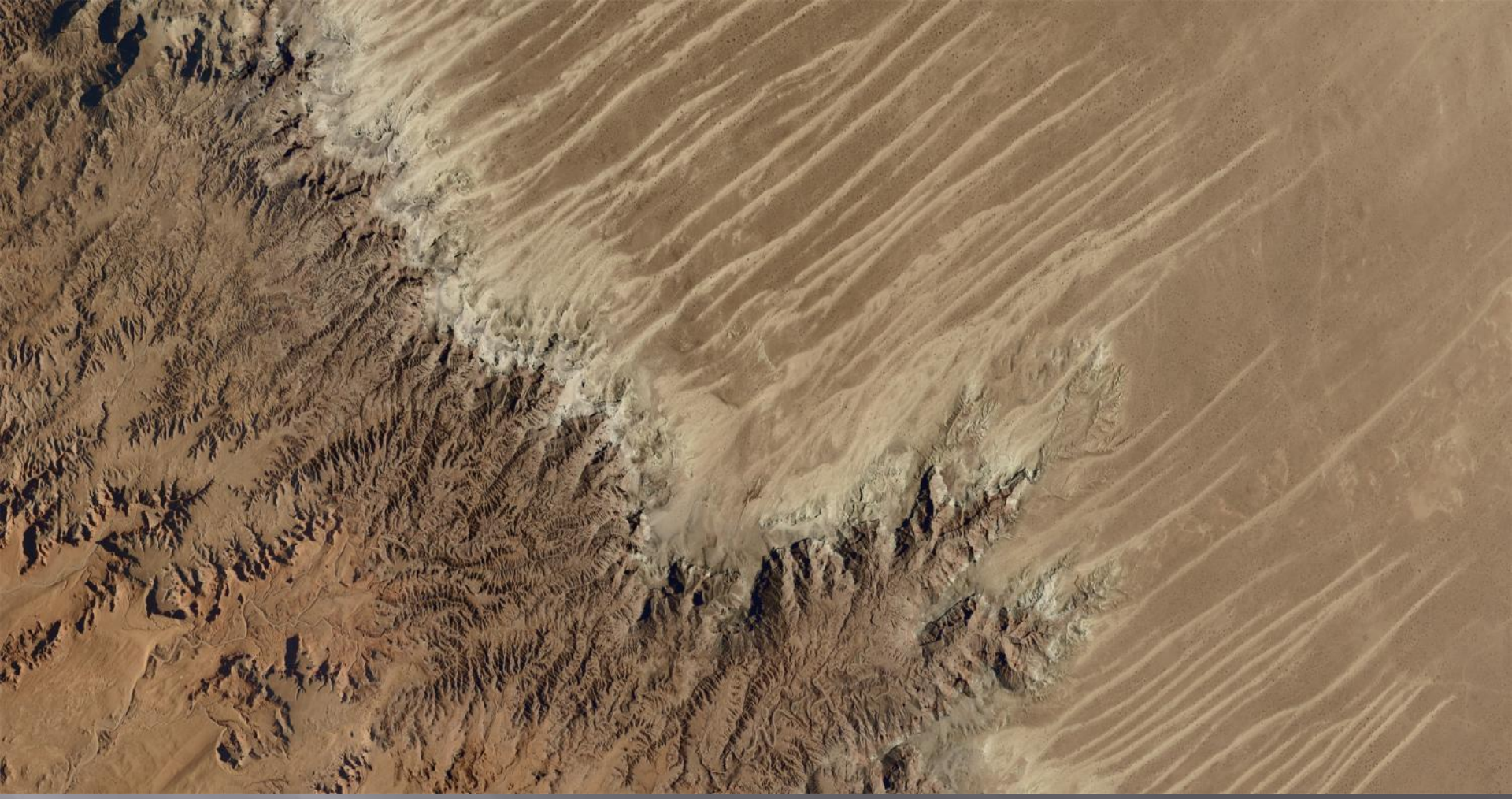


2007 NAIP LESSONS LEARNED
INDIANA COLOR 2M, ARIZONA 4-BAND 1M

North West Group/Fugro

Team:

- North West:
  - Project management
  - Arizona acquisition (49%)
  - Indiana acquisition (100%)
  - Ingest QC
  - Data archival
  - Processing
  - Delivery
  - Warranty fulfillment
- Fugro EarthData:
  - Arizona acquisition (19%)
  - Ingest QC
- Fugro Horizons:
  - Arizona acquisition (32%)
  - Ingest QC
- Due to limited awards ED/HZN did not perform any processing

