Alaska's Statewide Digital Mapping Initiative

May 22, 2012

Anne Johnson, Alaska Department of Natural Resources

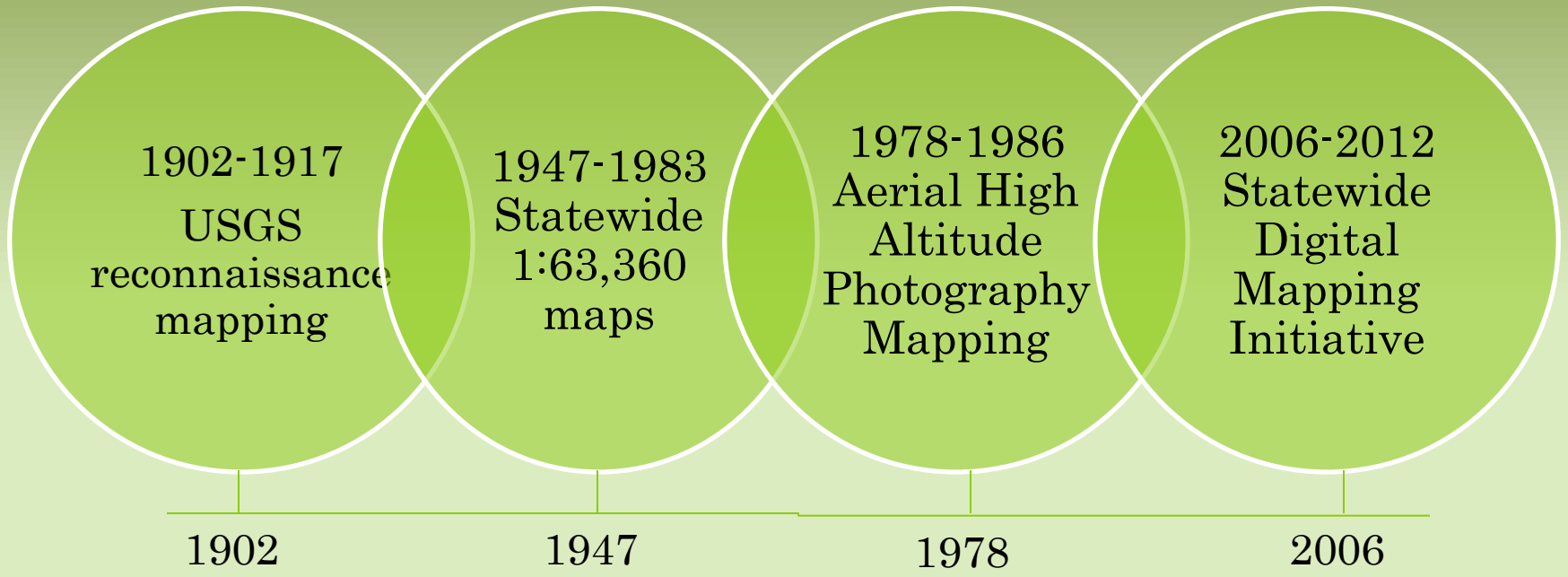
Roadmap

- Overview of mapping in Alaska
- How the Statewide Digital Mapping Initiative fits in,
  - Background and history
  - Goals and objectives
  - Current status and accomplishments
  - Plans forward

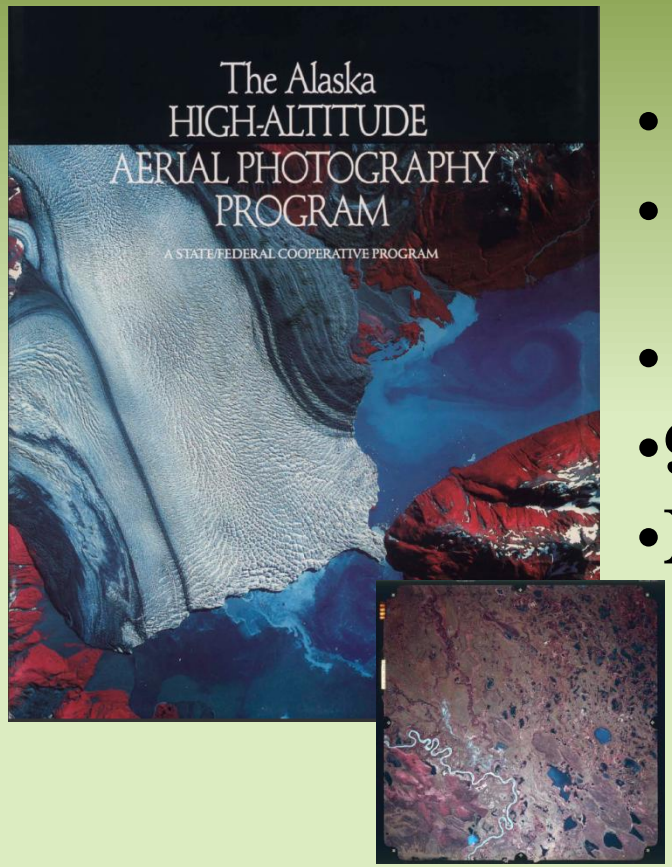
Unique Challenges

- Limited collection season
- Challenging weather conditions
- Large area, small population (1 person/mi^2)
- Vast remote areas (limited access to resources such as refueling stations, etc.)

Mapping in Alaska:
the last century



Alaska High-Altitude Aerial Photography Program



- 1978-1986
- $2.7M multi-agency funding
  ($6.4M in 2012 dollars)
- 1:60,000 color infrared
- 90%+ statewide coverage
- Not orthorectified systematically

Alaska Statewide Digital Mapping Initiative

www.alaskamapped.org

Primary goals:

1. **Acquire new and better maps** for Alaska, and
2. **Make existing map products more easily available**.

