DRCOG data acquisition projects: Update

Presented by:
Ashley Summers

May 2020
Agenda

- high-level timeline
- a note on COVID-19
- imagery project update
- lidar project update
- planimetric data project update
- land cover data project update
- next steps
**Timeline**

**Odd Year**
- **Q1**: Plan
  - DRCOG identifies stakeholders and gathers requirements for upcoming projects.
- **Q2**: Quote
  - DRCOG quotes potential partners for participation in upcoming projects.
- **Q3**: Commit
  - DRCOG asks stakeholders to commit to projects by submitting signed letters of intent for a specified contribution amount.
- **Q4**: Contract
  - DRCOG contracts with vendors to complete the scope of work agreed upon and funded by the partnership.

**Even Year**
- **Q1**: Collect
  - Data collection begins for imagery and lidar projects.
- **Q2**: Process
  - The vendor processes imagery and lidar data according to our specifications.
- **Q3**: Check
  - Partners validate the data to ensure it meets their needs and adheres to specifications.
- **Q4**: Deliver
  - Imagery and lidar products and services are delivered at the end of this quarter and into the next.

**Odd Year**
- **Q1**: Develop
  - Development begins on products that are derived from imagery and lidar like planimetric data and land use land cover.
- **Q2**: Process
  - The vendor processes planimetric data and land use land cover data according to our specifications.
- **Q3**: Check
  - Partners validate the data to ensure it meets their needs and adheres to specifications.
- **Q4**: Deliver
  - Planimetric data and land use land cover products are delivered at the end of this quarter and into the next.
A note on COVID-19

• **Vendor** operations have been uninterrupted by COVID-19, but future work may be affected if protocols change at the Denver International Airport tower, if infrastructure cannot support the pilots, or if critical team members become ill.

• **Partners** are experiencing uncertainty with budgets but are still committed to the projects that are underway (imagery and lidar). Derivative projects that are still being scoped (planimetric data and land cover data) may experience funding issues.

• **DRCOG** is moving forward with all projects as planned and is trying to be as flexible as possible with all partners and vendors facing hardship during this time.
IMAGERY 2020
Custom imagery specifications

Approximately 6,000 square miles of collection:

- four-band orthoimagery
- snow-free and leaf-off
- meets American Society for Photogrammetry and Remote Sensing positional accuracy standards for mapping and geographic information systems work
- independent quality control provided by partners
Flight progress

Goal
• Spring flight window is Feb. 15 to April 15.
• Summer flight window is June 1 to July 30.
• Flights should occur as close together as possible to decrease temporal differences.

Reality
• Spring flights occurred between March 18 and May 7.
• There were several gaps in the collection schedule so temporal differences between flight lines are expected.
• Double the amount of missions compared to 2018 (30).
• Summer flights are not expected to start in early June. The flight window may be pushed to Aug. 15.
Explanation

- February and early March conditions were poor due to snow cover throughout the project area.
- For 11 days in late March and early April, Denver International Airport closed airspace and would not grant permission to fly.
- Turbulent air in April meant shorter missions and more re-flights than usual.
- Snowpack in the mountains is more than in 2018.

Impact

- Production phase is approximately 6 weeks behind schedule.
- Final delivery phase is approximately 4 weeks behind schedule.
Mitigation strategies

Temporal differences
- weather conditions – a hard freeze in April – interrupted spring growth
- radiometric balancing minimizes differences between flight dates - no “hard lines” are expected

Schedule delay
- adding production staff to help with image processing
- reducing complexity of orders
- streamlining partner quality control process
Mitigation strategies – radiometric balancing

Before

After
A schedule revision for milestone dates is currently in development with early milestones moved by up to six weeks and final deliveries about four weeks later than originally planned.

Tentative new dates for:
• Spring interim WMS - mid-July
• Start quality control– mid-October
• Final deliveries – late January to mid-March 2021
Similar to the 2018 project, partners will need to perform aesthetic quality control on their area of interest.

**New this year!** Quality control help for partners from:
- students at Front Range Community College
- consultants at Icon Engineering, Logan Simpson, Diexsys, Stolfus and Associates
Nearmap service status

Goal
• At least one leaf-off and one leaf-on flight per year in the Denver metro area.

Reality
• Flights occurred from March 29 to April 6, and data is available in the map browser now.
• Those receiving the capture as an on-premises delivery should expect it by May 31.

Explanation
• Nearmap has a proprietary camera that may be flown at higher altitudes, so it was unaffected by the spring airspace closures and was able to collect more at once.
Approximately 5,000 square miles of lidar proposed for collection.

Deliverables, captured according to U.S. Geological Survey Lidar Base Specifications:

- classified lidar point cloud: quality level 2 and quality level 1
- bare-earth digital elevation model
- first return intensity raster
- breaklines
- Federal Geographic Data Committee metadata
- 1-foot and 2-foot machine-generated contours ➔ add-on
Lidar specifications

The DRCOG project will collect quality level 1 and quality level 2 lidar as well as 1-foot and 2-foot contours.

Process:

1. Make features classes from contour keypoints and hydro features and breaklines. Buffer by 100 feet.
2. Create contour terrain.
3. Use Esri surface contour tool to create contours.
4. Smooth using PAEK 5-foot. survey result
5. Contours isolations below 50-feet are removed from the contour dataset.
6. Contours are coded for layer type and then clipped to the project boundary.
7. Run topology tool and make any necessary fixes.
Lidar partnerships

- contracts with DRCOG
- providing 60% of project funding

- contract with USGS
- advocating on the partner’s behalf

- contract with USGS
- providing 40% of project funding
- will manage vendor and perform quality control

- contracts with DRCOG
- acquiring, processing and delivering the product

- state and local partners
- DRCOG
- Sanborn
- U.S. Geological Survey
Goal
• concurrent lidar flights and imagery flights in the spring

Reality
• Spring was spent getting the partnership details worked out.
• A kick-off meeting was held on May 6.