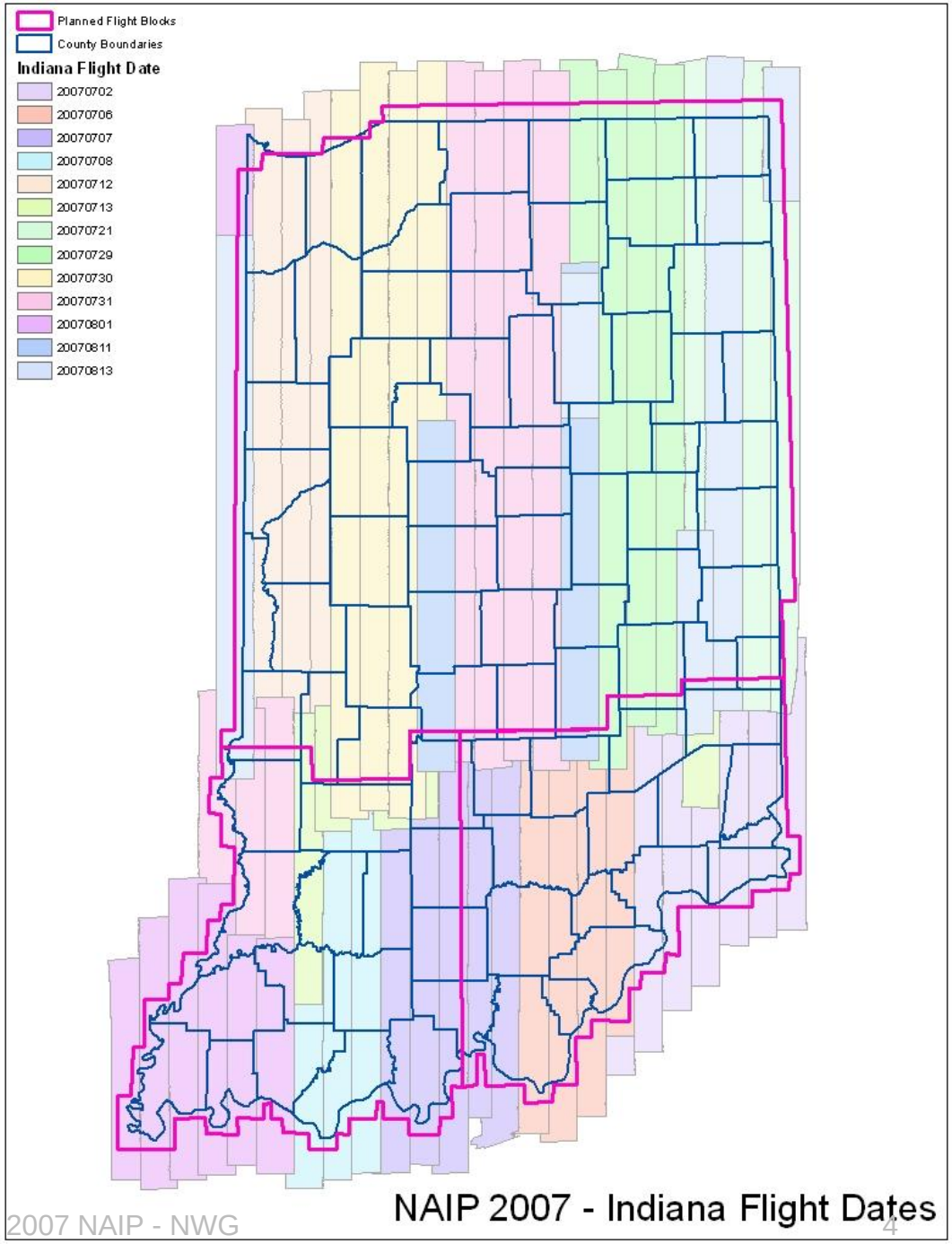
5th consecutive season of the same team

Resources:

- 7 Cessna Conquest's
- 4 Lear jet's (and doors)
- 9 ADS40-II SH52 sensors
- 3 processing centers
  - During NAIP work is shuffled to have processing centers "100%" NAIP – much better throughput doing so
- Used 2007 season:
  - 3 Conquests
  - 1 Lear Jet
  - 4 ADS40's
  - 1 processing center
    - 128 CPU cluster, 480TB online storage capacity
    - 6 staff dedicated to NAIP processing:
      - 1 Data management, 1 AT/Ortho, 1 Mosaic/DOQQ/CCM creation, 2 QA/QC, 1 deliverables and shipping

Indiana:

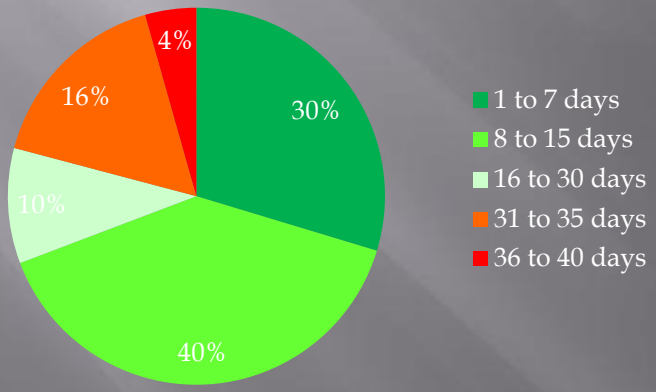
- Acquisition:
  - Flown with Lear Jet @ 47,000 ft
  - Flight lines collect 3 rows of DOQQ's
  - 3 flight blocks, 2 seasons
  - On site from season start to acquisition completion: 43 days
  - 13 good weather days
  - 30% days on site suitable for flight
  - 18 lifts
  - 35.9 hours online time
  - No mechanical downtime (aircraft or sensor)
  - 1.8TB raw data collected
- Processing:
  - AT – 6 hours
  - Ortho – 21 hours (cluster, 128 CPU'S)
  - Mosaic – 11 hours (3 systems)
  - CCM creation – 30 hours (Cluster, 8 CPU's)
  - Total: 68 hours, ~92 seconds per DOQQ
- Poor weather slowed acquisition
- Very quick inspection and acceptance by USDA!