SDMI Member Agencies

ALASKA
DEPARTMENT OF
COMMERCE, COMMUNITY, AND ECONOMIC DEVELOPMENT

Alaska Department of
Military & Veterans Affairs

UNIVERSITY of ALASKA
Many Traditions One Alaska

Alaska Department of
Natural Resources

Alaska Department of
Fish and Game

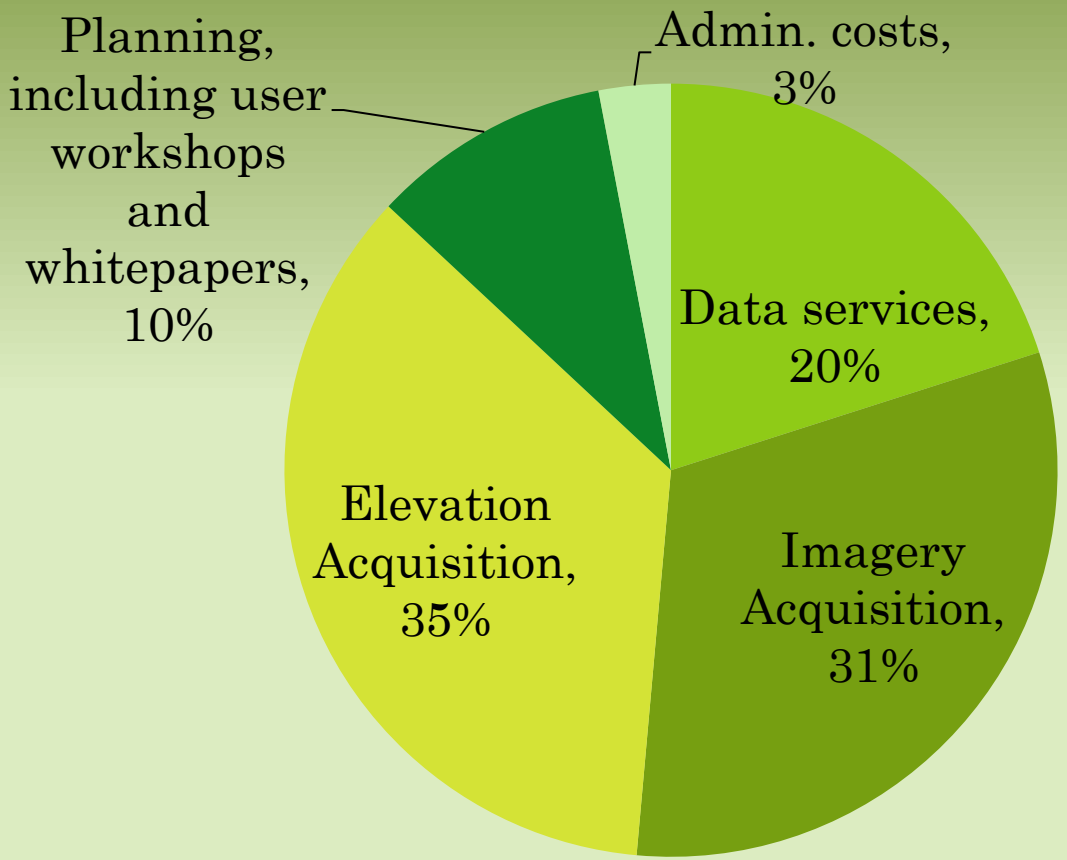
Alaska DEC
Alaska Department of
Environmental Conservation

Alaska Department of
Transportation & Public Facilities

SDMI spending

- Workshops and whitepapers
- Web mapping services of existing imagery and USGS topographic maps
- Mid-resolution elevation data through federal partnership pilot project
- Kenai peninsula LiDAR
- Statewide orthoimagery coverage

