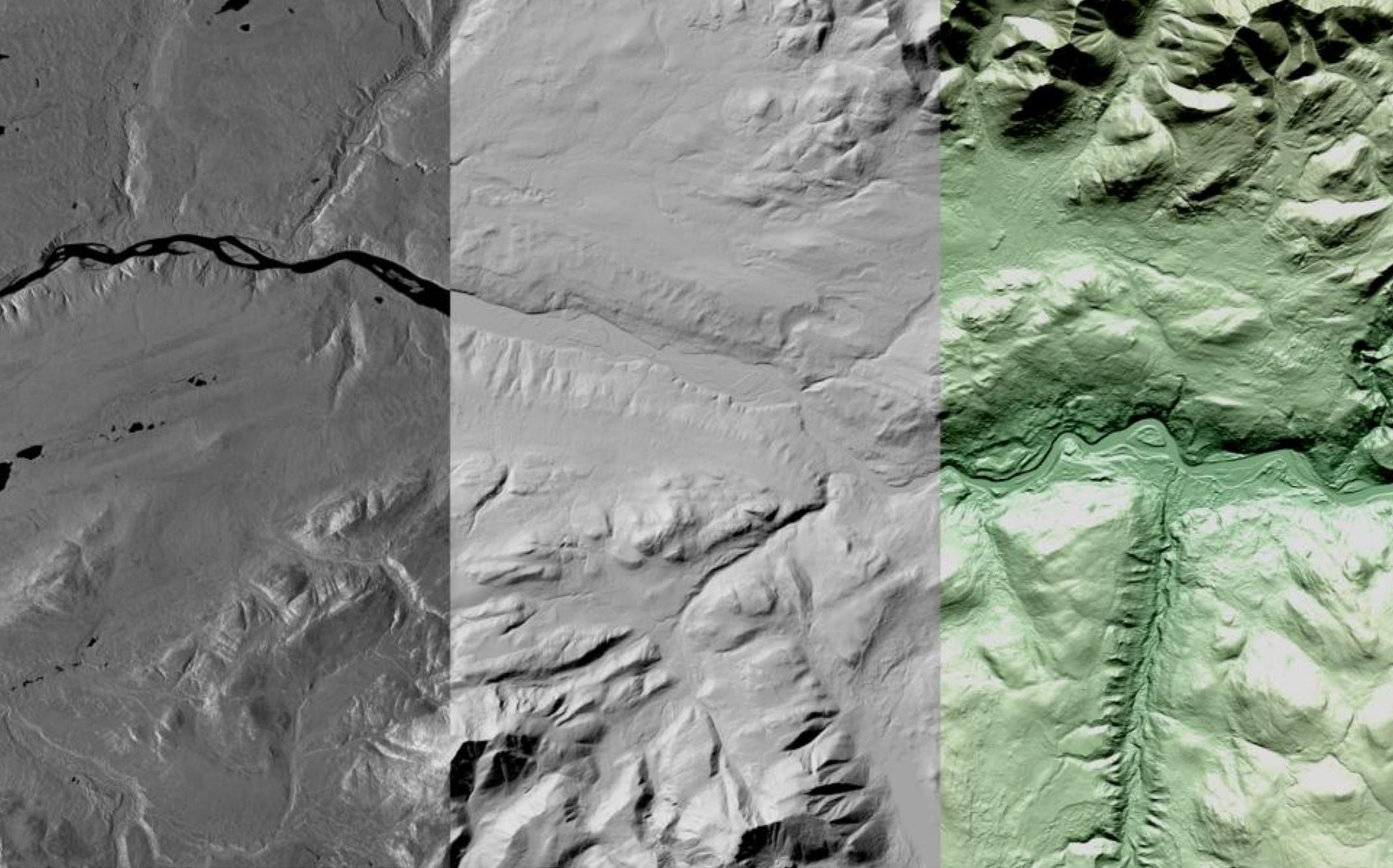


NAD 1983 Alaska Albers  
10 January 2012  
Denver NGTOC

**SDMI IFSAR DEM**  
SDMI 2010 IFSAR

- FUGRO 7%
- FUGRO: Not Purchased
- InterMap 5%
- Legacy Intermap Uplift 12 %





SDMI IFSAR ORI, DSM, and DTM near proposed Watana Dam



Mount Foraker & Kahiltna Glacier  
Denali National Park  
2010 SDMI Fugro IFSAR



Intermap IFSAR delivery accepted and integrated into USGS NED

Soon to be available from AlaskaMapped

First delivery of Fugro IFSAR received by State in March and going through State acceptance

Legacy Intermap IFSAR just received by Dayne last week .. dunno what that looks like yet

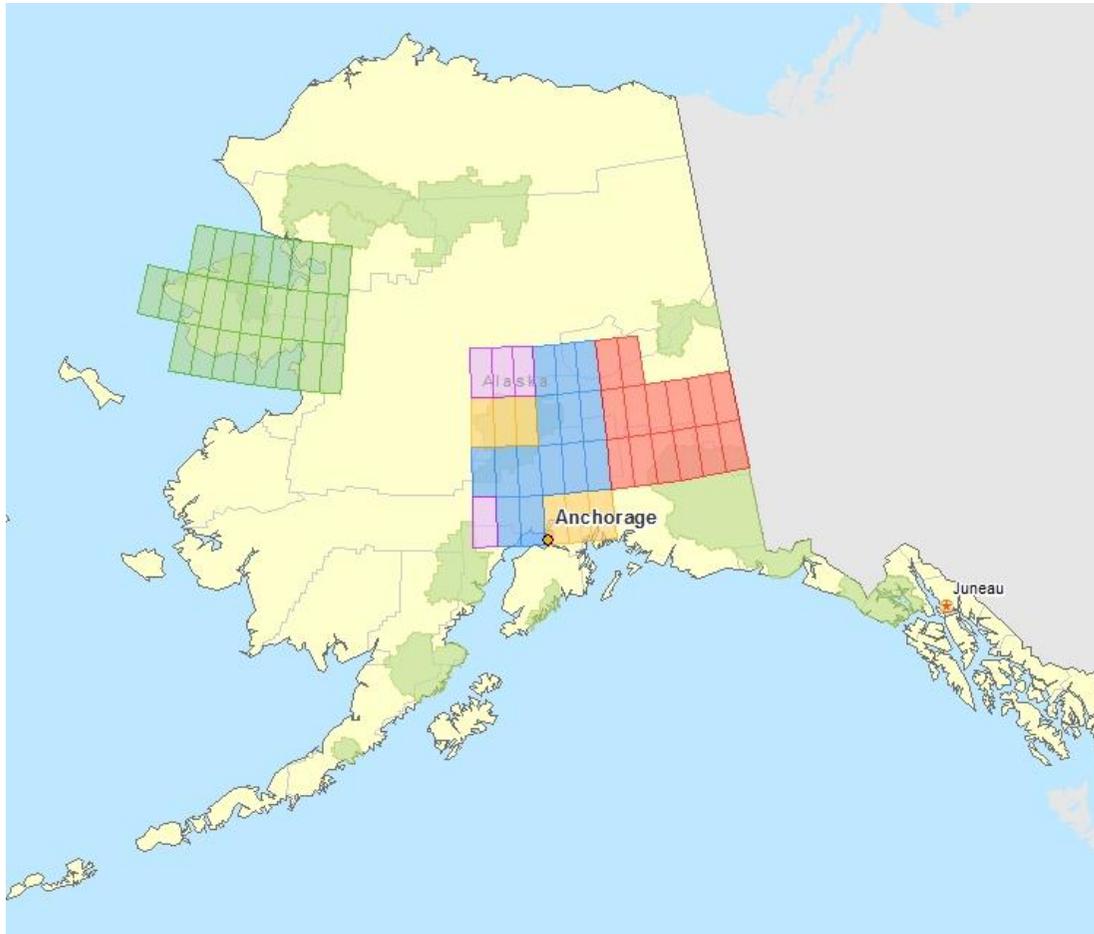
One more delivery of Fugro cells expected in coming months to finalize 2010 IFSAR collection and delivery

# Future status

Still some 2010 spec-collected  
Fugro cells to be purchased if  
funding becomes available

The Governor of Alaska  
interested in funding a 2012  
collection in North-West Alaska.

# Acquisition Areas



- Red, Intermap, 2010
- Blue, Fugro, 2010
- Gold, Fugro, 2011, flown “on spec” in 2010
- Pink, not funded, flown “on spec” in 2010
- Green, Intermap, 2012 (acquisition only)
- Total area funded: ~18% of Alaska



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# 2009 Imagery workshop and whitepaper