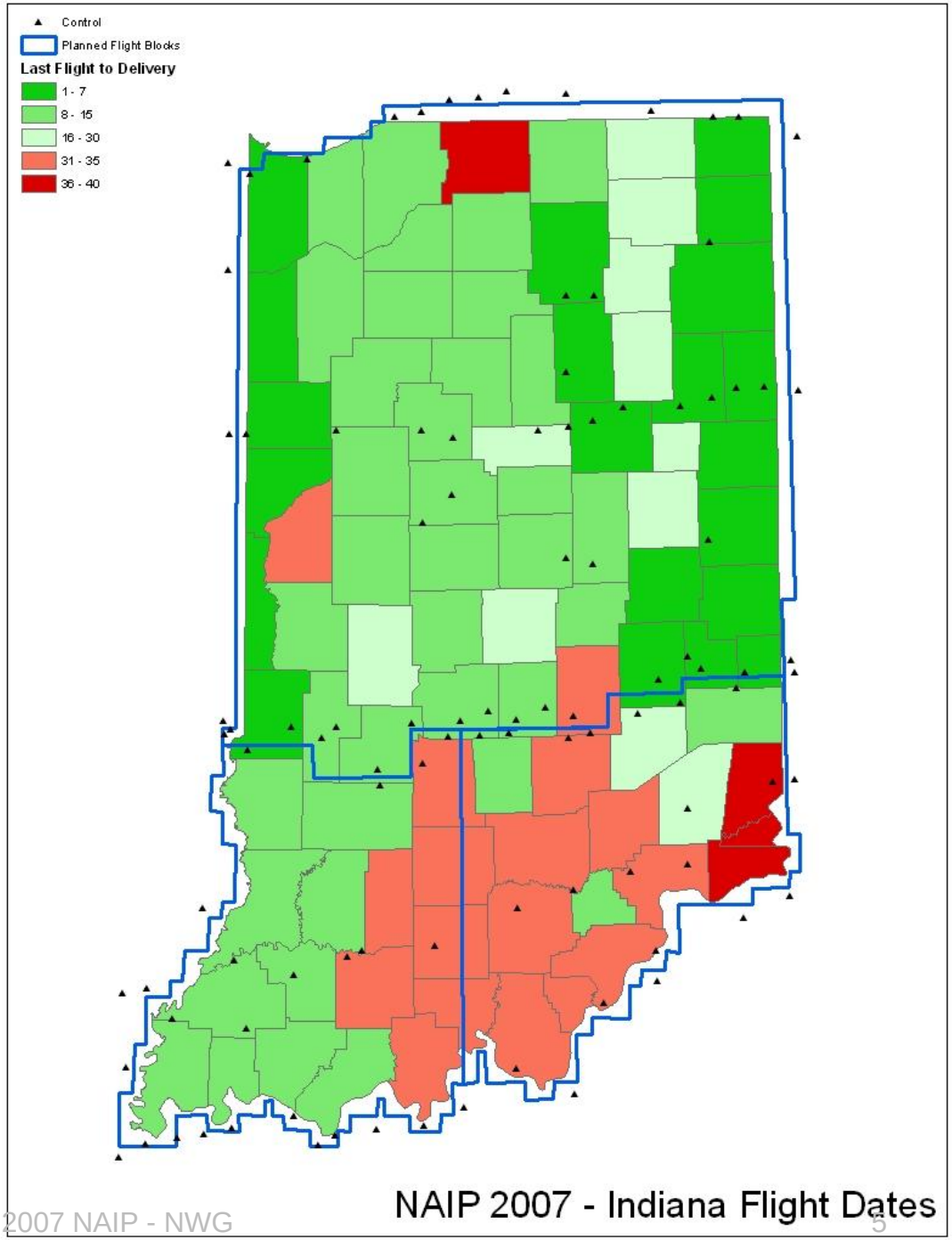


Indiana delivery time

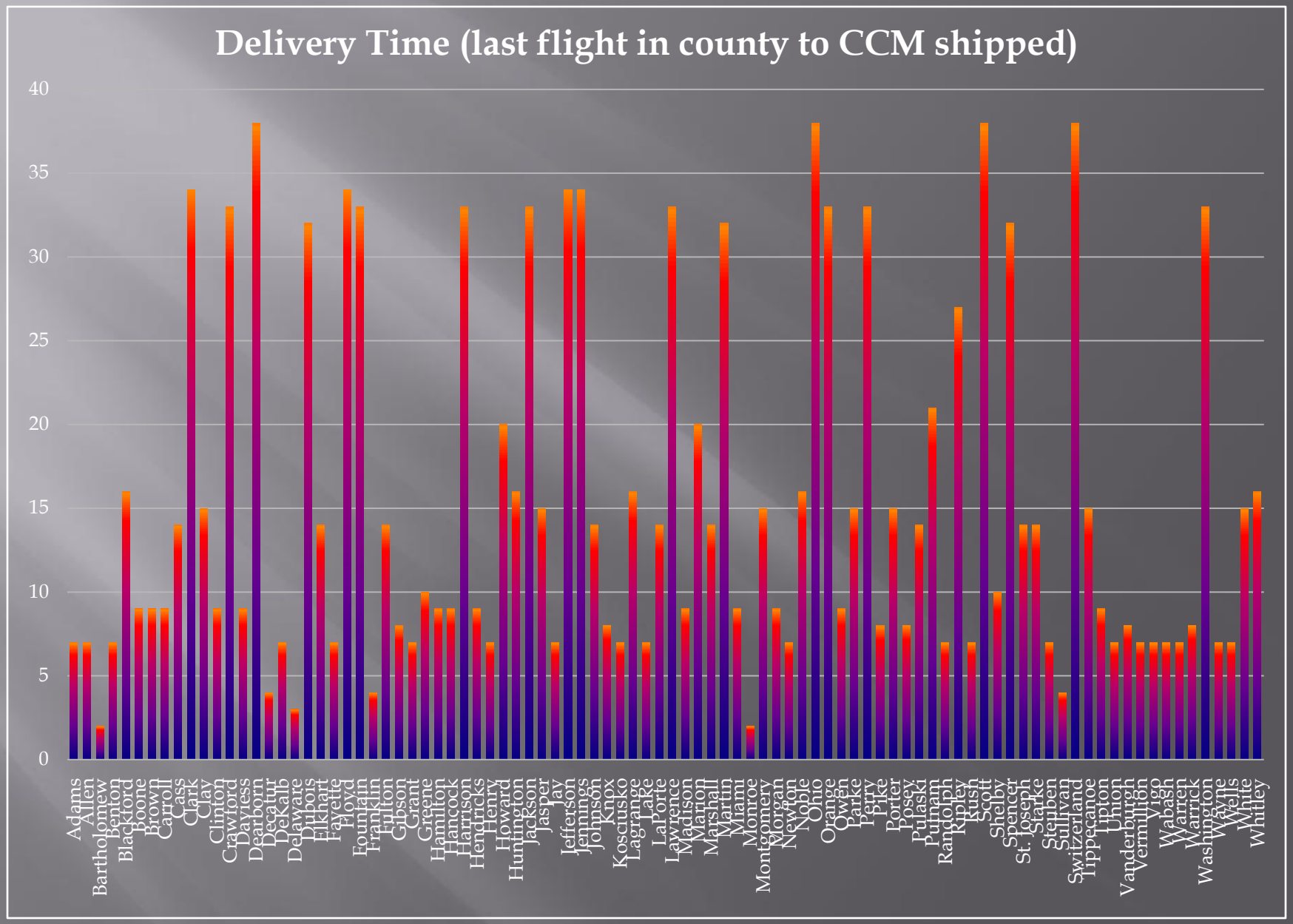
- 100% delivered prior to product due date

- Delivery from last flight:
- Maximum delivery time: 38 days
- Minimum delivery time: 2 days
- Average delivery time: 13 days

