# A Bird's Eye View: Drones Offer New Perspective for State Agencies

*Christopher Maike*

Previous newsletter articles have highlighted drone use and how they have advanced the technological capabilities for the State of North Dakota (Anderson and Maike, 2017; Maike, 2018a, 2018b). Drones have provided site-specific, high resolution imagery which is very useful as a first-step for geotechnical evaluations. In addition to assisting programs within the DMR, the drone program at the NDGS has provided several other agencies with imagery to support their missions. These agencies include the North Dakota Department of Health (Environmental Health), the Southwest Water Authority, the North Dakota Department of Transportation, and the Parks and Recreation Department (fig. 1).

The drone program has been utilized for all current surficial geology projects at the NDGS. The imagery has been useful for the rare earth element (REE), the sand proppant, reclamation, and landslide projects. The imagery for the sand proppant and REE projects are important for both the understanding of local stratigraphy and safety. Geologists have encountered numerous steep, high slopes, on several occasions that would be difficult to climb. The drone was used to observe from the top of the outcrop to see if any needed coals or sands were present. This enabled geologists' work to be completed much more efficiently and safely. Not all outcrops are reachable without repelling or climbing. In these cases, the drone can fly within 3-4 feet of the exposed rock. This allows geologists to view high quality images for accurately measuring section, have a deeper understanding of the local lithology, and to more accurately interpret local stratigraphy without sacrificing safety. The imagery obtained from the reclamation projects has been outstanding. The images have allowed geologists to view impacted sites from the air and to see progress in crop health (fig. 2).

For the past year, the NDGS has been partnering with the Materials and Research Department at the North Dakota Department of Transportation (NDDOT), providing them with drone imagery for various projects. The imagery assists them in looking at a larger scale for their geotechnical projects. The drone pictures also provide a good comparison to previous years of imagery from the National Agriculture Imagery Program and older stereoscopic images. The imagery has generated a fair amount of discussion on various projects between NDDOT engineers and NDGS geologists, as both sides see the scientific problems from different angles.

It is worth noting that the NDDOT was selected for the Federal Aviation Administration's (FAA) Unmanned Aircraft Systems (UAS) Integration Pilot Program (IPP). NDDOT is one of only ten organizations that were selected from around the country. This program will enable government agencies and companies to assist with FAA research and