# SDMI ORTHO

Statewide ortho mosaic that meet 1:24k  
mapping standards

CE90 of 12.2m

3x accuracy improvement over most existing  
maps of Alaska



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# Ortho imagery funders

BOEM Coastal Impact Assistance Program

Alaska Statewide Digital Mapping Initiative

# Aerometric Prime

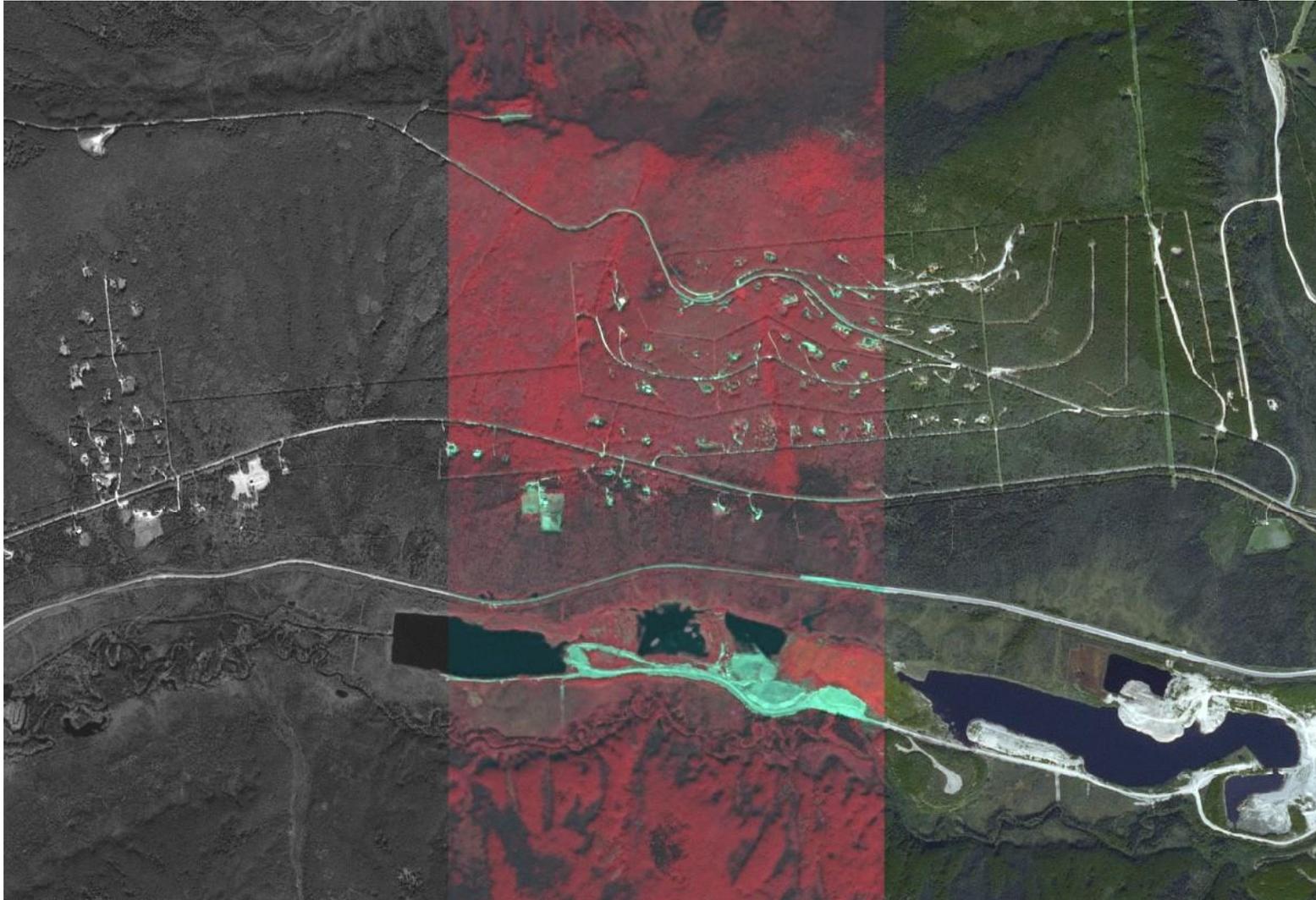
Astrium's SPOT5 providing source data

Fugro Earthdata turning it into map

Start: August 5th, 2010

End: June 30th, 2014

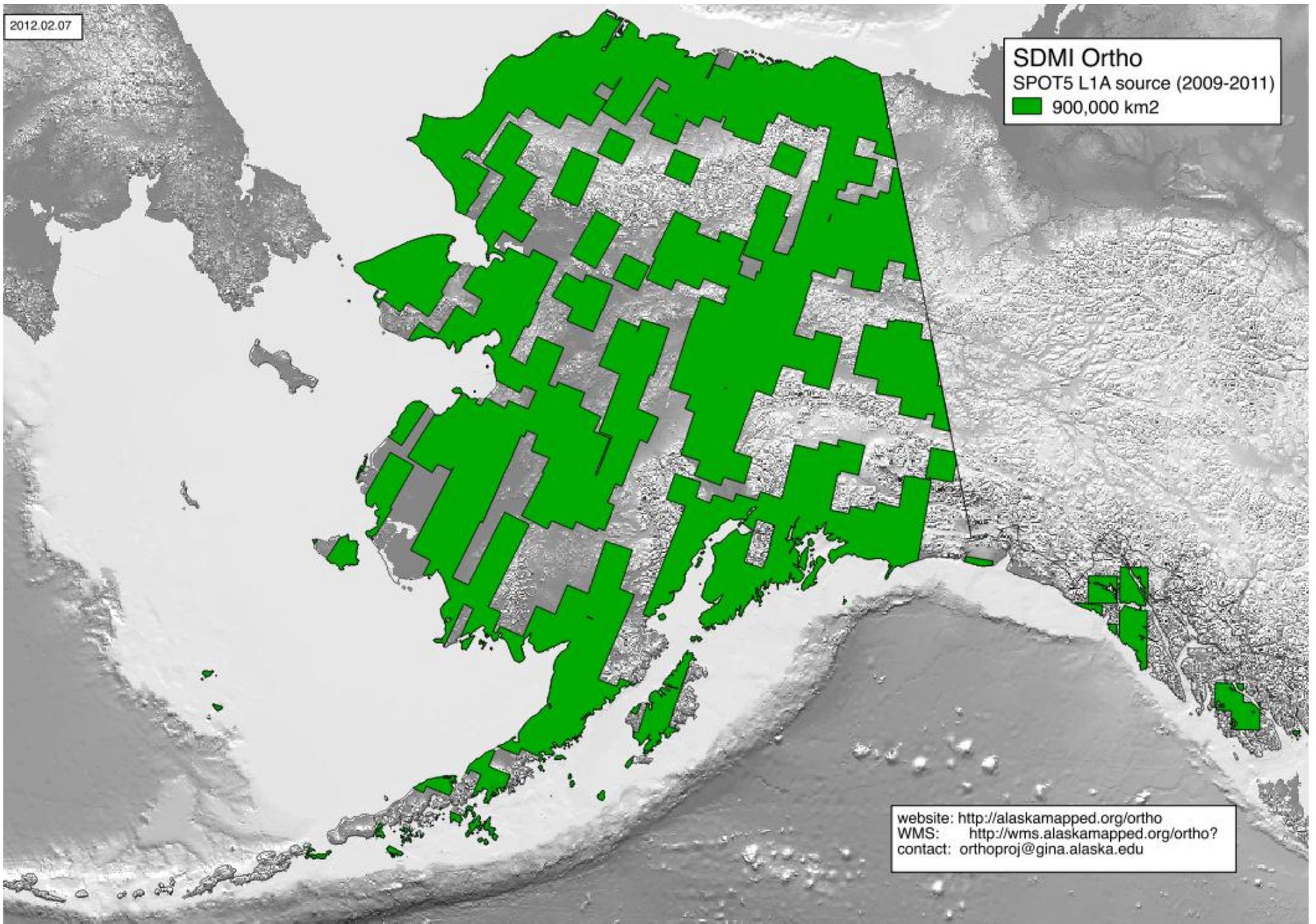
# SDMI Statewide Ortho-imagery



Providing a 2.5m color-infrared, psuedo-natural color, and greyscale statewide basemap for Alaska  
From a 5 year range (2009 - 2014)

2012.02.07

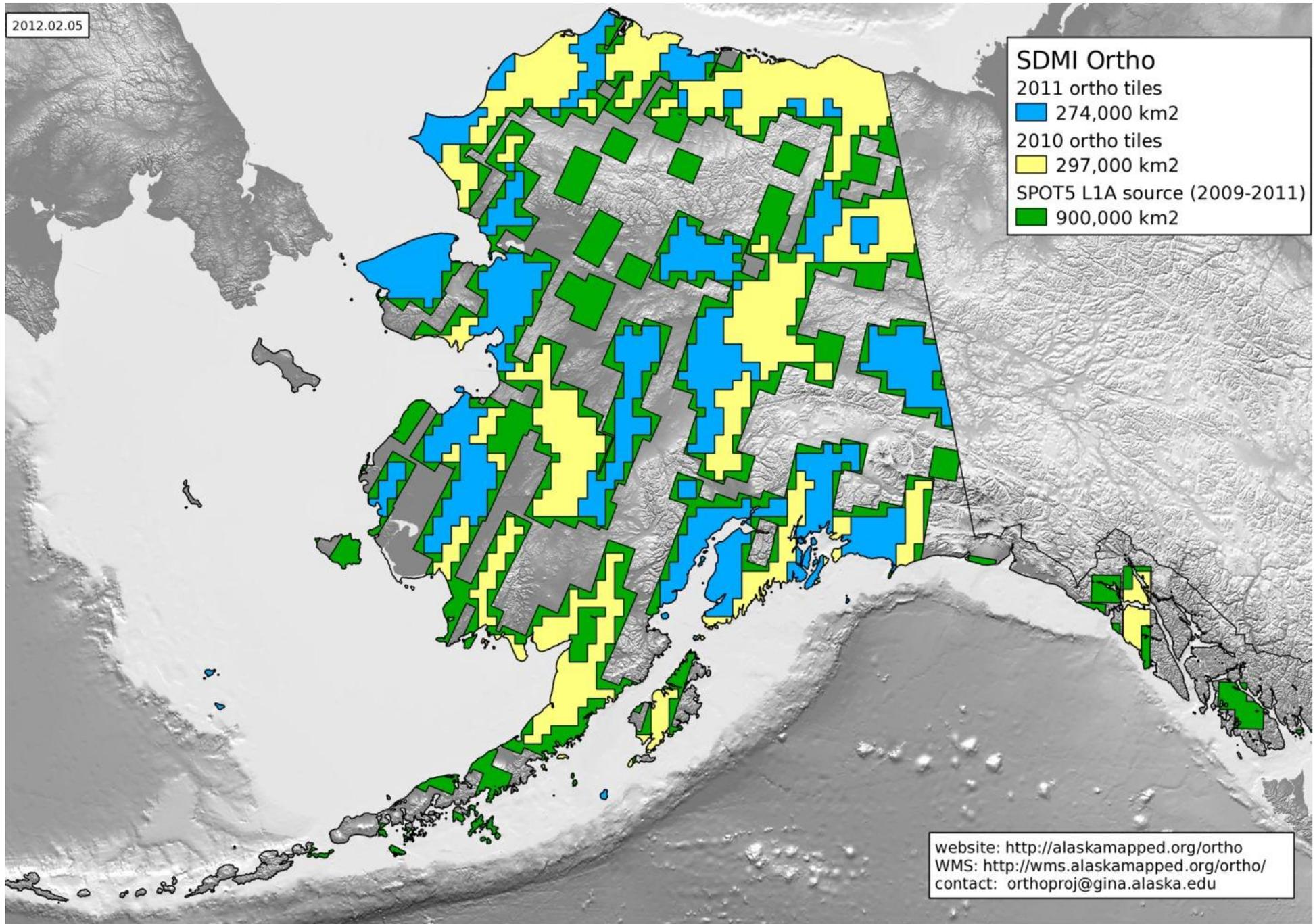
SDMI Ortho  
SPOT5 L1A source (2009-2011)  
900,000 km<sup>2</sup>



website: <http://alaskamapped.org/ortho>  
WMS: <http://wms.alaskamapped.org/ortho?>  
contact: [orthoproj@gina.alaska.edu](mailto:orthoproj@gina.alaska.edu)

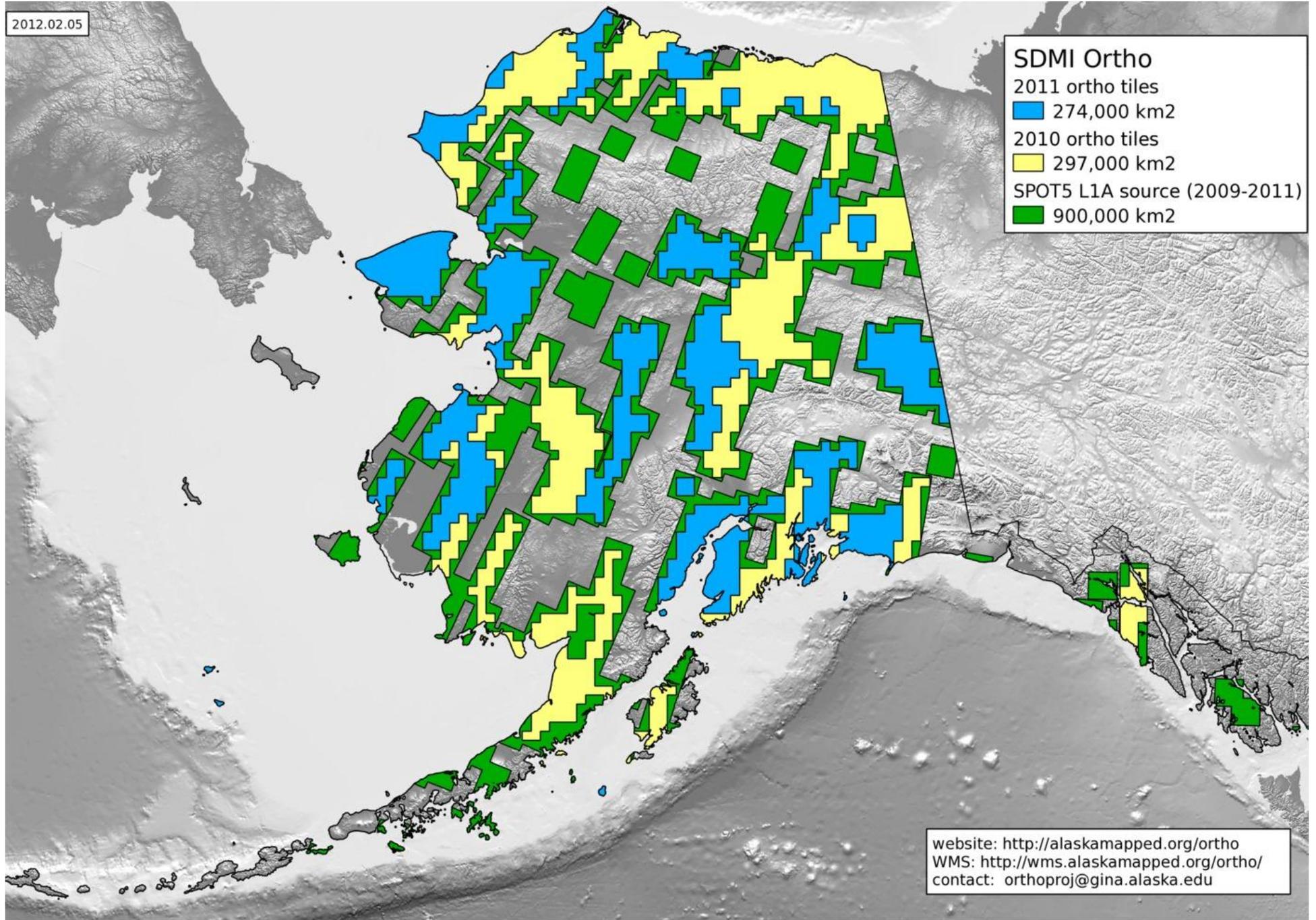
Source imagery (SPOT5) collection (green)  
900,953 km<sup>2</sup> (52%) at end of 2011 season

2012.02.05



2010 final ortho tiles (yellow) available now  
297,000 km<sup>2</sup> (17%)

2012.02.05



2011 ortho tiles (blue) by fall of 2012.  
36% coverage of ortho tiles after 2011 delivery