Statewide Digital Mapping Initiative Investments



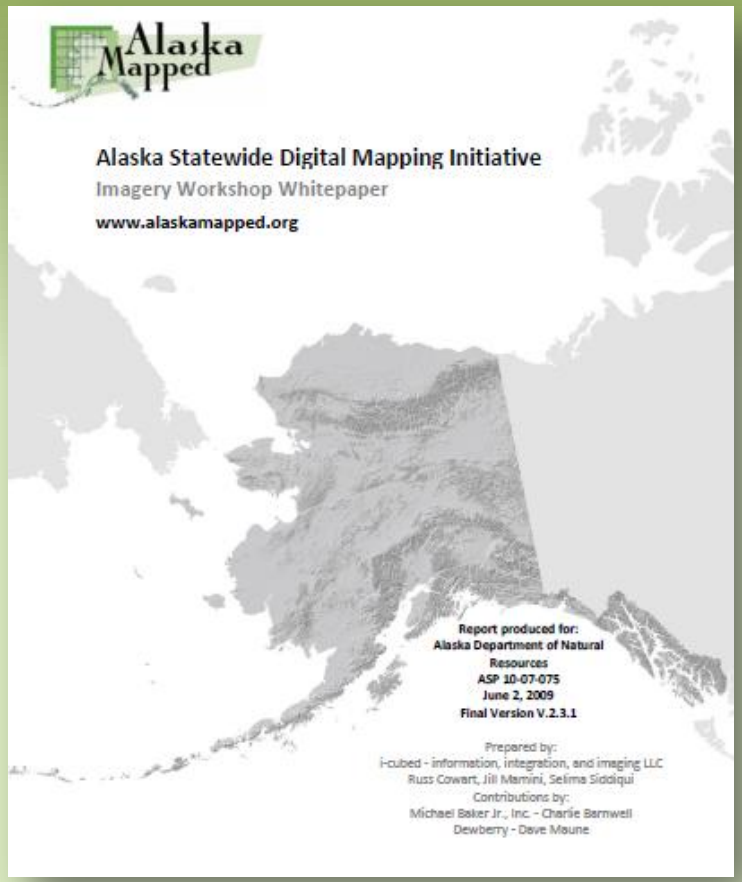
ORTHO-IMAGERY ACQUISITION

August 2010 – June 2014

State contract #10-10-062

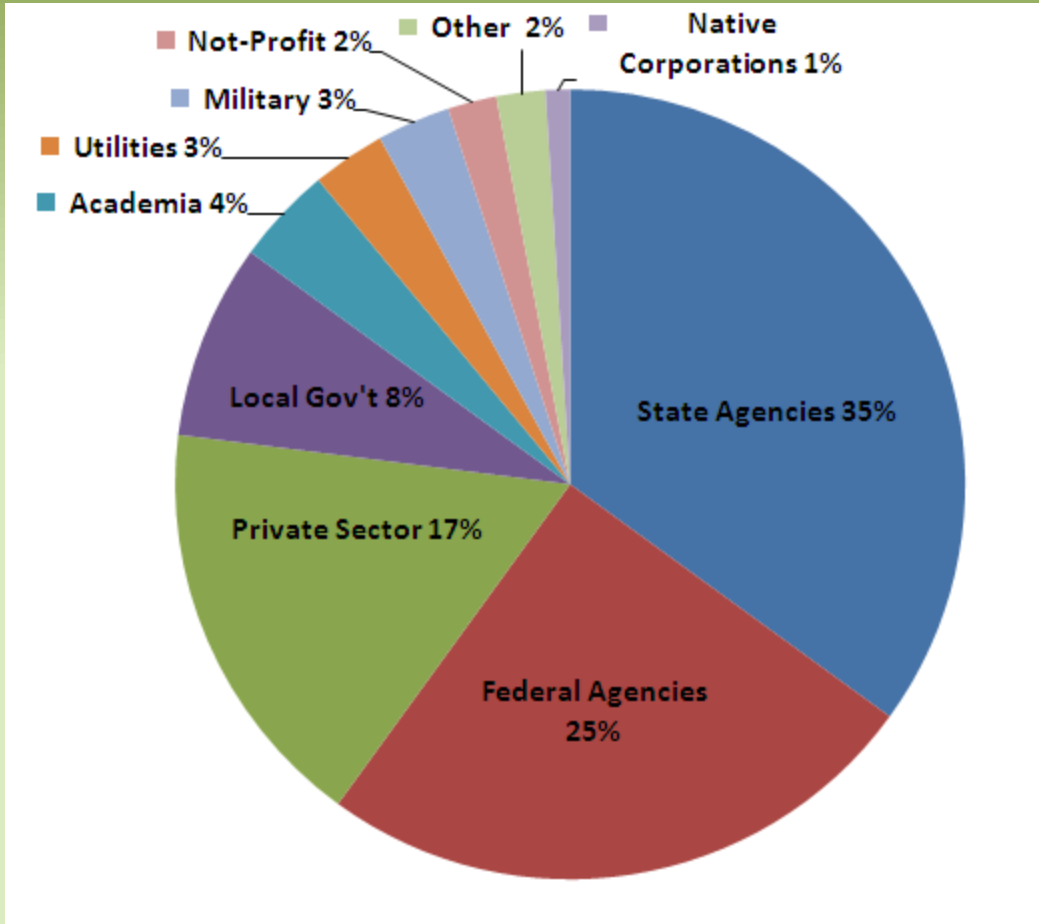
STATE of ALASKA

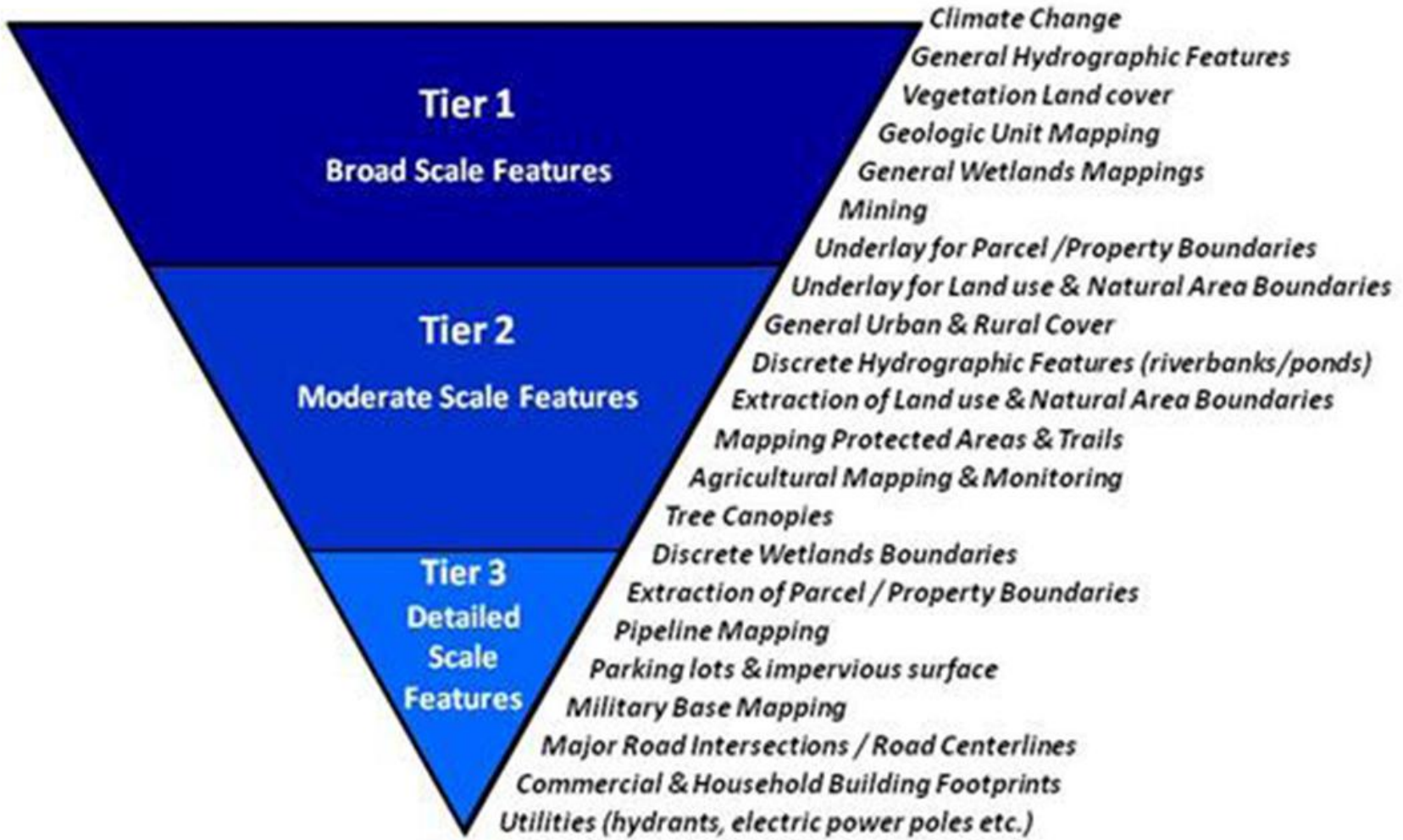
Requirements Gathering



- 2008 User Survey
- Imagery Workshop held March 2-3, 2009
- Whitepaper June 2009
- Available at www.alaskamapped.org

Participants




Tier 1
Broad Scale Features
Tier 2
Moderate Scale Features
Tier 3
Detailed
Scale
Features
Climate Change
General Hydrographic Features
Vegetation Land cover
Geologic Unit Mapping
General Wetlands Mappings
Mining
Underlay for Parcel /Property Boundaries
Underlay for Land use & Natural Area Boundaries
General Urban & Rural Cover
Discrete Hydrographic Features (riverbanks/ponds)
Extraction of Land use & Natural Area Boundaries
Mapping Protected Areas & Trails
Agricultural Mapping & Monitoring
Tree Canopies
Discrete Wetlands Boundaries
Extraction of Parcel / Property Boundaries
Pipeline Mapping
Parking lots & impervious surface
Military Base Mapping
Major Road Intersections / Road Centerlines
Commercial & Household Building Footprints
Utilities (hydrants, electric power poles etc.)

Uses

Use Case	Example Features
Transportation DOT&PF, Aviation (management), FHWA, utilities	Roads (general) Centerlines, Airports
Land Management BLM, NPS, ADNR, DCCED, Native corporations/organizations	Parcels Land ownership boundaries Mining claims Oil and Gas Leases
Land Cover USFWS, NPS, BLM, USFS, Private Industry	Land cover, e.g. LANDFIRE, NWI Wetlands, discrete wetlands, e.g. COE
Environmental mapping/analysis Academia, Conservation groups, USFWS, USFS, NPS	Land cover Hydrography, e.g. coastlines, stream banks, water bodies
Public Safety FAA, DMVA	Roads, airports, ice cover, hydrography/water-bodies, manmade features, general land cover
Natural Resource Inventories USGS, ADNR, USFS, Native Corporations & Organizations, Private Industry	Forest/timber, geologic units, mining exploration features, renewable energy sites, hydrographic (stream networks), water resources,

Requirements

- Statewide coverage
- 5 meter pixel resolution or better
- Ability to collect the state in 3-5 years or less, leaf-on, snow free and <10% cloud cover
- Multispectral optical, including infrared
- Ortho-image map products of 1:24,000 national map accuracy standards or better
- Image products available on web for distribution and use
- Licensing public (1st choice) or at minimum available to public agencies and academia (2nd choice)

Imagery Contract in 2010

- Contract awarded August 2010 to Aerometric
- Completion date June 2014
- Combined State funds with $1.8M BOEMRE CIAP (Coastal Impact and Assessment Project) funds for a total of $3.45M

