U.S. Geological Survey

Future of Analog Camera Calibration
and
Future of Digital Imagery Quality Assurance

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U.S. Geological Survey

Topics

Future of Analog Camera Calibration

- Background
- Situation Today
- Workload Projections
- Considerations
- Near Term Plans

Future of Digital Imagery Quality Assurance

- Background
- Previous Sensor Evaluation
- Calibration/Validation Ranges
- Next Steps

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Background

- Individual Analog Camera Calibration is done by USGS EROS contractors at USGS HQ in Reston via fully reimbursable agreements with camera owners.
- This has been done by the USGS for decades.
- Analog Camera Cal is done only as a service to industry, and is not a source of research.
- A significant consumable of the process are specially manufactured glass plates, used for precision calibration.

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Situation Today

- Key Consumable - Two years of glass plates remain
  - About 9-12 months from order to delivery of glass plates –
  - A decision to purchase needs to be made in July 2011
- Demand is down
  - # of cameras calibrated decreased to 58 in FY10
  - Expect 50 cameras in FY11
  - Reduced from 3 to 2 staff due to reduced demand
- Increased Cost; Price Update Required
  - Supply, maintenance and space costs have increased
  - Fee update was approved by USGS
  - Venders notified of increase in January and implemented February 1, 2011
  - Previous Increase was in October 2005
  -

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Situation Today

- **With Cost rising, and demand going down, Calibration Fees to vendors may continue to increase**

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Situation Today

Key Consumables in the OSL are Glass Plates and Film

- **Options for consideration are:**
  - **Procure more glass plates**
    - **Requires special, minimum order, 6-12 months deliver time**
    - **There is one single remaining vendor**
    - **Large order size to accommodate production setup**
  - **In-situ calibration**
    - **Requires research to determine if in-situ calibration can be used; Not proven yet; never a complete substitute for lab calibration**
  - **Replace glass plates with something else (e.g. CCD array)**
    - **Requires significant research and funding (years and >$250K)**

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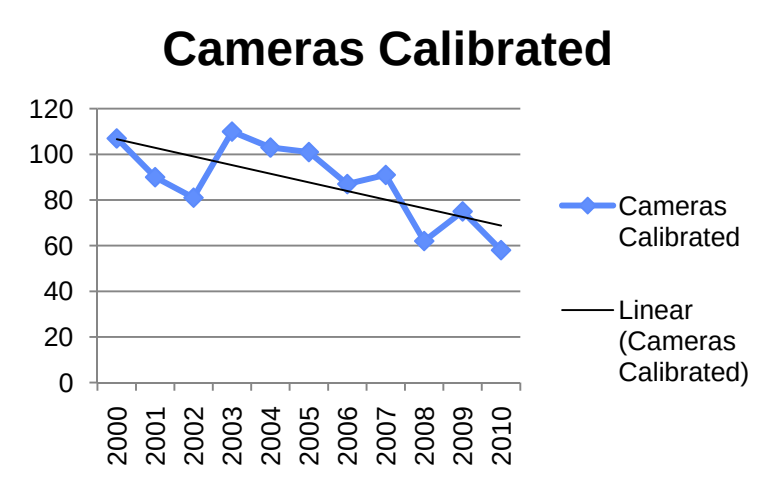
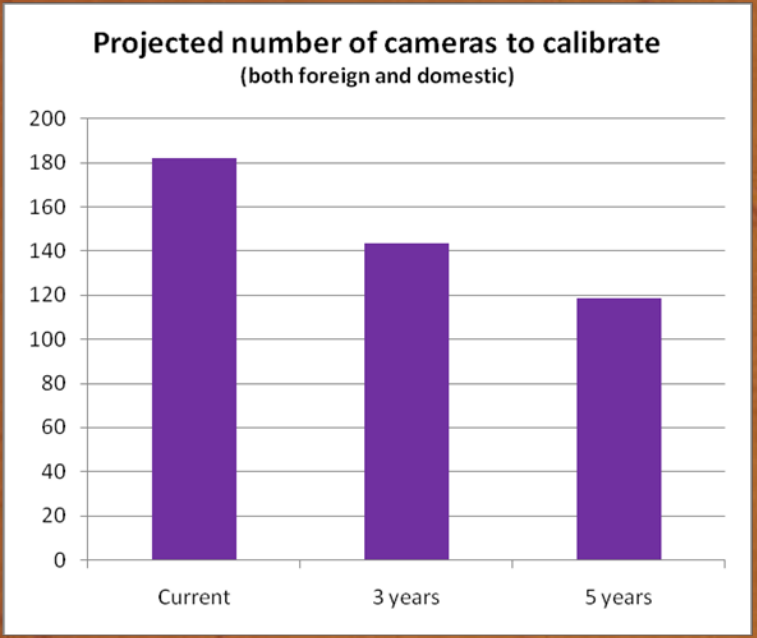
Initial investigation into Workload

- Talked to 87% of Optical Science Lab (OSL) domestic users and extrapolated results to all users.
- Typical OSL calibration done every 3 years, analog cameras, 1/3 of cameras done each year.
- The number of cameras calibrated in the future are estimated to be <50 in FY11 and beyond.
- The trend is down, the OSL will have to increase fees and adjust labor as needed.
- Glass Plates will have to be purchased in FY11/FY12 if operations are to continue past FY12.