# Natural Color at full 2.5-meter resolution





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# BDL NOW

Best *Available* (raster) Data Layer

*badl and bard were not picked as the name*



**SDMI BDL - global NASA blue marble**



**SDMI BDL** - high res including SPOT5  
now showing up as patch work



**SDMI BDL - TerraColor (Landsat 15m)**  
now takes over from blue marble



SDMI BDL (best available data layer)  
January 2012



SDMI ORTHO CIR  
Color Infrared on top of BDL



SDMI ORTHO CIR  
Color Infrared on top of BDL  
Golovin Alaska pointed at

# real world example

Golovin Alaska



**review - Golovin in BDL - January 2012**



**upgrade - SDMI Ortho RGB**  
<http://wms.alaskamapped.org/ortho>



**upgrade** - SDMI Ortho CIR  
<http://wms.alaskamapped.org/ortho>

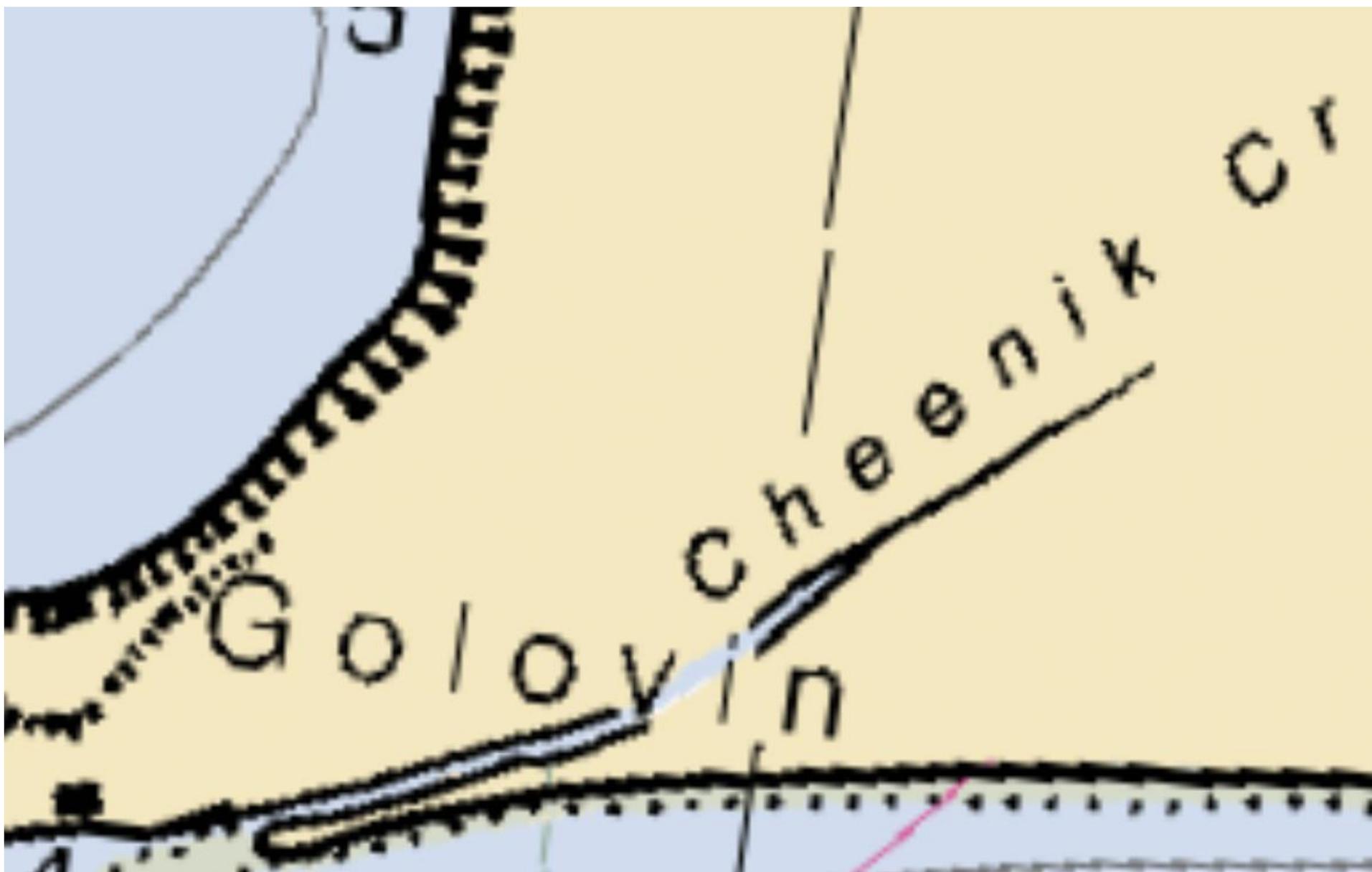


**upgrade** - SDMI Ortho PAN (greyscale)  
<http://wms.alaskamapped.org/ortho>



**USGS DRG**

<http://wms.alaskamapped.org/extras>



**NOAA charts**

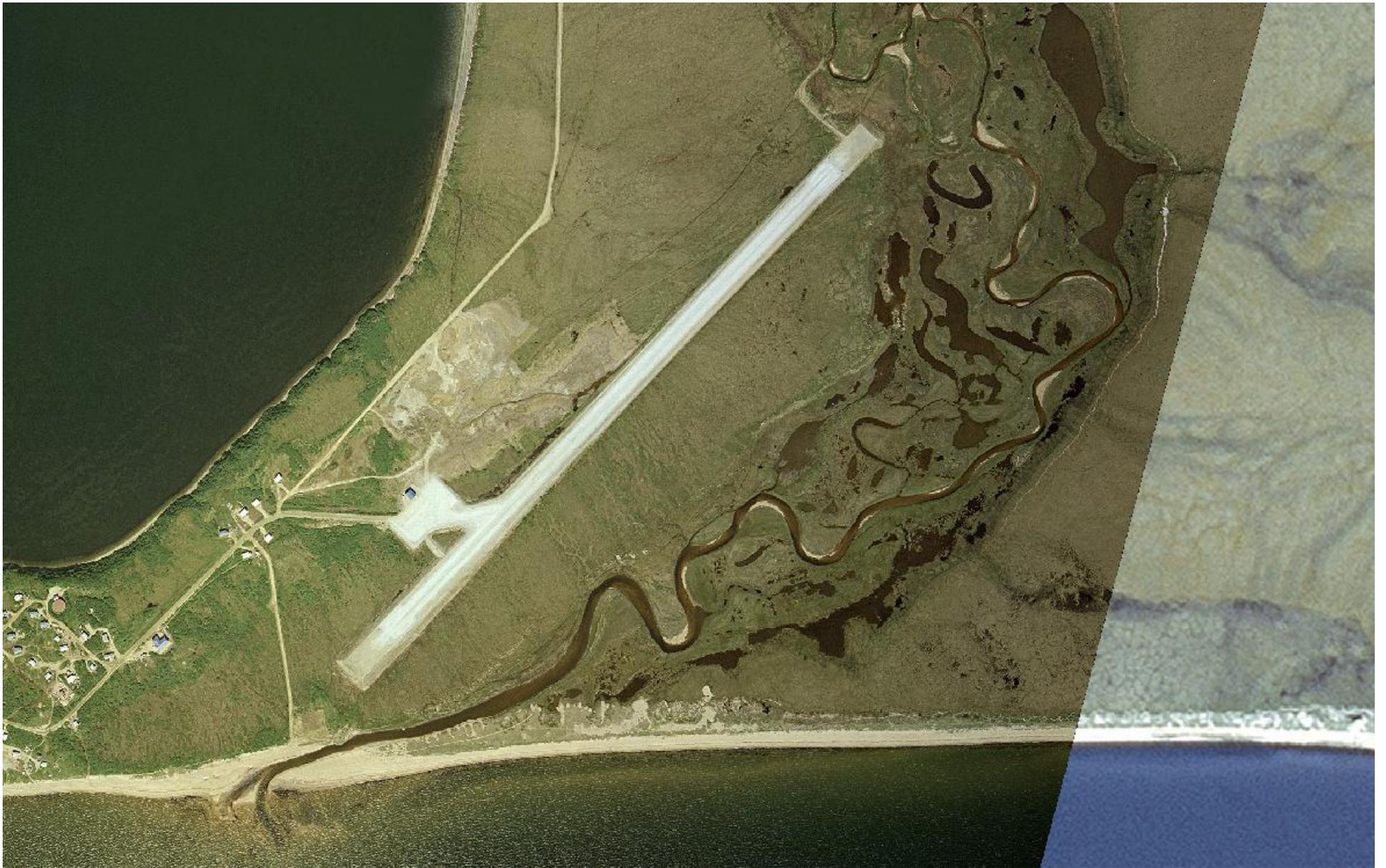
<http://wms.alaskamapped.org/charts>



**review - Golovin in BDL January 2012**



**upgrade** - SDMI Ortho RGB  
<http://wms.alaskamapped.org/ortho>



**SDMI win** - Golovin in BDL now  
SPOT5 and DCCED Villages Imagery combo

# SDMI ortho services

- ortho tiles integrated into the SDMI BDL
- dedicated WMS for each ortho layer
  - <http://wms.alaskamapped.org/ortho/>
    - RGB
    - CIR
    - PAN
- Tile service end points for all the major tile consumers in custom projections for online web map applications
  - Google Earth KML
  - Google Maps
  - Bing, OpenLayers (Alaska Albers), ...
  - ESRI REST end point - usable in ESRI ArcGIS Online
- Source data download for authorized users (AEA authorized)
  - <http://browse.alaskamapped.org>
- Integrated in State GIS servers (DNR, Fish & Game, DOT ....)

# AlaskaMapped and GINA Tile Services

OpenLayers

Alaskan Albers

Web Mercator

Polar

Google Maps

Google Earth (KML)

Bing

ESRI

ArcGIS Online

FLEX/REST

gina-map-layers

new library to simplify

including tile layers into your  
web

map[http://github.com/gina-  
alaska](http://github.com/gina-alaska)

Being used by:

- DNR, DOG, F&G, NPS,  
DGGS, BLM, DCCED, NSSI,  
AEA, DMVA, FAA, DOT,  
NRCS, AOOS, ERMA, .... *and  
more!*

- Alaska GIS community!



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# Is it any good?

Independent QA/QC of each

ortho tile by i-cubed

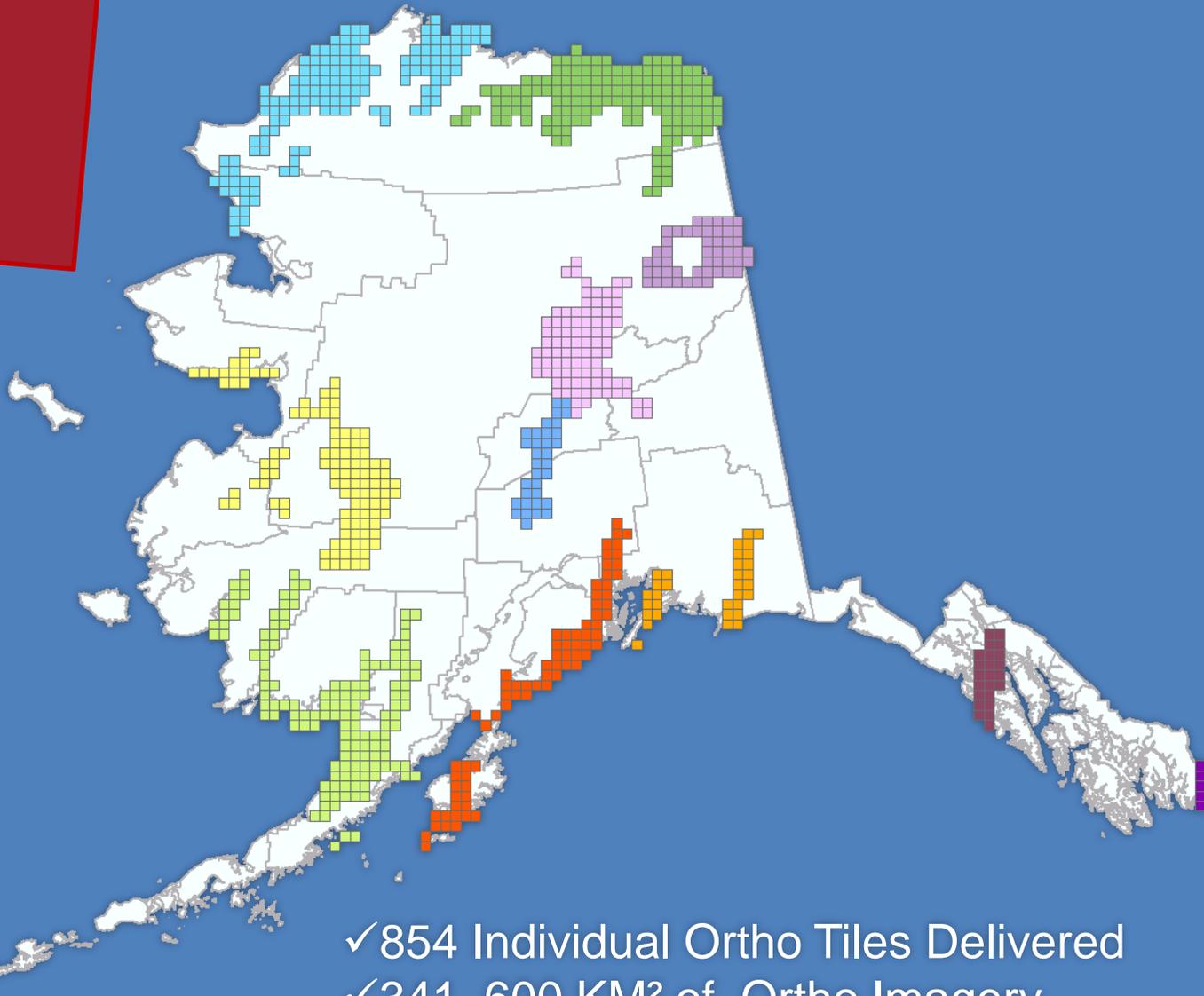
**Alaska SDMI**  
*Statewide Digital Mapping Initiative*