Product Specifications

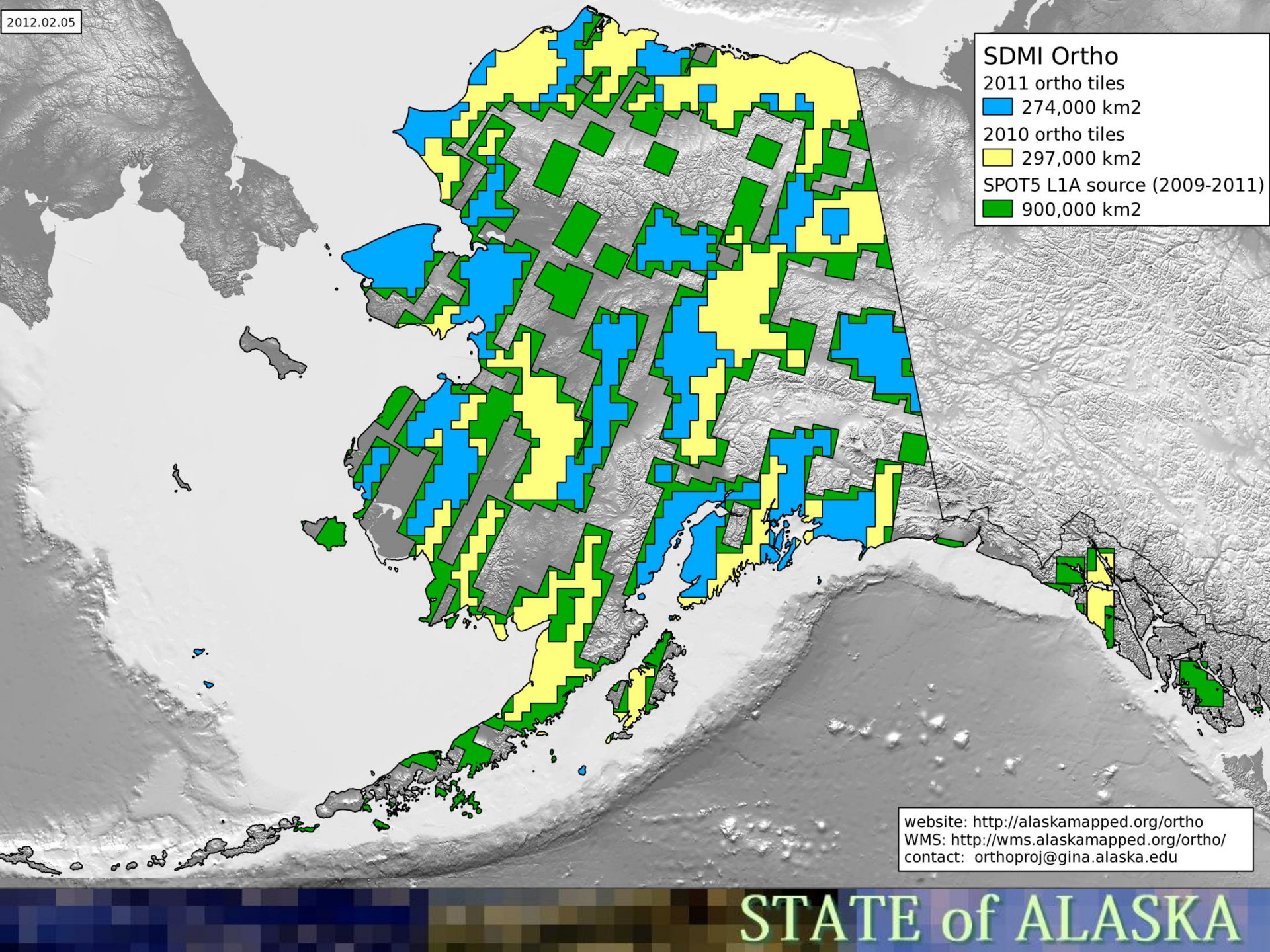
- 15% maximum incidence angle
- 10% cloud cover or less

SPOT 5 bands:

- XS1 (Green: 0.50 – 0.59 μm, 10 meter resolution)
- XS2 (Red: 0.61 – 0.68 μm, 10m resolution)
- XS3 (Near infrared: 0.78 – 0.89 μm, 10 meter resolution)
- MIR SWIR (short wave infrared: 1.58 – 1.75 μm, 20 meter resolution resampled to 10 meters)
- Panchromatic band (0.48 – 0.71 μm, 2.5 meter resolution)

Deliverables

- **Source imagery**, including FGDC compliant metadata containing information on spectral bands, rational polynomial coeffiecients (RPC), and all additional sensor information necessary for processing
- **Seamless orthoimagery tiles** delivered as 8-bit, natural color or psuedo natural color composite, pan sharpened, uncompressed GeoTiffs. Also mosaic blend lines, panchromatic mosaic, and metadata. All tiles will be delivered in Alaskan Albers NAD83 EPSG code 3338.
- **Color infrared orthoimagery tiles** delivered as 8-bit, color infrared composite, pan sharpened, uncompressed GeoTiffs
- **Product horizontal and vertical control** documenting all control points used for orthorectification, including information about and metadata for any DEM used for ortho rectification.


2012.02.05
SDMI Ortho
2011 ortho tiles
274,000 km2
2010 ortho tiles
297,000 km2
SPOT5 L1A source (2009-2011)
900,000 km2
website: http://alaskamapped.org/ortho
WMS: http://wms.alaskamapped.org/ortho/
contact: orthoproj@gina.alaska.edu
STATE of ALASKA