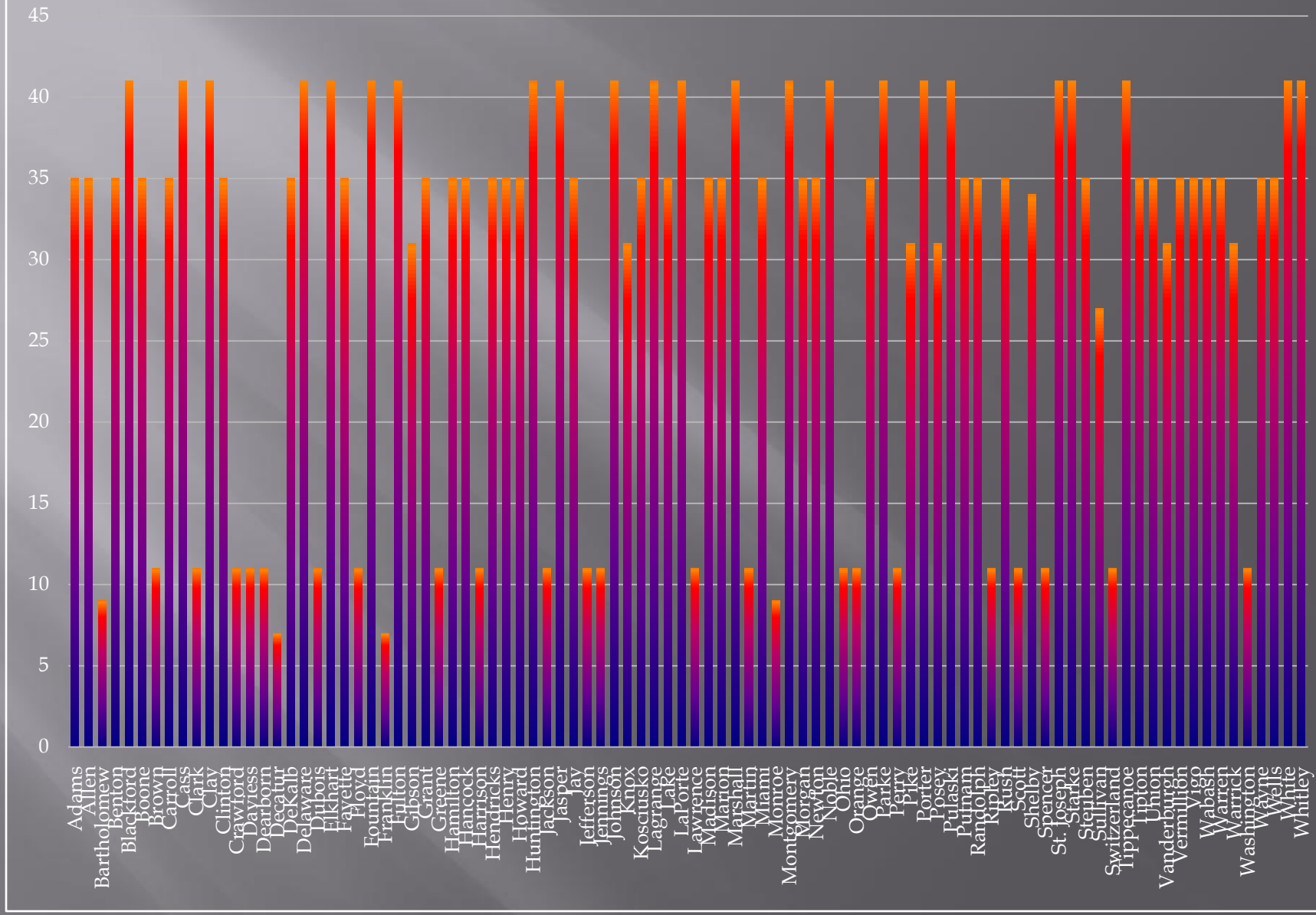




Delivery Time (last flight in county to CCM shipped)

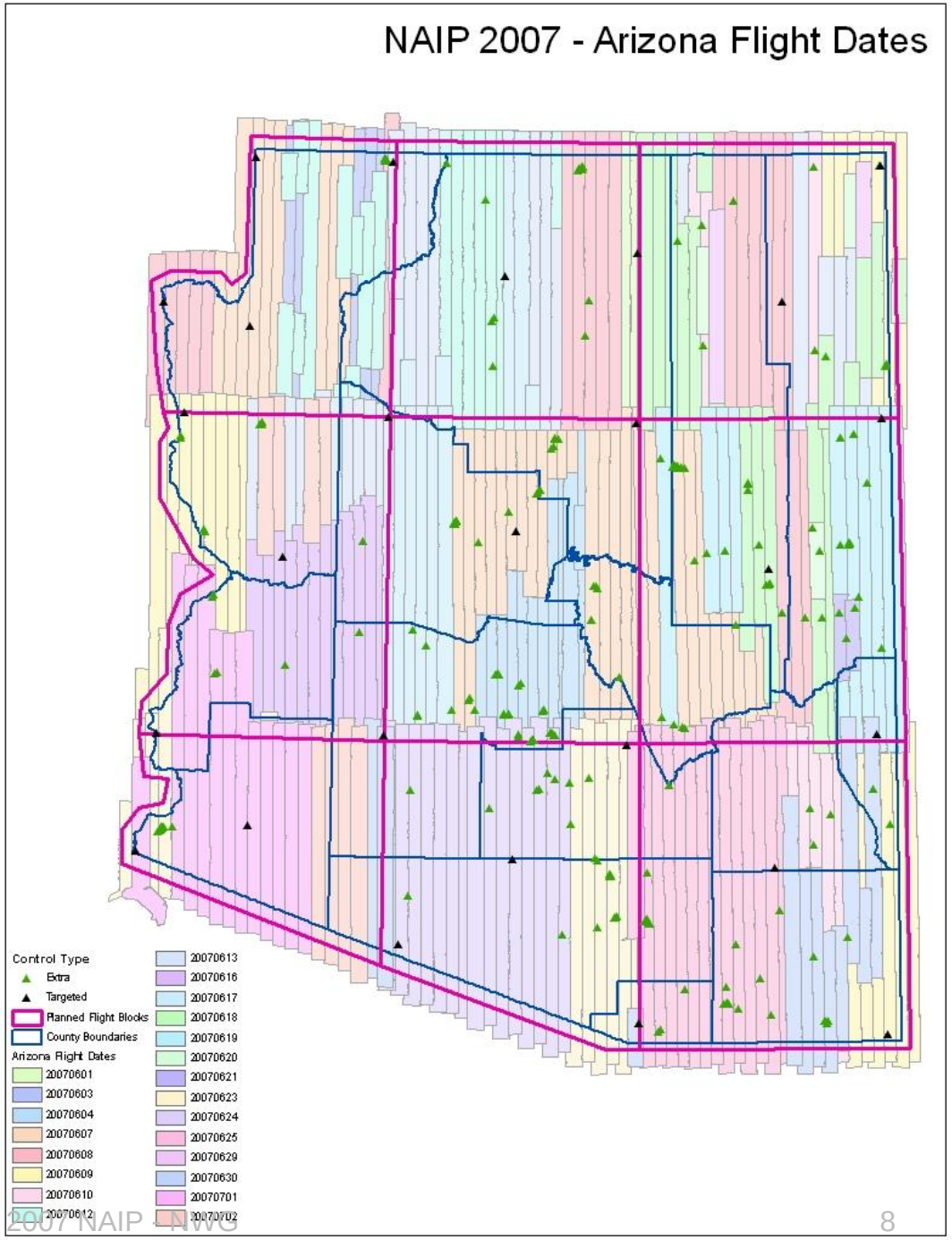


Delivery Time (Days BEFORE due date)



Arizona:

- Acquisition:
  - Up to 3 Cessna Conquests
  - First flight on first day of season
  - 33 days from start of season to completion of acquisition
  - 89 aircraft days on site
  - 22 good weather days (67%)
  - 44 lifts (multiple aircraft)
  - 180.4 flight hours
  - 6.3TB raw data collected
- Processing:
  - AT – 26 hours
  - Ortho – 86 hours (cluster, 128 CPU's)
  - Mosaic – 22 hours (3 systems)
  - CCM creation – 174 hours (cluster, 8 CPU's)
  - Total: 308 hours, ~145 seconds per DOQQ
  - Significant DOQQ's completed prior to complete counties due to county size



Arizona 1m

- Lots of new things:
  - First large scale project with ADS40-II SH52
  - First large scale project using Leica IPAS GPS/INS system with Honeywell uIRS INS
  - 4 Band pilot
  - Seam line shape file pilot
  - Absolute accuracy specifications