Third Party Quality Assurance of SDMI  
Orthoimagery  
2010 Collection Season

QA-QC presentation by i-cubed  
credit to: Jill Mamini & Jeremy Hale



# 2010 Collection



- ✓ 854 Individual Ortho Tiles Delivered
- ✓ 341,600 KM<sup>2</sup> of Ortho Imagery
- ✓ 18.75% Completed of the Total Project

# Quality Assurance

- ✓ Radiometric Quality
  - Cloud & Shadow
  - Haze
  - Blend
  - Contrast
  - Saturation
  - Color
  - Etc..
- ✓ Geometric Offset
- ✓ Geometric Accuracy



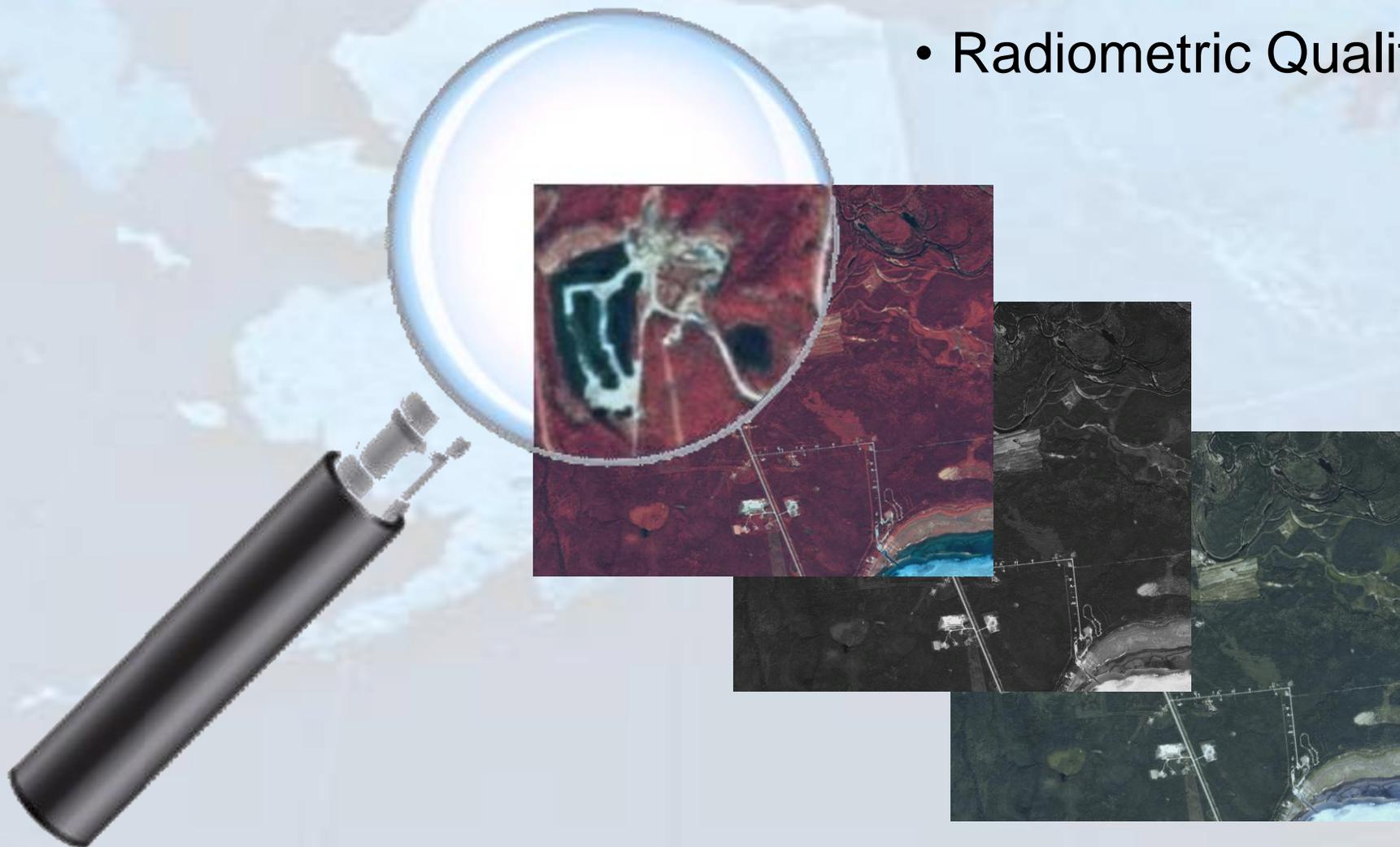
# ALASKA MAPPED



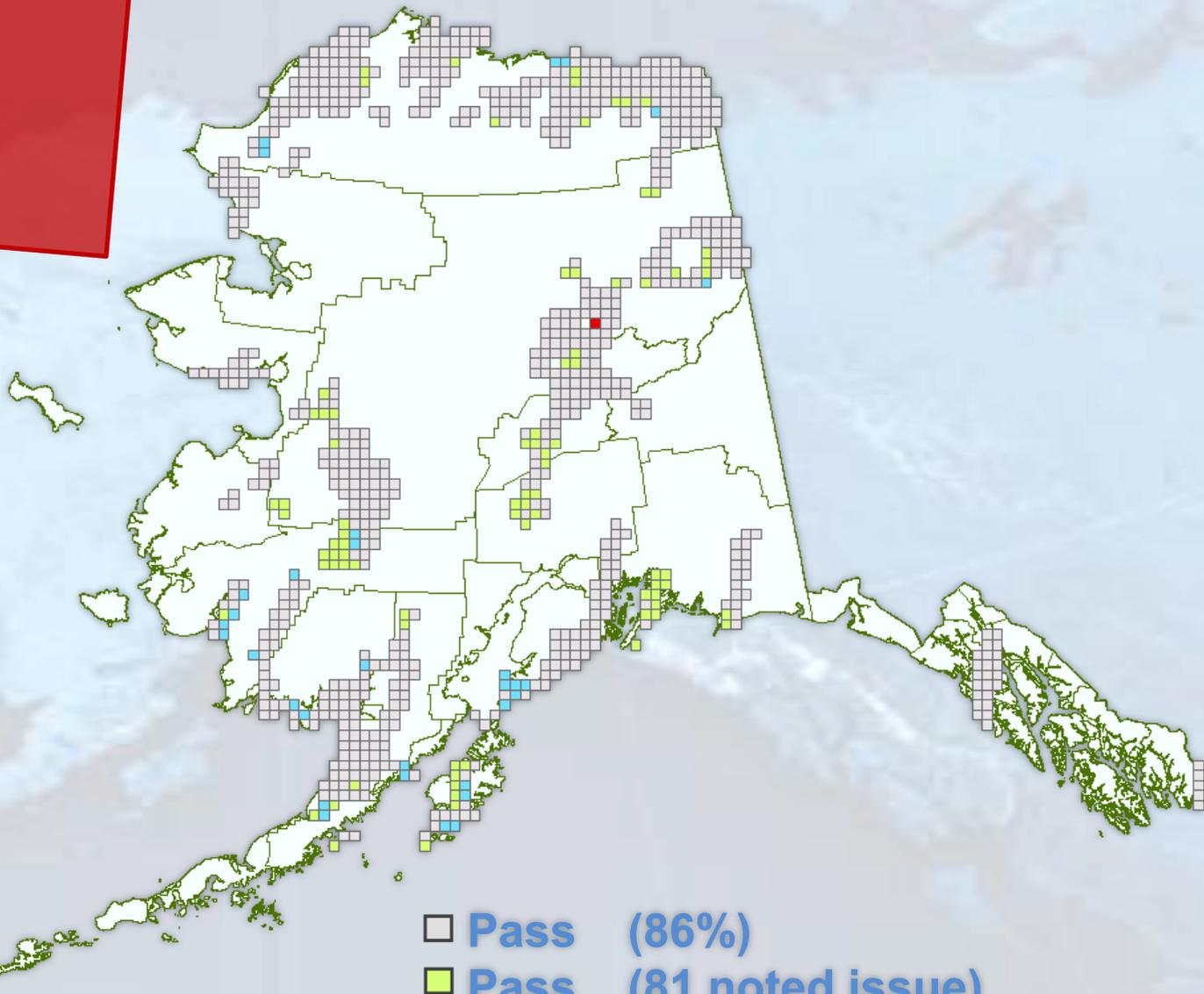
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- Radiometric Quality



# Cloud & Shadow



- Pass (86%)
- Pass (81 noted issue)
- Redo (31 recommended)
- Fail (1 fix required)

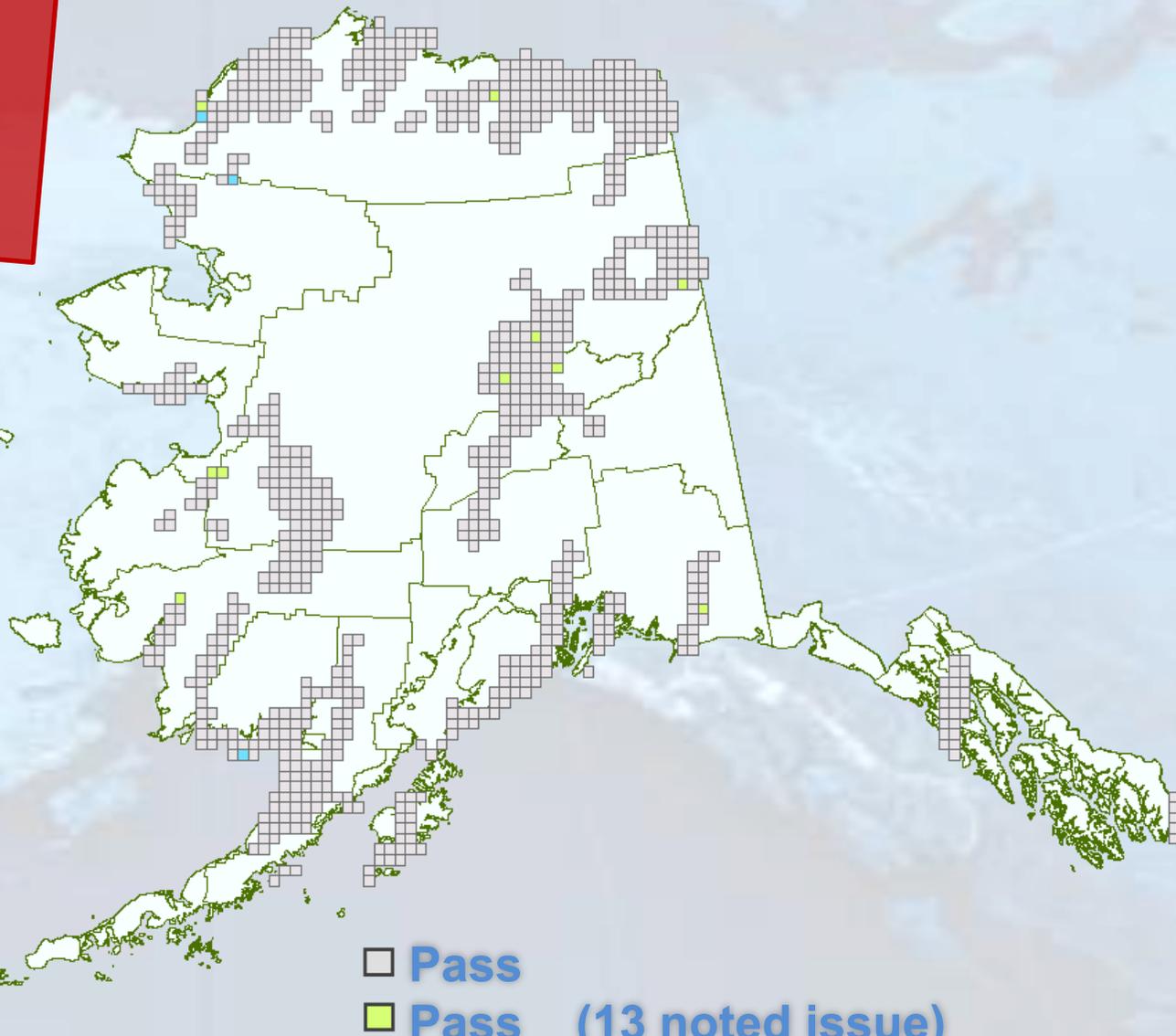
**Pass**  
**< 25%**

**Redo**  
**> 25%**

FID	Shape *	Ortho_Tile	Technician	Status	Problem	Comment
23	Polygon	1050_1184	BA	pass	1	cloud/shadow