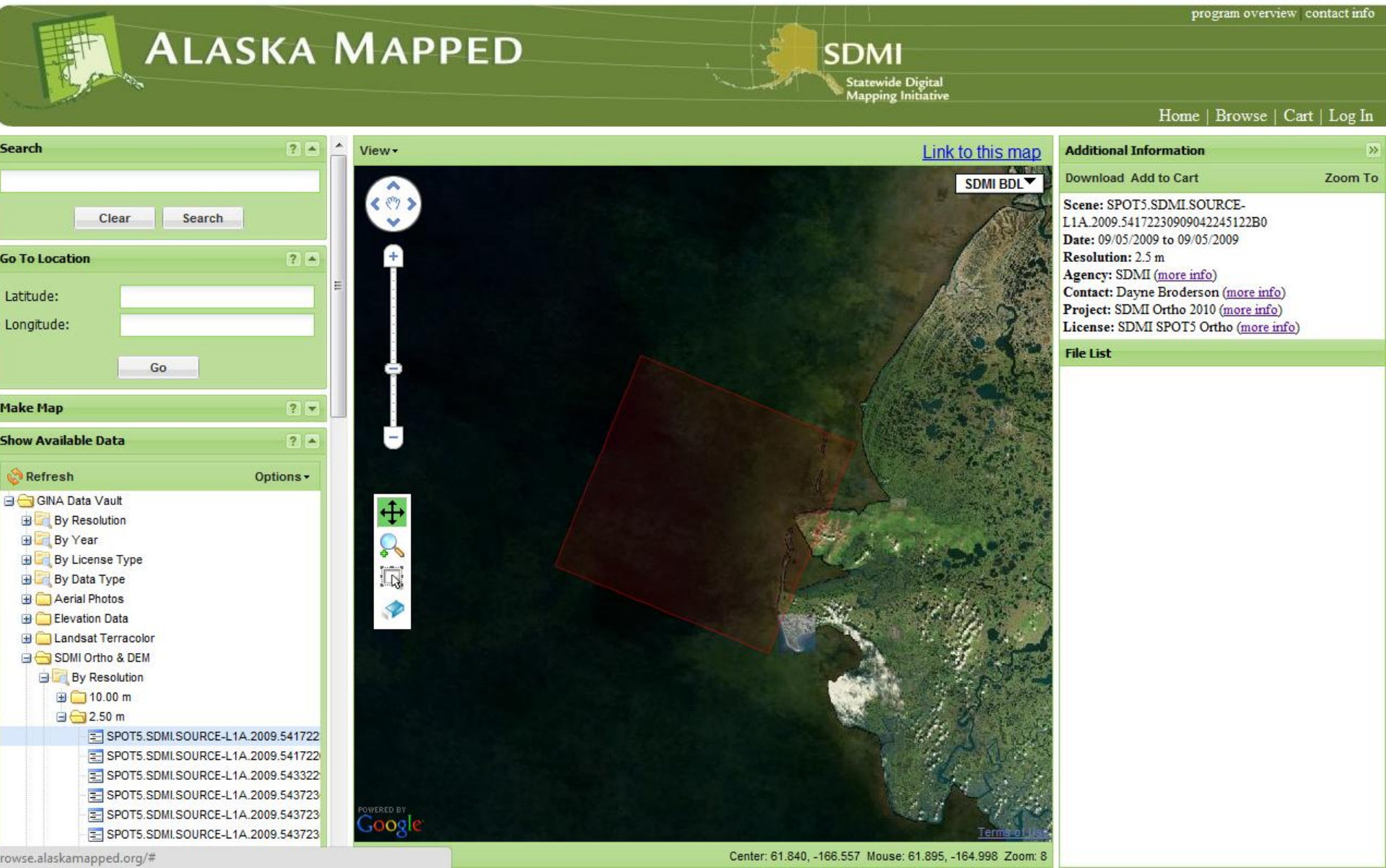
2010 QA/QC report

- Radiometric quality
  - cloud and cloud shadow, haze, blending along cut lines, contrast, saturation, artifacts, blurring, ghosting, color, and location based errors
- Geometric offset
  - Offset along cutlines of linear features such as roads or rivers
- Geometric accuracy

Geometric Accuracy

Block ID	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

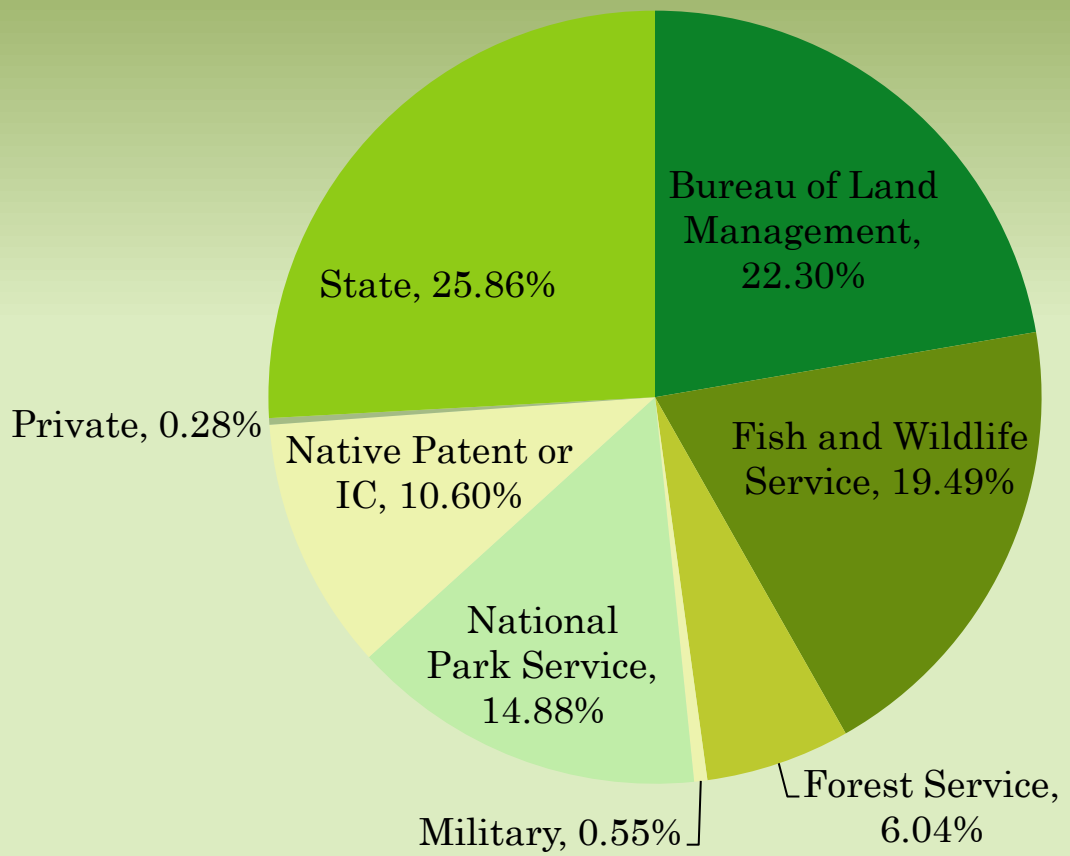
Select Scene – Add to Cart – Download



Plans forward

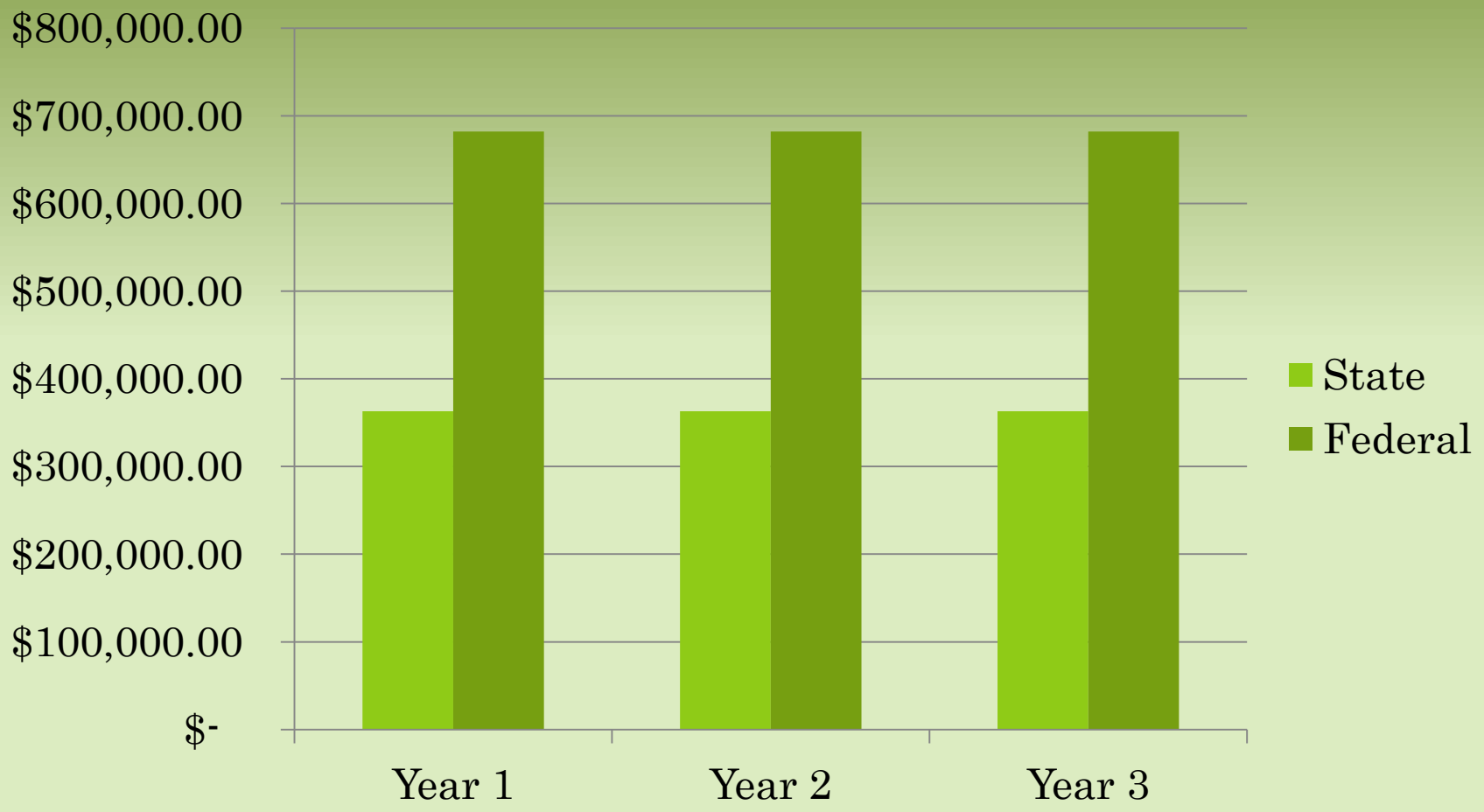
- 2011 license uplift amendment placed allowing USGS to use the imagery products in their US TOPO project
- Refresh program
- Coastal improvements

Land Ownership in Alaska



Cost of Refresh, 3 Year Cycle

Percentages Based on Land Ownership



THANK YOU!
QUESTIONS?