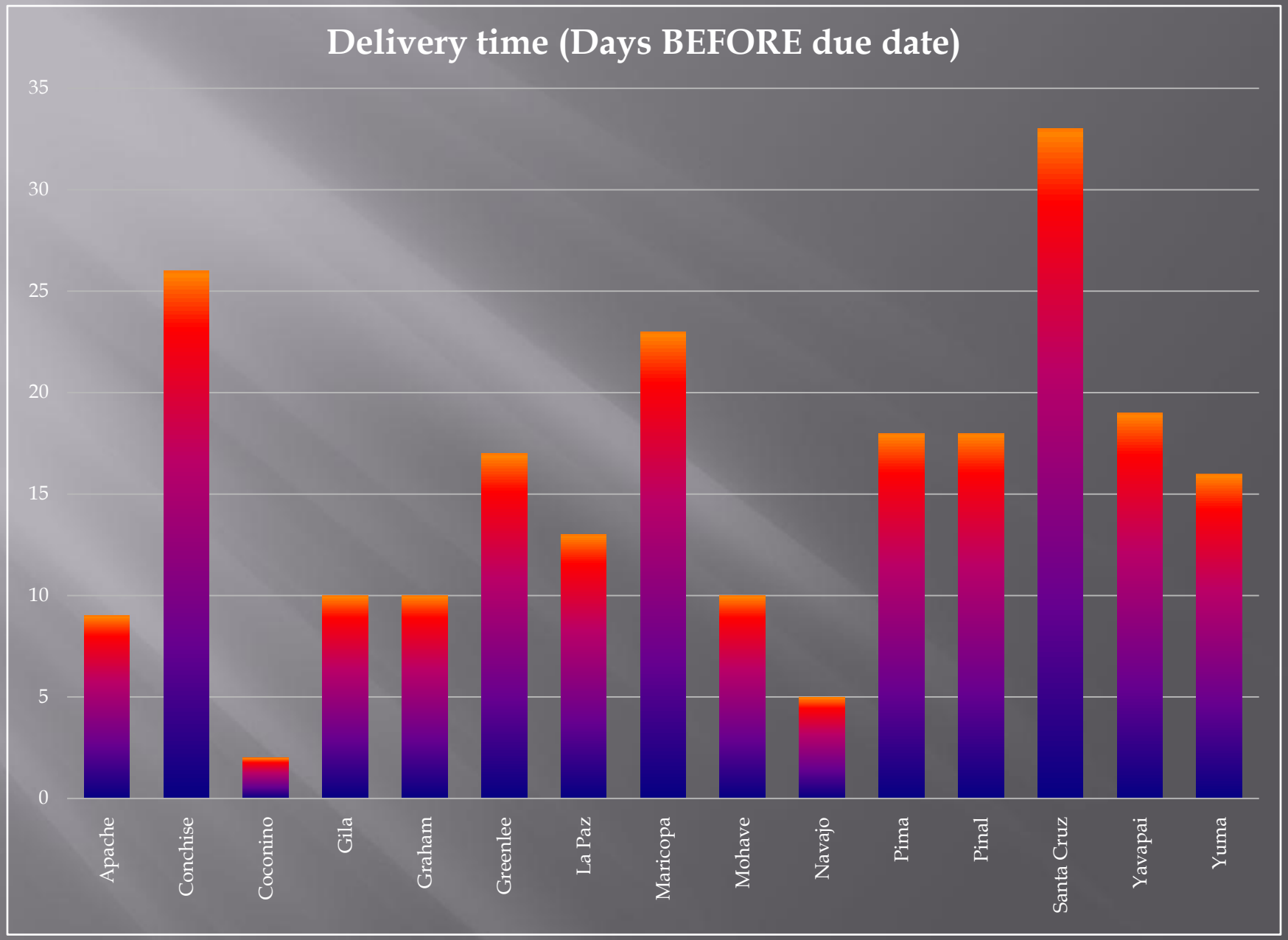
Control

- Communications is key to do this quickly and cost effectively
- AZ state and USDA worked very well on this pilot
- Different approach over Utah 2006:
  - Provide rough location of required control based on flight blocks
  - If weather didn't cooperate we had the ability to capture additional control
  - Best balance between minimizing control cost versus processing delays
- Use of FAA centerlines was a good approach
- For a 6m accuracy requirement we'd prefer more points in the ~1m range opposed to fewer in the 10cm range: lower cost per point
  - Photo ID points provided (29 points)
  - Supplemented control to lower costs (36 points)
  - Waiting on control delayed CCM production about 15 days

4 Band

- A few hiccups with the 4 band generation that had to be addressed:
  - Mr. SID could not compress 4 band imagery as input. Workaround: Strip RGB bands to create a 3 band dataset for Mr. SID compression.
  - Photoshop has issues with 4 band imagery, tough to apply the USDA color specification checks
    - Developed our own utility
  - Mosaic process tweaked to find the best seam line placement for *all* 4 bands
    - Forests are a problem: RGB is quite dark, IR is quite saturated due to vegetation
    - Reworking several CCM's for a better product and to work out a better process

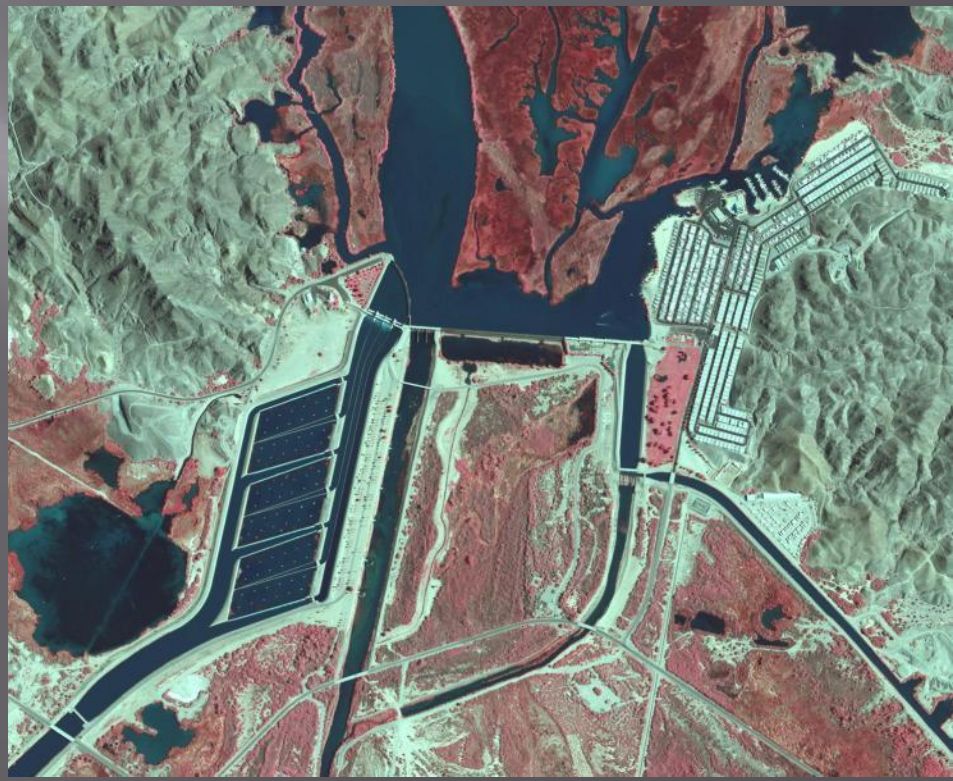
Delivery time (Days BEFORE due date)