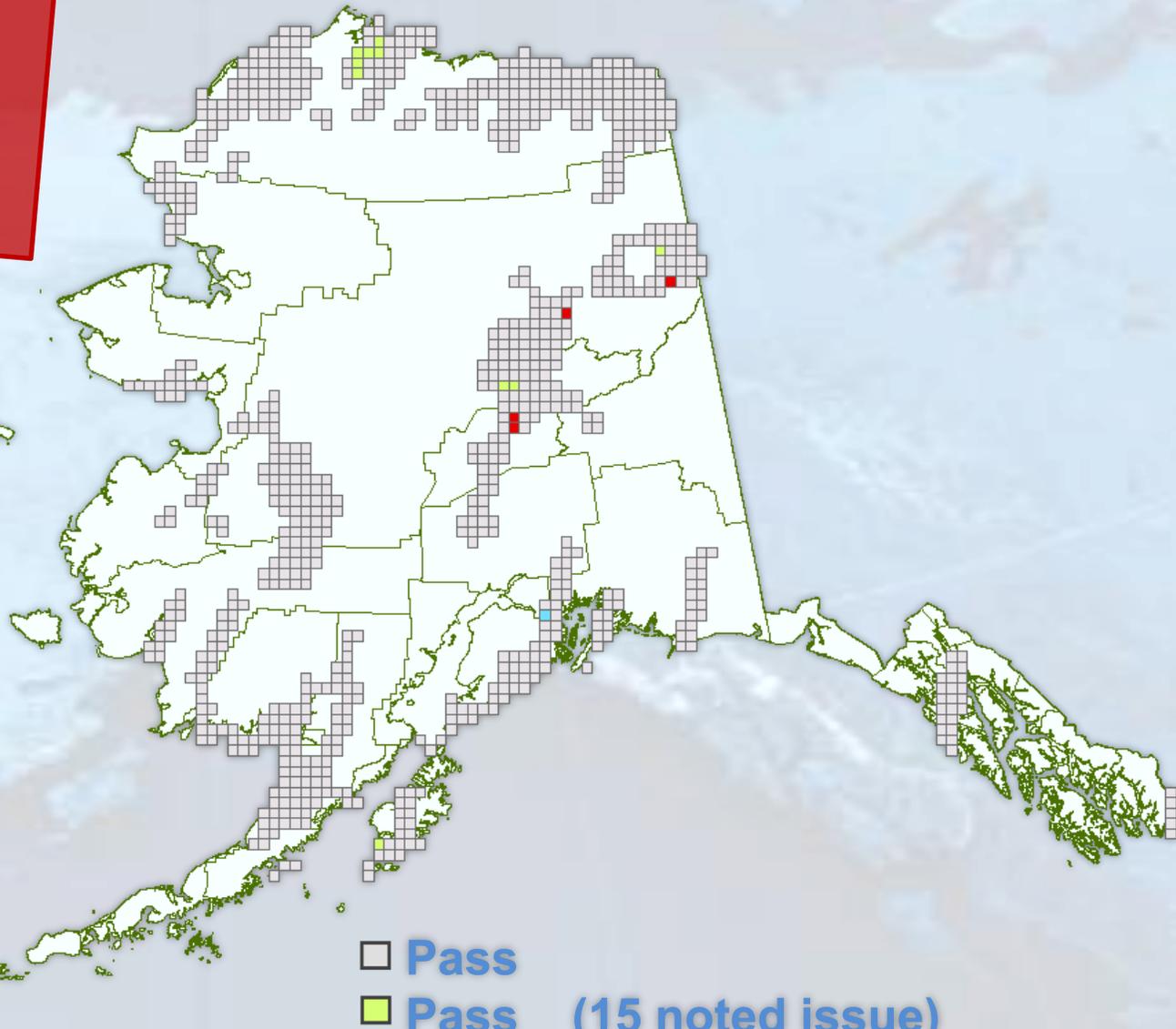
FID	Shape *	Ortho_Tile	Technician	Status	Problem	Comment
22	Polygon	1050_1182	BA	redo	1	cloud/shadow

# Haze



- Pass
- Pass (13 noted issue)
- Redo (3 recommended)
- Fail (0 fix required)

# Blend



- Pass
- Pass (15 noted issue)
- Redo (1 recommended)
- Fail (4 fixes required)

# Failed Blend



# Fixed Blend



# Contrast

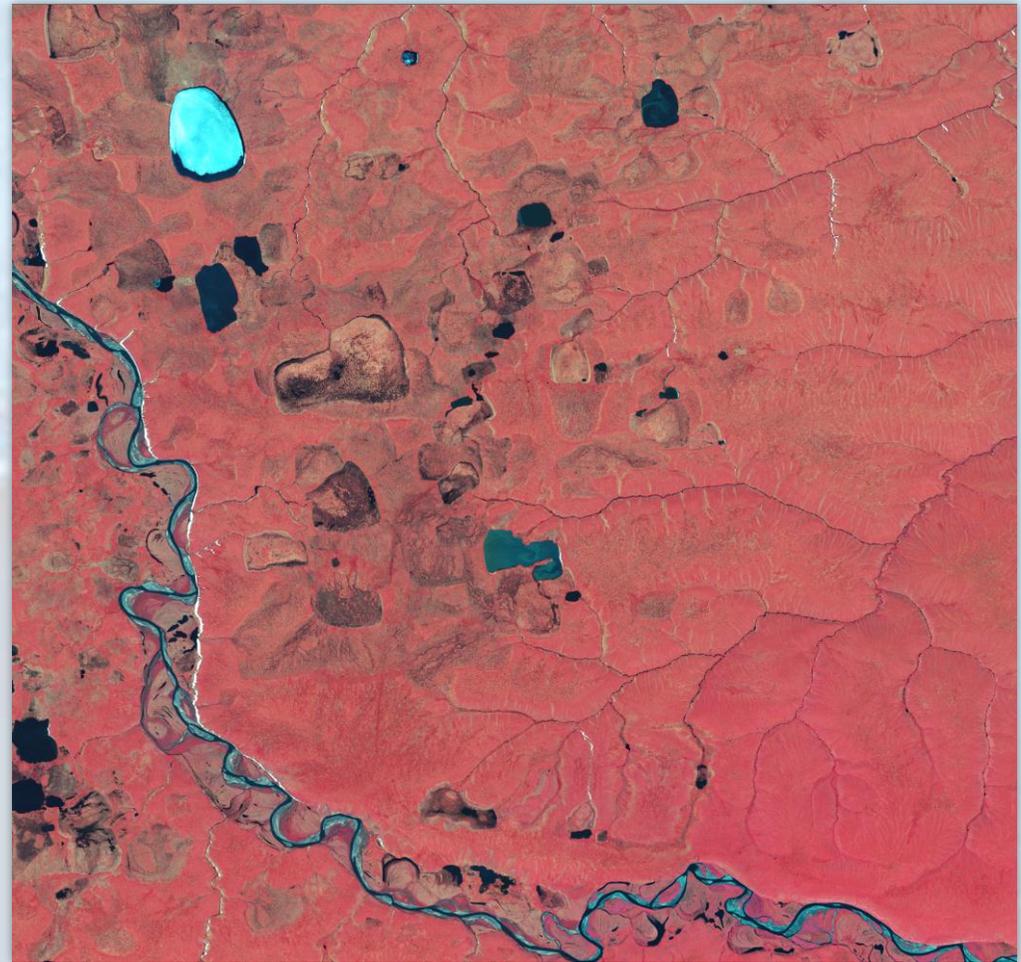


- Pass
- Pass (noted issue)
- Redo (recommended)
- Fail (fix required)

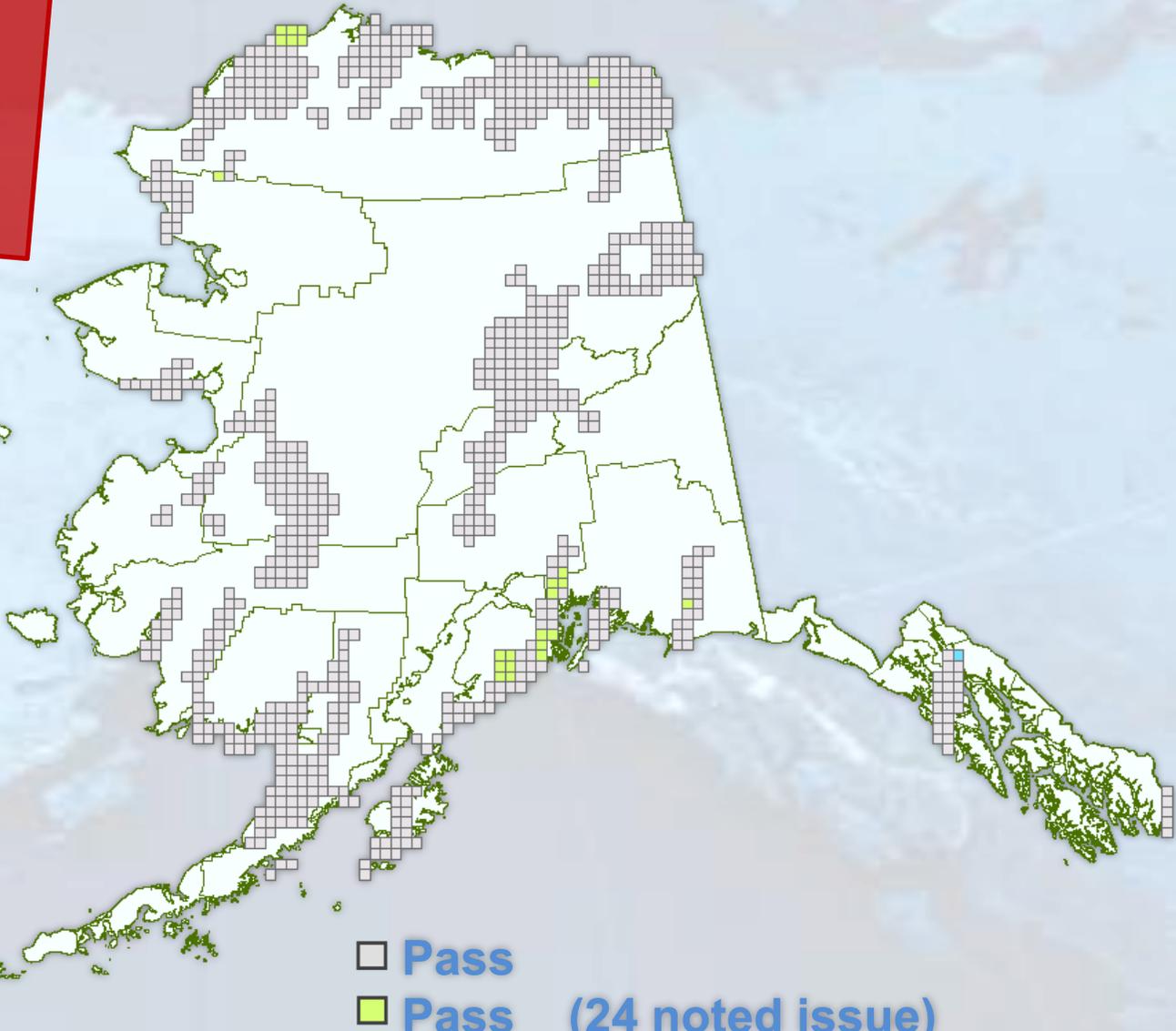
# Failed Contrast



# Fixed Contrast

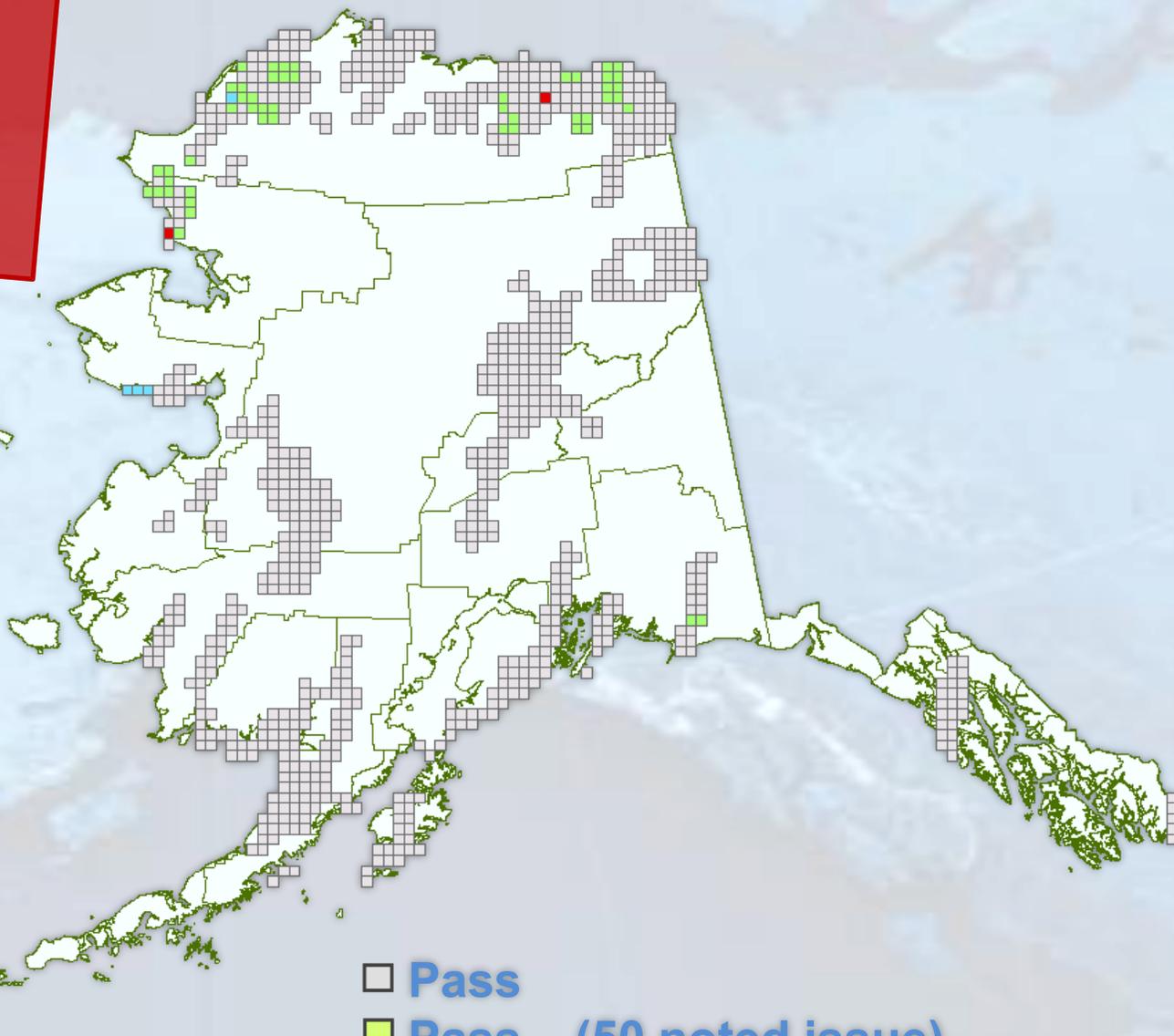


# Saturation



- Pass
- Pass (24 noted issue)
- Redo (1 recommended)
- Fail (0 fix required)