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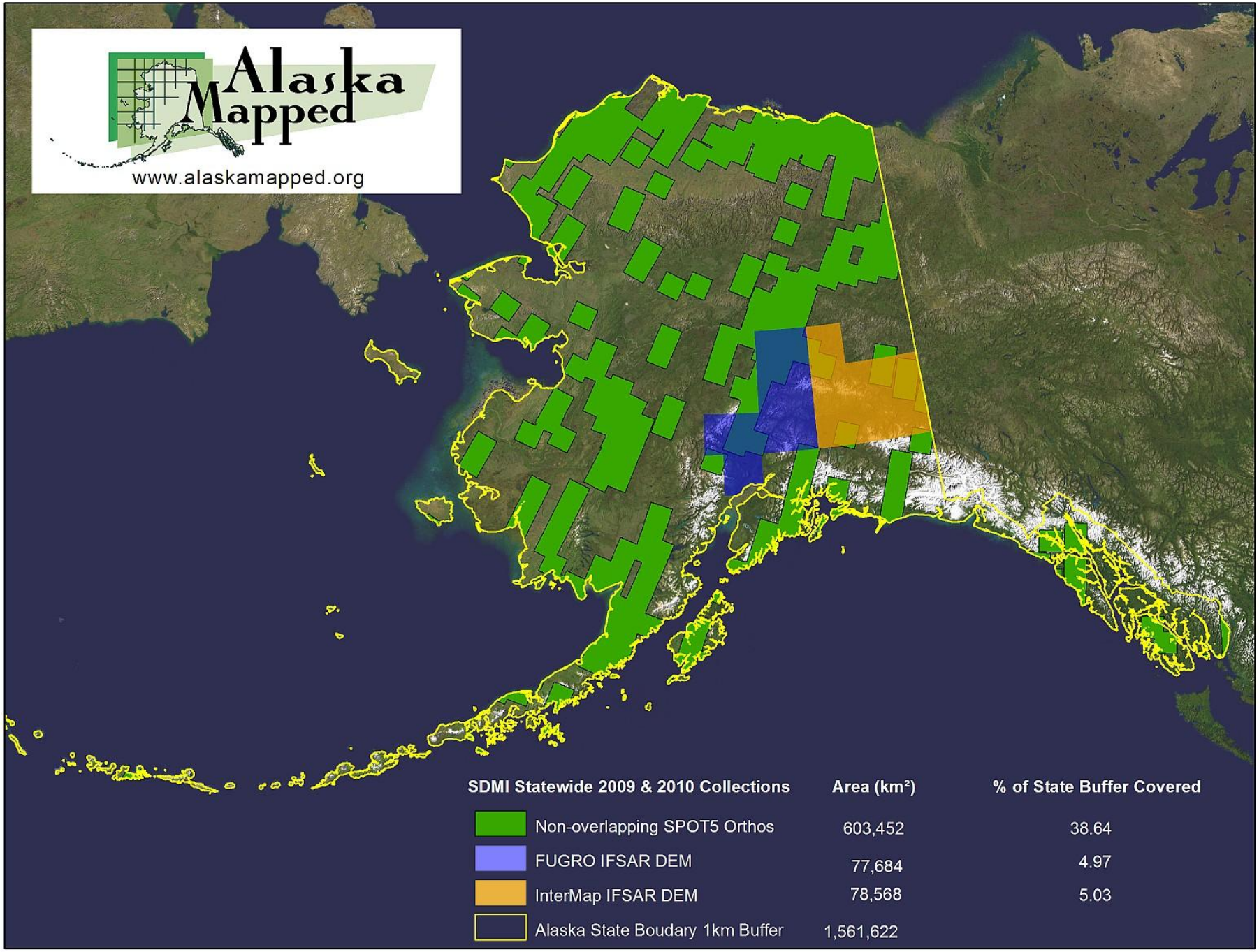
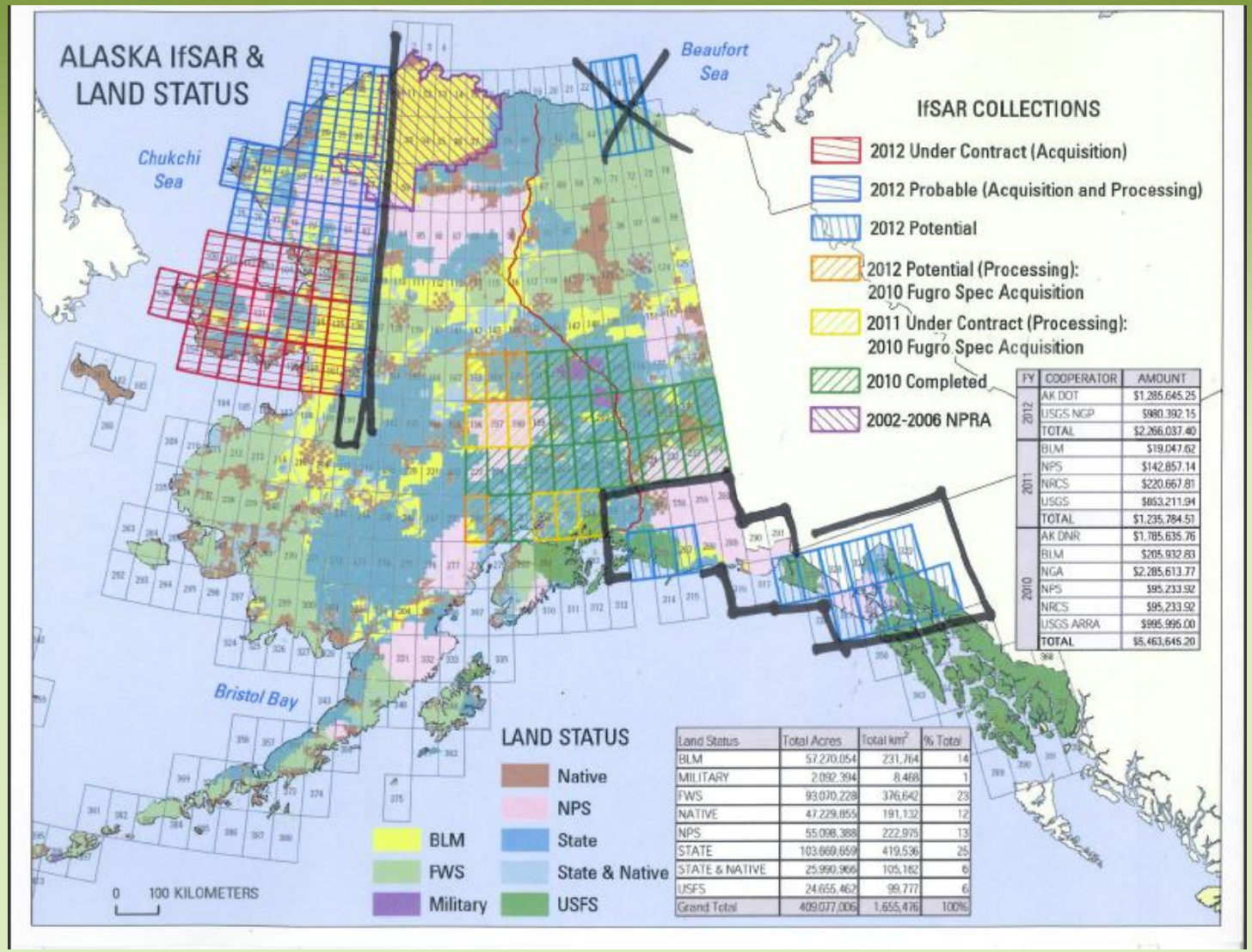