Arizona Results

ARIZONA 1M, RGB

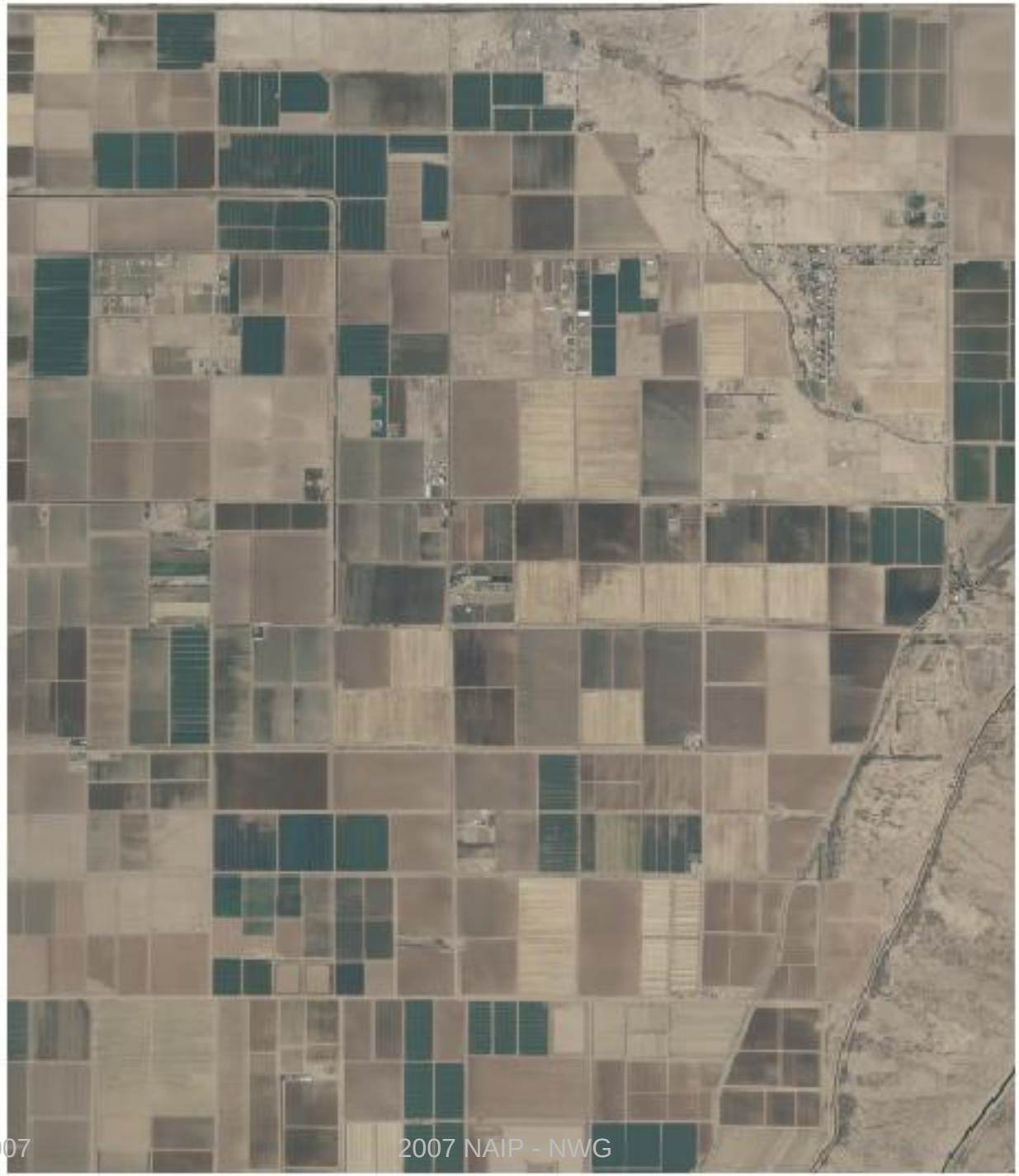
ARIZONA 1M, FCIR

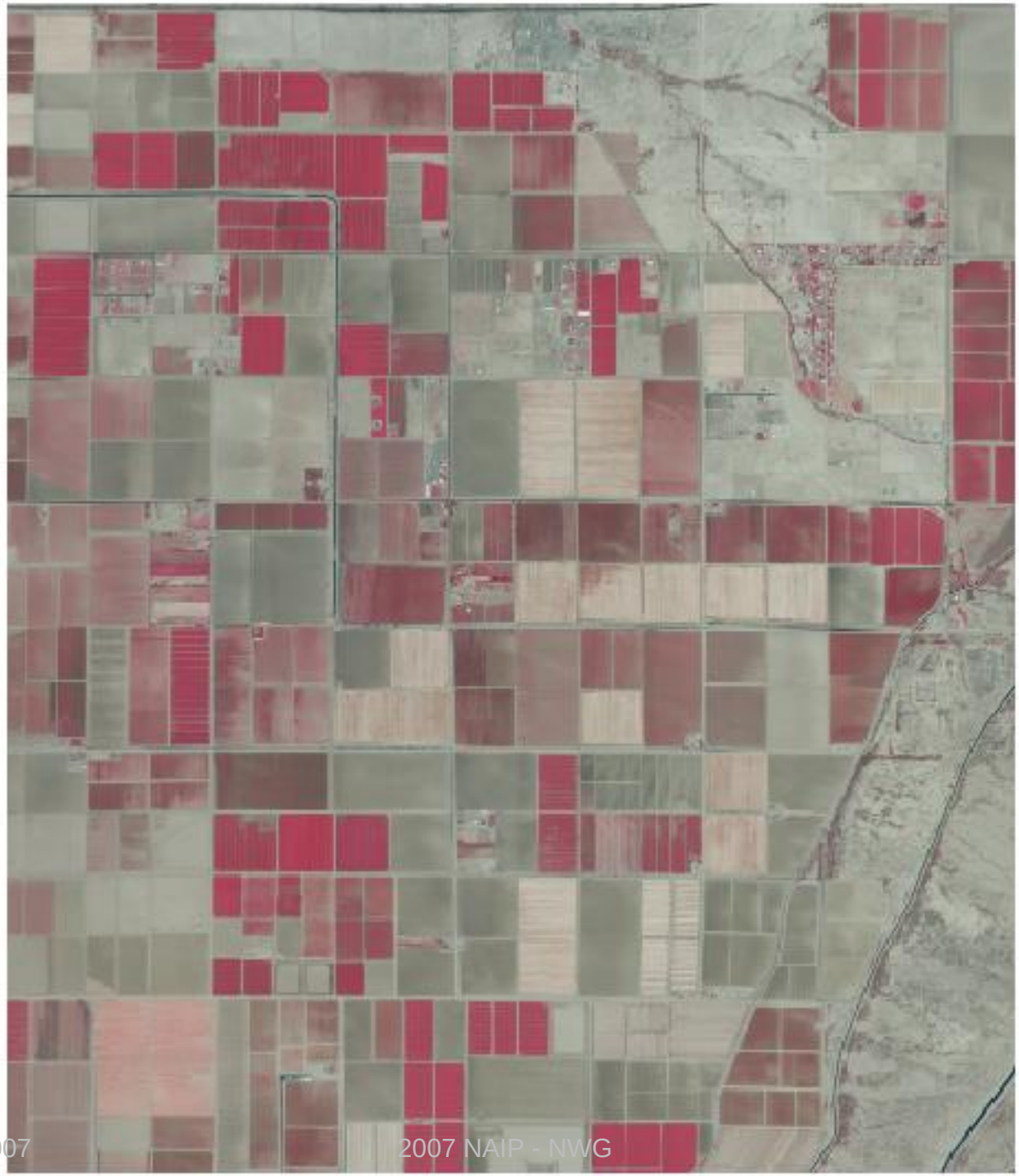


Arizona Results

ARIZONA, 1M, RGB

ARIZONA 1M, FCIR

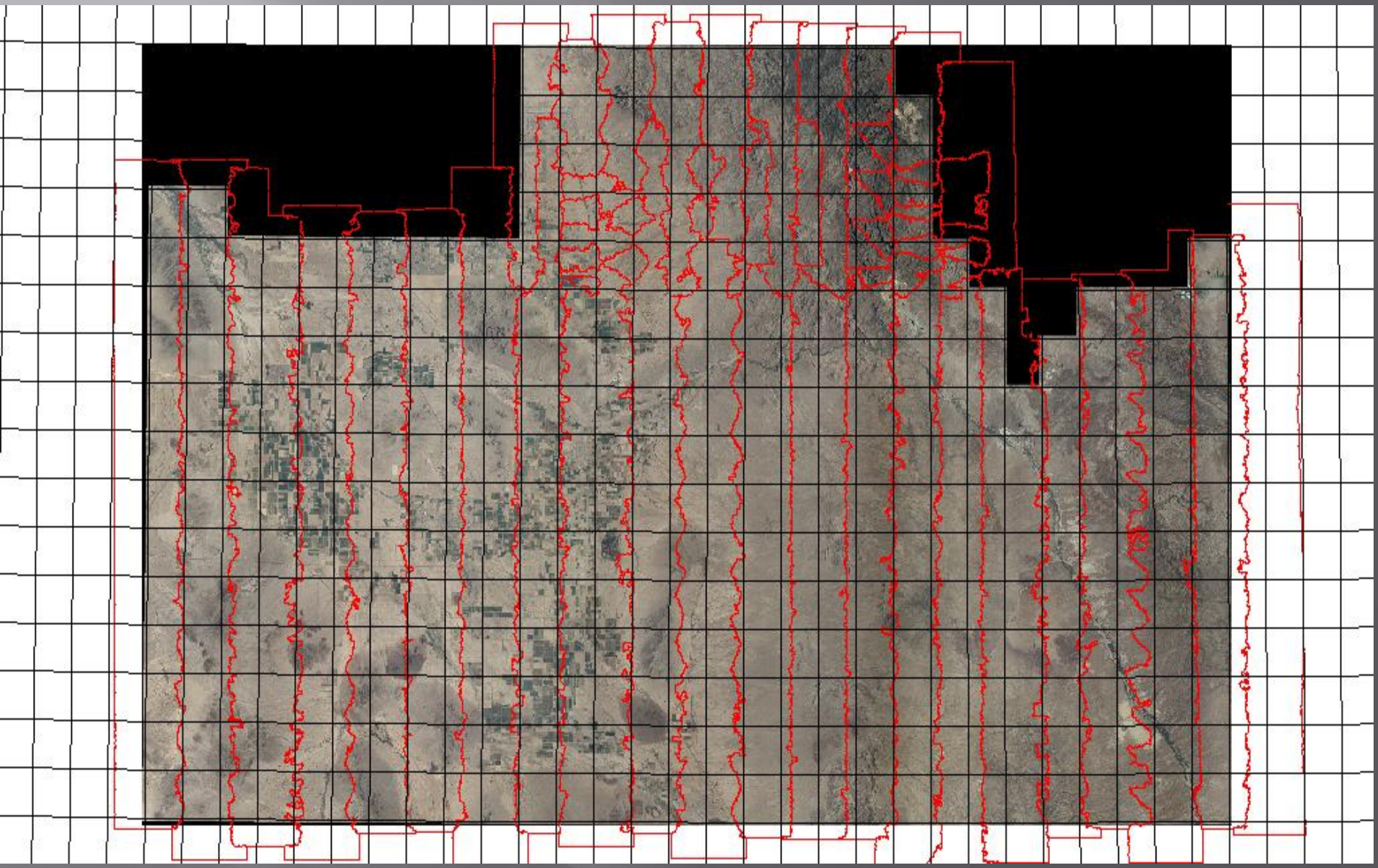




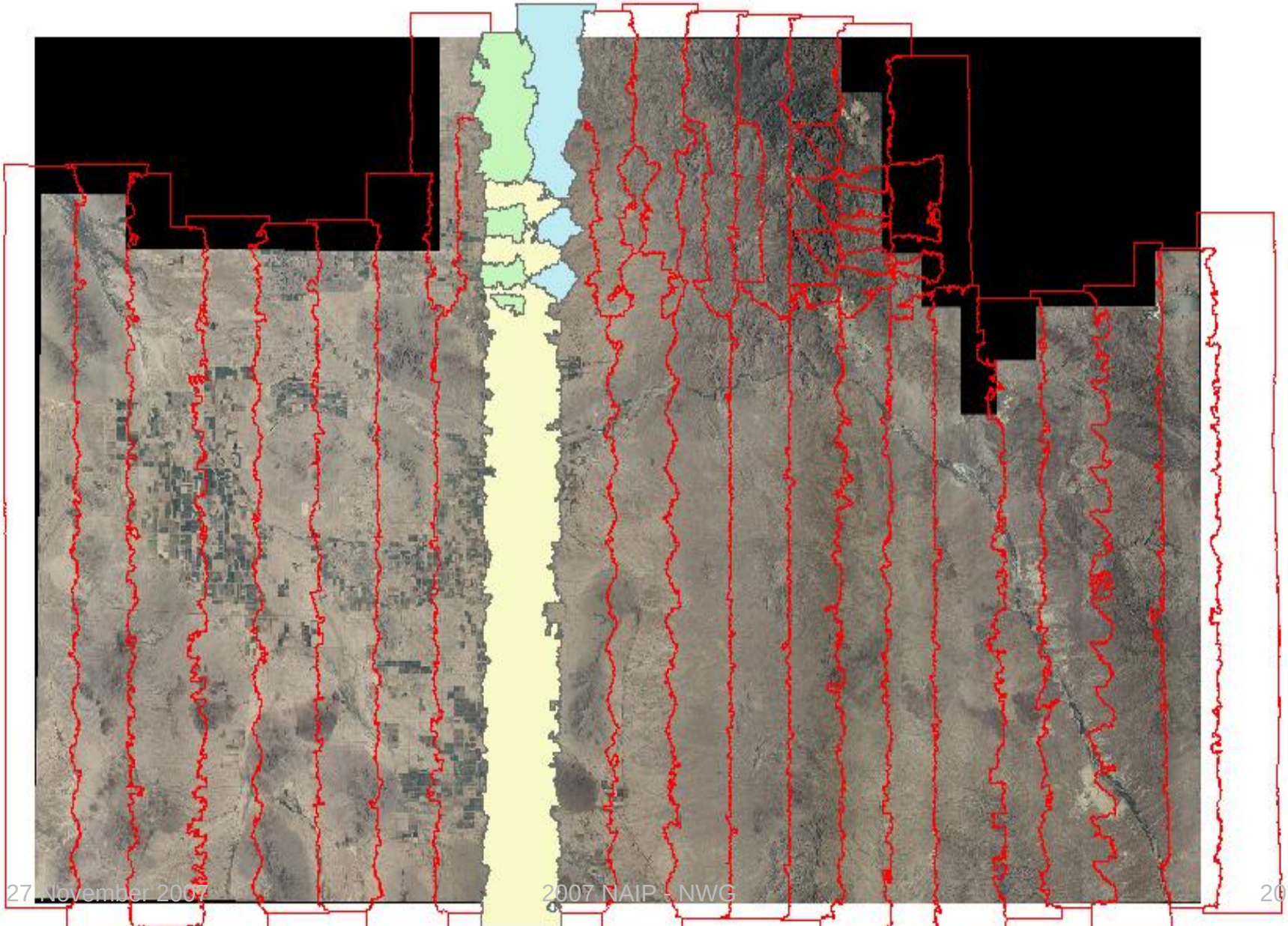
4 Band Pilot – Arizona 2007

4 Band Pilot – Arizona 2007

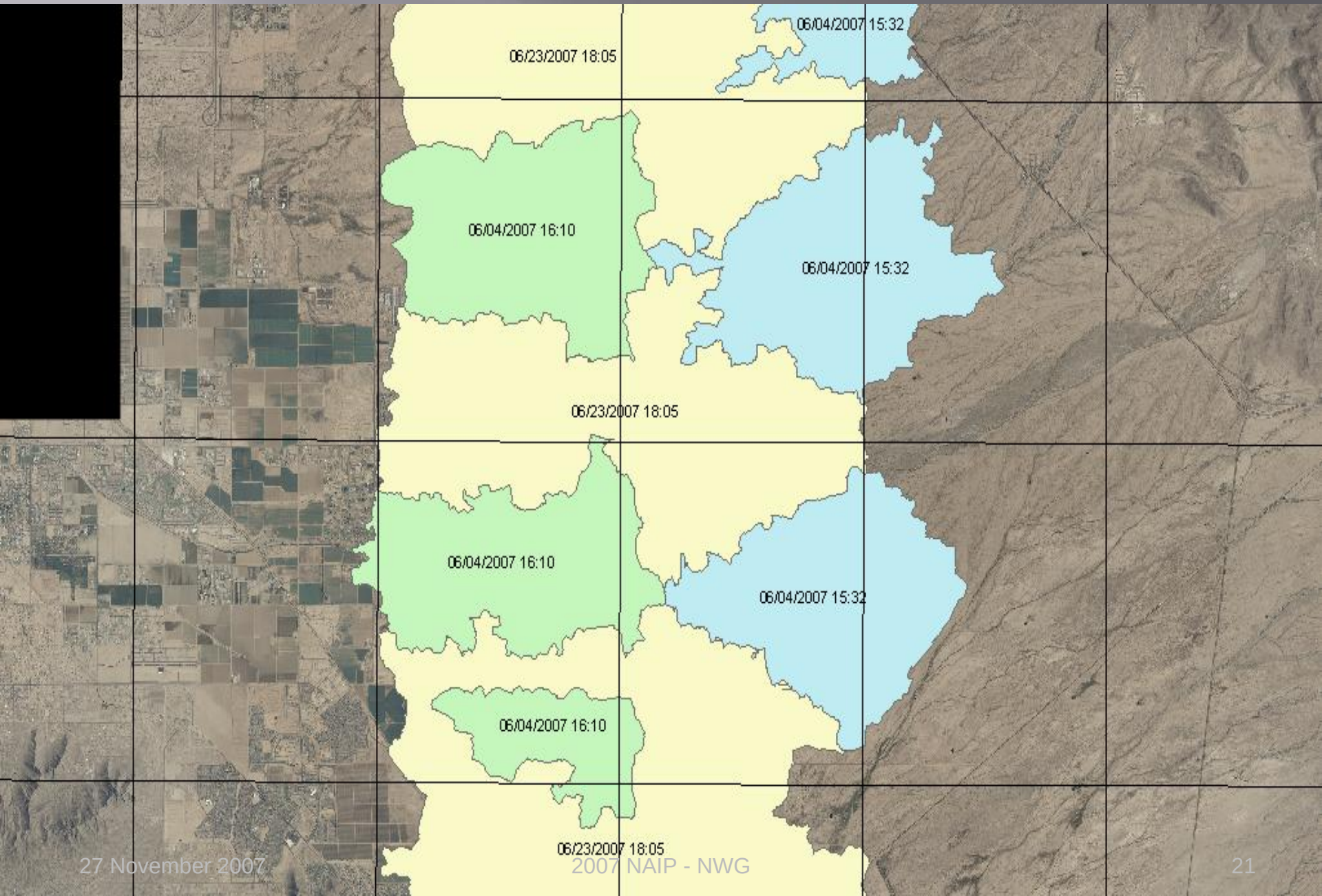
Seam Line Shape File



Pixel Pockets



“Pixel Pockets”



Improvements for next year:

- Modify process to be CCM based opposed to block based
- Improvements to 4 band product generation:
- Better seam-line generation method to give best color and false-color products
- Better seam line shape file generation
- ADS40-SH51/52 pan sharpening mode now in place
  - Reduces 1m acquisition DOQQ cost about 20%
  - For 2m we are already altitude limited
  - Allows 0.5m products for cost of current 1m products
- Better tools to ensure USDA color specs are met:
  - No more using photo shop for the QC steps