# Color



- Pass
- Pass (50 noted issue)
- Redo (4 recommended)
- Fail (2 fix required)

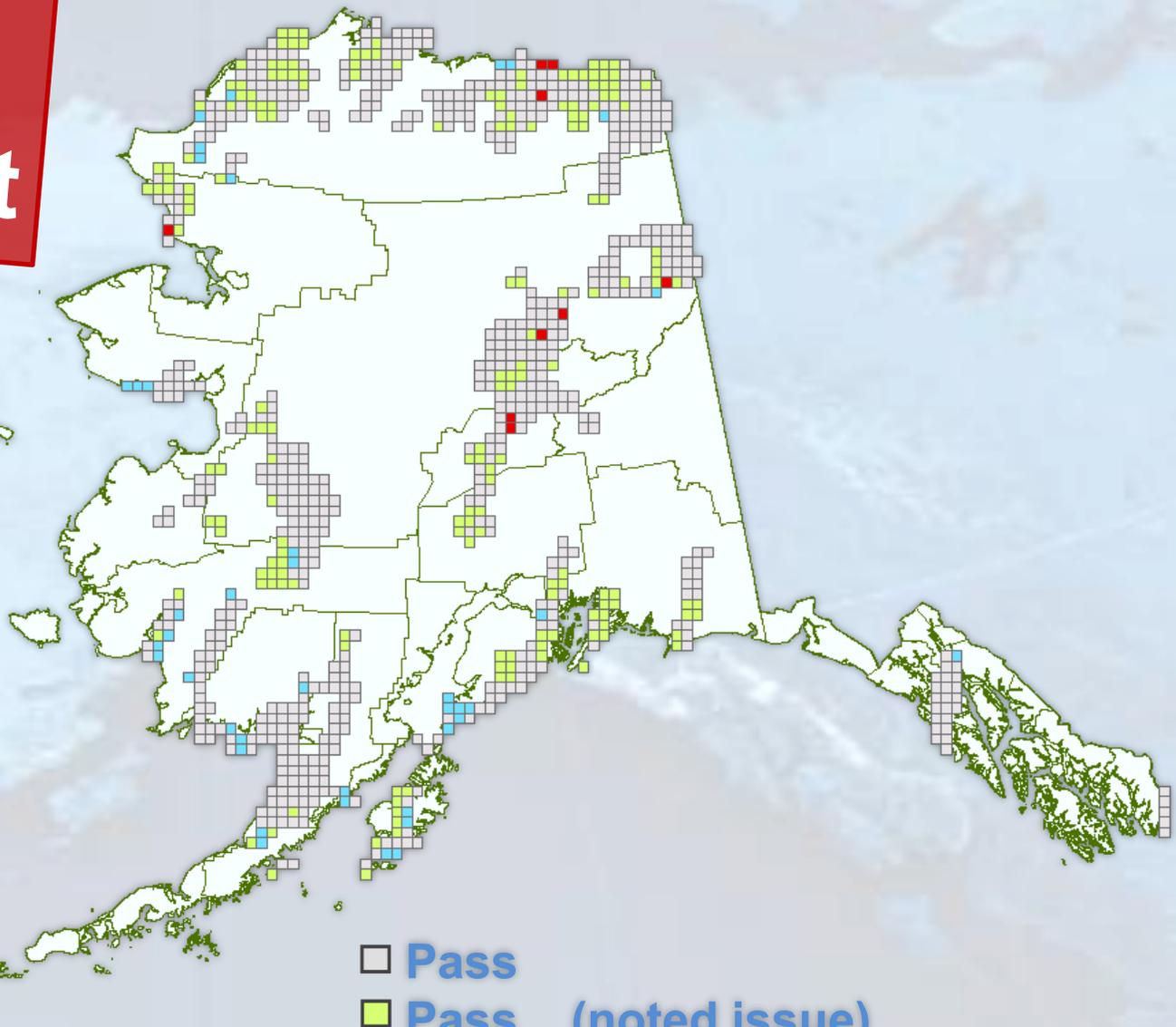
# Failed Color



# Fixed Color



# Radiometric Quality Assessment



- Pass
- Pass (noted issue)
- Redo (recommended)
- Fail (fix required)



# ALASKA MAPPED



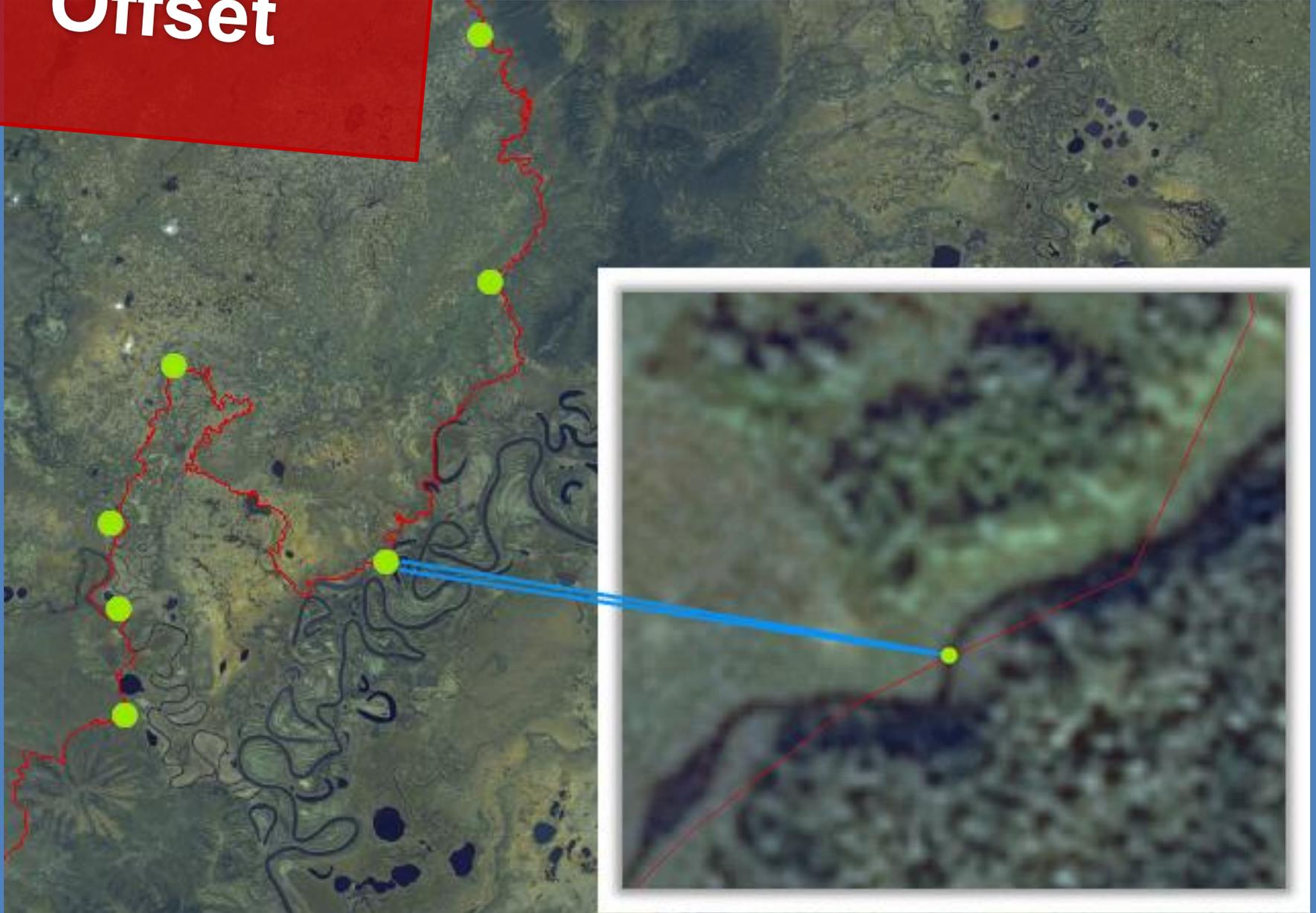
SDMI

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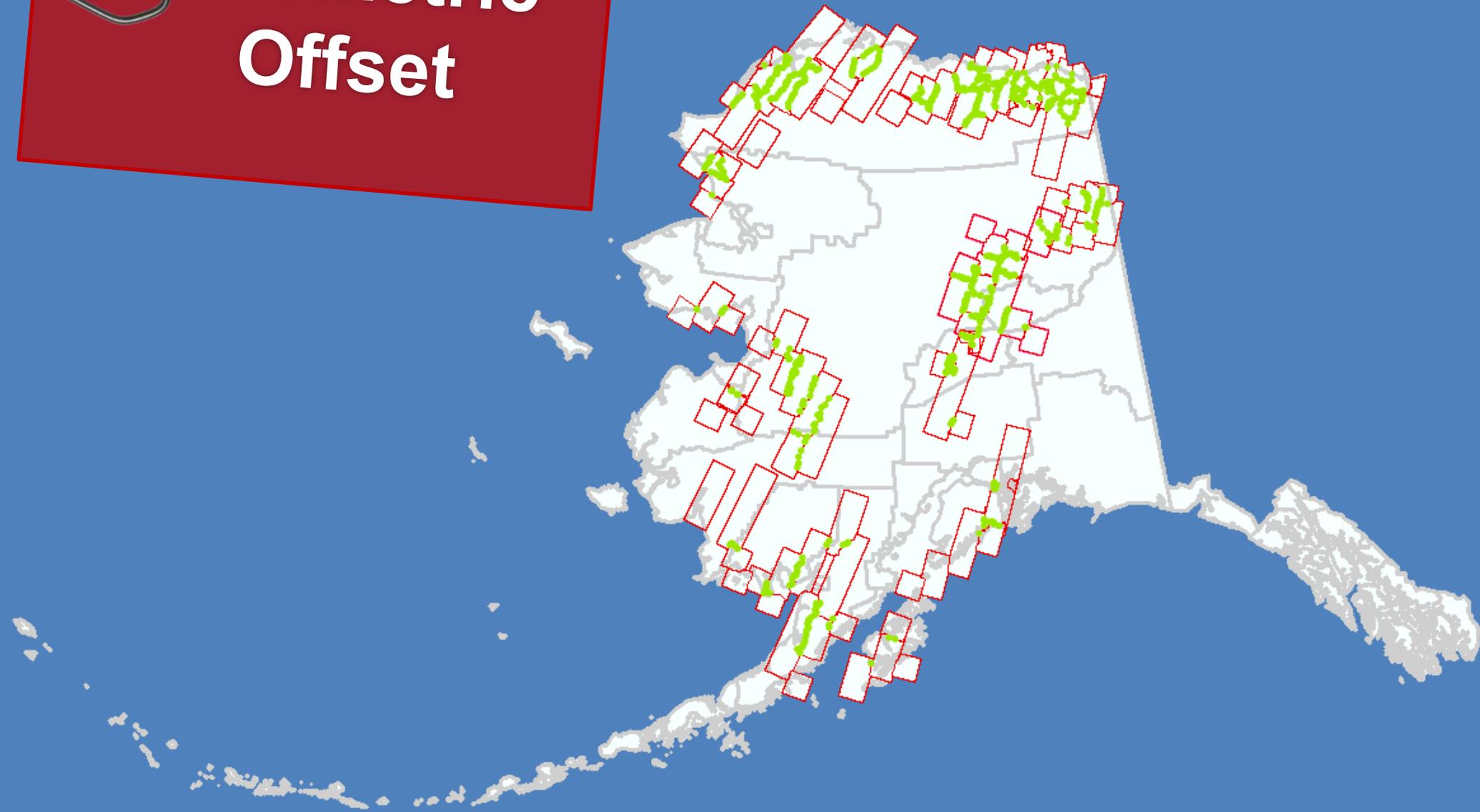