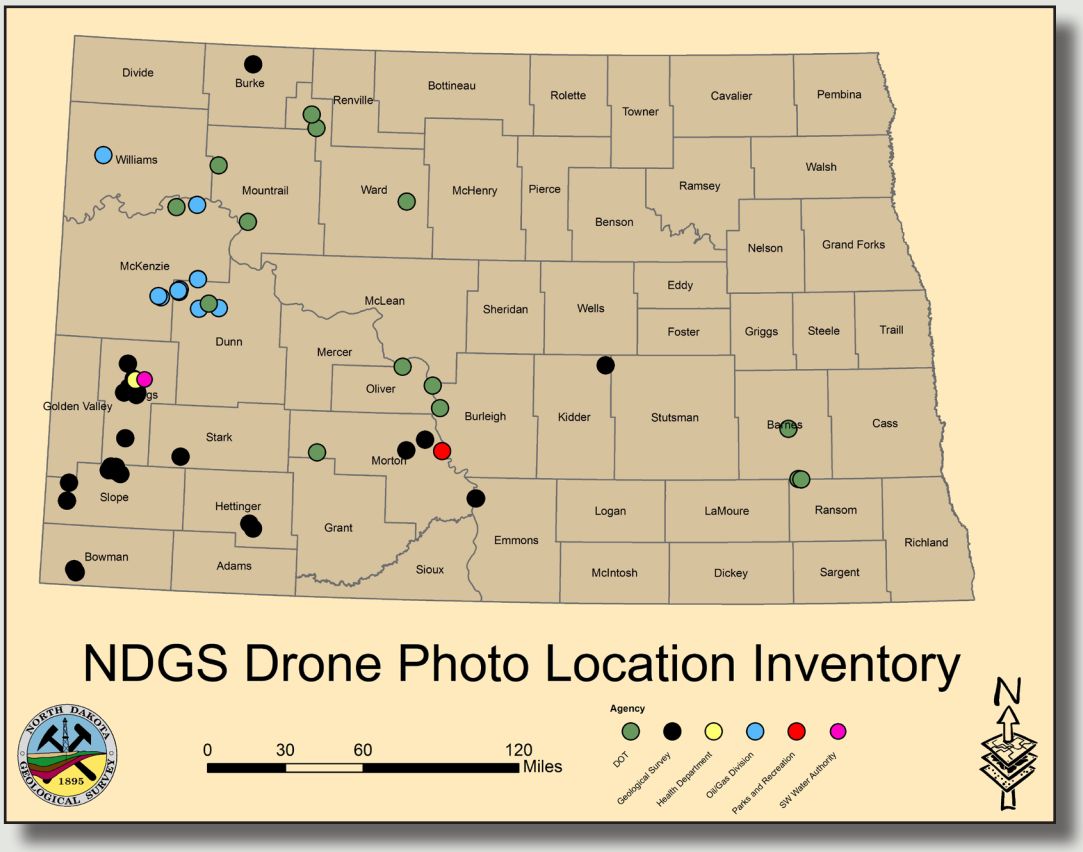


**Figure 1.** Map displaying the State of North Dakota where drone imagery has been acquired by the NDGS.

evaluate UAS for the potential implementation of new drone laws. These include operations such as flying over crowds, flying beyond the visual line of sight, remote package delivery, obstacle avoidance, and data security (FAA, 2018). For any questions regarding the NDDOT IPP Program please contact Russ Buchholz at rjbuchhholz@nd.gov.

To date, the NDGS has taken 6,431 photos and 69 videos with the drone. These images have played an important role in a variety of projects. In western North Dakota, a pipeline was unintentionally located within a landslide. The imagery acquired by the NDGS drone aided the operator and the Oil and Gas Division in re-routing their pipeline track to an alternative route (fig. 3). This is one of many examples how the technological advances can aid decision makers going forward.

This is a great time to be a geologist as there are many tools becoming available to make our jobs more efficient and safer. The NDGS will continue to use cutting-edge technology to assist in data collection and operations for future projects.

**Figure 2.** Reclamation site monitored by the NDGS in northwestern North Dakota. Notice how the green crops are starting to reclaim the site.

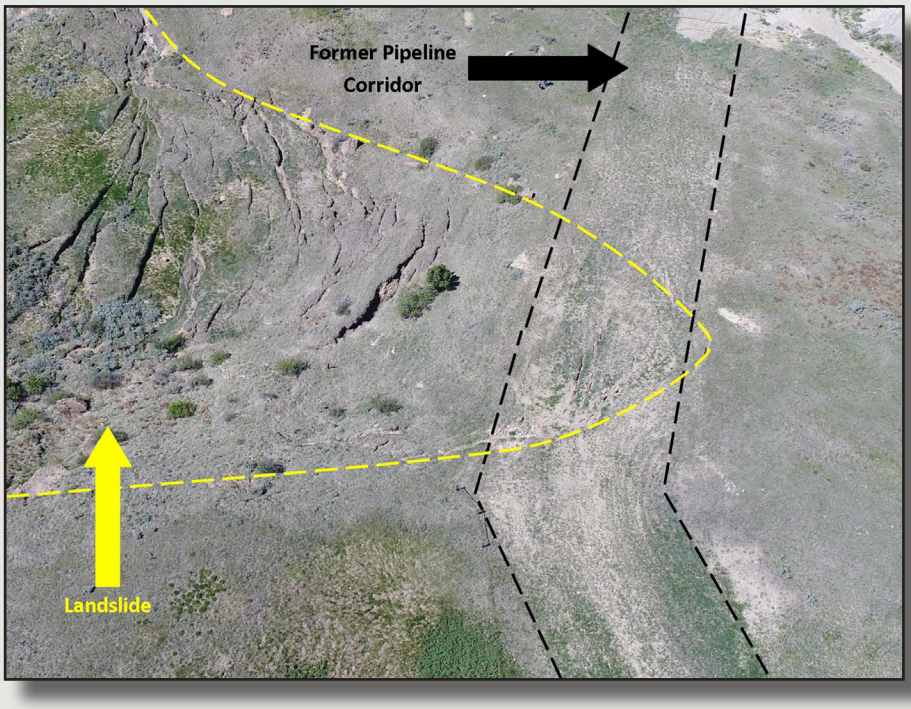


**Figure 3.** Former pipeline corridor in western North Dakota within a landslide.

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