Explanation
• The paperwork took longer than DRCOG anticipated.
• Additional partners – National Resource Conservation Service (NRCS) and Federal Emergency Management Agency (FEMA) – are joining to upgrade some areas in the mountains to quality level 1.
• New working conditions for all involved parties due to the COVID-19 pandemic may have caused additional delay.
Sanborn will use its TerrainMapper system to collect lidar data.

- Denver metro area and eastern plains – **May and June**
- Mountains below timberline – **June and July**
- Mountains above timberline – **July and August**

**Wait!** I thought we were doing a leaf-off collection.

Sanborn feels confident that its collection technology will meet the U.S. Geological Survey quality level 1 and quality level 2 specifications, regardless of leaf-cover.

Flying this summer maintains the schedule.

**Bonus:** We can post-process the data for tree canopy modeling.
Processing and delivery will be broken into two sections.

Denver metro area (shown in pink) – delivered by June 30, 2021

remaining area – delivered by Dec. 31, 2021
Data will be delivered:

- In the appropriate state plane zone (North or Central), with considerable overlap so that jurisdictions are covered entirely by one or both.

- On hard drive. DRCOG will receive one copy and create additional copies for partners.

- Through a service from the Governor’s Office of Information Technology? Maybe – more on that later.
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I = imagery project participant
L = lidar project participant
Vendor evaluation and quotes

• A request for proposals was released in March for planimetric data collection.

• A voluntary committee of partners evaluated the bids and selected **Kucera International Inc.** as its recommendation to complete the 2020 update – the same vendor that’s been used since 2014.

• Quotes for participation in an upcoming project were sent out in late April to inform internal budget processes at our partner organizations. **If you did not receive a quote and want one, email asummers@drcog.org.**
Basic package:
- building roofprints (polygons)
- edge of pavement (polygons and lines)
- parking lots (polygons)
- ramps (points)
- trails (lines)
- sidewalks (polygons and lines) ← DRCOG paid for these in 2018 – and may in 2020 – but for now, you are quoted for them.

Optional buy-ups:
- driveways
- impervious surface

- planimetric feature specifications
- download samples from the Regional Data Catalog
A persistent unique ID is maintained from 2018 for each feature in the **building roofprint, parking, driveway** or **ramp** layers that are:

- Unchanged in a subsequent update year. The update status is “NC” for no change.
- Modified such that the current and past polygons continue to share significant characteristics – as determined at the technician’s discretion. Modified such that the attribution changes.
- A persistent unique ID is not retained if significant portions of the feature have changed (e.g., indicating a repavement or construction event); the technician may delete the existing polygon(s) and replace with new polygon(s).
LAND USE LAND COVER 2020
Vendor evaluation and quotes

• A request for proposals was released in March for land cover data collection.

• A voluntary committee of partners evaluated the bids and selected the Sanborn Map Company as its recommendation to complete the 2020 project.

• Quotes for participation in an upcoming project were sent out in late April to inform internal budget processes at our partner organizations. If you did not receive a quote and want one, email asummers@drcog.org.
Land use land cover proposed specifications

- one-meter resolution
- nine classes:
  1. structures
  2. impervious surfaces
  3. water
  4. grassland or prairie
  5. shrubland or scrubland \(\rightarrow\text{possible with lidar}\)
  6. tree canopy
  7. irrigated lands or turf
  8. barren or rock
  9. cropland
Potential use cases

- **Regional Conservation Assessment**
- Municipal Separate Storm Sewer System Stormwater permitting
- trail planning
- land acquisition planning
- evaluating conservation goals set in the **Colorado Water Plan**
• National Land Cover Database is 30-meter resolution and has more classes.


• Resolution may not contain enough detail for small, local projects.

• The U.S. Geological Survey is interested in creating a crosswalk between its data and anything DRCOG creates so we have some comparability to historical data.

• Mark A. Drummond, Michael P. Stier and James (Jay) E. Diffendorfer (2019) Historical land use and land cover for assessing the northern Colorado Front Range urban landscape, Journal of Maps, 15:2, 89-93, DOI: 10.1080/17445647.2018.1548383
NEXT STEPS
Schedule

Summer 2020
• acquire and process imagery and lidar

Fall 2020
• continue to process imagery and lidar
• apply for a Colorado Water Plan Grant for the land cover project
• letters of intent for the planimetric and land cover projects
• partners perform imagery quality control

Winter and Spring 2021
• 2020 imagery is delivered
• planimetric data project begins

Summer, Fall and Winter 2021
• new lidar is delivered
• land cover project begins
Reach out to Ashley Summers at asummers@drcog.org if you have requirements for planimetric or landcover data that weren’t mentioned today.

Respond when prompted for:
  • imagery orders
  • imagery quality control feedback
  • payment

Stay tuned for more news:
  • Subscribe to our Data Consortium newsletter for general updates.
  • Become a project partner for more frequent and detailed updates.

Check out our featured use cases:
  Conservation planning
  Emergency response
  Urban development planning
  Improving storm drainage
  Mapping flood hazards

https://drcog.org/services-and-resources/data-maps-and-modeling