- Geometric Offset

# Geometric Offset



# Geometric Offset





# ALASKA MAPPED



SDMI

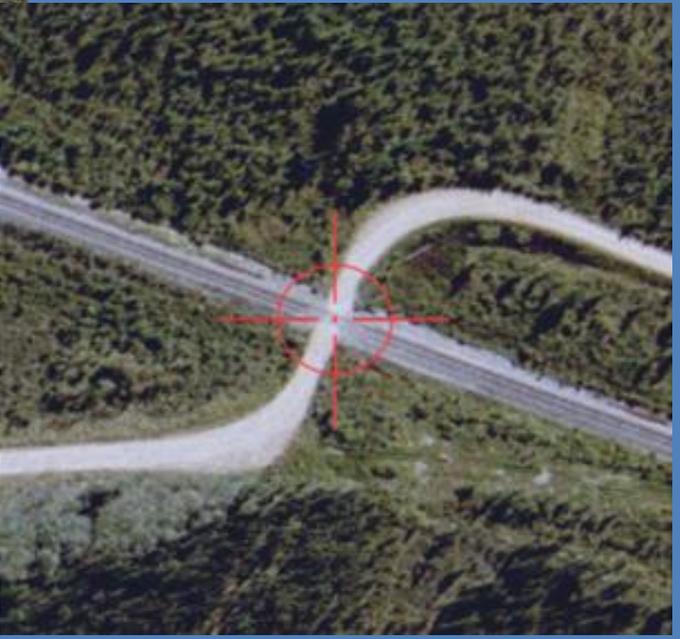
Statewide Digital  
Mapping Initiative

- Geometric Accuracy

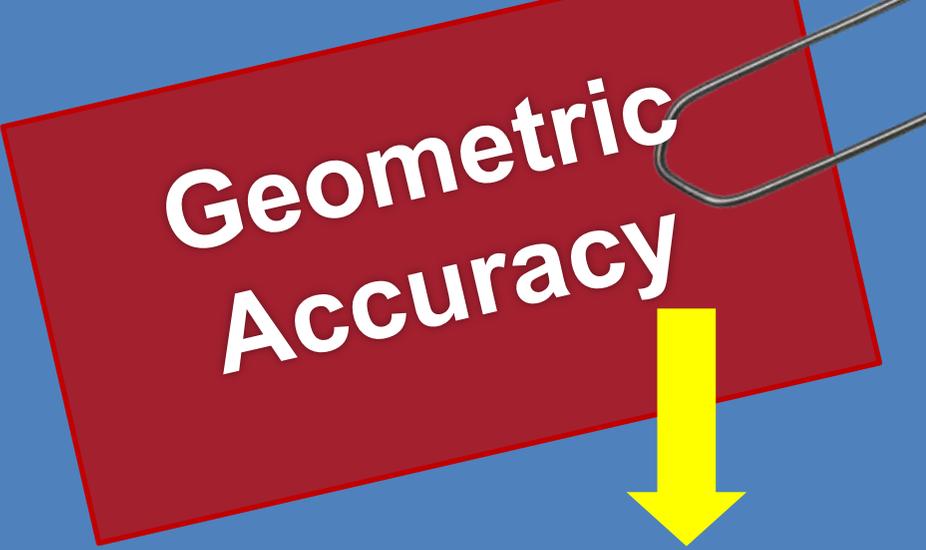




**Geometric Accuracy**

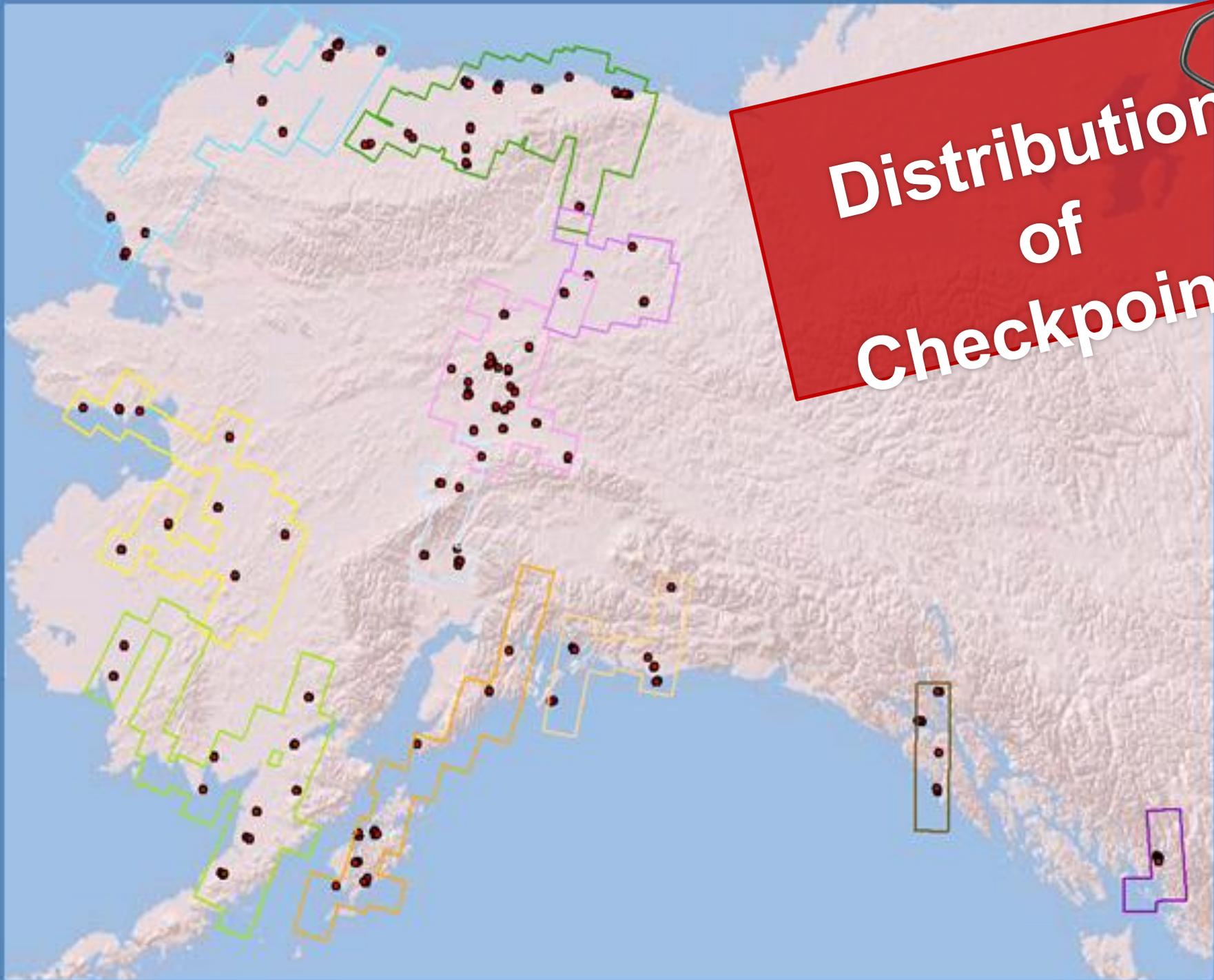


# Geometric Accuracy



BlockID	No. Points	RMS in X (m)	RMS in Y (m)	RMS (m)	CE90 (m)
CM1	23	4.01474	3.18580	5.12518	7.78
CM3_Pilot	39	1.92024	1.44665	2.40419	3.65
CM3_South	16	2.25656	2.41112	3.30236	5.01
JU1_East	9	2.22469	3.71440	4.32957	6.56
JU1_West	12	2.67875	4.07422	4.87595	4.06
NM1	23	3.60820	2.50492	4.39246	7.40
NM2	45	1.64688	2.30841	2.83567	4.30
NM2_East	9	1.63304	2.64374	3.10745	4.71
SM1	27	2.38353	2.27322	3.29381	4.99
SM2_East	15	2.42490	2.82015	3.71933	5.64
SM2_West	19	2.29724	2.55574	3.88594	5.90

# Distribution of Checkpoints



# SDMI Acceptance Tool

The screenshot displays the SDMI Acceptance Tool interface. The main window shows a satellite map with a central inset of a specific area. A right-hand panel provides details for a selected QC Cell (1022\_1158), including its status (Fail), technician (4), and comment (blend). A 'Radiometry Problem' dialog box is open, allowing the user to record a problem with a specific location and comment. At the bottom, a table lists various QC cells and their associated data.

**QC Cell: 1022\_1158**

Status:

Technician: 4

Comment: blend

Flags:

- Cloud/Shadow
- Haze
- Blend
- Contrast
- Saturation
- Artifact
- Blurry
- Ghosting

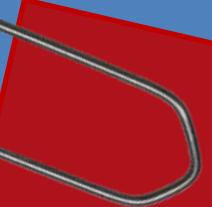
**Problems**

Location	Comment
POINT(227009.27734374 1583003.8452156)	poor blending between adjacent scenes

Center: (64.2480,-149.2344) | Mouse: (64.2025,-149.7561)

Buttons: Zoom, Mark problem, Save

QC Name	Ortho Tile	Delivery	Status	Boundry	Comment
1020_1154	1020_1154	CM3_South_20110...	Pass	full_box	
1020_1156	1020_1156	CM3_South_20110...	Pass	full_box	
1020_1158	1020_1158	CM3_South_20110...	Pass	full_box	
1022_1156	1022_1156	CM3_South_20110...	Fail	full_box	blend
1022_1158	1022_1158	CM3_South_20110...	Fail	full_box	blend
<b>Delivery: JU1_East_20110525 (5 Items)</b>					
1148_1078	1148_1078	JU1_East_20110525	Pass	full_box	
1148_1080	1148_1080	JU1_East_20110525	Pass	full_box	
1148_1082	1148_1082	JU1_East_20110525	Pass	full_box	



# 2010 Summary of Findings

- **Coverage:** 341,600 sq. km of ortho mosaic was completed from imagery acquired in 2010. Approximately 18.75% of project.
- **Radiometric Quality:** 94% the ortho tiles generated from the 2010 collection scenes were compiled into the ortho mosaic and met the acceptance criteria set forth by the SDMI project .
- **Geometric Offset:** 100% of locations assessed for geometric offset were marked as having no noticeable offset.
- **Geometric Accuracy:** All blocks completed from the 2010 collection season exceeded the geometric accuracy requirement set by the SDMI.

# the license

the gotcha



ALASKA MAPPED



SDMI

Statewide Digital  
Mapping Initiative

# SDMI EULA

Best license you can get except for that  
'oops' license that you can't really get



**Fed/Civ**  
**US State/Local**  
**Local government**  
**Universities**  
**Tribal non-profit**

please read the EULA for full details



# Defense users are sad

so are commercial users but we are working on a commercialization strategy



**DOD/NGA could uplift  
the whole SDMI ortho  
mosaic for their users  
use for only \$300K**

Ask me how! Seriously, I've already got people in DOD asking me for a copy of the 2010 ortho tiles and it makes me sad to say no.



The data can be  
consumed via OGC  
services by all US users  
- integration into BDL -



# SDMI EULA for others

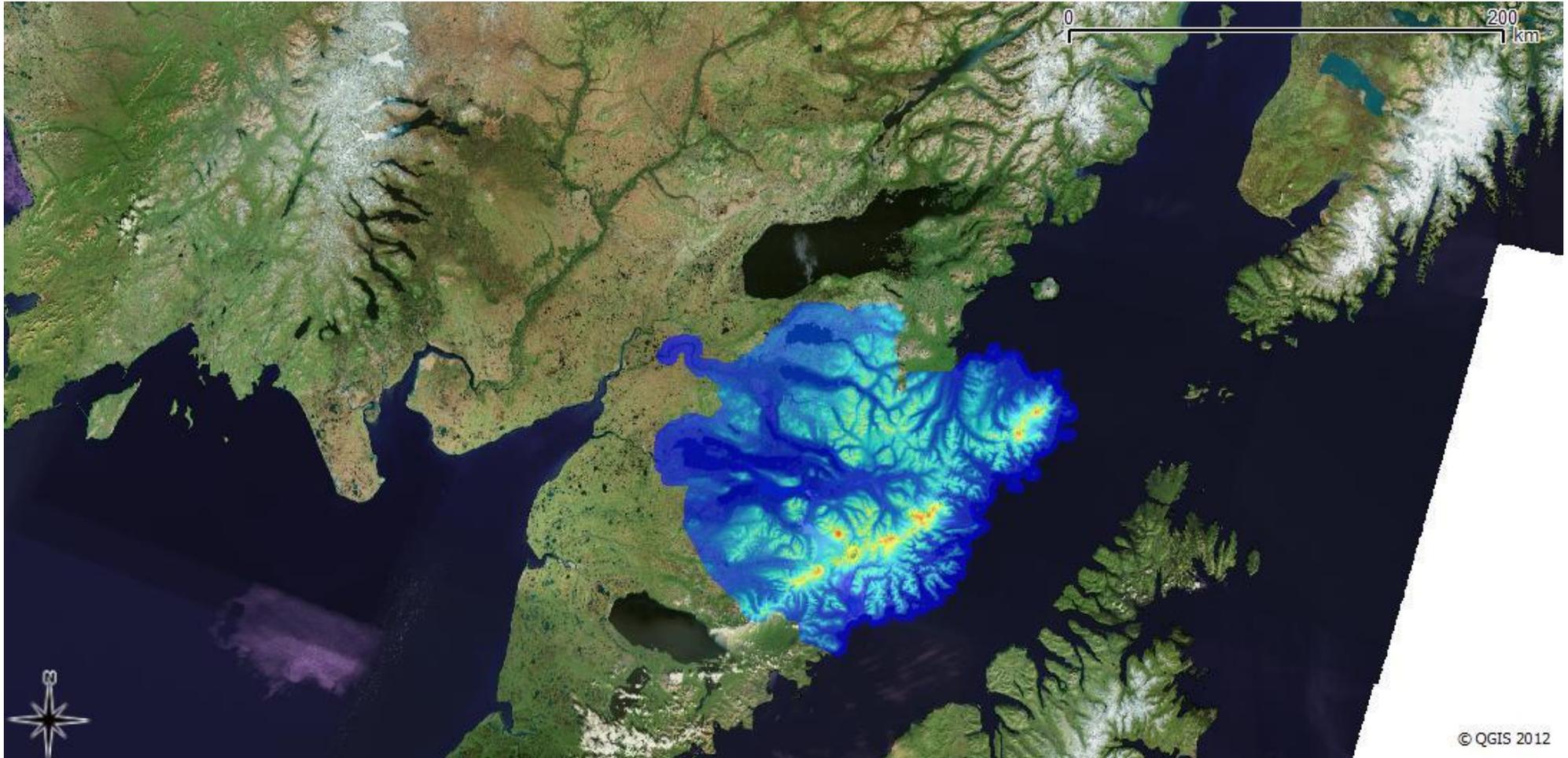
SPOT4 and SPOT5 data can be purchased with a SDMI EULA through Aerometric - find a great new SPOT5 scene in an already covered area consider this as an option.