- All 9 ADS40's are now upgraded to ADS40-II with SH52
- Team is capable of ~80,000 DOQQ throughput in NAIP window

Suggestions for next year?

- Consider same states to a vendor for the 5 year contract:
  - Some efficiencies gained as control, DEM doesn't need to be "re-prepped"
  - Better able to negotiate fuel and hotel rates for multi-year
  - Better able to negotiate resale opportunities early enough to impact NAIP pricing
- Lots of discussion over moving to JPEG2000:
  - Great idea!!
  - Slight cost reduction (~1.5%)
  - Warning: need a solid baseline spec to be set as lots of "knobs to tweak"
- Anything to enlarge the season is a win for everyone!

Cost increases?

- Conquest "mid life" inspection:
  - $140K per plane if they don't find anything wrong
  - $250K typical for a well maintained plane
  - Lots of damage history - $500K+
  - All 7 Conquest underway, complete by end of Dec
  - Will expand to cover most aircraft used in our industry
- Fuel increase: ~8%
- Hotel: ~10% - 40%
- Insurance: ~5%
- 4 band: ~3%
- Seam line shape files: ~1%
- Looking at ~15% increase before optimizations to offset

Resale's?

- A few interesting data resale's:
  - California 2005 data reprocessed to 1m FCIR ortho and panchromatic and color stereo products
  - Nevada 2006 reprocessed to 1m FCIR and also color stereo products
  - Arizona 2007 reprocessed with pan sharpening to a 0.5m color product
  - Indiana 2007 reprocessed with pan sharpening to a 1m FCIR and color product
  - Large oil and gas company using NY, Ohio, Wyoming, Utah, Nevada, Montana data via our Valtus subsidiary: ~1,500 image views/month
- Slow to develop the market but it is building….
- Stereo 4 band ortho and stereo products generating a lot of interest

Questions?

- For more info please contact:

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Marc Simard (marc.simard@nwgeo.com)

- Thanks for your time!