Alaska Mapped
www.alaskamapped.org
SDMI Statewide 2009 & 2010 Collections
Area (km²)
% of State Buffer Covered
Non-overlapping SPOT5 Orthos
603,452
38.64
FUGRO IFSAR DEM
77,684
4.97
InterMap IFSAR DEM
78,568
5.03
Alaska State Boudary 1km Buffer
1,561,622

DEM collection



FY	COOPERATOR	AMOUNT
2012	AK DOT	$1,285,645.25
	USGS NGP	$980,392.15
	TOTAL	$2,266,037.40
2011	BLM	$19,047.62
	NPS	$142,857.14
	NRCS	$220,667.81
	USGS	$853,211.94
	TOTAL	$1,235,784.51
2010	AK DNR	$1,785,635.76
	BLM	$205,932.83
	NGA	$2,285,613.77
	NPS	$95,233.92
	NRCS	$95,233.92
	USGS ARRA	$995,995.00
	TOTAL	$5,463,645.20

Land Status	Total Acres	Total km²	% Total
BLM	57,270,054	231,764	14
MILITARY	2,092,394	8,468	1
FWS	93,070,228	376,642	23
NATIVE	47,229,855	191,132	12
NPS	55,098,388	222,975	13
STATE	103,669,659	419,536	25
STATE & NATIVE	25,990,966	105,182	6
USFS	24,655,462	99,777	6
Grand Total	409,077,006	1,655,476	100%

Strategic Goals

- Strategic Goal 1: Establish a sustainable participatory governance structure to effectively and efficiently coordinate and communicate geospatial efforts
- Strategic Goal 2: Ensure statewide spatial data and technology are available to as many potential users as possible and are developed, managed, and coordinated according to best practices
- Strategic Goal 3: Expand and improve the use and awareness geospatial technologies through increased collaborative educational opportunities and outreach
- Strategic Goal 4: Identify and secure sustainable funding sources used to support ongoing statewide geospatial programs

Status of Alaska's Statewide GIS Program		
NSGIC Characteristic	**Alaska Status**	**Description**
A full time paid coordinator with authority to implement the state's strategic and business plans	Not implemented	No single coordinator exists for statewide geospatial efforts. The state does not have any formal leadership of geospatial activities to support the implementation of this Strategic Plan and a forthcoming companion Business Plan.
A clearly defined authority exists for statewide coordination of geospatial technologies and data production	Not implemented	No formal authority exists to coordinate statewide geospatial efforts in Alaska. Although the Statewide Digital Mapping Initiative (SDMI) has coordinated efforts for statewide data collection, this body does not have formal authority to prioritize, execute, and manage statewide geospatial initiatives.
A statewide coordination office has a formal relationship with the state's CIO (or similar office)	Not implemented	Alaska does not have a statewide coordination office or a Chief Information Officer. The state does have an Enterprise Technology Services (ETS) department, but this department does not have governance responsibilities for all of the state's technology initiatives. No formal relationship exists between the ETS department and statewide geospatial efforts (including SDMI).
A champion (political or executive decision maker) is aware and involved in the process of coordination	Not implemented	Several members of the executive, legislative, and administrative branches of state government are aware of the coordination planning that has been initiated, but no champion has been identified to continually support the coordination effort.
Responsibilities for developing the NSDI and a state clearinghouse are assigned	Not Implemented	The SDMI has taken responsibility for developing orthoimagery and elevation data, but there is no formal mandated assignment of these responsibilities.
The ability to work and coordinate with local governments, academia, and the private sector	Not Implemented	There are many examples of successful coordination between private and public sector organizations, but there are no formal mechanisms (including contract vehicles, standard operating procedures, etc.) within state government that can be continually utilized to support these collaboration efforts.
Sustainable funding sources exist to meet projected needs	Not implemented	No sustainable funding sources exist specifically for statewide geospatial needs. Funding is generally allocated for single initiatives or as part of related programs.
Coordinators have the authority to enter into contracts and become capable of receiving and expending funds	Implemented	Government agencies have the authority to contract with other organizations and can transfer funds. This authority and the resulting contracts are generally executed on an agency and/or project specific basis.
The Federal government works through the statewide coordinating entity	Not Implemented	No statewide coordinating entity exists. Although the Federal government has supported statewide and regional efforts, and has partnered with individual agencies, this coordination is not universal.

Status of Framework Data

Geodetic Control: exists, but not at the accuracy or density required for state mapping. Elevation heights in error up to 2m due to poor geoid model.

Orthoimagery: Satellite and aerial imagery with statewide 2.5m resolution imagery by 2014. 39% of state collected to date. No refresh program in place, or coordinated means of collecting higher resolution imagery.