SPOT HRS DEM pricing and SDMI EULA are an option too

# Katmai National Park DEM

NPS funded - SPOT 5 HRS DEM

20-m post spacing - 5.4-m LE90 (35-ft contour interval equivalent )  
currently in QC by GINA - accuracy evaluation above from other NGA assessments



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SDMI

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# SDMI ortho future

# 2012 collection starting

hoping for clear weather!

# The Aleutians might be a problem

would a large fan work?

# Refresh becoming a question

fires make alaska fun!



ALASKA MAPPED



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# SDMI IFSAR + ORTHO

USGS topographic maps for Alaska



[The National Map Home](#) << [US Topo Home](#) << Alaska Mapping Initiative

## Alaska Mapping Initiative: US Topo Feedback

### Sample Graphics and Feedback Form

*The USGS Alaska Mapping Initiative invites you to submit feedback, suggestions, and comments related to the US Topo products under development.*

### Background

The US Topo is a new kind of georeferenced map and intended to serve map users who are not GIS specialists. The priority design objectives were to create a traditional topographic map, in a digital format that can be displayed on any normal office computer without specialized software, and printed at map scale without specialized software or expertise. We believe PDF is the only format in common use that satisfies these requirements. The geospatial extensions add limited GIS functionality "for free" - users who are not interested in georeferencing can still use the product as a plain PDF. Viewing and analytical tools are available free for download from [Adobe](#) and [TerraGo Technologies](#). Further information about GeoPDF is available at <http://en.wikipedia.org/wiki/GeoPDF> and at <http://www.terragotech.com/>.

The Alaskan experimental US Topos include an [orthoimage base](#), [roads](#), [geographic names](#), [contours](#), [hydrographic](#) features, boundaries (including PLSS), and land cover. The quality and accuracy of any US Topo map depends on [The National Map](#) data used to make it.

Computer and software requirements can be found in the [US Topo user guide](#). More information about the the US Topo project can be found at <http://nationalmap.gov/ustopo>.

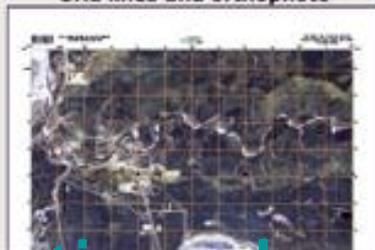
### Sample Graphics

Presented below are a set of 'browse' images that were created from full-resolution, experimental US Topo products. The full-resolution products allow users to toggle (or select) different data layers and/or remotely-sensed imagery in any manner they choose, creating maps 'on-the-fly'. The 'browse' images are non-functional and are provided as examples of what can be done with any of the full-resolution samples that can be found immediately below these images.

**Geographic layers only**



**Grid lines and orthophoto**



**Geographic layers and orthophoto**



<http://nationalmap.gov/ustopo/alaska/>

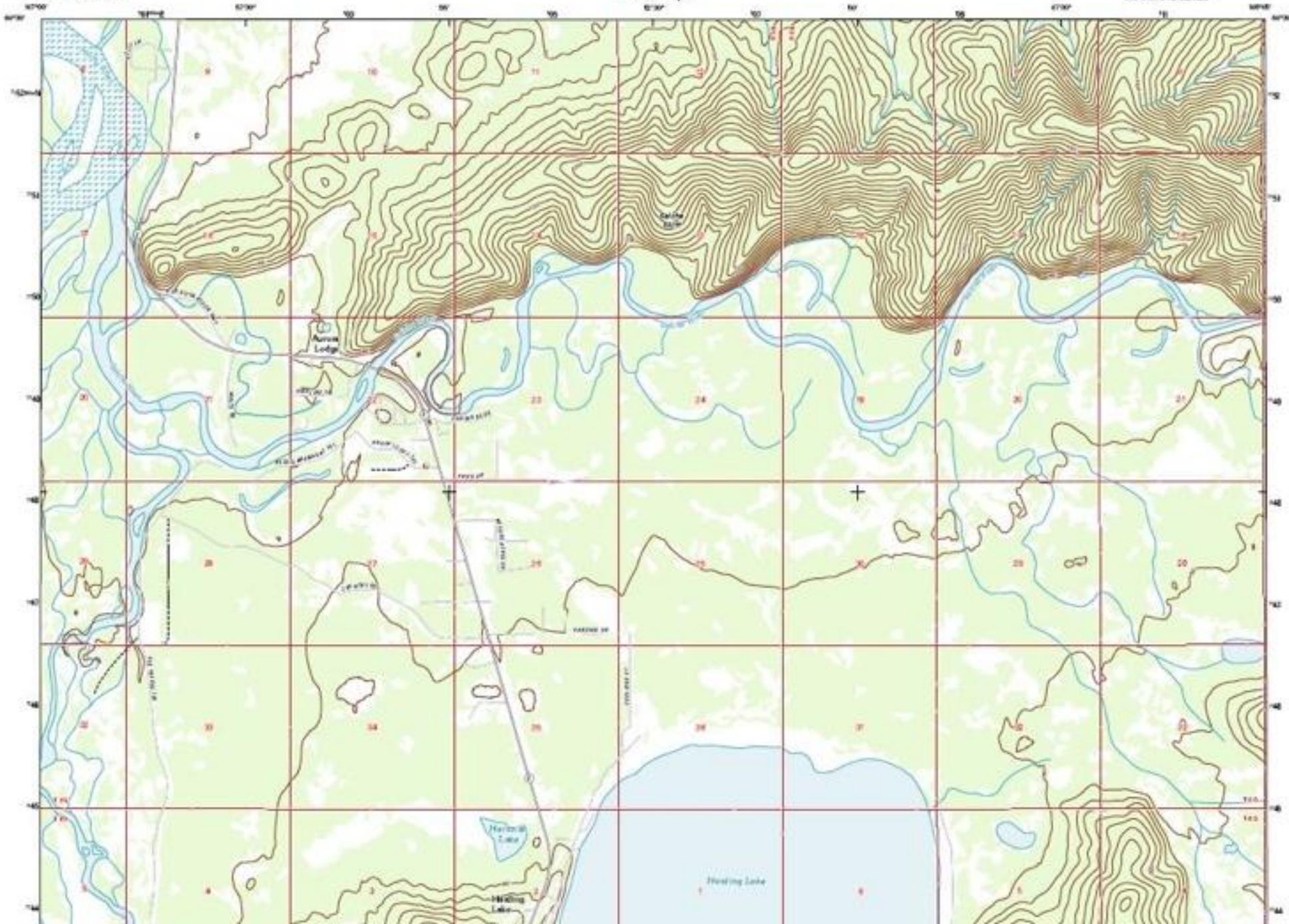
They have a survey going right now for feedback on the topos. Takes less than 5 minutes



U.S. DEPARTMENT OF THE INTERIOR  
U. S. GEOLOGICAL SURVEY



BIG DELTA B-6 NW QUADRANGLE  
ALASKA-FAIRBANKS NORTH STAR BOROUGH  
7.5-MINUTE SERIES

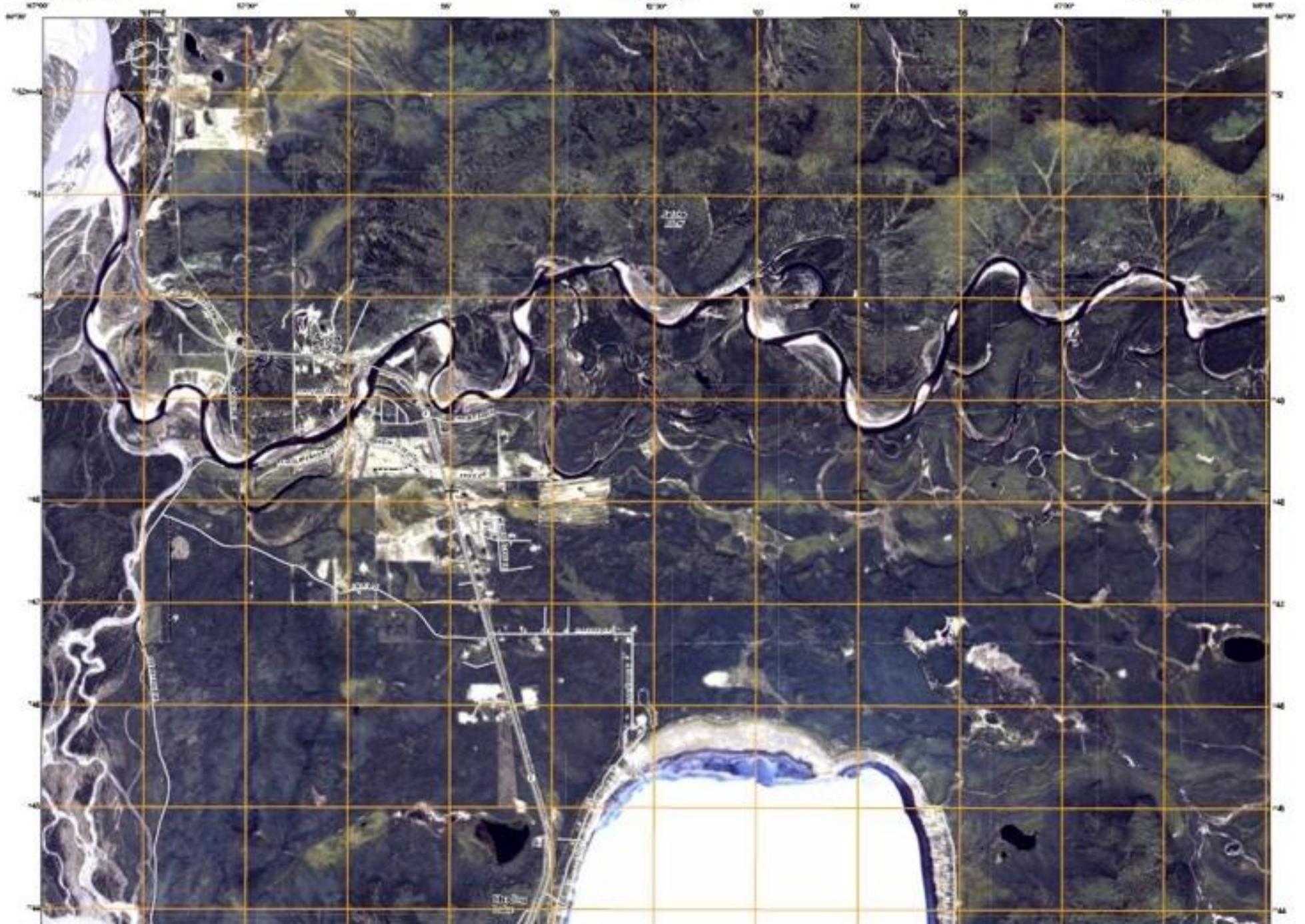




U.S. DEPARTMENT OF THE INTERIOR  
U. S. GEOLOGICAL SURVEY

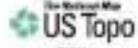


BIG DELTA B-6 NW QUADRANGLE  
ALASKA-FAIRBANKS NORTH STAR BOROUGH  
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7.5-MINUTE SERIES



**firehose off**

questions?

# Alaska Base Map status

Starting to make real progress

Key to success has been through funded partnerships and unfunded supporters getting on board with the program and goals

Need to keep moving forward updating, refreshing, and improving the basemaps in Alaska.