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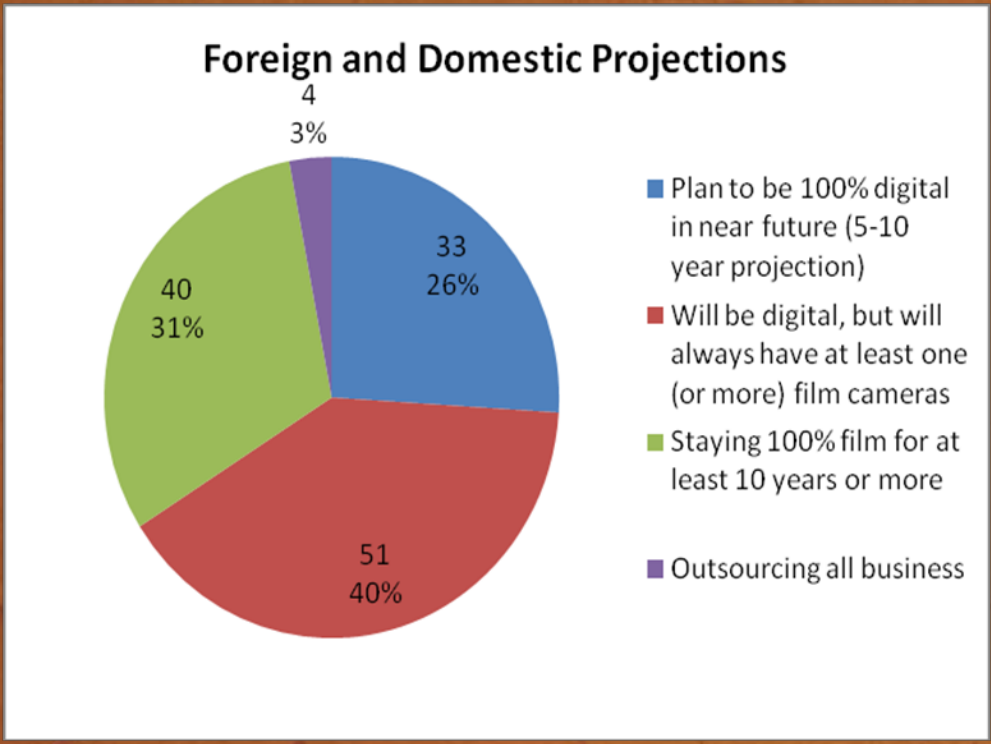
Projections Long Term

- There will still be some demand over the foreseeable future, but analog cameras are clearly being phased out.
  - 40% will stay in analog for at least 10 years (~28 / year)
  - Others are completely or mostly getting out of analog over the next ten years (which
    we are likely seeing in the decline in demand)



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Near Term Plans

- Request for Information RFI has been released asking for user comment
  - Solicitation Number: G11PS00140
  - Issued 03/02/2011
  - https://www.fedconnect.net/FedConnect/
  - Impacts of potential reduction in service in Fall of 2012 to 2016.
  - Potential calibration solutions including in-situ, interest in running the Optical Science Lab (OSL)
  - Other methodologies
- Prioritize funds to research in-situ calibration
- Schedule 3QFY11 decision point to purchase glass plates

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Future of Digital Imagery Quality Assurance

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Background

- “Digital Imagery Quality Assurance “, or DIQA.
  - To complement Analog Camera Calibration
  - Provide Digital Sensor system capability and performance assessment information
  - Provide Manufacturer Sensor Certification and Data Provider Evaluation
  - Provide Specification and QA tools
- Plan was to operate in ‘research mode’ during initial stages then switch to operational mode similar to analog camera calibration
- DIQA has been in ‘research mode’ for over three years
- The USGS Management has decided not to move to operational mode and to revise the research component

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Sensor Evaluation

- USGS has been conducting Sensor Type Certification in Research (Pilot) Mode
  - USGS Team visited manufacturers to learn about manufacturing and support processes and reviewed the system's performance and quality capabilities
  - Certification letter written, report published
  - 50/50 Reimbursable funding split
- Now, stopping certification and moving to evaluation only
  - Done without reimbursable funding
- Benefit and Impact:
  - Provides independent evaluation of sensor systems that meet USGS' new remote sensing and mapping technology requirements
  - Still keeps USGS and the community up to date with State of the Art Technology reviews
  - No common contract requirement for certification, specifications, and quality measures