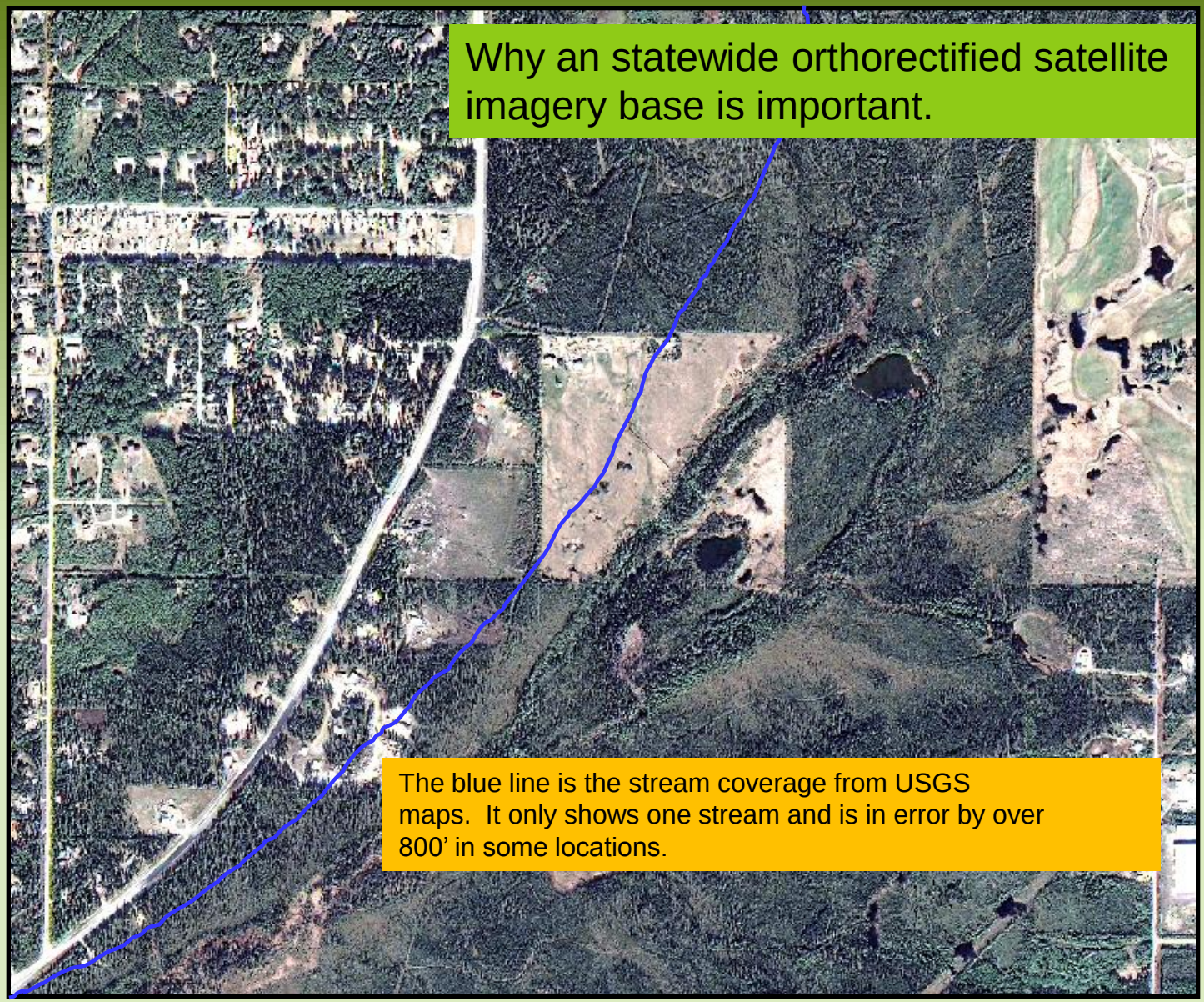
Elevation: NED is only available DEM for much of the state. 2010 IfSAR collect covered 10% of the state with 20m contour interval data. An additional 10% of the state is covered by Intermap IfSAr but at a lower resolution. LiDAR has been collected in certain areas, including Kenai and most recently the MatSu borough.

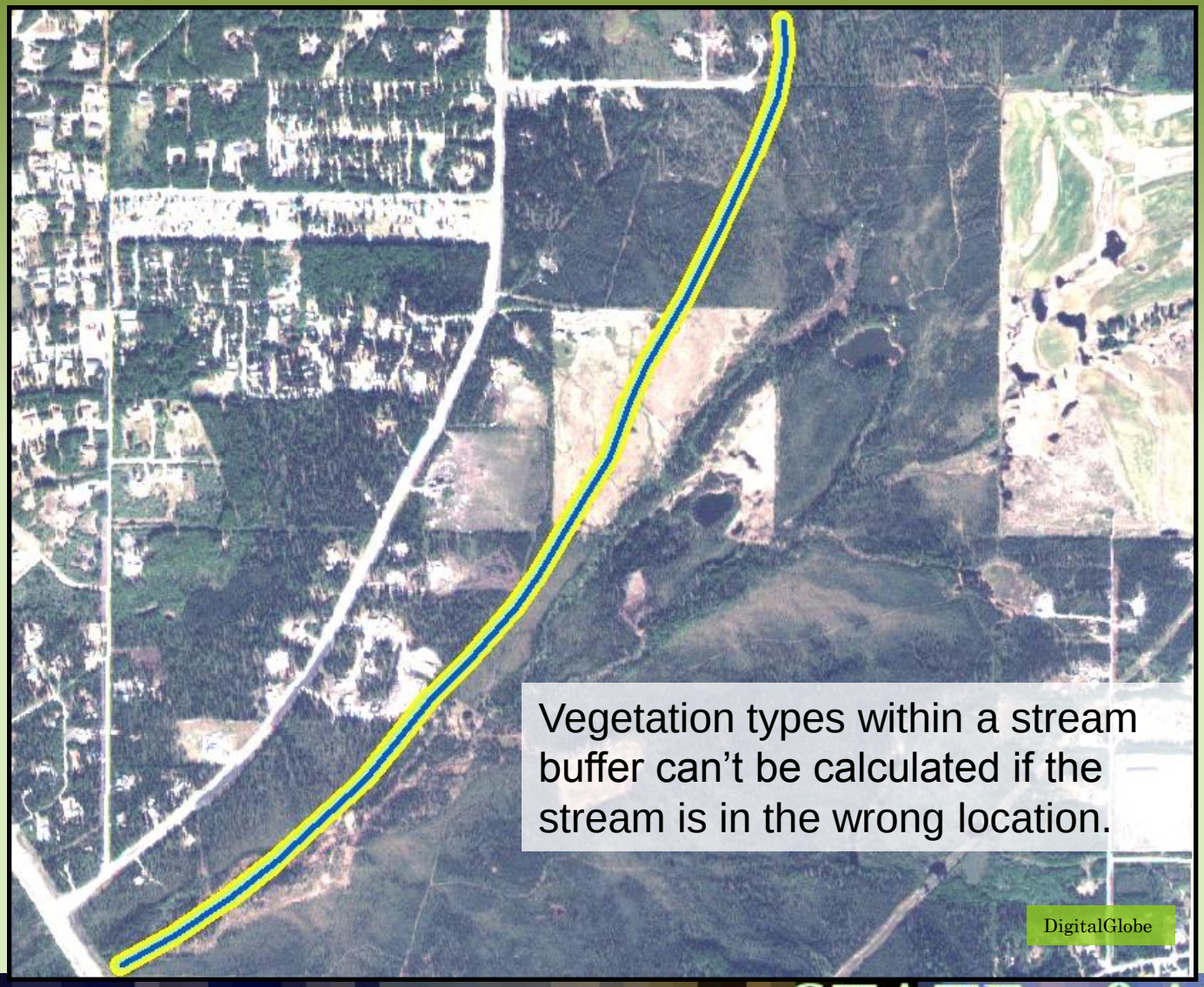
Transportation: Exists via various sources including DOT highway centerlines, local roads datasets, DNR and USFS datasets. No single, integrated raods dataset for the state.

Hydrography: Most hydrology datasets in use are derivations of the National Hydrology Dataset. There has been limited integration with moving updates from modified NHD layers back into the main dataset.

Cadastral: Efforts are underway to integrate federal, state, local and tribal parcel datasets and to develop procedures for updating the dataset over time. No statewide parcel layer currently exists.

Governmental Units: Generally derived from Census TIGER data, also state and local datasets for other administrative boundaries such as election districts.


Why an statewide orthorectified satellite imagery base is important.
The blue line is the stream coverage from USGS maps. It only shows one stream and is in error by over 800’ in some locations.


Vegetation types within a stream buffer can't be calculated if the stream is in the wrong location.
DigitalGlobe


Federal, state, and local governments and a multitude of private users need a good orthoimagery base product in order to use and update their coverages. Application development has been in vain until this problem is corrected.
Note the 100 foot difference between the road coverage and road location on the image.


N
Legend
State land Disposals
Cabins


Landsat 7 30-meter
Fairbanks, AK
Pike's
Landing


Spot 5 2.5-meter
Fairbanks, AK