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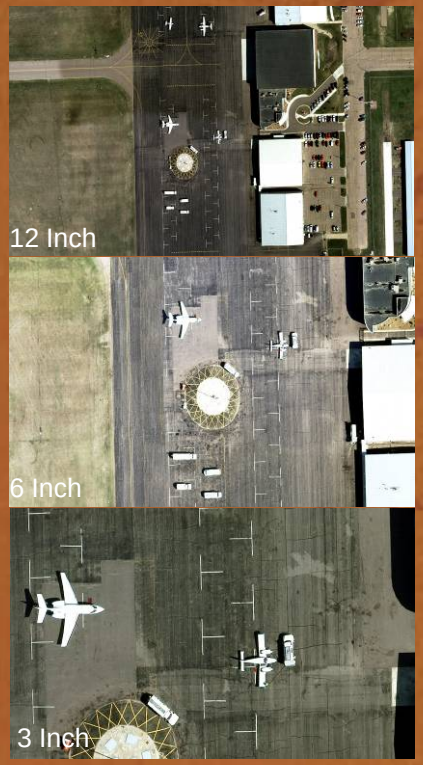
Data Provider Evaluation & Cal/Val Range Creation

- During the research effort, ranges were prepared as part of the preparation to support Sensor Assessment and Data Provider Evaluation
  - Operational Data Provider evaluation process is now stopped
  - Research Evaluation of Sensors Only
  - Developing Cal/Val Range Stds. & 5 National Ranges
  - Dual use for hi-res ortho & satellite, & LiDAR cal/val

Large area Geometric Test Range



USGS Cal/Val Basemap range: hi res image and LiDAR data

Geometric Targets and Control

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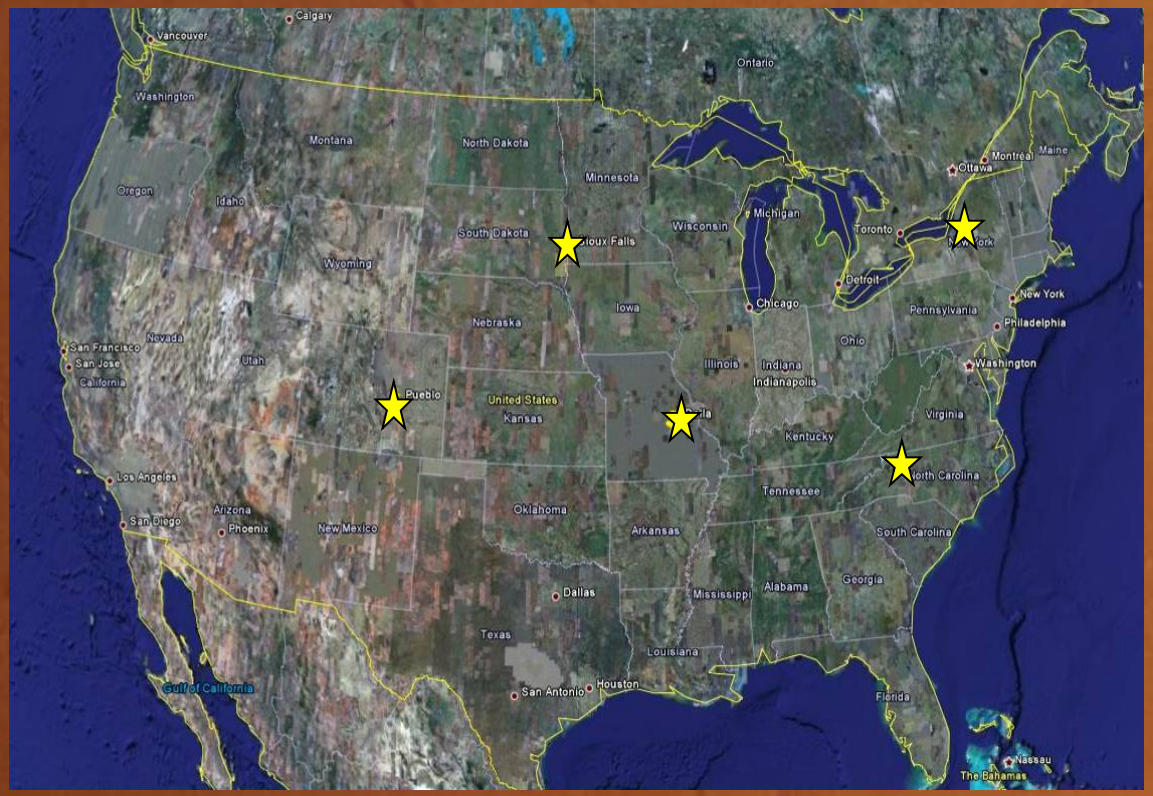
USGS National Range Locations



- Sioux Falls, SD; Rolla, MO and Pueblo, CO Ranges Completed
- Airy, North Carolina and Rochester, NY Ranges In-Process

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Next Steps - Sensor Research
First Thoughts

- Accomplish Sensor Research to Satisfy USGS Needs
  - Concentrate on New Sensors or New Technologies
  - Utilize USGS Science experts to guide areas of research
  - No Sensor Type Certification
  - No funding exchange; only in kind support via USGS Agreements
- Extend Research to new digital imagers, Hyper Spectral Imagers, LIDAR, RADAR, and other sensors
- Provide Research information to USGS Management and to QA and Contracts Personnel
- Provide research information via USGS website
- Maintain Range Capabilities for Research
- Potential for Request for Information (RFI) in future to get industry comment

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Questions?